

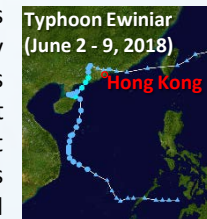
# Natural Hazards in a Changing Climate: Floods, Landslides, and Permafrost Degradation

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Under a warming climate, the Earth System has been and will continue being confronted with many challenges, such as frequent extreme weather events (e.g., typhoons) in tropical regions and significant hydro-environmental changes (e.g., permafrost thawing) in cold regions. Both these short-term events and long-term changes often cause severe natural hazards, e.g., floods and landslides (rainfall-induced and permafrost-related). In this talk, I will present work addressing these hydroclimate-related challenges.



Specifically, I first demonstrate progress on improving the predictability of rainfall-induced floods caused by extreme weather events – from developing quality atmospheric forcing fields and investigating hydrological mechanisms that govern flood response to extraordinary rainfall – to improving operational flood forecasts by assimilating real-time river discharge observations into a fully-distributed hydrologic model. Next, I unveil the relationship between subsurface hydrologic processes and the initiation mechanism of rainfall-induced shallow landslides in mountainous region by coupling slope stability models with the hydrological model. Permafrost thawing also affects slope stability and is one of the important triggering factors responsible for landslide initiation in cold regions. In the third part of the talk, I discuss the aspects affecting the modeling capability of permafrost dynamics with the land model of the NASA GEOSv5. Simulation results reveal that incorporating organic carbon impact on soil thermal properties significantly improves the model's ability to simulate realistic subsurface temperatures. Results also demonstrate that some permafrost areas in middle-to-high northern latitudes are experiencing significant degradation in recent decades, imposing severe hydro-environment impacts in cold regions.

I will conclude with a brief discussion on 1) the positive feedback of permafrost degradation to climate warming via releasing greenhouse gases into the atmosphere, and 2) the potential influence of climate warming on the occurrence of extreme weather events and the weather-associated natural hazards in tropical regions.

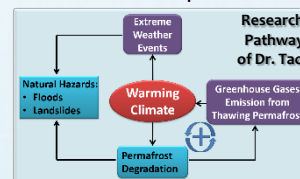
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Conference Room, 3/F,  
Mong Man Wai Building



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