

Final Report

Texas Environmental Research Consortium Project H-3

Emissions Inventory Associated with Forest, Grassland, and Agricultural Burning during the Texas Air Quality Study

Submitted by:

David Allen
Anil Katamreddy
Victoria Junquera
Jan Decabooter

Center for Energy and Environmental Resources
The University of Texas
Austin, Texas

Submitted to:

Anne Brun

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EXECUTIVE SUMMARY

An inventory of emissions of total particulate matter (PM), particulate matter smaller than 10 microns in aerodynamic diameter (PM_{10}), particulate matter smaller than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), nitrogen oxides (NO_x), non-methane hydrocarbons (NMHC), carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4) and ammonia (NH_3) from outdoor fires was performed for the period of August 1 to September 30, 2000. The domain over which fire emissions were estimated encompassed multiple states and was centered on the Houston/Galveston-Beaumont/Port Arthur (HGBPA) region.

The methodology employed in this study was based on the work of Dennis (2002). Information on fire location and acreage burned was gathered from various state and federal agencies for each day of the study period. Fuel loadings (in tons/acre) were calculated for each fire, based on land use data specific for the state of Texas, as well as comprehensive national sources of data. Emission factors (in pollutant emission rate per ton of fuel burned) were based on literature data.

Wildfires were the main source of emissions during the study period. Agricultural, slash and prescribed burns were found to contribute relatively little to emissions during the study period, due to severe drought conditions during the summer of 2000. The emissions exhibited considerable variability. On a day of moderate fire activity, such as August 31, emissions from wildfires were estimated to be 1300, 92, 120, and 11 short tons of CO, NMHC, $PM_{2.5}$, and NO_x , respectively. On one of the days with the highest fire activity, September 4, wildfire emissions were estimated to be 3709, 255, 334, and 48 short tons of CO, NMHC, $PM_{2.5}$, and NO_x , respectively. These emissions were significant compared to other emission sources in the region. For example, emissions of CO, NMHC from wildfires exceeded emissions from light duty gasoline vehicles in the 8-county Houston/Galveston area on several days between August 31 and September 8, 2000.

The ultimate goal of this study was to generate an emissions input file suitable for use in the photochemical model used by the State of Texas to evaluate regulatory policies (the Comprehensive Air Quality Model, with extensions, CAMx). For the model-ready input file, NMHC emissions were classified according to Carbon Bond IV (CB-IV) reaction classes, and the plume rises of the fires were based on calculations using the CALPUFF and FIREPLUME models.