Geophysical Research Abstracts
Vol. 19, EGU2017-10934, 2017
EGU General Assembly 2017

Development of a drought forecasting model for the Asia-Pacific region using remote sensing and climate data: Focusing on Indonesia

Jinyoung Rhee (1), Gayoung Kim (2), and Jungho Im (3)

(1) APEC Climate Center, Climate Application Department, Busan, Republic of Korea (jyrhee@apcc21.org), (2) APEC Climate Center, Climate Application Department, Busan, Republic of Korea (chorong@apcc21.org), (3) Ulsan National Institute of Science and Technology, Ulsan, Republic of Korea (ersgis@unist.ac.kr)

Three regions of Indonesia with different rainfall characteristics were chosen to develop drought forecast models based on machine learning. The 6-month Standardized Precipitation Index (SPI6) was selected as the target variable. The models' forecast skill was compared to the skill of long-range climate forecast models in terms of drought accuracy and regression mean absolute error (MAE). Indonesian droughts are known to be related to El Nino Southern Oscillation (ENSO) variability despite of regional differences as well as monsoon, local sea surface temperature (SST), other large-scale atmosphere-ocean interactions such as Indian Ocean Dipole (IOD) and Southern Pacific Convergence Zone (SPCZ), and local factors including topography and elevation. Machine learning models are thus to enhance drought forecast skill by combining local and remote SST and remote sensing information reflecting initial drought conditions to the long-range climate forecast model results. A total of 126 machine learning models were developed for the three regions of West Java (JB), West Sumatra (SB), and Gorontalo (GO) and six long-range climate forecast models of MSC_CanCM3, MSC_CanCM4, NCEP, NASA, PNU, POAMA as well as one climatology model based on remote sensing precipitation data, and 1 to 6-month lead times. When compared the results between the machine learning models and the long-range climate forecast models, West Java and Gorontalo regions showed similar characteristics in terms of drought accuracy. Drought accuracy of the long-range climate forecast models were generally higher than the machine learning models with short lead times but the opposite appeared for longer lead times. For West Sumatra, however, the machine learning models and the long-range climate forecast models showed similar drought accuracy. The machine learning models showed smaller regression errors for all three regions especially with longer lead times. Among the three regions, the machine learning models developed for Gorontalo showed the highest drought accuracy and the lowest regression error. West Java showed higher drought accuracy compared to West Sumatra, while West Sumatra showed lower regression error compared to West Java. The lower error in West Sumatra may be because of the smaller sample size used for training and evaluation for the region. Regional differences of forecast skill are determined by the effect of ENSO and the following forecast skill of the long-range climate forecast models. While shown somewhat high in West Sumatra, relative importance of remote sensing variables was mostly low in most cases. High importance of the variables based on long-range climate forecast models indicates that the forecast skill of the machine learning models are mostly determined by the forecast skill of the climate models.