Evaluation of Fire Emissions using New Satellite Imagery of Burned Area and Carbon Monoxide

Ivar R. van der Velde

SRON Netherlands Institute for Space Research, Netherlands

Author list (excluding presenting author)

G. R. van der Werf, D. van Wees, N. A. J. Schutgens, R. Vernooij, E. Chuvieco, I. Aben

Abstract

Satellite observations offer invaluable insights into fires and deforestation worldwide, especially in remote regions that lack reliable ground data. While providing crucial information on burned areas and active fires, current satellite instruments with coarser spatial resolution (0.5-1km) often miss small fires that occupy only a fraction of a pixel. In Africa alone, fires contribute to approximately 50% of global fire carbon emissions (~1 PgC), yet this estimate possibly under represents the true impact due to undetected small fires, particularly those linked to agricultural activities in savannas. To address this limitation, we assess different remotely sensed burned area data at 20m specific to Africa (from Sentinel-2) and global data at 300m (from Sentinel-3) and 500m (from MODIS). With this data we derive an ensemble of CO emission estimates using an improved fuel consumption model coupled with monthly varying emission factors (EF) based on field observations. In addition, these new emission estimates are compared against the Global Fire Emission Database (GFED). These emissions serve as inputs for the Weather Research and Forecasting Model with Chemistry (WRF-Chem), enabling realistic simulations of atmospheric chemistry, transport, and mixing of CO. Through evaluation against remotely sensed TROPOMI CO data, and additional aircraft data and ground-based sites, we provide a comprehensive assessment of the impact of small fires on African and Indonesian emission estimates.

Early Career Scientist

NO, I am not an early career scientist.

IGAC Activities

BBURNED: Biomass Burning Uncertainty: ReactioNs, Emissions and Dynamics