



Calculation of smoke plume mass from passive UV satellite measurements by GOME-2 polarization measurement devices

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The Wallow wildfire of 2011 was one of the most devastating fires ever in Arizona, burning over 2,000 km² in the states of Arizona and New Mexico. The fire originated in the Bear Wallow Wilderness area in June, 2011, and raged for more than a month. The intense heat of the fire caused the formation of a pyro-convective cloud. The resulting smoke plume, partially located above low-lying clouds, was detected by several satellite instruments, including GOME-2 on June 2. The UV Aerosol Index, indicative of aerosol absorption, reached a maximum of 12 on that day, pointing to an elevated plume with moderately absorbing aerosols.

We have performed extensive model calculations assuming different aerosol optical properties to determine the total aerosol optical depth of the plume. The plume altitude, needed to constrain the aerosol optical depth, was obtained from independent satellite measurements. The model results were compared with UV Aerosol Index and UV reflectances measured by the GOME-2 polarization measurement devices, which have a spatial resolution of roughly 10x40 km². Although neither the exact aerosol optical properties nor optical depth can be obtained with this method, the range in aerosol optical depth values that we calculate, combined with the assumed specific extinction mass factor of 5 m²/kg lead us to a rough estimate of the smoke plume mass that cannot, at present, be assessed in another way.