## Emissions of climate-altering species from open vegetation fires in the Mediterranean region: methods and data review

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Climate change in the Mediterranean region raises serious concerns about the role of open vegetation fires in the climate-altering species. This study reviews current methodologies for quantifying greenhouse gas and black carbon emissions from open vegetation fires and examines the data provided by four state-of-the-art inventories of carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and black carbon (BC) in the Mediterranean region from 2003-2020.

Only a limited number of studies have addressed the quantification of emissions from open fires in this region. Our review revealed discrepancies among the four inventories (GFED v4.1s, GFAS v1.2, FINN v2.5, and EDGAR v8.0). FINN v2.5 consistently reported the highest emissions, while GFED v4.1s reported the lowest. The relative ranking of total emissions varies by species (e.g., CO2 vs. CH4), and different proportions are attributed to the countries within the Mediterranean domain. These differences arise from variations in the spatial resolution of fire detection, the approaches to estimating fuel loads, and emission factors applied.

The three inventories that reported wildfire emissions identified consistent peaks in 2007, 2012, and 2017. These peaks are likely linked to extreme fire seasons and may have been influenced by La Niña events. To improve the accuracy and consistency of emission estimates for the region, we recommend combining bottom-up methods with the top-down approaches based on satellite and in situ atmospheric observations.

**Keywords: wildfires, Mediterranean, emission inventories**