



FOREST FIRE BLACK CARBON POLLUTION



APPLICATION NOTE

MOTIVATION

Savanna fires are the largest global source of biomass burning emissions. While these compounds adversely impact the local air quality and long-term climate change, documentation on qualitative and quantitative characteristics of the emissions are still very scarce.

The adverse effects of smoke on air quality and visibility are of great concern for fire and land managers planning prescribed burns. Since the fire emissions may lead to a violation of the National ambient air quality standards, decisions about the prescribed burns must be made not only based on the fire safety criteria (wind speed, fuel moisture etc.) but also taking into account impacts of the smoke on air quality and visibility.

RESEARCH TOPICS

FOREST FIRE EMISSION FACTORS

- Airborne sampling of forest fire plumes using air planes to determine emission factors.
- The emission factors from individual fires varied between 0.26 and 0.91 g BC kg⁻¹ of dry matter.

CONTROLLED TESTS

- Burning of surface biomass composed of leaf litter, twig, seedling, and understory.
- The samples are dried until reaching constant weight, measured and burned.

PREDICTING EFFECT OF FOREST FIRES

- Atmospheric pollution regulations have emerged as a dominant obstacle to prescribed burns.
- Using emission factors and performing air mass movement modeling (WRF-SFIRE) the effect of forest fires can be predicted.

EFFECT OF DISTANT FOREST FIRES

- A background station is used to detect distant forest fire events.
- Air mass origin, trajectory and plume arrival time are estimated by HYSPLIT backtrajectory analysis.
- Measurements were done in the Mediterranean islands in summer when there are intense biomass-burning events.

Related articles

- M. O. Andrea et. al., „Airborne studies of aerosol emissions from savanna fires in southern Africa“, *Journal of Geophysical Research: Atmospheres*, 103, 1984-2012 (1998).
- U. Chaiyo et. al., „Estimation of Black Carbon Emissions from Dry Dipterocarp Forest Fires in Thailand“, *Atmosphere*, 5, 1002-1019 (2014).
- A. K. Kochanski et. al., „Air pollution forecasting by coupled atmosphere-fire model WRF and SFIRE with WRF-Chem“, *Proceedings of 4th Fire Behavior and Fuels Conference*, 18-22 February 2013, Raleigh (2013).
- A. Bougiatioti et. al., „Processing of biomass-burning aerosol in the eastern Mediterranean during summertime“, *Atmos. Chem. Phys.*, 14, 4793-4807 (2014).

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