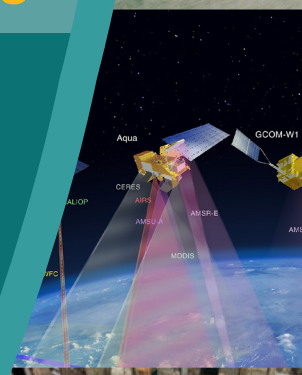
香港中文大學太空與地球信息科學研究所
INSTITUTE OF SPACE & EARTH INFORMATION SCIENCE CUHK

The 2nd International Conference on Remote Sensing Applications in Tropical and Subtropical Areas

第二届国际热带与亚热带遥感应用会议

8-10 December 2015

The Chinese University of Hong Kong



Guidebook

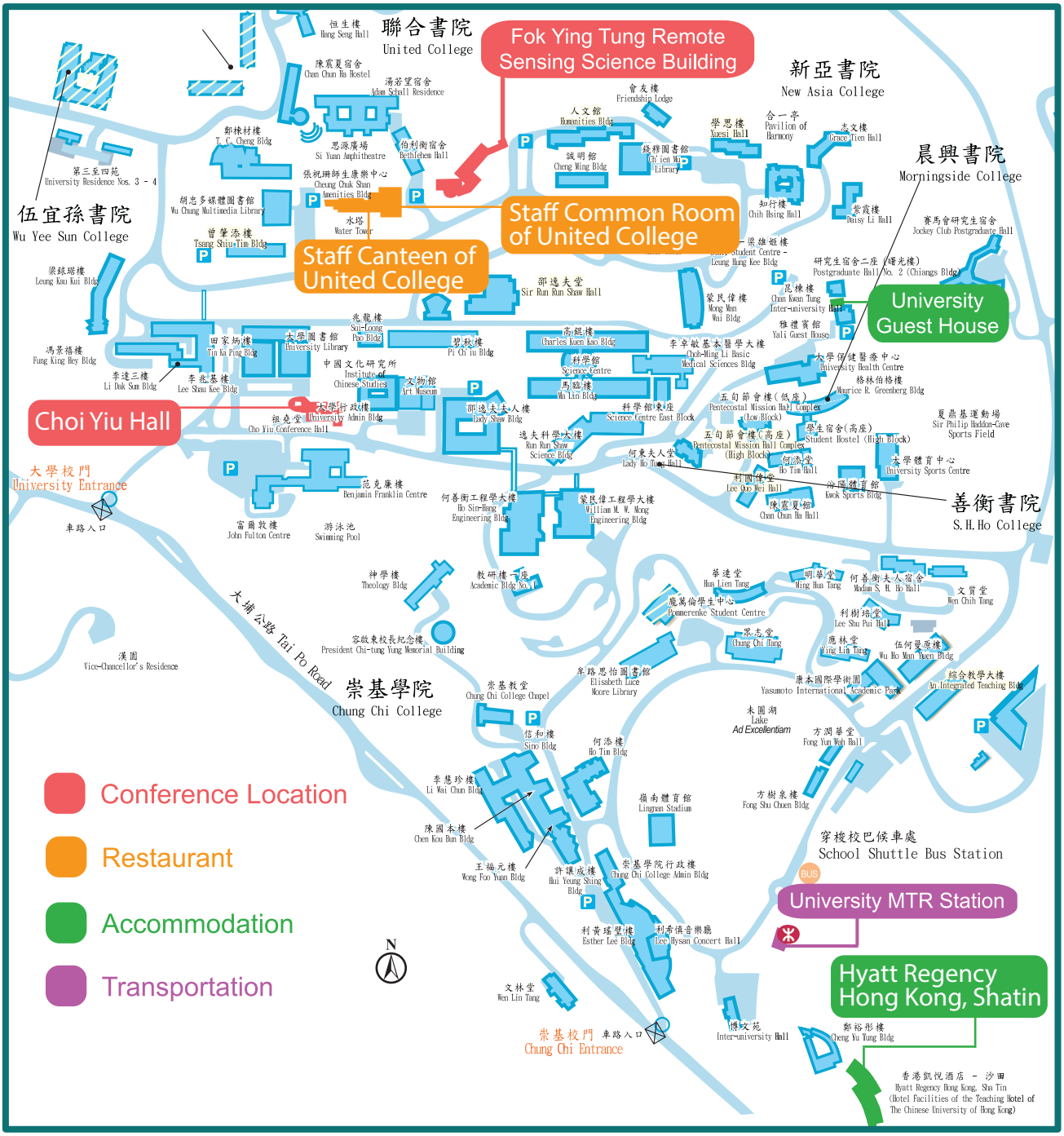
Organizers:

Sponsors:

Mr. Leung Hin Ting

Location Map

The Chinese University of Hong Kong



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Introduction

Compared to mid- and high-latitude areas, the tropical and subtropical region, due to its special climate, presents an all-year-round cloudy and rainy climate feature with a very long rainy season and rich precipitation even in short-term dry season. Besides, natural disasters, such as typhoon, earthquake, tsunami and flood, occur frequently in this region because of its special meteorological environment. Therefore, simple use of optical remote sensing will be greatly limited in tropical and subtropical region. Multi-source remote sensing techniques, e.g. synthetic aperture radar (SAR), with their ability to work in all day and all weather conditions, have distinctive advantages in this region. Unfortunately, most countries located in the tropical and subtropical region are developing countries, who are constrained by limited capability of remote sensing technologies. Therefore, there is an urgent need to establish a comprehensive platform for discussion and promotion of advanced remote sensing applications in this region.

The geographical environment in tropical and subtropical region is very complex, including complex meteorological, hydrological, topographic and ecological environment, which have brought great challenges for the remote sensing applications in this region. For instance, because of severe weathering, physical and chemical erosion, the topography in tropical and subtropical region is complex, such as the distinctive Danxia landform, karst landform, red weathering crusts and krasnozem. All these complex topography will result in problems of obvious shadow and buried structure on remote sensing images, which become a challenge in remote sensing monitoring. Additionally, complex topography, meteorological and hydrological environment are the cause of various natural disasters, such as karsts, landslides and debris flows, which make it more difficult for remote sensing application. Besides, the rapid urbanization put great pressures on the environment, such as the increase in atmospheric aerosol and water pollution, all of which pose a great challenge for the environmental remote sensing application in tropical and subtropical region.

To bridge the gap between great successes of remote sensing technology and challenging applications in tropical and subtropical region, this conference aims at providing facilitation and communication between experts from multidisciplinary domains so that they are able to discuss key issues about how to make full use of remote sensing technology to promote its comprehensive and effective applications in this region with a focus on the developing world.

Organizers

- Institute of Space and Earth Information Science, The Chinese University of Hong Kong
- National Remote Sensing Center for China
- Chinese National Committee for Remote Sensing
- Hong Kong Society for Remote Sensing, Hong Kong
- Key Laboratory of Poyang Lake Wetland and Watershed Research, Ministry of Education (Jiangxi Normal University)

Sponsors

- ChinaRS Geoinformatics Co.,Ltd
- FOK YING TUNG FOUNDATION LIMITED
- Mr. Leung Hin Ting
- Vastitude(Hong Kong) Technology Co.,Ltd

Committees

International Steering Committee

Honorary Chairmen:

Guanhua Xu	Chinese Academy of Sciences
Shunji Murai	Asia Association on Remote Sensing
Qingxi Tong	Chinese Academy of Sciences
Deren Li	Wuhan University

Chairman:

Huadong Guo	Chinese Academy of Sciences

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Jingming Chen	University of Toronto
Ian Dowman	University College London
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Bojie Fu	Research Center for Eco-Environmental Sciences, CAS
Tung Fung	The Chinese University of Hong Kong
Paolo Gamba	University of Pavia
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Peng Gong	Tsinghua University
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Xiuping Jia	University of New South Wales
Claudia Kuenzer	German Aerospace Center
Edwin Lai	Hong Kong Observatory
Qingquan Li	Shenzhen University
Zengyuan Li	Chinese Academy of Forestry
Shunlin Liang	University of Maryland
Xiaohan Liao	National Remote Sensing Center of China
Yui-An Liou	National Central University
Delu Pan	Second Institute of Oceanography, State Oceanic Administration
G. Pandithurai	Indian Institute of Tropical Meteorology, Pune
Stuart Phinn	University of Queensland
Fabio Rocca	Politecnico di Milano
Jiancheng Shi	Institute of Remote Sensing and Digital Earth, CAS
Chih-Hong Sun	National Taiwan University
Yeqiao Wang	The University of Rhode Island
Qihao Weng	Indiana State University
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Chenghu Zhou	Institute of Geographic Sciences and Natural Resources Research, CAS

Committees

Programme Committee

Co-Chairperson:

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Kohei Cho	Asia Association on Remote Sensing

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Jun Li	Sun Yat-Sen University
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Dengsheng Lu	Michigan State University
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Chao Wang	Institute of Remote Sensing and Digital Earth, CAS
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Lixin Wu	China University of Mining and Technology
Qiming Zeng	Peking University
Liangpei Zhang	Wuhan University

Committees

Local Organizing Committee

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Hui Lin	The Chinese University of Hong Kong
Bo Huang	The Chinese University of Hong Kong

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Rongrong Li	The Chinese University of Hong Kong
Jiayi Pan	The Chinese University of Hong Kong
Bo Wu	The Hong Kong Polytechnic University
Hongsheng Zhang	The Chinese University of Hong Kong

Programme Coordinator

Hongsheng Zhang	The Chinese University of Hong Kong

Conference Secretariat

Chloris Yip	The Chinese University of Hong Kong
Wendy Wong	The Chinese University of Hong Kong

Speakers

Pre-conference Workshop Invited Speakers:

Prof. Armin Gruen

Professor
Institute of Conservation and Building Research ETH-Hoenggerberg

Speech Title 1: *Multi-sensor Approaches in Liveable City Modeling*
Speech Title 2: *Moorea Avatar – Physical Ecosystem Modeling of a Tropical Island*

Prof. Deren Li

Professor
Wuhan University

Speech Title 1: *Big Data in Smart City*
Speech Title 2: *Earth Observation Technology and Digital Ocean, Coast Zone and Harbor*

Prof. Shunji Murai

Professor
University of Tokyo

Speech Title 1: *New Approach for the Prediction of Earthquakes using GNSS Data and its Validation*
Speech Title 2: *Proposal of Weather Monitoring System with Fish-eye Camera*

Conference Keynote Speakers:

Prof. Peng Gong

Professor
Tsinghua University

Speech Title : *Global Land Cover Mapping over theTropics*

Prof. Huadong Guo

Director-General
Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences

Speech Title : *Lunar-based Earth Observation for Large Scale Geoscience Phenomena*

Speakers

Prof. Bo Huang
Professor
The Chinese University of Hong Kong

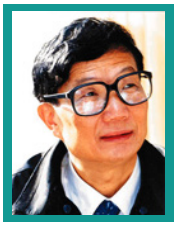
Speech Title : *Unified Satellite Image Fusion for Urban Environmental Monitoring*

Mr. Edwin Lai
Assistant Director
Hong Kong Observatory

Speech Title : *Typhoons - the Good, the Bad and the Ugly*

Prof. Delu Pan
Professor
State Key Laboratory of Satellite Ocean Environment DynamicsSecond Institute of Oceanography, State Oceanic Administration

Speech Title : *Air-sea CO2 Flux Satellite Remote Sensing in China*



Prof. Fabio Rocca
Professor
Politecnico di Milano

Speech Title : *Airborne and satellite SAR tomography: a tool to investigate forest and glaciers structures*

Prof. Danling Tang
Professor
South China Sea Institute of Oceanology, Chinese Academy of Sciences

Speech Title : *Marine Ecosystems Respond to Environmental Changes- Observations from Satellite*

Prof. Yeqiao Wang
Professor
The University of Rhode Island

Speech Title : *Integrated Monitoring of Ecological Security in Changing Environments - a Reflection from the Poyang Lake*

Conference Information

Location

Conference Venue

- **Cho Yiu Hall, University Administration Building, The Chinese University of Hong Kong (CUHK)**
  8 December 2015 (Morning)
- **Room 303 and Room 305, Fok Ying Tung Remote Sensing Science Building, CUHK**
  8 December 2015 (Afternoon) - 10 December 2015

Common Area

- **Room 304 and Room 305, Fok Ying Tung Remote Sensing Science Building, CUHK**
  8 December 2015 (Afternoon) - 10 December 2015

Lunches

- **Staff Common Room of United College, 3/F, Cheung Chuk Shan Amenities Building, CUHK**
  8 - 9 December 2015
- **Staff Canteen of United College, CUHK**
  10 December 2015

Dinner

- **Regency Ballroom, Hyatt Regency Hong Kong Shatin, 18 Chak Cheung Street, Shatin, Hong Kong**
  8 December 2015

Language

The official language of presentation is English.

Name Badge

Please wear the conference name badges for identification during the conference period.

Smoking

Smoking is *strictly forbidden* in the whole CUHK campus.

Mobile Phone

As a courtesy to other participants and presenters, please ensure that all mobile device(s) is/are turned off or is/are in *"SILENT"* mode during the sessions.

Secretariat

Chloris Yip and Wendy Wong

Institute of Space and Earth Information ScienceFok Ying Tung Remote Sensing Science Building,
The Chinese University of Hong Kong, Shatin, Hong Kong
Tel: (852) 3943 6538 / 3943 4082

Shuttle Bus

8 December 2015 (Tuesday)			
From	To	Departure Time*	Assembly Point
Royal Park Hotel	Cho Yiu Hall	8:10am	Main Lobby of Royal Park Hotel
University Guest House	Cho Yiu Hall	8:30am	Outside Chan Kwan Tung Building
Hyatt Regency HK Shatin	Cho Yiu Hall	8:40am	Main Lobby of Hyatt Hotel
Cho Yiu Hall	Staff Common Room of United College	After the end of morning session	Outside Cho Yiu Hall
Fok Ying Tung Remote Sensing Science Building	Hyatt Regency HK Shatin	After program	Outside Fok Ying Tung Remote Sensing Science Building
Hyatt Regency HK Shatin	University Guest House and Royal Park Hotel	After banquet	Outside the Hyatt Regency Ballroom

9 December 2015 (Wednesday) and 10 December 2015 (Thursday)			
From	To	Departure Time*	Assembly Point
Royal Park Hotel	Fok Ying Tung Remote Sensing Science Building	8:50am	Main Lobby of Royal Park Hotel
University Guest House	Fok Ying Tung Remote Sensing Science Building	9:10am	Outside Chan Kwan Tung Building
Hyatt Regency HK Shatin	Fok Ying Tung Remote Sensing Science Building	9:10am	Main Lobby of Hyatt Hotel
Fok Ying Tung Remote Sensing Science Building	University Guest House, Hyatt Regency HK Shatin and Royal Park Hotel	After program	Outside Fok Ying Tung Remote Sensing Science Building

Programme

Pre-conference Workshop

7 December 2015 (Monday)	
Venue: Room 303, Fok Ying Tung Remote Sensing Science Building, The Chinese University of Hong Kong	
08:45 - 09:15	Registration
09:15 - 09:30	Welcome and Introduction by Prof. Hui Lin
Geo-spatial Technologies for Sustainable Cities Chair: Prof. Hui LIN	
09:30 - 10:30	**Big Data in Smart City** by Prof. Deren LI - Wuhan University
10:30 - 11:00	Tea Break
11:00 - 12:00	**Multi-sensor Approaches in Liveable City Modeling** by Prof. Armin GRUEN - Institute of Conservation and Building Research, ETH-Hoenggerberg
12:00 - 13:30	Lunch (Venue: Staff Canteen of United College, CUHK)
Landscape and Seascape Modeling Chair: Prof. Bo HUANG	
13:30 - 14:30	**Earth Observation Technology and Digital Ocean, Coast Zone and Harbor** by Prof. Deren LI - Wuhan University
14:30 - 15:00	**Moorea Avatar – Physical Ecosystem Modeling of a Tropical Island** by Prof. Armin GRUEN - Institute of Conservation and Building Research, ETH-Hoenggerberg
15:00 - 15:30	Tea break
Earthquake Prediction and Weather Monitoring Chair: Dr. Hongsheng ZHANG	
15:30 - 17:00	**New Approach for the Prediction of Earthquakes using GNSS Data and its Validation** by Prof. Shunji MURAI - University of Tokyo
17:00 - 17:30	**Proposal of Weather Monitoring System with Fish-eye Camera** by Prof. Shunji MURAI - University of Tokyo

Conference

8 December 2015 (Tuesday)		
Venue: Cho Yiu Hall, University Administration Building, The Chinese University of Hong Kong (CUHK)		
08:30 - 09:00	Registration	
09:00 - 09:30	Opening Ceremony and Group Photo Taking	
09:30 - 09:50	Tea Break	
	Keynote Addresses (1) Chair: Prof. Hui LIN	
09:50 - 10:40	**Keynote Speech 1** **Airborne and satellite SAR tomography: a tool to investigate forest and glaciers structures** Prof. Fabio ROCCA - Politecnico di Milano	
10:40 - 11:30	**Keynote Speech 2** **Marine Ecosystem Respond to Environmental Changes-Observations from Satellite** Prof. Danling TANG - Sourth China Sea Institute of Oceanology, Chinese Academy of Sciences	
11:30 - 12:20	**Keynote Speech 3** **Lunar-based Earth Observation for Large Scale Geoscience Phenomena** Prof. Huadong GUO - Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences	
12:20 - 14:00	Lunch (Venue: Staff Common Room of United College, 3/F, Cheung Chuk Shan Amenities Building, United College, CUHK)	
	Session 1 Atmosphere / Urban Environment (1) Chair: Prof. Yong WANG	Session 2 Land Use/Land Cover Change (1) Chair: Prof. Xiangming XIAO
	Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK	Venue: Rm 305, Fok Ying Tung Remote Sensing Science Building, CUHK
14:00 - 14:15	**538: Troposphere Carbon Monoxide Over Middle East Using MOPITT Retrievals And MERRA Winds Observations** Dr. Hwee San LIM - Universiti Sains Malaysia (USM)	**559: Quality Assessment and Application Analysis of TanDEM-X IDEM** Ms. Yuting DONG - State Key Lab. of Info. Eng. in Surveying, Mapping and Remote Sensing, Wuhan University
14:15 - 14:30	**543: Atmospheric Path Radiation Remote Sensing Image of Typical Areas in China** Prof. Xianhua LI - Research Center of Remote Sensing and Spatial Information Science, Shanghai University	**580: Retrieval of forest above ground biomass using Random KNN model** Ms. Chunmei LI - Institute of Forest Resources Information Techniques, Chinese Academy of Forestry
14:30 - 14:45	**631: Spatiotemporal distribution and variation of the aerosol and driving factors in Guangdong by remote sensing and statistics** Dr. Lili LI - Guangzhou Institute of Geochemistry, Chinese Academy of Sciences	**548: Automated artificial eucalyptus tree crown detection using JSEG multiple-scale image segmentation and near infrared camera onboard UAV platform** Mr. Jun KANG - Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences

Programme

14:45 - 15:00	**614: Urban Environment Change Detection by Employing Object-Based Approach – Using Taipei Metropolitan Area as an Example** Mr. Chih-Ping Peng - Chaoyang University of Technology	**549: Mapping bamboo forests in Zhejiang Province from 2000 to 2014 using Landsat time-series** Ms. Mengna LI - Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences
15:00 - 15:15	**644: Comparison of Algorithms to Remove Clouds Using a Single Optical Dataset** Prof. Yong WANG - University of Electronic and Science Technology of China	**603: Mapping forests and plantations in tropical and subtropical Asia through analysis of optical and microwave images during 2007-2010** Prof. Xiangming XIAO - University of Oklahoma
15:15 - 15:30	Tea Break	
	Session 3 **Vietnam Special Session** **Chair: Prof. Bui Quang HUNG**	**Session 4** **Land Use/Land Cover Change (2)** **Chair: Dr. Ting WANG**
	Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK	**Venue: Rm 305, Fok Ying Tung Remote Sensing Science Building, CUHK**
15:30 - 15:45	**636: Air pollution mapping from high spatial resolution satellite images: a case study in Hanoi** Mr. Hung LUU - University of Engineering and Technologies, Vietnam National University	**542: Remote sensing and mapping of land use in hilly area of central Sichuan by using Domestic Airborne Synthetic Aperture Radar** Prof. Xianhua LI - Research Center of Remote Sensing and Spatial Information Science, Shanghai University
15:45 - 16:00	**639: Comparison of several widely-used classifiers for land-cover using Landsat-8 images in Red Delta River: a case study in Tien Hai district, Thai Binh province, Vietnam** Mr. Chuc MAN DUC - Center of Multidisciplinary Integrated Technologies for Field Monitoring, University of Engineering and Technology, Vietnam National University	**620: Comparison of Land Use and Land Cover Change between in Sichuan Province and in Chengdu District, China** Dr. Zezhong ZHENG - University of Electronic Science and Technology of China
16:00 - 16:15	**618: Paddy rice extraction by using temporal satellite image and similarity index** Mr. Pham NGOC HAI - Center of Multidisciplinary Integrated Technologies for Field Monitoring (FIMO), University of Engineering and Technology, Vietnam National University	**569: Hyperspectral Image Classification Based on Morphological Feature Coding with Dictionary Learning** Mr. Zhe-zheng WANG - Nanjing University
16:15 - 16:30	**643: Spatio-temporal Analysis of Urban Growth in the Hanoi city (Vietnam) for the 1993-2013 period using Remotely Sensed Data and Selected Soft Computing Classifiers** Ms. Thu-huong LUONG - LEMA, Faculty of Applied Sciences. University of Liege, Belgium	**570: IRS Snow Products and Snow Prediction using MODIS Snow Cover Maps** Prof. Yan ZHOU - School of Resources and Environment, University of Electronic and Science Technology of China

16:30 - 16:45	**641: Development of a method for urban land-cover classification in Vietnam** Mr. Pham Tuan DUNG - Center of Multidisciplinary Integrated Technology for Field Monitoring, University of Engineering and Technology, Vietnam National University	**632: Land Use/ Land Cover Change and Its Effects on Water Quality in Xin'An River Basin During Last 10 Years** Ms. Ying WANG - Institute of Urban Environment, Chinese Academy of Sciences
16:45 - 17:00		**612: Spatio-Spectral Feature Based Species Classification Of Mangroves in Mai Po Nature Reserve from Worldview-3 Imagery** Dr. Ting WANG – Institute of Space and Earth Information Science, The Chinese University of Hong Kong
17:00 - 17:40	**Panel Discussion** **Remote sensing applications in tropical and subtropical areas: challenges and opportunities** Panelist: Prof. Huadong GUO, Prof. Peng GONG, Prof. Bui Quang HUNG, Prof. Fabio ROCCA and Prof. Xiangming XIAO	
18:00 - 21:00	**Welcome Dinner** (Venue: Regency Ballroom, Hyatt Regency Hong Kong Shatin, 18 Chak Cheung Street, Shatin, Hong Kong) **- 18:00-18:30: Reception** **- 18:30-21:00: Dinner**	

9 December 2015 (Wednesday)	
Keynote Addresses (2) **Chair: Prof. Yeqiao WANG**	
Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK	
09:30 - 10:20	**Keynote Speech 4** **Global Land Cover Mapping over the Tropics** Prof. Peng GONG - Center for Earth System Science , Tsinghua University
10:20 - 10:40	**Tea Break**
10:40 - 11:30	**Keynote Speech 5** **Unified Satellite Image Fusion for Urban Environmental Monitoring** Prof. Bo HUANG – Institute of Space and Earth Information Science, The Chinese University of Hong Kong
11:30 - 12:20	**Keynote Speech 6** **Typhoons - the Good, the Bad and the Ugly** Mr. Edwin LAI- Hong Kong Observatory
12:20 - 14:00	**Lunch** **(Venue: Staff Canteen of United College, CUHK)**

Programme

	Session 5 Atmosphere / Urban Environment (2) Chair: Prof. Mingsheng LIAO	Session 6 Oceanography / Coastal Environment (1) Chair: Prof. Danling TANG
	Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK	Venue: Rm 305, Fok Ying Tung Remote Sensing Science Building, CUHK
14:00 - 14:15	**605: Object-based data fusion for land cover classification using high-resolution SAR and optical images in Thailand** Ms. Chanika SUKAWATTANAVIJIT - Beihang University	**564: Observation of typhoon eye and rainband-related features using multi-sensors** Ms. Shui YU - Second Institute of Oceanography, State Oceanic Administration Ocean College, Zhejiang University
14:15 - 14:30	**610: Degradation of Nyainqentanghla Glacier and its supplying to Nam Co Lake's level rising** Mr. Gang LI - Institute of Space and Earth Information Science, The Chinese University of Hong Kong	**544: Ecological effects of artificial reefs in Guangdong coastal waters, China - satellite and in situ observations** Dr. Jing YU - South China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences
14:30 - 14:45	**530: Three Dimensional Displacement Retrieval with Two Desecending TerraSAR-X Datasets** Prof. Mingsheng LIAO - State Key Lab. of Info. Eng. in Surveying, Mapping and Remote Sensing, Wuhan University	**581: Estimation of the sea surface salinity during typhoon from observations of SMOS and WindSat satellites** Dr. Zhongbiao CHEN - Nanjing University of Information and Science and Technology
14:45 - 15:00	**651: Spatial patterns of vegetation succession in degraded tropical landscape of Hong Kong** Mr. Sawaid ABBAS - Department of Land Surveying and Geo-Informatics, The Hong Kong Polytechnic University	**604: Analysis on Compact Polarimetric SAR Features for Oil Slicks Detection** Dr. Yu LI - Institute of Space and Earth Information Science, The Chinese University of Hong Kong
15:00 - 15:15		**534: Optical properties and spatial distribution of chromophoric dissolved organic matter in typical waters of Poyang Lake** Mr. Jian XU - Jiangxi Normal University
15:15 - 15:30	Tea Break	
	Session 7: Atmosphere/Urban Environment (3) Chair: Prof. Liming JIANG	
	Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK	
15:30 - 15:45	**649: Antarctic ice shelf dynamics detection using long-term satellite remote sensing data** Prof. Xiao CHENG – Beijing Normal University	
15:45 - 16:00	**607: The Sensitivity Study of Rainfall to Land Surface Models over Complex Topography** Dr. Shahzad SULTAN - Institute of Space and Earth Information Science, The Chinese University of Hong Kong, Hong Kong	
16:00 - 16:15	**537: Study of Tropospheric Aerosol Distribution In Penang Island, Malaysia Using a Ground-Based Backscatter Lidar System** Dr. Hwee San LIM - Universiti Sains Malaysia (USM)	

16:15 - 16:30	**625: Research on advanced multi-temporal radar interferometry methods for petroleum reservoir subsidence surveillance** Mr. Jie CHEN - Institute of Space and Earth Information Science, The Chinese University of Hong Kong, Hong Kong
16:30 - 16:45	**647: Tianjin Land Surface Subsidence Monitoring by Using PS-DS Combined Adjustment MTInSAR Technology** Dr. Tao LI - Satellite Surveying and Mapping Application Center
16:45- 17:00	**627: Monitoring ground deformation in Wuhan urban area with High-resolution TerraSAR-X images** Prof. Liming JIANG - Institute of Geodesy and Geophysics, Chinese Academy of Sciences

10 Dec 2015 (Thursday)

Keynote Addresses (3)
Chair: Prof. Bo HUANG

Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK

09:30 - 10:20	**Keynote Speech 7** **Air-sea CO2 Flux Satellite Remote Sensing in China** Prof. Delu PAN - State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration
10:20 - 10:40	**Tea Break**
10:40 - 11:30	**Keynote Speech 8** **Integrated Monitoring of Ecological Security in Changing Environments - a Reflection from the Poyang Lake** Prof. Yeqiao WANG - Department of Natural Resources Science , The University of Rhode Island The Chinese University of Hong Kong
11:30 - 12:20	**Panel Discussion** Oceanography and coastal environment monitoring in tropical and subtropical areas: challenges and opportunities Panelist: Prof. Delu PAN, Prof. Dangling TANG and Prof. Yeqiao WANG
12:20 - 14:00	**Lunch** **(Venue: Staff Canteen of United College, CUHK)**

	Session 8 Oceanography/Coastal Environment (2) Chair: Prof. Yun SHAO	Session 9 Natural Disasters Chair: Dr. Hongshuo WANG
	Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK	Venue: Rm 305, Fok Ying Tung Remote Sensing Science Building, CUHK
14:00 - 14:15	**608: Oil spill distribution mapping and analysis based on satellite remote sensing and GIS: A case study in the Bohai Sea and the north of the Yellow Sea** Dr. Lei BING - Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences	**648: ESCAP's work on promoting regional cooperation in space applications for disaster risk reduction in Asia and the Pacific** Mr. Keran WANG - United Nations ESCAP

Programme

14:15 - 14:30	**609: A spatial and temporal model with auto-regression error correction** Ms. Jing WANG - Institute of Space and Earth Information Science, The Chinese University of Hong Kong	**554: Deformation Mechanism Analysis of Landslide in Reservoir Coupling Time-series SAR Results with Water Level Variation and Rainfall** Dr. Yanan JIANG -State Key Lab. of Info. Eng. in Surveying, Mapping and Remote Sensing, Wuhan University
14:30 - 14:45	**571: Wetlands classification mapping and seasonal transformation analysis in Nanjishan Wetland National Nature Reserve using Gaofen One remote sensing data** Ms. Zhanghua TAO - Jiangxi Normal University	**619: Drought Monitoring in The Middle Reach of Yangtze River Based On Modis** Dr. Zezhong ZHENG - University of Electronic Science and Technology of China
14:45 - 15:00	**568: Capability of C-Band Polarimetric Information to Assess Sugarcane Lodging Caused by Typhoon** Dr. Hongzhong LI - Shenzhen University	**621: The application of a new ant colony algorithm in emergency rescue** Dr. Zezhong ZHENG - School of Resources and Environment, University of Electronic Science and Technology of China
15:00 - 15:15	**545: A modified water cloud model considering volume fraction for rice biophysical parameters estimation with polarimetric SAR** Prof. Yun SHAO - Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences	**645:Monitoring Vegetation Responses to Drought with Meteorological and Remotely Sensed Drought Indices** Dr. Hongshuo WANG - College of Information and Electrical Engineering, China Agricultural University
15:15 - 15:35	**Tea Break**	

Session 10: Oceanography/Coastal Environment (3)
Chair: Dr. Hongsheng ZHANG

Venue: Rm 303, Fok Ying Tung Remote Sensing Science Building, CUHK

15:35 - 15:50	**650: A Study of Engineering Applications of Space-borne SAR Data in Tropical and Subtropical Regions** Ms. Qiong HU - Vastitude(Hong Kong) Technology Co.,Ltd
15:50 - 16:05	**617: Dimensionality Reduction of Hyperspectral Image by Manifold Learning** Dr. Zezhong ZHENG - University of Electronic Science and Technology of China
16:05 - 16:20	**646: Object-Based Extraction of Wetland Information Using VHR Imagery** Dr. Lifan ZHOU - Changshu Institute of Technology
16:20 - 16:35	**623: Mangrove Species Classification with Very High Resolution Satellite Images** Dr. Hongsheng ZHANG - Institute of Space and Earth Information Science, The Chinese University of Hong Kong
16:35 - 17:00	**Closing session**

Session 1

538:
Troposphere Carbon Monoxide Over Middle East Using MOPITT Retrievals And MERRA Winds Observations

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The aim of the present study is to investigate the variability of the tropospheric carbon monoxide (CO) over eastern Mediterranean (EM) and Iraq by using observations carried out by satellite-borne instrumentations, the Measurements of Pollution in the Troposphere (MOPITT) and the Modern Era Retrospective-Analysis for Research and Applications (MERRA). Measurements of CO and wind from dispersed seven sites in the study area were analyzed to study the troposphere variations of CO. The seasonal variation in the troposphere CO fluctuated considerably observed between winter and summer seasons. The mean and the standard deviation of monthly CO was (81.729 ± 23.9 ppbv) for the entire period (from January 2010 to December 2011). This is due to the various activities of both eastward and northward winds. The greater draws down of the CO values were observed over pristine coasts environment on February (57.79 ppbv) at Iskenderun, and a highest CO occurred on July (105.67 ppbv) at Beirut. Furthermore, the elevation in CO values can be observed throughout the year over the regions lower of the Latitude 32°. The monthly CO VMR maps for 2011 were generated using Kriging Interpolation technique. The result shows that the CO observation by MOPITT is providing meaningful information for different altitude layers closer to the troposphere, and the Satellite measurements are able to measure the increase of the atmosphere CO concentrations over different regions.

Keywords- MOPITT; Carbon monoxide; Satellite measurements

543:
Atmospheric Path Radiation Remote Sensing Image of Typical Areas in China

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In this study, the atmospheric path remote sensing radiation image which was independent of the ground and capable to characterize the regional atmospheric conditions was computed by the remote sensing image and its matched ground spectral reflectance. In particular, the typical atmospheric path radiation remote sensing image of China was of great significance for developing new methods of atmospheric environment, constructing and exploring spatial and temporal spatial distributions and detections of PM2.5-10 content in the typical region of China. And it was a priority for the national economy and people's livelihood and meet the major needs of the country.

The principle of atmospheric path remote sensing radiation image, and image process technology to produce atmospheric path image were studied. The series of atmospheric path radiation images in typical districts in China were generated and air pollution monitoring based on the atmospheric path radiation images were explored. These results provide theoretical and technical preparation and foundation to apply atmospheric path radiation to air pollution monitor system.

Abstracts

631:
Spatiotemporal distribution and variation of the aerosol and driving factors in Guangdong by remote sensing and statistics

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As the most developed province in China, Guangdong experiences unprecedented rapid economic growth and population explosion in the past three decades, with concomitant severe air pollution. Increasing haze days and deteriorating air quality, greatly impairing the health of the population and the visibility over the region, have drawn widespread attention from the government and the public. Spatio-temporal variations of AOT in Guangdong have attracted worldwide attention in recent years. What determines the aerosol distribution in Guangdong? Are there natural and/or anthropogenic factors? These questions are still under debate. For exploring the driving factors of aerosols in Guangdong, this paper analyzes the spatio-temporal variation of AOT over Guangdong Province using MODIS-retrieved aerosol data from 2010 to 2012. Considering atmospheric aerosols arise from natural sources as well as anthropogenic activities, we selected both natural and social-economic factors including Normalized Difference Vegetation Index (NDVI), elevation, urbanized land fraction, and several socio-economic variables. Linear regression and self-organizing maps (SOM) are used to investigate the relationship between AOT and its affecting factors. Results show that the highest values of τ0.55 mainly occur over the rapidly-developing Pearl River Delta (PRD) region and the eastern coast. Seasonal averaged AOT is highest in summer (0.416), followed by spring (0.351), winter (0.292), and autumn (0.254). From unary linear regression and SOM analysis, AOT is shown to be strongly negatively correlated to NDVI (R2=0.782) and elevation (R2=0.731), and positively correlated with socio-economic factors, especially GDP, industry and vehicle density (R2 above 0.73), but not primary industry. Multiple linear regression between AOT and the contributing factors shows much higher R2 values (>0.8), indicative of the clear relationships between AOT and variables. This study illustrates that human activities have strong impacts on aerosols distribution in Guangdong Province. Economic and industrial developments, as well as vehicle density, are the main controlling factors on aerosol distribution, which emphatically points to the significance and necessity of reforestation, industrial pollution prevention, and strict emission controls on vehicles.

614:
Urban Environment Change Detection by Employing an Object-Based Approach – Using the Taipei Metropolitan Area as an Example

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A metropolitan area is usually defined as a region consisting of a densely populated urban core and its less-populated surrounding territories. In Taiwan, almost one-third of the population has come to live in the Taipei metropolitan area, such that the area's urban environment has experienced significant changes. The normalized difference vegetation index, NDVI, is used to record the distribution of vegetation surrounding urban areas at a particular period. With the migration of people toward urban areas, the vegetation distribution surrounding these areas will be decreased. This paper proposes an approach for examining the vegetation conditions to evaluate the urban environment changes by calculating the areas occupied by plants in different years. In doing so, the urban environment can be monitored constantly such that the government can develop more effective urban planning to better distribute the burgeoning population. Segmentation plays a fundamental role in human perception. In this respect, segmentation can called the process of transforming a collection of pixels in an image into a group of regions or objects with meaning. This paper proposes an algorithm based on total variation within an image to segment the normalized difference vegetation index, NDVI, of urban areas into several sub-regions, and to ensure that the NDVI distribution in each sub-region is homogeneous. Those regions whose values of NDVI are close will be merged into the same class. In doing so, a complex NDVI map can be simplified into two classes, corresponding to high and low NDVI values. The class with low NDVI values corresponds to those regions containing roads, buildings, and other manmade construction, whereas the class with high NDVI values denotes regions that contain vegetation in good health. Processing using the algorithm generates objects with low or high NDVI values: by comparing the generated objects in different years, changes in the urban environment can be located and quantified.

Partial differential equations (PDE) and total variation techniques have been widely employed in image processing, especially in segmentation. However, such approaches seem to produce over-smoothed results such that blurred results are introduced in the segmentation. In this paper, the authors employ a total-variation-based algorithm with an iteration scheme to segment NDVI maps generated in different years. The total variation measure can retain the image details without losing texture and edge information. In order to verify the processed results, the regional boundaries are extracted and laid down on the given images to check whether the extracted boundaries fall on buildings, roads, or other artificial constructions. In addition to the proposed approach, another approach called statistical region merging is employed, whereby sets of pixels with homogeneous properties are grouped such that those sets are iteratively grown by combining smaller regions or pixels. In doing so, image segmentation can be treated as a statistical inference problem and coarse-to-fine segmentations can be generated.

The satellite imagery of the Landsat series is employed to evaluate the performance of the proposed approach. The satellite imagery of Taipei Metropolitan Area—which covers Taipei, New Taipei City, and Keeling City—is chosen to evaluate environmental changes between 1984 and 2014. The series of change maps generated show that patches of land with a high density of green have significantly decreased. Furthermore, the change maps created by statistical region merging generate similar processed results to the proposed approach. Furthermore, in image processing, non-local operators can be widely used to find optimal approximations in image processing. In this paper, the authors attempt to employ non-local operations in image segmentation, and the results of the experimental evaluation demonstrate that it is possible to apply a non-local operator in image segmentation, and indeed this modified approach provides even better texture information in NDVI maps. By implementing the proposed algorithm using finite difference operations, this method offers an efficient and stable approach to numerical solution.

Keywords: Change Detection; Image Segmentation; NDVI

Subject classification codes: Remote Sensing

Abstracts

644:
Comparison of Algorithms to Remove Clouds Using a Single Optical Dataset

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Four types of algorithms to remove clouds in optical data were studied. They were the homomorphic filtering, replacement, independent component analysis (ICA), and radiative transfer model (RTM) algorithms. To assess the performance of each algorithm qualitatively and quantitatively, we analyzed a subimage of Landsat-8 acquired on 6 May 2015. The subimage was near Virginia Beach, Virginia (VA), USA. The primary landuse and land cover types were water, vegetation, urban and bare soil. Visually, clouds disappeared after each algorithm was applied to the subimage. Although results in cloud removal varied quantitatively when compared to the reference image acquired on 22 May 2015, the ICA algorithm might be favorite for removing clouds over water, vegetation, and urban areas. The homomorphic filtering algorithm should be preferred when cloud removal over bare soil was desired.

Keywords: Cloud and cloud removal algorithms, homomorphic filtering, replacement, ICA, RTM.

Session 2

559:
Quality Assessment and Application Analysis of TanDEM-X IDEM

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The primary goal of TanDEM-X mission is to generate a global, high precision digital elevation model (DEM) with single-pass bistatic SAR interferometry in a period of 3~4 years' time, which has a nominal relative vertical accuracy in the order of two2 meters. TanDEM-X Intermediate DEM (IDEM) was produced from the first year's single-baseline observation data and thus inevitably contains phase unwrapping errors and data voids. In this paper we evaluated the accuracy of IDEM over Henan province which is a mountainous area in Henan Province of central China. Experimental results show that for 12 m IDEM of 12 m resolution, its absolute vertical and horizontal accuracy can meet the accuracy specification of TanDEM-X and relative vertical accuracy is very close to nominal relative vertical measurement accuracy of TanDEM-X mission. Finally, we carried out a case study of quarry surface change detection and quarrying volume estimation to demonstrate the potential application of IDEM data.

Keywords: IDEM; quality assessment; quarrying volume estimation

Subject classification codes: P23

580:
Retrieval of forest above ground biomass using Random KNN model

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Forest is an important component of terrestrial ecosystems, so it is necessary to estimate the forest aboveground biomass (AGB) accurately in order to reduce the uncertainty of the carbon stock in forest ecosystem. The use of multi-mode remote sensing data to estimate forest above ground biomass (AGB) is faithful but challenging. The estimation of forest AGB of Genhe forest reserve was conducted using Landsat 8 OLI image, P-band PolSAR image and ASTER GDEM product based on Random KNN (RKNN) model. Based on the leave-one-out (LOO) cross-validation, the results of RKNN showed its power in quantitative retrieval of forest AGB by combining the multi-source remote sensing data, with R2=0.68 and RMSE=26.55t/ha, which outperformed the results obtained from the single-sensor with R2=0.59 and RMSE=27.17t/ha.

Key words: Multi-mode; High dimensional forest above-ground biomass(AGB); Random KNN;

548:
Automated artificial eucalyptus tree crown detection using JSEG multiple-scale image segmentation and near infrared camera onboard UAV platform

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In this paper, we propose an automatic artificial eucalyptus forest crown identification method from imagery captured by a near-infrared camera on board an unmanned aerial vehicle platform over an area in Guangdong Province, China. The method extracts the forest crown by applying mathematical morphology, unsupervised segmentation based on J-value segmentation, local spatial statistics, and ISODATA unsupervised classification methods. Different morphology filters and four segmentation scales were compared between sunlit and shaded areas, and between dense and sparse forest distribution areas. The opening operation by a 9×9 window size and a segmentation scale of four achieved the best performance with omission and commission errors ranging from 8% to 12% for crown extraction performances in sparsely sunlit, densely sunlit, sparsely shaded, and densely shaded areas. Based on these results, our method can produce an acceptable tree crown identification result for the artificial eucalyptus.

Keywords: aerial photography; segmentation; crown identification; eucalyptus; automated

Abstracts

549:
Spatial patterns of bamboo expansion in Zhejiang, China, from 1990 to 2014

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Bamboo is a fast-growing vegetation type and provides a number of critical ecosystem services. Reliable and consistent information on bamboo distribution is required to better estimate its effect on socioeconomic development and climate change mitigation. In this study, we proposed a systematic method, including feature extraction and feature selection, to derive long-term dynamics of bamboo distribution. We applied our methods to all available Landsat time-series data from 1990 to 2014 covering Zhejiang Province in China and derived bamboo distribution for every five incremental years (1990, 1995, 2000, 2005, 2010 and 2014). We found that bamboo distribution in Zhejiang substantially increased from 1990 to 2014, particularly during the 2000s. Based on the produced maps, the area of bamboo in this area increased from 5363±490 km2 in 1990 to 11671±653 km2 in 2014. This paper also analyzed the spatial pattern and the expansion of bamboo with associated environmental and socio-economic factors and provided some important insights on the characteristics and the determinants of bamboo distribution and dynamics.

Keywords: Bamboo mapping; Landsat; time-series; Random Forest; Regression analysis

603:
Mapping forests and plantations in tropical and subtropical Asia through analysis of optical and microwave images during 2007-2010

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Natural forests in tropical and subtropical Asia play an important role for biodiversity, carbon cycle, climate as well as human wellbeing. In the last few decades, extensive deforestation has occurred in the region; a large proportion of deforested lands were converted to plantations such as rubber, oil palms, and eucalyptus plantations. Such transformation from natural forests to tree plantations could have significant impacts on the environment and biodiversity, in addition to some economic benefits to producers and landowners. Satellite remote sensing has been used for decades to track deforestation and map tree plantations in the region. Images from optical sensors such as Landsat and Moderate Resolution Imaging Spectroradiometer (MODIS) are widely used. Because of frequent cloud cover in the moist subtropical and tropical forests, very limited amounts of good observations (cloud-free observation) in a year from optical sensors are available, which constrains our capacity to track annual dynamics of deforestation and plantation. Recently, we started to combine images from the Phased-Array L-band Synthetic Aperture Radar (PALSAR) sensors (ALOS) with MODIS and Landsat images to map forests and plantations in tropical and subtropical Asia. In this oral presentation, we will introduce and present a summary of our research activities in mapping forests and plantations in the region. We will start with detailed case studies in Hainan island and Xishuangbanna, China, where we generated annual maps of natural forests and rubber plantations in 2007-2010 at 25-m and 50-m spatial resolution, which were then analyzed to identify those areas being forests over these four years, those areas transformed from forests to non-forests (deforestation), and those areas transferred to rubber plantations. We also report the regional maps of forests in tropical and subtropical Asia during 2007-2010, which illustrates annual dynamics of deforestation and rubber plantations in the region. The resultant maps of forests in tropical and subtropical Asia at 25-m and 50-m spatial resolution will be made available to the public, distributed through the data portal at the University of Oklahoma (http://www.eomf.ou.edu). The resultant geospatial datasets of forest cover and plantations in the tropical and subtropical Asia are useful input datasets to support other studies of biodiversity, carbon cycle, hydrology, climate, as well as REDD+ activities.

Session 3

636:
Air pollution mapping from high spatial resolution satellite images: a case study in Hanoi

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Optical satellite images have been widely used in air pollution monitoring but applications have only concentrated in medium and sparse resolution. In this article we investigate the application of Least Square Fitting using high resolution aerosol optical depth (AOD) derived from SPOT image to estimate the Particulate matter concentration (PM10). Experiments carried out on data recorded in three year over Hanoi, Vietnam indicating a case study of air pollution mapping. These results provide confidence that the AOD models can make an accurate predictions of the concentrations of PM and its constituents.

Keywords: air pollution, Particulate Matter, satellite image, optical depth

639:
Comparison of land cover classifiers for Landsat-8 images: a case study in Tien Hai district, Thai Binh province, Red River Delta, Vietnam

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Since no land-cover classifier at global scale performs with high accuracy over a specific local area, classification methods need a deeper investigation. In this study, we examine land-cover classification in Red River Delta, Vietnam. We concentrate on evaluating classifying performances of several widely-used classifiers, namely Maximum Likelihood Classifier (MLC), Decision Tree (DT), Artificial Neural Network (ANN), and Support Vector Machine (SVM), on seven land cover classes including paddy field, aquaculture, high-density urban, low-density urban, bare-area, mangrove, and water body. We specifically use Landsat-8 surface refletance image data that has been recorded on 25 September 2014 over Tien Hai district, Thai Binh province in Red River Delta region. Classification results of DT, ANN, SVM methods provided better visual inspection than results of MLC. The overall accuracy was found to be 94.93% using ANN, 94.26% using SVM, 92.80% using DT and 92.15% using MLC. Accuracy assessment suggested that ANN was better than the other classifiers.

Keywords: Land cover classification (LCC), Maximum Likelihood, Decision Tree, Artificial Neural Network (ANN), Support Vector Machine (SVM), Landsat-8, Red River Delta.

Abstracts

618:
Paddy rice extraction by using temporal satelite image and similarity index

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Paddy rice is the most cultivation in the Red river Delta, Vietnam. Many method using satellite data are used for paddy rice extracting. In this study, we proposed the new method base one similarity index to discrimination spatial of paddy rice distribution. There are six similarity index: Fourier Component Similarity Measure (FFCM), Minimum squared Euclidean distance (MSED), Cosine similarity, Correlation coefficient, Kleyshan's similarity index, and the Lhermitte's method index are used to identify the best similarity index to extracting paddy rice from temporal MODIS image when comparison to another similarity index. The Lhermitte's method index was proven to discrimination to extract paddy rice spatial information. The similarity index can be used for extracting land cover and land use types.

643:
Spatio-temporal Analysis of Urban Growth in the Hanoi city (Vietnam) for the 1993-2013 period using Remotely Sensed Data and Selected Soft Computing Classifiers

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Keywords: Urban pattern, peri-urban, Hanoi, Landsat, soft classification.

Hanoi is the capital and the second biggest city in Vietnam that has witnessed a dramatic change in its urbanization process since the economic reform of 1986. Despite achievements in economic growth and poverty reduction, the city is now faced with demands for the expansion of the urban infrastructure, public service systems, and the change of land uses. The main objective of this study is to identify and analyse patterns and processes of urban growth of the Hanoi city during the last 20 years using the Landsat satellite imagery. Urban area expansion in 7-year periods were extracted from the satellite imagery using selected current state-of-the-art soft computing classifiers such as Support vector machines, Random forest, and Rotation forest J48 Decision trees. We then focused on analysis of specific urban patterns at the local level, including interaction of soil, water, and vegetation in different urban forms through time. Specifically, we used photo/socio survey conducted within peri-urban areas of Hanoi. Two different types of urban patterns were identified so far: planned development operations, operated by large real estate developers, scattered in peri-urban areas on the one hand and spontaneous development, operated by local inhabitants, located around existing rural villages on the other hand. The results show that the pace of change in the Hanoi city has dramatically increased over the last 10 years when compared to the previous period. It further reveals the sprawl of urban resettlement along main corridors represent the main urban extension in the city.

641:
Development of a method for urban land-cover classification in Vietnam

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In recent years, urbanization in Vietnam is a main reason for rapid change of land-cover, especially urban land-cover change. Method for urban land-cover classification is necessary for many kinds of higher-level applications such as quickly producing statistical reports on urban land-cover. Currently, there are 7 global land-cover data sets. Urban land-cover classifying methods used by these data sets are for global scale and we could not naively use them for Vietnam area. This paper focuses on verifying Vietnam urban land-cover data of the GLCNMO2008 (a global land-cover data set) and improving a Vietnam urban land-cover classification method by inheriting the method of GLCNMO2008. The main features of the method are as follows: i) reuse training data of GLCNMO2008 after verifying and combining Vietnam data, ii) use existing Vietnam land cover products as potential land cover maps, iii) compare two supervised classification methods: decision tree method and maximum likelihood method, iv) improve an individual mapping for Vietnam's urban class from the method of GLCNMO2008. The experiment results show that our method achieves good accuracy and can be used for higher-level applications.

Abstracts

Session 4

542:
Remote sensing and mapping of land use in hilly area of central Sichuan by using Domestic Airborne Synthetic Aperture Radar

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Remote sensing monitoring and survey of land use/land cover (LULC) in cloudy, rainy and foggy area face great challenges. Recent aviation synthetic aperture radar (SAR) provide an effective way to deal with such issue for it owns high spatial and temporal resolution /stereoscopic precise imaging system with the features of multi-band, multi-polarization, multi-angle, flexible, self-initiative, dynamic real-time and all-weather. There are many applications to monitor LULC by using aviation SAR abroad and some experiments by space borne SAR in China. This study monitors firstly LULC change by aviation SAR in Hengduan Mountains and southeast Tibet, the southwest of China, where terrain and climate are complex, to investigate the land use image of 1:10000 and 1:50000.

To meet the national urgent needs for the LULC change monitoring in western area in China based on remote sensing, the investigation and experiment were carried out to map LULC change in 1:10000 and 1: 50000 scale based on the domestic made high-efficiency aviation SAR and InSAR data combining with the spectral remote sensing images. The fields of application of domestic made aviation SAR data were further studied to provide the basis and typical demonstration .

The interpreting accuracy and potential of each land use types in study area from domestic made aviation SAR data were evaluated and analyzed based on the LULC maps of 1:50000 and 1:10000 from conventional spectral remote sensing in study area and the national "secondary survey" rules.

The typical test study area (31°30′00″-31°40′00″, 104°30′00″-104°45°00″, about 439 km2) located in Mianyang, Sichuan Province in southwest of China, covering county Anxian, Jiangyou and Mianyangs'border area (Fig.4-1). 1: The working base map of land use in test area. There are four working base maps of land use in test area :the orthophoto of optical and aviation SAR images of 1:50000 and 1:10000;DTM;slope map; 2: Establishment of the interpretation symbols of LULC for the aviation SAR image and construction of associated database 3: The LULC maps in demonstration area 2)Field measurements and record of land use in scale of 1:5000 or 1:2500 3) The LULC map\n4: LULC maps of 1:50000 and 1:10000 in test area from spectral and aviation SAR image 1)The LULC interpretation map of 1:10000 from SAR and spectral remote sensing image in test area. 2)The LULC interpretation map of 1:50000 from SAR and spectral remote sensing image in test area. 3) LULC maps of 1:50000 and 1:10000 of test area based on optical remote sensing images \n4) LULC maps of 1:50000 and 1:10000 of test area from aviation SAR image. The area statistics and measurement of LULC based on 1:50000 and 1:10000 LULC Through analysis and comparison of interpretation and mapping between optical remote sensing and domestic made InSAR images in hilly area of central Sichuan it is confirmed that domestic made aviation SAR images have the potential and ability to meet the national "Second Survey" 's requirements in southern China with cloudy, rainy and foggy weather conditons, particularly in the southwest Hengduan Mountains and southeast Tibet(mountain, hills and plains).

620:

A comparison study of land use and land cover change between in Sichuan province and in Chengdu district, China

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Accurate land use and land cover change is necessary for exploring the causes leading to heavy drought and rainy-flood disaster of some districts in Sichuan province and monitoring eco-environment in Sichuan province. A method based on remote sensing (RS), geographic information system (GIS), globe positioning system (GPS) and Google earth (GE) is presented to establish land use and land cover change (LUCC) in Sichuan province and Chengdu district. Firstly, LUCC is interpreted on the basis of the new temporal images in light of interpreted database from TM in 2000. Secondly, some ground objects which could not be ascertained in the new temporal images were quickly interpreted utilizing GE with some higher spatial resolution images in some cities. Thirdly, the new interpreted result was validated in the field with GPS handheld receiver and land use and land cover of Sichuan province was updated subsequently. At last, the LUCC was extracted from the final database with GIS.

Then a comparative analysis of LUCC between in Sichuan province and in Chengdu district was conducted and the result shows: (1) a large amount of farmland (rice land and dry land) in Sichuan Province was occupied from 2000 to 2005 and the area is 84 573 ha, amounting to 49.2% of the total areas lost. Whereas construction land gained obviously and its area was 35 828 ha, amounting to 20.8% of the total area gained. The percentage is 45% from the farmland lost and 14% from the forest land and grassland lost. The dynamic degree of construction land was 111.10 ‰ and the annual average dynamic degree was 22.22‰ from 2000 to 2005. The annual average dynamic degree was much bigger than the other ground objects. This shows that the economy of Sichuan province continued to develop, the cities were overspreading and the urban heat island effect was deteriorated. Thus, the eco-environment of Sichuan province has been destroyed to some extent in the past 5 years. (2) A large amount of farmland (rice land and dry land) was also occupied in Chengdu district from 2000 to 2005, the area amounted to 12 989 ha and its percentage is 90.9% of the total areas lost, which is much bigger than the others'. The farmland lost was mainly converted to construction land, amounting to 93%. And the dynamic degree was 117.41‰, thus, the annual average dynamic degree was 23.48‰ from 2000 to 2005. It was also maximal of all ground objects in Chengdu district and is bigger than in Sichuan province.

It shows that the economy of Chengdu district was developing fast, the construction land was skyrocketing and the urban heat island effect was more deteriorated. Thus, the eco-environment of Chengdu district also becomes worse to some degree in the past 5 years

(3) It can be seen that forest and grassland gained obviously in Sichuan province from 2000 to 2005. The area adds up to 111 359 ha and the percentage amounts to 64.7 of the total area gained. But the some previous grassland and forest was degraded at the same time. The area adds up to 84 092 ha and the percentage is 48.8 of the total area lost. The ultimate area with the degraded forest and grassland cutting down was 27 267 ha. The dynamic degree of grassland and forest is -0.97 ‰ and 2.51 ‰ respectively, and the annual average dynamic degree is -0.19‰ and 0.50‰ respectively. It shows that although a large amount of farmlands was grained for green project, some forest and grassland were still degraded to a considerable degree. Thus, the total accomplishment of grain for green project is limited and works little to improve the eco-environment of Sichuan province.

(4) It can also be seen that forest and grassland gained in Chengdu district from 2000 to 2005. The area adds up to 809 ha and the percentage amounts to 5.6 of the total area gained in Chengdu district. But the some primitive grassland and forest was also degraded at the same time. The area adds up to 1 292 ha and the percentage is 48.8 of the total areas lost. The ultimate area with the forest and grassland gained cutting down was 483 ha. The dynamic degree of grassland and forest was -6.05‰ and -0.50‰ respectively and the annual dynamic degree is -1.21‰ and 0.10‰ respectively in Chengdu district from 2000 to 2005. It shows that the total accomplishment of grain for green is very limited in Chengdu district. But the forest and the grassland dynamic degree is very little. Thus, the forest and grassland change has little effect on the eco-environment of Chengdu district. Therefore, we have to consider other factors to explain the outstanding difference between in Suining, Bazhong and Dazhou districts of Sichuan province and in Chengdu district.

Keywords: LUCC; dynamic monitoring on eco-environment; RS; GIS; GPS; Sichuan province; Chengdu district

Abstracts

569:
Hyperspectral Image Classification Based on Morphological Feature Coding with Dictionary Learning

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Remote sensing and hyperspectral image classification has been a hot topic of research in recent years. In the past, researchers have paid more attention to the spectral-spatial classification of hyperspectral images. Several techniques are investigated for combing both spectral and spatial information. In this paper, a novel dictionary learning framework for considering spatial information is proposed. Firstly, the extended morphological profiles algorithm is used for extracting the local features including size, contrast and orientation of the spatial structure in a hyperspectral image. However, there is semantic gap between the local features and the high-level semantics. To improve this disadvantage, a dictionary learning and feature coding scheme is presented in order to generate more discriminative high-level features. In the coding stage, a locality-constrained linear coding algorithm is defined, which utilizes the locality constraints to project each local feature into its local-coordinate system. By doing so, it can preserve the locality of the codes containing rich spatial information. Experiments are conducted on two hyperspectral image data sets to show our approach outperforms the state-of-art classification methods.

Keywords: Hyperspectral image; Dictionary learning; Extended morphological profiles; Feature coding

570:
IRS Snow Products and Snow Prediction using MODIS Snow Cover Maps

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Water perhaps is the most value natural asset on earth, and frozen water accounts for more than 80% of all freshwater on the earth, and snow-covered area is a fundamental parameter in the hydrologic cycle and climatology of the earth. Both understanding regional and global climate change and water resource change evaluation need to monitor spatial and temporal variations of snow cover. This paper is mainly about snow change monitoring based on HJ-1B IRS images and snow change prediction, main contents and innovation are as following: (1) Use HJ-MNDSI method to produce snow mapping products, the results tell that from 2008 to 2010 the snow cover area kept steady growth, but decreased in 2011, in 2012 appeared the phenomenon of the sudden increase, and in 2012 the value of the snow cover area is the largest of seven years. (2) Compared different prediction methods, including grey prediction, exponential smoothing (ES), Fourier analysis, time series prediction, use these prediction methods to snow prediction and analyse the accuracy, the results show that: GM(1,1) is the best method of the three, can get higher prediction precision.

Keywords: IRS; NDSI; snow map; MODIS; prediction

632:
Land Use/ Land Cover Change and Its Effects on Water Quality in Xin'An River Basin During Last 10 Years

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Land Use/ Land Cover Change is the cross scientific research subject by the cooperation of IGBP and IHDP international project, its aim is to study the process of interaction between the continuous development of the human society urbanization and the earth ecological environment system.

Land Use/ Land Cover Change impact on regional ecological environment is one of the hot study topics in last years. It has a great influence on the water quality of the adjacent rivers, lakes and other water bodies.

Different degrees of land use and land cover change, can lead to soil erosion and nutrient with the surface runoff into the water, increasing water pollution load, cause water pollution and eutrophication of water bodies. With the continuous development of economic society, the level of urbanization, urban construction land area increased, deforestation, land reclamation, bare land increase and a series of Land Use/ Land Cover Change is becoming more and more significant, the domestic and foreign research shows that: The interaction between Land Use/ Land Cover Change and water quality , and Land Cover types can significantly affect water quality. Formulate reasonable land management measures, can effectively control the non-point source pollution and improve water quality.

Qiandao lake was an artificial lake which formed in 1959 after the completion of xin an river dam. Lake is famous for excellent quality, belong to the national fisrt level water body. The area of Xin'An River Basin where Qiandao lake located was 11850 km2, across zhejiang and anhui provinces.

Qiandao Lake water is one of the important water source of fresh water in east China. Due to its unique geographical environment, inherit a large number of exogenous nutrient input pressure from the Xin'An River upstream and tributaries around every year. By using remote sensing and GIS technology, monitoring Xin'An River Basin Land Use/ Land Cover Change in last 10 Years. Through the research of Land Use/ Land Cover Change and the correlation of water quality to explore the effects on the Qiandao Lake water quality, optimizing land use structure for the future and provide reasonable basis and reference for prevention and control of water pollution.

Land use types of the Xin'An River Basin from 2002 to 2012 were obtained through remote sensing image interpretation. Analysis results indicated that the dominate type of land use from 2002 to 2012 were woodland, cultivated land, water, construction land with a total area ratio of 98.39%~99.52% of the whole watershed. Meanwhile, the main tendency of Land Use/ Land Cover Change from 2002 to 2007 was the transformation of grassland, cultivated land and construction land to forest, with a transfer rate of 10.96%, 3.47% and 9.97%, respectively, and cultivated land to construction land conversion, with a transfer rate of 2.53%. From 2007 to 2012, the main tendency of land cover changes was the transformation of woodland, cultivated land to construction land, with a transfer rate of 0.19% and 1.82%, respectively. The overall tendency of 10 years land use structure change is the transformation from cultivated land to construction land.

Study on the relationship between Land Use/ Land Cover Change of Xin'An river basin and water quality was carried out and the following results were discoveryed: Xin'An River basin land use spatial configuration was an important driver for the Qiandao Lake water quality change. In the sub basin scale, a high correlation was observed between the waters, cultivated land and construction land with the TP, TN, CODMn, NO3-N and NH3-N concentrations. The analysis results indicated that the vast water area can effectively dilute the concentration of pollutants, resulting in a weakening effect of water pollution. The cultivated land and construction land play a significant promoting role on water pollution. In the buffer zone scale, forest land, cultivated landand construction land were significantly related with TP, TN, CODMn, NO3-N and NH3-N concentrations in almost every scale. In the stepwise regression analysis, 100 m buffer zone showed the optimal fitting among the types of land use which were statistically significant with the indicators of water quality, indicating that the structure of land use and water quality relationship more close and more significant near the river. Woodland was negatively correlated with various indicators of water quality, implying that coastal shrub cover and forest cover can effectively weaken the Qiandao Lake water pollution. Construction land was significantly positively correlated with all studyed water quality indexes, indicating the coastal urban residents and industrial land expansioncan exert a serious impact on the water quality of Qiandao Lake. In order to effectively curb the deterioration of water quality of Qiandao Lake, rational allocation of land use structure in the Xin'An River Basin should be strengthened, together with the strengthen of forest protection in the coastal basin and the avoid of land construction development.

KEY WORDS: Xin'An River Basin, Remote Sensing, water quality, Land Use/ Land Cover Change.

Abstracts

612:
MANGROVE SPECIES DISCRIMINATION USING SPATIO-SPECTRAL FEATURES FROM HIGH RESOLUTION REMOTE SENSING IMAGE

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Mangrove habitat is one of the most significant ecosystems and the recognition of its species plays a key role in analyzing the dynamics of its succession, deforestation, stand density and health conditions, etc. Traditional refined management of mangrove species requires industrious manual field work while remote sensing techniques provide a cost-efficient means in mapping and monitoring mangrove forests at a large scale. Discrimination of mangrove species using satellite remote sensing is still challenging due to many factors such as spatial resolution of data, number of species and the spectral confusion between different species. The latest development of very high resolution optical sensors has provided new opportunities for accurate inter-species mangrove forest mapping. Although the coarse spectral resolution had limited the number of species that could be distinguished, it is promising that performance of classifiers could be enhanced with more intrinsic and accurate features like textural features. This study explored the potential of derivative textural to map mangrove inter-species problem from high spatial resolution image for a sufficient number of species for mangroves studies in Hong Kong. Experiments suggested that classifier with enhanced features can improve classification accuracy and give out satisfying and reliable mapping results.

Index Terms— Mangrove species, Worldview-3, High resolution, Textural feature

Session 5

605:
Object-based data fusion for land cover classification using COSMO-SKYMED SAR and THAICHOTE optical images

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Object-based image analysis (OBIA) is becoming widely popular for land cover classification using high resolution image. COSMO-SkyMed SAR data was fused with THAICHOTE (namely, THEOS, an Earth observation mission of Thailand) optical data for land cover classification using object-based. This paper indicates a comparison between object-based and pixel-based approaches in image fusion. The per-pixel method, support vector machines (SVM) was implemented to the fused image based on Principal Component Analysis (PCA). For the object-based classification was applied to the fused images to separate land cover types by neatest neighbor classifier. Finally, the accuracy assessment was employed by comparing with the classification of land cover maps generated from fused images and THAICHOTE image. The object-based data fused COSMO-SkyMed with THAICHOTE images demonstrated the best classification accuracies, well over 80%. As the results, an object-based data fusion provides higher land cover classification accuracy than per-pixel data fusion.

Keywords: COSMO-SkyMed, THAICHOTE, OBIA, image fusion and land cover classification

610:
Degradation of Nyainqentanghla Glacier and its supplying to Nam Co Lake's level rising

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Nyainqentanglha Range is located in the southeastern of Inner Tibetan Plateau. Its glaciers coverage was 795 km2 in 2001, and their melting at the western slopes feeds Nam Co Lake. Elevation of Nam Co Lake increased at a rate of 0.26m/a during 2003-2009 by ICESat laser altimetry monitoring. Previous study applied in situ observations on Zhadang Glacier’s height change and yielded during 1999 and 2010 glacier melting contributed 28.7% of the lake increasing. However, Zhadang Glacier only occupies less than 1% of the whole glacier area and almost bellows zero equilibrium line (ZEL), therefore the result should be biased and with large error. In this study, aiming on taking a spatial covered observation on glacier height change and analyzing its melting contribution to the endorheic lake increasing, we applied DEM differencing method to quantify glacier mass balance at Nyainqentanglha Range. Based on C and X band SRTM obtained in 2000 and six pairs of bistatic TanDEM-X X-band SAR images observed during 2011-2014, decadal glacier height changes were derived by D-InSAR processing. For X-band SRTM covering area, we use same band DEMs for differencing processing to void penetration depth discrepancy on glacier-covered area. For where X-band SRTM is unavailable, we applied the correction of penetration depth discrepancy evaluated through differential processing of C and X band SRTM at adjacent area with X-band SRTM covering, which is ~1.56m. Overall, mean annual glacier thinning rate was ~0.18 m/a for the whole range. Vertical precision of DEM formed by bistatic TanDEM-X images is about ±4.1 m evaluated by overlapped ascending and descending images. Our results of glacier height change consist well with previous in-situ observations during 2005-2008 at Zhadang Glacier. Glacier degradation was more severe in southeastern slope than in northwestern slope. This could be because southeastern slope is gentle and large parts of low-altitude glaciers distribute. Glacier thinning/thickening rate was correlated with its elevation; the zero equilibrium line (ZEL) was around 5900 m for the both southeastern and northwestern slope. Glacier tongues suffered from quick degradation, especially for several long glaciers at the southeastern slope. Debris covering also affects glacier-thinning rates. The maximum height change accumulation in one decade was up to ~80 meters found at the tongue of one debris-covered glacier in the southeastern slope at an elevation of ~5500 m. It showed slight positive mass balance at most firn basins, this could be due to increasing precipitation in Inner Tibetan Plateau. Consider that within Nam Co's drainage area, glacier-cover area was 198.1±5.6 km2, if presuming all the melted ice flows into the lake, our estimation of Nyainqentanglha Glacier's melting contribution to Nam Co Lake water volume increasing was about 5.6% between 2000 and 2014, which is much less than the previous study based on biased sampled in-situ observations.

530:
Three Dimensional Displacement Retrieval with Two Descending TerraSAR-X Datasets

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Landslides are serious geo-hazards in Three Gorges area, China especially after the impoundment of Three Gorges Reservoir. It is very urgent to monitoring the landslides for early warning or disaster prevention purpose. In this paper, point-like targets offset tracking (PTOT) was proposed to monitoring fast moving landslides. Furthermore, in order to describe the true displacement on landslide, two TerraSAR-X datasets obtained from different descending orbits were combined to obtain the three dimensional displacements on Shuping landslides with the PTOT measurements in the azimuth and range direction.

Keywords: InSAR; Landslides; Point-like targets offset tracking; three dimensions

Abstracts

651:
Spatial patterns of vegetation succession in degraded tropical landscape of Hong Kong

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Decrease in tropical forest is accelerated by 62 % from 4 million hectare per year during 1990s to 6.5 million hectare per year during 2000s. However, net forest loss in later half of 2000s (2005 to 2010) is reported to be deaccelerated by 7.2 % partially due to accelerated forest gain in tropical Asia. Therefore, regenerating natural secondary forest is more important for biodiversity conservation, catchment protection, climate control and ecological services they provide. This study describes the dynamics of tropical forest regeneration in Hong Kong since its last complete clearing during World War 2. Recovering natural secondary forest, availability of the post war aerial photographs since 1945, and recent high resolution satellite imagery, provided a good opportunity to monitor and model tropical vegetation succession in the degraded hills of Hong Kong. Analysis of changes in spatial structure of the landscape indicates that succession of forest started with smaller isolated patches and then number of patches and their relative size increased over time. Results of structural changes in habitat showed that forest cover has increased from 0.17 % of the landscape to about ~36 % during the period of 70 years. Overall, forest has increased at an annual rate of 7.7 % from 1945 to 2104, however the fastest period of forest regeneration was 1989 – 2001, at an annual rate of 10.9 %. The results showed that establishment of shrubland is important stage along the successional gradient as rate of shrubland transition into forest is much faster than conversion of grassland into shrubland. Therefore, for rapid forest restoration, forest management policies should include seedling of shrubs extending linearly from established forest to maximize edge length between woodland and grassland.

Session 6

564:
Observation of Typhoon Eye and Rainband-related Features Using Multi-sensors

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In our study, we use multi-sensor data to observe typhoon eyes and rainband-related features including ENVISAT, RADASAT synthetic aperture radar (SAR) images, MTSAT, FY-2 infrared (IR) radiometer images, visible (VIS) images, Doppler radar data. Wavelet analysis is applied to extract such features, a large horizontal distance of typhoon eye location between ocean surface from SAR and cloud top from IR/VIS is demonstrated. Then the wind speeds are estimated by feature tracking using quasi-concurrent multi-sensor data. It is found that the feature-tracking-estimated wind speeds are reasonable compared with maximum wind speed reported by the Joint Typhoon Warning Center (JTWC). This research shows the potential application of the multi-sensor data and the technique may offer useful wind information for typhoon simulations and forecasts.

Keywords: typhoon eye; rainband; wavelet analysis; wind shear

544:
Ecological effects of artificial reefs in Guangdong coastal waters, China - satellite and in situ observations

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Fishery resources along China coasts are declining, which could be alleviated by deploying artificial reefs (ARs) in suitable area. The present study investigated spatial and temporal variations of Chlorophyll a concentration (Chl a) in Daya Bay in the northern South China Sea in 11 years (2002-2012). Artificial reef groups with a total dimension of 966.10x2850.60 m2 and the total surface area of 91,500 m2 were deployed in the water with depth of 12.0-18.3 m in December 2007. Both In situ and satellite (Moderate Resolution Imaging Spectroradiometer, MODIS) data were analyzed. \nVariations of annually Chl a during 2002-2012: Time series of monthly mean Chl a from July 2002 - December 2012 showed that the minimum Chl a was 1.22 mg m-3 (April 2006), and the maximum Chl a was 3.61 mg m-3 (November 2006). Linear regression analysis performed on monthly Chl a in the pre-AR deployment period (2002-2007) showed an ascending trend at a rate of 0.012 mg m-3 per month. During the post-AR deployment period (2008-2012), Chl a performed at a relatively high level (most Chl a >2.0 mg m-3) but decreased at a rate of 0.016 mg m-3 per month. Additionally, we compared monthly Chl a anomalies between the pre-AR and post-AR deployment. During the pre-AR period (2002-2007), Chl a anomalies ranged from -1.21 (June 2004) to 1.93 (August 2006); while during the post-AR period (2008-2012), it experienced a smaller range from -0.72 (June 2010) to 1.04 (April 2012). For the entire observation period (2002-2012), the trend identified through the linear regression analysis based on Chl a anomalies shifted from positive to negative. As can be seen, the slope of linear regression increased from 0.012 (2002-2007) to -0.002 (2008-2012).\nIncrease of seasonal Chl a in post-AR period: Seasonal variations of Chl a were compared between the pre-AR (2002-2007) and post-AR (2008-2012) periods. Chl a concentration in the post-AR period was higher than that in the pre-AR period in each season by 0-0.5 mg m-3. Chl a concentration evenly distributed during the pre-AR period. But a high Chl a concentration area was observed during the post-AR periods. This high Chl a concentration area was the largest in fall (Sep-Nov), spread along the coast in winter (Dec-Feb) and spring (Mar-May), and concentrated in the AR reef area in summer (Jun-Aug). Chl a concentration increased in each month after the AR deployment, ranging from 0.27 to 0.80 mg m-3 (no data in April 2008-2012). For the entire AR waters, Chl a concentration increased by 10.79-27.06 % in 2008-2012, compared to that in 2002-2007. The largest increase concentrated in September-November.\nEnvironmental condition in artificial reef area: In situ Chl a and DIN/P ratio in the surface and bottom layer during the background and tracking surveys were compared on the 4 stations along cross section. Tracking survey data were higher than that in background survey, not only for surface layer, but also for bottom layer. Chl a decreased gradually along with the increase of distance from the central of ARs. Chl a in the tracking survey was higher than that in the background survey in each station, especially for bottom Chl a. DIN/P ratio was low before the AR deployment (background survey), and became close to Redfield value, reaching standard values of 10-20 after AR deployment. In addition, during the tracking survey, surface and bottom DIN/P ratio were close and remained in a constant range in each station.\nAttaching organisms and fishery resources in AR area: After the deployment of ARs in December 2007, attaching organisms on the AR sets were investigated 5 times on April, July, September, October, and December 2008, respectively. The species of attaching organisms varied from 26 (December) to 45 (September) in different seasons, and the density ranged from 747.98 ind m-2 (September) to 311.25 ind m-2 (July). The biomass of attaching organisms decreased from spring (April) to summer (July), then gradually increased and reached its maximum 540.32 g m-2 in winter (December). Stock density of fishery resource (in weight) and species of catch in the AR area showed an increase after the ARs deployment in December 2007. During the background survey (April 2007), stock density of fish was 154.04 kg km-2 and the species of catch was 73. While in the tracking survey, stock density increased by 4.66-16.22 times that of background survey, varying from 871.80 kg km-2 (May 2008) to 2652.99 kg km-2 (May 2009). Total species of catch increased by 15-23%, ranging from 84 (March 2008) to 90 species (May 2009).

The fish assemblage was connected with variations of nutrients, Chl a increase, and the appearance of attaching organisms on the AR sets. The ecological effects of ARs extended to 4.9 km distance where water depth are 12.0-18.3 m in Daya Bay region. This study suggests that the deployment of ARs could benefit the local primary production and therefore be favorable to fish production. Ecological effects of ARs in the bay area were testified. Combining satellite remote sensing with shipboard monitoring can provide reliability checks on the assessment of the ecological effects of ARs.

Abstracts

581:
Estimation of the sea surface salinity during typhoon from observations of SMOS and WindSat satellites

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This paper proposes a method to estimate sea surface salinity (SSS) during typhoon from the observations of the Soil moisture and ocean salinity (SMOS) and WindSat satellites. To reduce the influences of land and radio frequency interference on the SSS observed by SMOS, one typhoon event that occurred in the middle of the Pacific Ocean is firstly studied. A linear relationship between the SSS anomaly observed by SMOS and the rain rate measured by WindSat is developed, with a slope of -0.1744 psu/(millimeter/hour), based on which the SSS during typhoon is retrieved. The method is validated both qualitatively and quantitatively, and the root-mean-square error between the surface salinity measured by Argo and the SSS retrieved from observations of SMOS and WindSat during another typhoon is 0.32 psu. The influence of wind on the SSS observed by SMOS is also analysed.

Keywords: Sea surface salinity, typhoon, SMOS, WindSat

604:
Analysis on Compact Polarimetric SAR Features for Oil Slicks Detection

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Compact polarimetry (CP) synthetic aperture radar (SAR) has proven its potential in distinguishing oil slicks and look-alikes. Polarimetric information can be retrieved directly from scattering vector or from reconstructed pseudo Quad-Pol covariance matrix of CP SAR data. In this paper, we analysed features from Circular Transmit and Linear Receive (CTLR) CP SAR data that derived by taking both of these two methods. K-means clustering followed by accuracy assessment also implemented for performance evaluation. Through experiments that conducted based on L-band UAVSAR fully polarimetric data, it was found that optimum extraction methods various for different features. The histogram analysis and segmentation results also demonstrated the comparable performance of CP SAR features in distinguishing different damping properties within oil slicks. This study proposed a framework of statistically analysing polarimetric SAR (Pol-SAR) features and provides guidelines for determining optimum feature extraction methods from CP SAR data, for marine oil-spills detection and classification.

534:
Optical properties and spatial distribution of chromophoric dissolved organic matter (CDOM) in typical waters of Poyang Lake

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Optical absorption properties of chromophoric dissolved organic matter (CDOM) are critically important in quantitative retrieval of water-color remote sensing for inland waters. During the wet season, the absorption properties and spatial distribution of CDOM were investigated and analysed in four typical waters of Poyang Lake, China. The results showed that the absorption coefficients of CDOM varied significantly in Poyang Lake and were apparently higher in wetland waters of the Nanji wetland national reserve than in other three water areas. The specific absorption coefficient of CDOM at 440nm (ag(440)) also showed a similar trend, ranged between 0.39m-1 and 1.14m-1 with averaged value of 0.70m-1 in Poyang Lake. A significant negative correlation between ag(440) and spectral slope (Sg) was found in wetland waters of the Nanji wetland national reserve, which could be used in remote sensing application by improving bio-optical model of CDOM for sub-region. Besides, there was a significant positive correlation relationship between dissolved organic carbon (DOC) concentration and CDOM absorption coefficient at shorter wavelengths (280-440nm) in Poyang Lake waters. Therefor it is possible to use remote sensing techniques to estimate DOC in Poyang Lake. The results demonstrated that it is necessary to learn the optical properties and spatial distribution of CDOM in Poyang Lake, which would be fundamental both in water-color remote sensing applications and protection of aquatic ecosystems for inland waters.

Keywords: CDOM; absorption coefficient; Sg; spatial distribution; DOC; Poyang Lake

Session 7

649:
Antarctic ice shelf dynamics detection using long-term satellite remote sensing data

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Antarctic ice shelf and sea ice in southern ocean are the most sensitive and key regions in global climate change, contributing more and more to global sea level rise. The fast change of Antarctic ice shelf and sea ice in the past decades is a key reason for the uncertainty in predicting sea level rise. Iceberg calving from all Antarctic ice shelves has never been directly measured, despite playing a crucial role in ice sheet mass balance. Rapid changes to iceberg calving naturally arise from the sporadic detachment of large tabular bergs, but can also be triggered by climate forcing. Using huge amount of ENVISAT SAR images spanning from 2005 to 2011, we provide a direct empirical estimate of mass loss due to iceberg calving and melting from Antarctic ice shelves. We find that between 2005 and 2011 the total mass loss due to iceberg calving of 755±24 gigatonnes per year (Gt/yr) is only half the total loss due to basal melt of 1516±106 Gt/yr. However, we observe widespread retreat of ice shelves that are currently thinning. Net mass loss due to iceberg calving for these ice shelves (302±27 Gt/yr) is comparable in magnitude to net mass loss due to basal melt (312±14 Gt/yr). Moreover, we find that iceberg calving from these decaying ice shelves is dominated by frequent calving events, which are distinct from the less frequent detachment of isolated tabular icebergs associated with ice shelves in neutral or positive mass balance regimes. Our results suggest that thinning associated with ocean-driven increased basal melt can trigger increased iceberg calving, implying that iceberg calving may play an overlooked role in the demise of shrinking ice shelves, and is more sensitive to ocean forcing than expected from steady state calving estimates.

Abstracts

607:
The Sensitivity Study of Rainfall to Land Surface Models over Complex Topography

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Water management in arid and sub-arid regions is critical and it could turn out to be precarious over the mountainous regions due to related hazards, like flash flooding, debris flow, land sliding etc. To understand the impact of land surface models impact on rainfall simulation the WRF-ARW modelling framework is coupled with Unified Noah and Noah-MP land-surface models (LSM) with various physical schemes and domain setup. This helps to investigate the impact of LSM physics on rainfall simulation over the complex terrain and their possible links with landuse datasets. We use GIS platform to modify and rectify the landuse datasets to investigate the impact on rainfall simulations with different physical parameterizations in WRF modelling setup. In nested domain, all simulations coupled with Noah-MP shows negative bias for rainfall over the mountain areas, while there is no significant impact on storm structure when single domain is considered for both unified Noah and Noah-MP LSM. Furthermore, Noah-MP improves the rainfall simulations over the complex terrain, and there is no substantial impact in the plains of River Indus. Moreover, updated landuse and corrected elevation dataset also slightly improves the simulation quality and MODIS landuse shows marginally negative bias in urban areas as compared to default USGS landuse dataset..

Keywords; rainfall, WRF, landuse, GIS, terrain, Pakistan

537:
Study of Tropospheric Aerosol Distribution In Penang Island, Malaysia Using a Ground-Based Backscatter Lidar System

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A ground-based backscatter Lidar, operate at 355 nm wavelength produced by Raymetrics was set up at the roof top of the School of Physics, Universiti Sains Malaysia (USM) in Penang Island. In this study, the tropospheric aerosols distribution in Penang Island to be analyzed for different weather condition like during the Dry and Wet season that involves extension of data acquisition period to night time. The variation of the aerosol intensity, distribution and planetary boundary layer (PBL) height values are the parameter of the study. It is found that the aerosols are very intense during the heavily polluted day regardless of monsoon seasons or dry/wet seasons and it slowly decrease during the night time. Generally, the aerosols are more intense during the afternoon and slightly lower in the morning and night time. Most aerosols are found contained below the PBL which is generally found at around 1000 – 2000 m in height.

Keywords-LIDAR; PBL; backscatter; tropospheric

625:
Research on advanced multi-temporal radar interferometry methods for petroleum reservoir subsidence surveillance

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Oil and gas reservoir is one of the major sources of energy, most of which is located at the eastern of China. However, as the increasing of hydrocarbon production, subsidence induced by earth surface pressure change is a key issue not only in urban areas but also in the rural scenarios. Although it is clearly that hydrocarbon production will cause surface deformation, the relationship quantitatively between subsidence observation and reservoir volume change is not clear. Furthermore, land subsidence may cause many problems including the damage to buildings, bridges, roads, storm drains, levees et al.

In our research, an advanced multi-temporal radar interferometry methods for qualitatively and quantitatively monitoring detailed reservoir subsidence is developed. Meanwhile, all the possible damage will be exploited which may be caused by hydrocarbon production induced subsidence. InSAR, especially Multi-Temporal InSAR, has been proved its extremely potential on monitoring surface land subsidence with millimeter accuracy. However some limitations are still addressed. DInSAR measurements are able to detect subsidence with higher spatial coverage, but with low accuracy. PSInSAR and SBAS perform better on detecting deformation in urban and rural areas separately. Fortunately, SqueeSAR is illustrated its capacity on land subsidence extraction both in urban and rural scenarios. It exploits the temporal and spatial variation of both Persistent Scatterer (PS) and Distributed Scatterer (DS) simultaneously. However, the model assumption of SqueeSAR is linear deformation, which makes it lack of sensitivity to rapid and nonlinear deformation induced by underground fluid extraction within the process of hydrocarbon production. An advanced MT-InSAR (multi-temporal InSAR) post-processing is developed. The linear deformation and relative height correction will be removed from all the differential interferograms with small temporal and spatial baselines. With phase unwrapping and L1-norm inversion, the deformation history will be addressed.

The proposed method can detect surface subsidence, which includes the rapid and nonlinear deformation, with high spatial coverage both in urban and rural areas. With the aid of our improved method, the government departments and oil companies can obtain a more comprehensive understanding of surface change model induced by hydrocarbon production, which can help them manage oil and gas activity and make risk assessment more effectively.

Daqing and Dongying are selected as the research area, as the two sites are encircled by large oilfields. Both urban and rural scenarios are contained to exploit our new MT-InSAR processing approach. X-band TerraSAR, L-band ALOS SAR and C-band Envisat ASAR images are collected. With the three different band of SAR archives, the feasibility of our approach can be tested. On the other hand, X-band TSX data has high spatial resolution and short revisit time, which is better in detecting the man-made infrastructures in urban. L-band ALOS data can coverage larger scenes and have better coherence in rural areas.

Abstracts

647:
Tianjin Land Surface Subsidence Monitoring by Using PS-DS Combined Adjustment MTInSAR Technology

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Distributed scatterer InSAR (DSInSAR) was proposed in recent years to provide highly accurate subsidence measurements with higher spatial density compared with persistent scatterer InSAR (PSInSAR). However, DSInSAR-related algorithms to obtain subsidence map are not updated. Therefore, low efficiency and accuracy are always introduced. In this paper we proposed an improved multi-temporal InSAR (MTInSAR) processing strategy using PS-DS combined adjustment algorithm to overcome the two significant disadvantages. First of all, PSs are treated using traditional processing chains. Areas of interest (AOIs) are able to be selected through this step. After that DSs are detected and processed only in those AOIs to improve processing efficiency. Meanwhile, PSs in AOIs are used as references to keep subsidence patterns in AOIs identical with the whole investigated area. Through PS-DS combined adjustment, DS subsidence rates are obtained with PS accuracy maintained. We use 40 TerraSAR-X images acquired over Tianjin to test the proposed algorithm. Four subsidence funnels are detected over Tianjin suburban areas. By conducting PS-DS combined adjustment, the valid measurements increase by at least 264% in the subsidence funnel of Jinghai, and 2067% in Shengfang. The experiments indicate that the proposed method is useful in providing denser subsidence measurements.

Keywords: Persistent scatterer; distributed scatterer; combined adjustment; Tianjin subsidence.

627:
Monitoring ground deformation in Wuhan urban area with High-resolution TerraSAR-X images

Liming JIANG
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A time-series InSAR approach is employed to detect ground deformation in the urban area of Wuhan city in central China. A total of 12 TerraSAR-X images over Wuhan acquired from October 2009 to August 2010 are used in the InSAR analysis. The result of ground deformation velocity shows that land subsidence occurs widely in the Wuhan metropolitan region, with a maximum subsidence rate up to -39.9 mm/year. The causes for the subsidence are analyzed with the urban development information and geological materials. We find that the large-scale urban construction over soft soils and the well-developed karst geology are responsible for ground subsidence.

Keywords: Time-series InSAR; Wuhan city; ground subsidence; urban development; karst geology

Session 8

608:
Oil spill distribution mapping and analysis based on satellite remote sensing and GIS: A case study in the Bohai Sea and the north of the Yellow Sea

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Routine satellite remote sensing surveillance on oil spills with Synthetic Aperture Radar (SAR) appears to be ideal for analyzing distribution of oil pollution in macro scale. In this research work, considering the presence of "look-alikes" phenomena on SAR images as well as current operational use of "confidence level", a confidence-oriented oil spill geodatabase was firstly designed for quantification analysis. Then, in view of the requirement of marine grid management, a common framework based on remote sensing and Geographic Information System (GIS) is proposed to map and reveal the spatio-temporal distribution of oil pollution, in the process of which, oil pollution index (OPI) was put forward to evaluate oil pollution levels. Finally, a case study of a five-year inter-annual oil spill satellite monitoring by China Maritime Safety Administration (MSA) was studied.

Keywords: oil spill; oil pollution index (OPI); satellite remote sensing; mapping; the Bohai Sea

Abstracts

609:
A spatial and temporal model with auto-regression error correction

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[1]Depa2rtment of Geography & Resource Management, The Chinese University of Hong Kong

This paper proposed a spatial and temporal model with auto-regression error correction (AREC) for spatial and temporal fusion between Moderate Resolution Imaging Spectroradiometer (MODIS) and Enhanced Thematic Mapper Plus (ETM+). MODIS had low spatial resolution from 250 to 1000 m in the different spectrums, but high temporal resolution of 1 day. ETM+ had high spatial resolution of 30 m, but low temporal resolution of 16-day revisit cycle. In order to get the accurate surface reflectance data with both high spatial resolution (30m) and high temporal resolution (1 day), this paper applied the AREC method to blend the two types of images and added classification technique for obtaining spectrally similar pixels. Experiments and validation were conducted on two data sets located in Shenzhen, China and Australia respectively and compared with Spatial and temporal adaptive reflectance fusion model (STARFM) in several objective indexes and visual analysis. It was found that AREC could effectively predict the surface inter-annual changes and intra-annual (seasonal) changes and the fusion results had better performances versus the ones of STARFM.

571:
Wetland mapping and seasonal change analysis in Nanjishan wetland using Gaofen one data

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[2]Key Laboratory of Poyang Lake wetland and watershed research, Ministry of Education

Nanjishan Wetland National Nature Reserve (NWNNR) lies in southern of Poyang Lake, which is the largest wetland reserve in Poyang Lake. Due to the effect of typical subtropical monsoon climate, the Nanjishan wetland is a dynamic wetland system. But, up to present, there are a few systematic and specific researches on Nanjishan wetland mapping and assessed the wetland change. Hence, This paper conducted a case study on discussed the methods of wetland classification mapping and analyzed wetland seasonal change in the flood and dry season in the Nanjishan Wetland, and qualitative description the reason of the wetland seasonal change. In this paper, two typical dates of remote sensing images (GF-1) in flood and dry season were collected and were pre-processed. Meantime considering the characteristics of Support Vector Machine (SVM) classification method can effectively deal with small amount of samples and high dimension issues, we adopt SVM to classify Nanjishan wetland. The SVM method obtained the highest overall accuracy of 93.53% and 95.73%. Two high precision wetland classification maps were acquired, which were applied to wetland change detection. The change detection result shows the area of water, grassland change significant, also with remarkable transformation between the different wetland features. The result in this paper will provide fundamental information for local government protecting and restoration the ecosystem of Nanjishan wetland.

Key word: Nanjishan wetland, GF-1 data, SVM method, wetland classification, change detection

568:
CAPABILITY OF C-BAND POLARIMETRIC INFORMATION TO ASSESS SUGARCANE LODGING CAUSED BY TYPHOON

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Sugarcane is an important sugar and energy crop. Sugar made from sugarcane accounts for about 80% of the total sugar production in China, and sugarcane has been tapped as a major source of energy production around the world, especially for distilling ethanol.

In China, about 90% of sugarcane crops grow in subtropical and tropical regions, where typhoon happens several times per year. Typhoon is one of the worst natural disasters for sugarcane growing. Sugarcane lodging caused by typhoon can drastically reduce profitability through reduced yield.

Remote sensing technology provides a promising tool to grasp timely, synoptic and repetitive information about the status of agricultural crops. It has been used to attempt to monitor crop lodging, such as wheat and paddy [1,2], and polarimetric index has been found very sensitive to wheat lodging [3,4]. The objective of this study was to determine the potential capability of polarimetric information from satellite C-band SAR sensors for the assessment of sugarcane lodging caused by typhoon. Polarimetric information derived by target decomposition techniques, polarimetric interferometric parameters, object-oriented image analysis and texture information were utilized to map sugarcane fields, to analyze the changes between the lodging fields and normal fields, and to accessthe grade of sugarcane lodging.

545:
A modified water cloud model considering volume fraction for rice biophysical parameters estimation with polarimetric SAR

Zhi YANG, Yun SHAO, Kun LI, Long LIU
Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences

Rice is mainly located in inland plains or large river deltas with humid tropical and subtropical climate. Such rice systems feed about 3.5 billion people worldwide, and account for 90% of global rice supply. Earth observation data from satellites, in particular from Synthetic Aperture Radar (SAR), are useful for rice crop yield estimation and monitoring on a global scale. Accurate information about biophysical parameters, such as LAI, plant height, biomass, volumetric water content etc., is essential for monitoring rice growth condition and yield estimation. This paper proposed a modified Water Cloud Model (MWCM) considering volume fraction in different phenological stages for rice biophysical parameters estimation with RADARSAT-2 quad-pol data. A genetic algorithm was used to build the relationships between rice biophysical parameters and scattering components generated from a modified polarimetric decomposition methods. The validation was conducted using the field data with the average R2 of above 0.8. The results demonstrated that the MWCM works well for the estimation of rice biophysical parameters with polarimetric SAR data, and canopy volume fraction is an important factor need to be considered when estimated rice biophysical parameters using the Water Cloud Model.

Keywords: paddy rice; synthetic aperture radar (SAR); water cloud mode (WCM); leaf area index (LAI); height; ear biomass; RADARSAT-2

Abstracts

Session 9

648:
ESCAP's work on promoting regional cooperation in space applications for disaster risk reduction in Asia and the Pacific

Keran WANG
United Nations ESCAP

I will brief the Conference the work of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in promoting regional cooperation to assist member States particularly the high-risk and low-capacity developing countries in the region to effectively use space technology and GIS for disaster risk reduction, through the following core activities: (a) the timely provision of near real-time satellite imagery to countries affected by severe disasters; (b) operationalization of the Regional Cooperative Mechanism for Drought Monitoring and Early Warning; (c) the strengthening of institutional capacity-building to address gaps and emerging challenges; and (d) the expansion of applications of emerging technology.

554:
Deformation Mechanism Analysis of Landslide in Reservoir Coupling Time-series SAR Results with Water Level Variation and Rainfall

Jiang Yanan, Liu Yuzhou, Liao Mingsheng, Zhang Lu, Shi Xuguo
State Key Lab. of Info. Eng. in Surveying, Mapping and Remote Sensing, Wuhan University

In this study, we recommend the ensemble Kalman filter (EnKF) to study the deformation response mechanism with inducing factors for understanding the development process of landslide. Shuping landslide in Three Gorges Reservoir (TGR) was chosen as the study area, and the analysis was performed over the periodic component of the SAR time-series. Through integration new observations, the assimilation EnKF estimates provided better matches with true processes than the simulation did.

Keywords: Shuping landslide; deformation mechanism; SAR; EnKF; triggering factors;

619:
Drought monitoring in the middle reach of Yangtze river with MODIS

Zezhong Zheng[1,2,3,4,5], Chengjun Pu[1,2,3,4,5], Lanying Yuan[1], Jun Xia[2], Xiang Zhang[2], Yong He[6], Jiang Li[7]
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Drought is one of the major environmental disasters. In recent years, drought has been occurring very frequently, and the influences are being exacerbated by the increase in water demand and the variability in hydro-meteorological variables due to the extreme climatic phenomenon. As a result, drought has become a great threat for human being. leading to food shortages, economic disturbances, and losses of life around the globe. The middle reach of Yangtze river is one of the primary grain-producing regions that makes up the corn and wheat belts of China. For the subtropical monsoon, the drought reoccurs frequently and severely in the reach. In the paper, we monitored the drought to explore the relationship between the drought and vegetation coverage in the middle reach of Yangtze River. The normalized difference vegetation index (NDVI) and Land Surface Temperature (LST) from moderate resolution imaging spectroradiometer (MODIS) data were utilized to establish the feature space between NDVI and LST, and to calculate the temperature vegetation dryness index (TVDI). Our research results showed that the area of drought came up to about two thirds of the middle reach of Yangtze river, and most occurred in the north and in the center of the region. The difference of relative soil moisture was correlated to TVDI, ranging from -25% to 25%. Therefore, our approach for drought monitoring is reliable.

Keywords: Drought monitoring, NDVI, LST, TVDI, middle reach of Yangtze river

621:
The application of a new ant colony algorithm in emergency rescue

Zezhong Zheng[1,2,3,4,5], Pengxu Chen[1], Mingcang Zhu[6], Zhenlu Yu[1], Huan Wei[1], Yufeng Lu[1], Jiang Li[7]
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The accidents such as fire occur in the indoor buildings then, to effectively organize the mass evacuation and fire rescue are closely related to the safety of human lives and property.Therefore, people's ability to emergency evacuation has become a critical issue of public concern. This paper presents an improved ant colony algorithm to solve the problem of optimizing the evacuation route and rescue route in the fire.Considering the key factors such as indoor building environment,fire and its combustion products and path's optimal selection, we developed a GIS route network analysis to improve the ant colony algorithm, and eventually proposed an emergency evacuation model, which is able to give an optimal evacuation route for the mass and an optimal rescue route for the firefighters. We also analyzed the search results of the model.The result approximated the optimal solution with a probability of one for short-distance tests, and is close to the optimal solution in a range of small errors for the long-distance tests, indicating the robustness of the proposed algorithm.

Abstracts

645:
Monitoring Vegetation Responses to Drought with Meteorological and Remotely Sensed Drought Indices

Hongshuo WANG
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Effective drought monitoring is a big challenge we human beings are facing under a context of global environmental change. Southwest China suffered extreme drought during 2009-2010, which caused great damages to vegetation growth in that area. We analyzed the vegetation responses to drought with both remotely sensed drought index and meteorological drought index. Monthly Vegetation Health Index (VHI) was calculated from NDVI and LST from 2001 to 2010. VHI was adopted to characterize vegetation responses to southwestern drought characterized by Standard Precipitation Index (SPI). At the beginning of drought, vegetation has little response (VHI > 50). As drought aggravates, VHI shows consistent and significant response (VHI < 30 in most areas). VHI and 3-month SPI have highest correlation for croplands, whereas VHI and 6-month SPI have highest correlation for forest. SPI and VHI have good spatiotemporal consistency during drought period in Southwest China. Meteorological drought index combined with remote sensing drought index can work well in monitoring vegetation responses to drought threat.

Session 10

650:
A Study of Engineering Applications of Space-borne SAR Data in Tropical and Subtropical Regions

Qiong HU
Vastitude(Hong Kong) Technology Co.,Ltd

The acquisition of space-borne SAR data is featured with all-weather and all-time availability, whereby SAR data is suitable for applications in cloudy and rainy areas, typically as tropical and subtropical regions. COSMO-SkyMed is a constellation consisting of 4 satellites, characterized with both left and right looking modes and large incidence angle range, thus data acquisition efficiency highly enhanced. This article is mainly based on COSMO-SkyMed SAR data, introducing COSMO-SkyMed SAR application in land use change detection, ground deformation monitoring, boundary safeguard and maritime management, and application of COSMO-SkyMed data in actual engineering projects.

Keywords: Space-borne SAR; change detection; ground deformation; engineering project.

617:
Dimensionality Reduction of Hyperspectral Image by Manifold Learning

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Hyperspectral remote sensing image (HSI) consists of hundreds of bands that contain rich space, radiation and spectral information. The high-dimensional data can also lead to the course of dimensionality problem making it difficult to be used effectively. In this paper, we proposed a manifold learning algorithm to reduce the dimensionality for HSI data. For high dimensional datasets with continuous variables, it is often the case that the data points are arranged along with low dimensional structures, named manifolds, in the high dimensional space. Manifold learning aims to identifying those special low dimensional structures for subsequent usage such as classification or regression. However, many manifold learning algorithms perform an eigenvector analysis on a data similarity matrix whose size is N×N, where N is the number of data points. The memory complexity of the analysis is at least O(N2) that is not feasible for a regular computer to compute or storage for very large datasets. To solve this problem, we used statistical sampling methods to sample a subset of data points as landmarks. A skeleton of the manifold was then identified based on the landmarks. The remaining data points were then inserted into the skeleton by Locally Linear Embedding (LLE). We tested our algorithm on AVIRIS Salinas-A data set. The experimental results showed that the HSI dataset could be reduced to a lower-dimensional space for land use classification with good performance, and the main structure was preserved well.

Keywords: dimensionality reduction; hyperspectral image; incremental manifold learning

646:
Object-Based Extraction of Wetland Information Using VHR Imagery

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[2]Hangzhou Hikvision Digital Technology Co., Ltd.

Wetland information extraction from very high resolution (VHR) imagery is an extremely challenging task. Classification techniques developed for medium/low resolution images are not effective when applying to VHR data (e.g. QuickBird, IKONOS) due to spatial heterogeneity issue. In this paper, an integrated wetland information extraction framework using object-based approach was proposed by combining different spectral, morphological, texture features of objects, resulting from the segmentation and region merging steps. The approaches are evaluated using a subset of QuickBird VHR image covering Xixi National Wetland Park, Hangzhou, China. The experimental results show this is effective to exact segmentation of land boundaries and suppress classification noises. In addition, the classification results show an overall accuracy of 84% and perform better than conventional method in terms of classification accuracy.

Keywords: object-based method; wetland; information extraction; very high resolution imagery

Abstracts

623:
Mangrove Species Classification with Very High Resolution Satellite Images

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Mangrove is one of the most important ecosystems in wetlands, which provides significant ecosystem services, such as carbon sequestration, flood mitigation, water quality protection and a wide range of habitats to support a rich variety of flora and fauna (Gibbs 2000; Wright and Gallant 2007). Mangrove can be especially vulnerable from the local impacts of global climate change. Given its importance, conservation of mangrove and its plant biodiversity becomes particularly crucial from local to regional and global scales. Conventionally, the assessment of mangrove biodiversity was conducted by field survey, which requires numerous resources and consequently difficult to update. Remote sensing techniques provide a relatively easy and much less costly approach to monitor the dynamics of mangrove. However, remote sensing of mangrove is challenging due to the nature of mangrove and limitations of spectral and spatial resolutions of remote sensing data.

Species classification of mangrove using remote sensing is beneficial to study the biodiversity of mangrove. Nowadays, advances in the high spatial and spectral resolutions of sensors now available to ecologists are making the direct remote sensing of certain aspects of biodiversity increasingly feasible (Turner et al. 2003). Very high spatial resolution data and hyperspectral data are more and more frequently used in direct monitoring of biodiversity. Indirect method can also offer valuable information. Species richness can be derived from certain environmental parameters captured by remote sensing images. Factors such as primary productivity, climate and habitat structure are widely applied for deriving the information of species richness. Additionally, the backscattering information for plants using active microwave remote sensing is also useful for identifying various plant species on high resolution images, since microwave is sensitive to the surface roughness (e.g. vegetation structure) and biophysical properties of plants (Hess et al. 1990; Imhoff 1995; Ramsey et al. 2013; Santos et al. 2003; Wong and Fung 2013, 2014). Nevertheless, the potential of synthetic aperture radar (SAR) is still under explored and discussion. Moreover, multi-polarimetric SAR data offer better capability for distinguishing different scattering mechanisms of ground targets, which will greatly help overcome the spectral confusion problems in optical data (Ainsworth et al. 2008; Bhattacharya and Touzi 2011), and thus may also provide complementary information for identifying various mangrove species. In this research, high spatial resolution satellite images from Worldview-2 with 8 bands and ALOS PALSAR were employed to classify the mangrove plants in the Mai Po wetland of Hong Kong. Spectral and textural features were extracted from the optical images and polarimetric features were extracted from the PALSAR image. Support vector machine was applied to classify the mangrove species with the spectral and textural information from the optical image and polarimetric information from the PolSAR image. Subsequently, all these features were fused to conduct the plants classification with a supervised classification process. Statistical data of field survey from the Agriculture, Fisheries and Conservation Department of Hong Kong government was used to validate the species classification result in this study. Experimental results indicated that 1) mangrove species classification with very high resolution satellite images was generally low (less than 80% of the overall accuracy) due to the highly spectral confusion between different mangrove species; 2) polarimetric features did not provide a generally positive result to the accuracy, while it was able to improve the accuracy of some species; 3) the combination of very high resolution optical and polarimetric SAR images is necessary to improve the classification accuracy of mangrove species.

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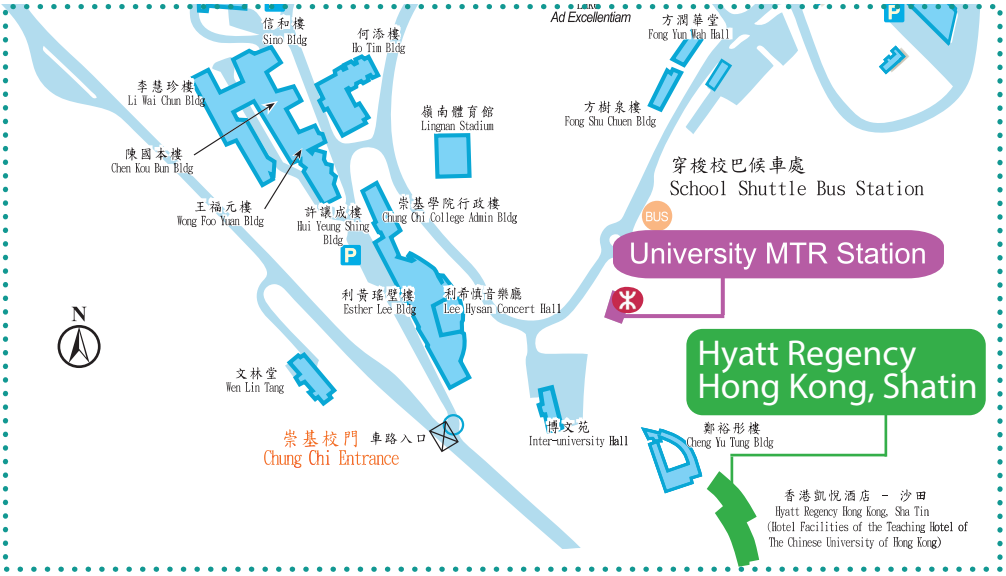

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University Guest House
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The Chinese University of Hong Kong,
Shatin, Hong Kong
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Tel: +852 2603 6411

Fax: +852 2603 5272

Website:
http://www.cuhk.edu.hk/ugh/

University Guest House provides free shuttle pick up from MTR University Station (the lay-by at Exit "C") to the Guesthouse. You can make reservation by calling at 26036411. The timetable is shown as below:

From Yali Guesthouse to MTR University Station **
由雅禮賓館開出 至 港鐵大學站 **
(Circular Route 循環線)

0800	1600
0830	1700
0900	1800
0930	1830
1000	1900
1100	1930
1200	2000
1245	2030
-	2100
1330	2130
1400	2200
1500	2245

** Please make reservations in advance
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Royal Park Hotel
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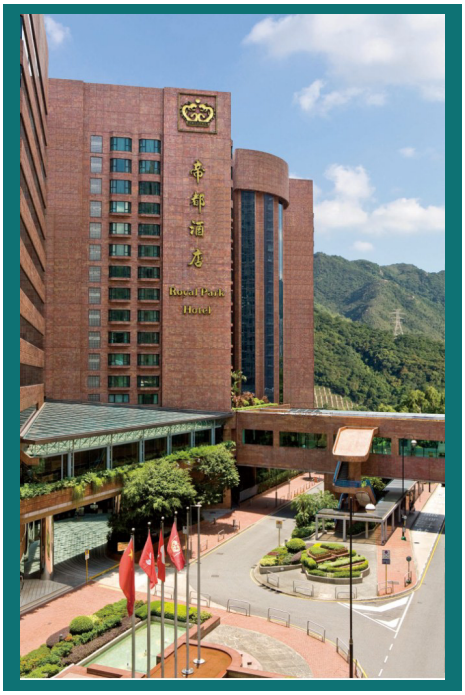

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Website:
http://www.royalpark.com.hk

Royal Park Hotel is well-connected with public transport. Guests can walk between Shatin MTR station and Royal Park Hotel:

More about Hong Kong

Area

Hong Kong can be divided into four distinct parts:

- Hong Kong Island
- Kowloon Peninsula
- New Territories
- The Outlying Islands

Map of Hong Kong

Transportation in Hong Kong

Variety of public transportations can be found in Hong Kong. MTR Subway and bus are examples of the most popular public transportations in Hong Kong.

More about Hong Kong

Time Difference

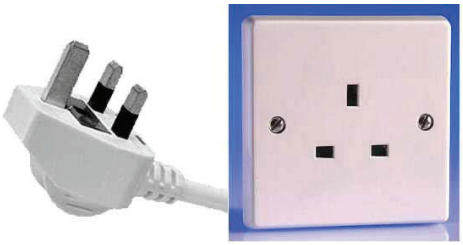
GMT/UTC + 8 hours

Local Language

Hong Kong's official languages are Chinese and English. In hotels, major restaurants, stores, and tourist centers, most people speak English and Mandarin. This is not always the case, however, with taxi drivers, bus drivers, and workers in small shops, cafes, and market stalls, people just say native Cantonese.

Electricity

220 volts, 50 cycles. Three-rectangular pin plugs are the norm.



Currency & Currency Exchange

The Hong Kong dollar (HK$) is the official currency. It is pegged to the US dollar at HK$7.8 to US$1.00 and is freely convertible. Traveler's checks are honored at most banks, hotels and shops.

Major credit cards are also widely accepted and ATM (ETC) facilities are widespread.

Weather

Hong Kong is sub-tropical and temperatures in November range from 68° F / 20° C to 75° F / 24° C with humidity range from 67% to 77%. A sweater or light jacket is recommended for air conditioned restaurants and hotels. An umbrella is recommended in case of rain. The most updated information of weather can be found in the website of Hong Kong Observatory: http://www.hko.gov.hk

More about Hong Kong

Useful Telephone Numbers

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Dial-a-Weather Service:	+852 1878 2000
Kowloon Bus (KMB):	+852 2745 4466
City Bus:	+852 2873 0818
First Bus:	+852 2136 8888
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港鐵路綫圖 MTR system map

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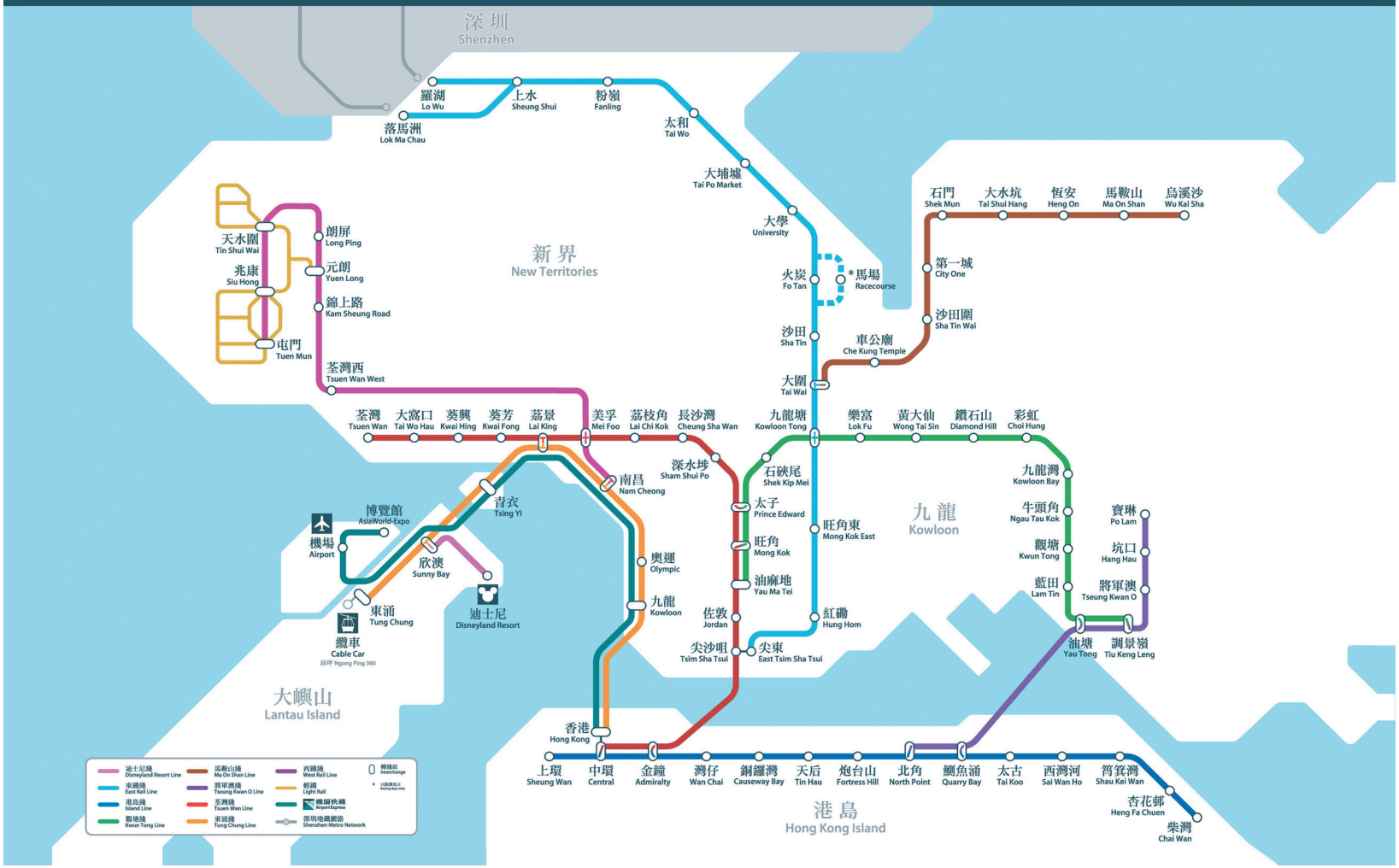

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