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Inter-comparison of four operational satellite Fire Radiative Power (FRP) products: A spatial and temporal consistency assessment.

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We inter-compare four remotely sensed Fire Radiative Power (FRP) products, the polar-orbiter products derived from active fires detected using the Moderate Resolution Imaging Spectroradiometer data (MCD14ML) and VIIRS (VNP14ML and VNP14IMGML), and geostationary products derived from data collected by Meteosat's Spinning Enhanced Visible and Infrared Imager (the LSA-SAF FRP-PIXEL product). We focus on seven years of data (January 2012 to December 2018), and using the ability of the geostationary product to capture the daily fire cycle we quantify for each polar-orbiter FRP product the proportion of daily fire energy release that they capture and that which they miss, and also identify the areas where their overpass times successfully capture the diurnal fire activity peak, and where they do not. In addition, by analysing frequency density (f-D) distributions of FRP at a 0.5° grid cell resolution we evaluate each products minimum FRP detection limit, which typically precludes detection of a proportion of the highly numerous but individually relatively small and/or low intensity fires. Results are summarized by biome type based on the ESA CCI Land Cover product. Our inter-comparison allows for the identification and quantification of some of the key non-fire effects causing FRP underestimation in satellite FRP products: pixel size, pixel area growth off-nadir, and the low temporal resolution of polar-orbiting sensors. Our results and the methodology developed herein should serve to evaluate and cross-calibrate FRP estimates obtained by the future Copernicus Climate Change Services (C3S) FRP products, which initially at least will be based only on SLSTR data collected by the Sentinel-3 satellite.