GEONEX: Land monitoring from a new generation of geostationary satellite sensors

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The latest generation of geostationary satellites carry sensors such as ABI (Advanced Baseline Imager on GOES-16) and the AHI (Advanced Himawari Imager on Himawari) that closely mimic the spatial and spectral characteristics of Earth Observing System flagship MODIS for monitoring land surface conditions. More importantly they provide observations at 5-15 minute intervals. Such high frequency data offer exciting possibilities for producing robust estimates of land surface conditions by overcoming cloud cover, enabling studies of diurnally varying local-to-regional biosphere-atmosphere interactions, and operational decision-making in agriculture, forestry and disaster management. But the data come with challenges that need special attention. For instance, geostationary data feature changing sun angle at constant view for each pixel, which is reciprocal to sun-synchronous observations, and thus require careful adaptation of EOS algorithms.

Our goal is to produce a set of land surface products from geostationary sensors by leveraging NASA's investments in EOS algorithms and in the data/compute facility NEX. The land surface variables of interest include atmospherically corrected surface reflectances, snow cover, vegetation indices and leaf area index (LAI)/fraction of photosynthetically absorbed radiation (FPAR), as well as land surface temperature and fires. In order to get ready to produce operational products over the US from GOES-16 starting 2018, we have utilized 18 months of data from Himawari AHI over Australia to test the production pipeline and the performance of various algorithms for our initial tests. The end-to-end processing pipeline consists of a suite of modules to (a) perform calibration and automatic georeference correction of the AHI L1b data, (b) adopt the Multi-Angle Implementation of Atmospheric Correction (MAIAC) algorithm to produce surface spectral reflectances along with compositing schemes and QA, and (c) modify relevant EOS retrieval algorithms (e.g., LAI and FPAR, GPP, etc.) for subsequent science product generation. Initial evaluation of Himawari AHI products against standard MODIS products indicate general agreement, suggesting that data from geostationary sensors can augment low earth orbit (LEO) satellite observations.