FIELD EVALUATION OF PB-PIEDMONT, A MESOSCALE SMOKE DISPERSION MODEL, FOR APPLICATION TO OKLAHOMA LANDSCAPES

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ABSTRACT

Prescribed fire is becoming an increasingly used tool in Oklahoma for fuels management, with 1–2 million acres annually being burned. For purposes of smoke management, it is especially important to know where smoke may go during nighttime conditions. If a reliable forecast tool could be developed, fire managers could, for example, forgo a burn on a given day if it looked like sensitive areas would be smoked out overnight. Besides adverse health effects, poor visibility is also a concern and can contribute to motor vehicle accidents. PB-Piedmont is a mesoscale numerical model that was originally developed to simulate and predict nighttime smoke movement near the ground over terrain characteristic of the Piedmont of the southeastern United States. The current model simulates flows (e.g., drainage, synoptic) over complex terrain and utilizes digital elevation data to 30-m resolution. It is initialized with hourly synoptic weather observations and can run with either hourly synoptic data (in a historic, post-burn mode or "nowcast" mode) or with hourly output from the MM5 model (in a forecast mode). Through a research agreement between Oklahoma State University and the Southern Research Station of the USDA Forest Service, PB-Piedmont is now being tested in Oklahoma to see if it is applicable to local landscapes outside the Piedmont region. Much of Oklahoma, with the exception of the plains of the western areas and the mountains in the southeast, has terrain similar to that of the Piedmont. Several case studies will be presented from prescribed burns in Oklahoma during 2007 and 2008. With the aid of a GPS unit, "smoke" or "no-smoke" observations were taken by the first author during the nighttime hours by driving local roads surrounding and within the prescribed burn areas. PB-Piedmont was later run in the post-burn, historical mode with hourly synoptic weather data. Comparisons of smoke locations predicted by the model were then made with the actual smoke observations from a given location and time. This presentation will give the results from these case studies. Animated maps of hourly modeled smoke distribution will be shown, as well as comparisons with field observations.

Keywords: dispersion, forecasting, modeling, PB-Piedmont, prescribed fire, smoke management, wildfire.

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MODELING MERCURY EMISSIONS AND DISPERSION FROM THE 2007 SOUTH GEORGIA WILDFIRES

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ABSTRACT

In April 2007, several wildfires broke out in the southern part of Georgia around the Okefenokee National Wildlife Refuge. By the start of June these fires, along with other new ignitions, had spread into northern Florida, forming several fire complexes (Big Turnaround, Georgia Bay, and the Bugaboo) that combined for >600,000 acres (approximately 243,000 ha). The potential air quality impacts of these fires are tremendous due to their long duration and geographic location. For approximately 2 months these fires had been a significant source of air pollutants, and the prevailing weather patterns dispersed these pollutants throughout an area extending from Tampa, Florida, to the south, Memphis, Tennessee, to the west, and up the east coast into Virginia. Using mercury deposition information gathered as part of a prescribed burning study in this region, mercury emissions from these wildfires are estimated and the subsequent dispersion of the mercury is tracked using the Community Multiscale Air Quality model (CMAQ). This research represents just a small fraction of an overall assessment into the air quality impacts of these fires.

Keywords: air quality, GA/FL Wildfire, mercury, smoke plume.

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