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Session 3 *Modeling methods - Data assimilation, inline coupling, etc*

Title: Estimating smoke emissions by assimilating satellite observations with HYSPLIT model

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Abstract

Wildfire smoke forecasts are mostly hindered by large uncertainties in the smoke emission estimates. An emissions inverse modeling system has been developed to estimate wildfire smoke source strength, vertical distribution, and temporal variations by assimilating NOAA GOES Aerosol/Smoke products (GASP) with the HYSPLIT model. In this top-down approach, a cost function is defined to mainly quantify the differences between model predictions and satellite measurements of column integrated air concentrations, weighted by the model and observation uncertainties. Smoke sources that minimize this cost function provide the optimal smoke emission estimates. These smoke source terms that generate the best HYSPLIT predictions in agreement with the satellite observations can be utilized as inputs to other smoke prediction models besides the HYSPLIT model. A wildfire event that took place in the Southeast US during November 2016 has been used as an example to test the emission estimation system. Hindcasts using the emission estimates by the inverse system have been performed. In addition, a comparison between this new emission estimation system and the US Forest Service BlueSky emission prediction that is currently used by the US National Weather Service's operational forecasts has been conducted.