

SSEC/CIMSS Seminar

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Forecasting Smoke Emissions, Dispersion, and Impact on Air Quality in the Continental United States Using Real-Time MODIS Data and Meteorology

We have developed a Weather Research and Forecasting – Smoke Dispersion (WRF-SD) System to predict atmospheric pollutant concentrations downwind from large fires in the United States twice daily with a horizontal resolution of 22 km x 22 km and 37 vertical layers. The system also quantifies and forecasts the amount of trace gases and aerosol particles emitted by biomass burning twice daily with a 1-km x 1-km resolution in the continental U.S. The forecast model is based on near real-time emission rates of trace gases and aerosol particles from the fires. The emission rates with a 1-km x 1-km resolution are computed using (1) real-time MODIS-derived fire locations and burn scars, (2) a fire behavior model, (3) the fuel maps, (4) the daily fuel moisture content, and (5) the emission factor of each compound in different ecosystems. The fire locations and burn scars were generated 40 minutes after the Terra and Aqua satellite overpasses by our in-house MODIS Direct Broadcast System four times per day. A fire behavior model is used to predict fire propagation and the burned areas every four hours for the next 24 hours based on meteorological and vegetation conditions. The MODIS algorithms for fire detections and burned areas were validated by the National Fire Occurrence Database and the fire polygons of five large fires in the U.S. and Canada.

I will present (1) a time series of daily emissions of CO and PM_{2.5} from fires in the continental U.S. from January to September 2006, and (2) the contours and vertical profiles of CO and particulate concentrations in the continental U.S. during the fire season. The WRF-SD model can be applied to compute smoke emissions and forecast air quality in other regions of the world with access to real-time MODIS data from the Direct Broadcast System.

Friday, 21 September 2007

11:00 a.m.

Room AOSS 351