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Preface to the Special Issue on "Earth Observations and Societal Impacts"

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We would like to present, with great pleasure, a special issue volume on "Earth Observations and Societal Impacts". This special issue is part of the the journal ***Terrestrial, Atmospheric and Oceanic Sciences (TAO)***, and is devoted to The International Conference on Earth Observations and Societal Impacts (ICEO&SI; http://www.iceo-si.org.tw/) which is an annual conference sponsored by the Taiwan Group on Earth Observations (TGEO; http://tgeo.org.tw/) since 2011.

This special issue is based primarily on the papers presented in ICEO&SI 2013 to summarize the most recent developments and ideas in Earth environment observations, including atmospheric, oceanic, geophysical research, healthy environmental conditions for humans, plants and animals and their societal impacts.

The papers presented in this special issue involve:

I. Atmospheric Science and Oceanography:

(1) Vanishing Ponds and Regional Water Resources in Taoyuan, Taiwan.

(2) Land Cover Classification Accuracy Assessment Using Full-Waveform LiDAR Data.

(3) Long-Term (1982 - 2012) Summertime Sea Surface Temperature Variability in the Taiwan Strait.

(4) Northern South China Sea Surface Circulation and its Variability Derived by Combining Satellite Altimetry and Surface Drifter Data.

The precipitation in Taiwan varies widely in response to seasonal effects and weather events such as Typhoon and Meiyu systems. To provide and regulate sufficient water supply for Taiwan, precipitation must be held back in reservoirs. Liou et al. (2015) used SPOT satellite images taken in 1993, 2003, and 2010 to analyze and assess the importance of small-scale ponds in Taoyuan, Taiwan as water conservation facilities. It was found that the irrigation pond water area decreased by 35.94% from 1993 - 2010. The ponds on the Taoyuan Tableland improve regional rainfall interception and surface detention capabilities and provide additional planning advantage for regional water management.

The geomorphology of Taiwan is characterized by dramatic changes in terrain, geological fractures and frequent natural disasters. It is quite important for decision makers to know the changes in land cover and land use. In this special issue, Chang et al. (2015) applied airborne LiDAR data to assess the accuracy of land cover classification. Their results pointed out that the accuracy can be enhanced by applying the Gabor texture and geomorphometric features.

In addition to terrain studies, oceanic features around Taiwan are also a major issue for regional studies. Lee et al. (2015) applied the sea surface temperature (SST) to study its variability in the Taiwan Strait. They indicated that the SST is warming and varying associated with El Niño and Southern Oscillation (ENSO) in the Taiwan Strait in summer.

Ocean surface circulation is related to the climate variability from regional to global scales. Peter et al. (2015) integrated satellite altimeter and surface drifter data to study the surface circulation on the northern South China Sea (NSCS). They found the mean velocity field is more aligned to the northeast monsoon circulation pattern and the anomaly field illustrates significant current deviations in the southern part. The influence of ENSO on NSCS circulation is found in zonal and boundary flows.

II. Disasters and Water:

(1) Investigating Near Surface S-Wave Velocity Properties Using Ambient Noise in Southwestern Taiwan.

Ambient noise is typically used to estimate seismic site effects and velocity profiles instead of earthquake recordings, especially in areas with limited seismic data. This is a simple but mature method in quick acquiring of earth subsurface velocity characteristics, good for engineering and seismic site evaluation. A linear correlation between dominant frequency and Vs30 (average S-wave velocity in the uppermost 30 m ground) is found in this study. This relationship could be used as a proxy of Vs30 from a quick ambient noise measurement.

(2) Regional Flooding Induced by Tide and Warm Water Effects in Tuvalu.

Tuvalu is a chain of low-lying islands only 4.6 m above sea level. Unlike most countries, flooding in Tuvalu is caused mainly by the spring tide and warm-water mass regardless of sea level rise. In this study a statistical flooding prediction model is developed and applied. Nineteen years of sea level data from tide gauge and satellite altimetry are analyzed to predict the regional flooding. The result is good provided that careful validation is made using a subset of data.

(3) Ecological and Hydrological Changes and Interactions After Recent Comprehensive Control Projects in the Heihe River Basin.

Recent Comprehensive Control Projects in the Heihe River Basin (HRB) were implemented beginning in 2001. The ecological and hydrological benefits of this effort were evaluated by analyzing the resulting changes in the vegetation cover and groundwater levels. Ten-year time series vegetation data were used. It is found that increases in mountainous precipitation and runoff resulted in increasing vegetation cover. In some regions in the middle and downstream portions of the HRB, decreases in vegetation cover exhibited a strong relationship with changes in groundwater levels. Big differences in the relationships among the SINDVI derived from satellite observations with several hydrological variables in the different HRB regions were observed. Constructive suggestions are provided for local governments based on the analysis results.

(4) Shallow and Deep-Seated Landslide Differentiation Using Support Vector Machines: A Case Study of the Chuetsu Area, Japan.

Both statistical approach and artificial Intelligence methods are good in evaluating landslide susceptibility as indicated in recent studies. The present study found that one of the artificial Intelligence methods - SVM (support vector machines) is not only good in evaluating landslide susceptibility, but also useful in predicting and differentiating shallow and deep-seated landslides.

This paper used landslides triggered by the M 6.8 Chuetsu earthquake in Japan and the successive aftershocks, using a 2-m DEM derived from airborne Light detection and ranging (LiDAR), and related data to build a landslide susceptibility model for shallow and deep-seated landslide differentiation. This model was used to prepare a map showing probable areas of shallow and deep-seated landslides as well as areas with no future landslides. The testing accuracy and the prediction of landslide types were 89.2 and 77.8%, respectively.

(5) A Study on Factors Affecting Airborne LiDAR Penetration.

This new technology has been applied in forest area in Taiwan for many years and has accumulated a lot of valuable experiences. These include the present proposed penetration rate problem. The present study used full-waveform LiDAR to analyze surface reflected echoes and penetration rate. The result shows that dry ground, zero incidence angles, and less vegetation cover are the important factors to increase the penetration rate. To avoid employment of the LiDAR survey directly following precipitation is the most important thing to follow.

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