Improving Monitoring of Tropical Forests and their Characterizations in NCEP Models Using GOES-R ABI Land Products Data

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To meet increasing demands for high resolution weather forecasts and climate service products, NCEP needs an improved land surface product with fine resolution and high frequency to reflect and describe real-time conditions of vegetation dynamics in its numerical weather prediction and climate models. Unlike the maximum once per day acquisition of a polar-orbiting satellite, the Geostationary Operational Environmental Satellite-R Series (GOES-R) Advanced Baseline Imager (ABI) will provide multiple daily views and thus significantly increase the chance to produce a high quality and high frequency data product with reduced cloud contamination. To reduce the data noise and gaps (both in time and space), this project aims to use the GOES-R ABI product to generate, a real-time daily/weekly cloud-free land surface dataset of normalized difference vegetation index (NDVI), green vegetation fraction (GVF) with the best quality over tropical rainforests where the data quality has been a long standing issue. Observations from the Spinning Enhanced Visible and Infra-red Imager (SEVIRI), onboard the European Meteosat Second Generation (MSG) satellite, will be used as proxy before the GOES-R ABI is available. The second equally important part of the proposed work is to examine impacts of our derived GVF datasets on numerical weather predictions. In particular, we will examine if surface temperature and precipitation forecasts will be improved using the NCEP GFS coupled with the Noah Land Surface Model.

The SEVIRI data we used contain observation of land surface at 30-minute time intervals. We used top of atmosphere (TOA) reflectance values from the red (0.635um), NIR (0.81um) and other satellite geometry information to calculate NDVI, angular corrected NDVI (which is used to calculate GVF) and GVF at 30-minute time interval from 2009. We generated daily, weekly and monthly NDVI and GVF dataset based on maximum NDVI. We examined Daily/weekly/monthly NDVI and GVF values to find vegetation phenology and how the magnitude in NDVI and GVF changes from wet to dry seasons in tropical region. Our estimated phenology is compared with that from AVHRR. The smoothness and robustness of seasonality of the two NDVI and GVF datasets are compared and reasons for the differences between our data and the data of AVHRR are identified. In year 2, we will continue our work of the comparison between AVHRR and SEVIRI data and begin the impact study of SEVIRI GVF on NCEP

GFS model forecasts (currently NCEP models use AVHRR monthly/weekly GVF as the land surface boundary condition dataset) for different scenarios. We anticipate generating a blended GVF from AVHRR and SEVIRI for EMC/JCSDA and implementation of the new technique at OSDPD for full disk daily SEVIRI NDVI and GVF product.