Toward a New Paradigm for Southern Smoke Management

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Most tools currently available to land managers for conducting prescribed burns rely on some form of the Ventilation Index (VI). The VI gives a rough measure of the total volume of air passing over a burn site during the course of a burn. The VI is a major factor in VSMOKE, a smoke planning model used to estimate smoke concentrations at select locations downwind from prescribed burns. VSMOKE adds an additional refinement of representing smoke as within two Gaussian plumes, one originating from just below the top of the mixed layer and the other originating from the ground. Preliminary results from field observations are showing that smoke plumes from large prescribed burns overshoot the mixing layer with the result that smoke is injected into the free atmosphere and lost from ground-level smoke concentratrions. Observations from networks of PM2.5 samplers placed down-wind from prescribed burns consistently show much less daily smoke concentrations then estimated from VSMOKE. Furthermore, the smoke plume model, Daysmoke, has identified weather conditions that support plume-dominated prescribed burns. In some simulations, all of the smoke is injected into the free atmosphere save for that produced during the ramp-up, ramp-down, and smoldering phases. As more observations support these preliminary findings, a new and different approach to how smoke is managed will take into consideration how the burn is engineered, the weather conditions that support plume-dominance, and the risk of erratic plume behavior. Local and regional scale air quality models will be needed to support pre-burn planning.