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Assimilation of FRP Observations for Global Fire Emission Estimation in MACC-II

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We present the Global Fire Assimilation System (GFAS) that is run routinely at ECMWF by the MACC-II project in preparation of the operational GMES atmospheric service. The GFAS currently combines Fire Radiative Power (FRP) observations from the polar orbiting MODIS instruments and applies a quality control, a partial cloud cover correction and observation gap filling with a Kalman filter to generate daily global FRP maps. These are subsequently used to calculate the daily average dry matter combustion rate and emission rates for 40 atmospheric trace constituents in real time with a time lag of 7 hours. The emission estimates are consistent with the GFED3 emission dataset, but FRP appears to have a lower detection threshold than the burnt area observations used in GFED3. The emissions are further validated with the atmospheric composition models of MACC by comparing the simulated smoke plumes with atmospheric observations. The temporal and spatial patterns of the emissions are shown to be realistic. However, a general mismatch between various aerosol smoke emission rates from bottom-up and top-down inventories is evident. Upcoming upgrades of GFAS will include FRP observations from the geostationary instruments aboard Meteosat-9, GOES-East and GOES-West and improve the temporal resolution to one hour.