Topics (T)
Climate Change Impacts and Challenges (Biodiversity, Forests and Land, Ocean/Marine Ecosystems, the Arctic and beyond) [2] (2B)

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ADVANCES IN BURNED AREA DETECTION FROM REMOTE SENSING: THE FIRECCI PRODUCTS

Abstract

The FireCCI project, as part of the ESA Climate Change Initiative (CCI), has developed and validated burned area (BA) algorithms and products with the objective to meet, as far as possible, GCOS (Global Climate Observing System) Essential Climate Variable requirements for global satellite data products from multi-sensor data archives. The current suite of global products include FireCCI51, whose algorithm uses as input MODIS NIR surface reflectance at 250 m and 1-km-resolution active fires, and currently covers a 20-year time series. An evolution of this algorithm uses the SWIR bands of the Sentinel-3 SLSTR sensor, provided at 300 m resolution by the Synergy products developed by ESA. This input is complemented by VIIRS active fire information at 375 m resolution. The resulting BA product, called FireCCIS310, takes advantage of the improved BA detection capacity of the SWIR bands and the higher resolution of the VIIRS thermal information, apart from upgrades in the algorithm itself. This product is currently available for 2019, and it is being further processed for the subsequent years. FireCCIS310 is capable of detecting 28% more BA than FireCCI51 for the same year. Complementary, a specific dataset has been created for sub-Saharan Africa, where more than 70% of the total global burned area occurs. This product, called FireCCISFD (SFD standing for Small Fire Dataset), uses surface reflectance from the Sentinel-2 MSI sensor at 20 m spatial resolution, supplemented by active fire information. Version 1.1 of this dataset (FireCCISFD11) covers the year 2016 and is based on Sentinel-2A data plus MODIS active fires, while

the newer version (FireCCISFD20) has been processed for the year 2019, and takes advantage of the additional data provided by Sentinel-2B, duplicating the input data amount and temporal resolution, and the improved spatial resolution of VIIRS active fires. Due to the much higher spatial resolution of the input data, this product detected 58% more BA than FireCCI51 in 2016, and 82% more in 2019, mostly due to the enhanced detection of small burned patches, not detectable with coarser resolution sensors. All these datasets provide very valuable information regarding land cover change dynamics due to fires, and their associated aerosols and greenhouse gasses emitted to the atmosphere. Particularly, the SFD datasets show that current estimations of fire occurrence and emissions have been underestimated, and that they should be re-assessed taking into account the capabilities of the information provided by medium to high-resolution sensors.