Hong Kong Observatory
1-year Placement Programme 2017
List of projects and job specifications

Project Reference	Project title and details
A2a	**Title:** Study on Impacts of Satellite Data Assimilation and Sensitivity to Parameterization of Observation Errors in Convective Resolving Model **Description:** Due to the lack of conventional observations and the limited coverage of land based radar, satellite becomes the only viable source of observations over ocean. The aim of the project is to study the ways and the benefits of assimilating satellite data (including atmospheric motion vector, clear sky irradiance, surface wind from scatterometer, etc) in convective resolving model. Sensitive to quality control, data thinning and parameterization of observation errors would also be studied. **Necessary skills/attributes:** Strong analytical skill. Experience in numerical simulations. Interest in meteorology. Experience with computer programming. **Target Students :** Physics

Project Reference	Project title and details
A2b	**Title:** Large Eddy Simulation (LES) of Complex Airflow near the Hong Kong International Airport **Description:** The Hong Kong International Airport is located near the geographically complex Lantau Island, downstream of which terrain-disrupted airflow is known to impact on landing/departing aircraft. This project studies the feasibility of, and develops methods for, simulating these small-scale, fast-evolving wind features using an extremely high resolution configuration of the WRF (Weather Research and Forecast) Model. Validation will be made against advanced observation data e.g. LIDAR scans. **Necessary skills/attributes:** 2nd or 3rd year of undergrad. Study Strong academic background Good programming skills (Fortran or C++) Interest in statistical physics or fluid dynamics **Target Students :** Physics

Project Reference	Project title and details
F3a	**Title:** Verification of Quantitative Precipitation Estimates and Forecasts **Description:** Currently HKO has verification systems to benchmark the performance of quantitative precipitation estimates and forecasts. They were developed years ago and not capable for adding new verification methodologies. Thus a consolidated replacement system bearing the following features is required: 1) Process data efficiently and generate results within reasonable time frame; 2) Verify both real-time and back-tested products; 3) Verify probabilistic forecasts; and 4) Support fuzzy verification to quantify errors in different spatial, temporal or intensity scales. The student will work, together with a System Developer and an Experimental Officer, to: 1) Review the existing verification methodologies and architectures of the verification systems; 2) Conduct research to understand novel verification methodologies; and 3) Design and develop the replacement verification system. **Necessary skills/attributes:** Forecast verification techniques, Linux, HTML5, database and Java programming **Target Students :** Physics, ESS, CSE

Project Reference	Project title and details
F3b	**Title:** High-resolution 3-dimensional Objective Consensus Forecasts **Description:** The Automatic Regional Weather Forecast (http://maps.weather.gov.hk/ocf/) is currently based on the surface forecasts of computer weather models, with adjustments made on model outputs according to recent deviations of model prediction from the actual observations. This may fail to capture rapidly-changing weather scenarios, and the project aims at enhancing the adjustment scheme by taking into account of the geographical characteristics and information provided from model forecasts on upper levels. The student is expected to: 1) apply certain physical laws in the data processing, 2) carry out statistical analysis of the results, 3) experiment with different methodologies, and 4) assess the efficiency of the computer code. **Necessary skills/attributes:** Numerical analysis, C/C++, Shell script programming **Target Students :** Physics, ESS, CSE

Project Reference	Project title and details
F4	**Title:** Development of a Suite of Algorithms for Efficient Correction of the Automatic Weather Forecasts for Hong Kong **Description:** The Hong Kong Observatory delivers worded weather forecasts and automatic forecasts through a variety of dissemination channels to meet the needs of the public. For local weather, the Observatory's forecaster compiles worded 9-day weather forecasts while automatic gridded forecasts are generated from computer models directly without manual adjustment. Correction to the automatic forecasts is needed from time to time when the automatic forecasts do not agree with the subjective forecasts issued by the forecasters. In this project, reference will be made to the results from a preceding study on the methods and techniques currently available for modifying gridded forecasts. A suite of algorithms will then be developed for efficient correction of the automatic forecasts for Hong Kong taking into account the specific local conditions and environment. **Necessary skills/attributes:** Good knowledge in physics, scientific programming and statistical data analysis.

Project Reference	Project title and details
R2	**Title:** Development of a Radiation Repository System for Management of Knowledge on Radiation Monitoring, Laboratory Measurements and Consequence Assessment **Description:** A Radiation Repository System will be developed to facilitate quick search and retrieval of information, documents and templates for handling enquiries, problem solving and retention of knowledge and expertise in radiation monitoring, laboratory measurements and consequence assessment. It is a knowledge management tool which enables access to databases and information systems residing in various servers and media. A mobile version of the system equipped with restricted and open access for different types of information will also be explored. The student of this project will go through system planning, design and development phases based on users' requirements and feedback. **Necessary skills/attributes:** Strong programming skills and experience with web authoring with PHP scripting, MySQL database, and JavaScript (jQuery). Knowledge on CLIPS rule based programming language is desirable. Good communication skills to gather users' feedback and demonstrate applications of the tool. **Target Students :** Computer Science

Project Reference	Project title and details
R3	**Title:** Evaluation and Application of Meteorological Sensors for Use in Portable Automatic Weather Stations for the Study of Micro-climate in Hong Kong. **Description:** Evaluate the performance of different meteorological sensors and apply them in portable automatic weather stations for the study of micro-climate in Hong Kong. Potential application areas are studying the urban heat island effect as well as measuring the vertical temperature and humidity profile at selected locations in Hong Kong. **Necessary skills/attributes:** Genuine interest in meteorology. Knowledge in data analysis. Experience in the use of Matlab is preferable. **Target Students :** Physics, Earth System Science, Computer Science or related disciplines.