ABSTRACT

In this study, a set of numerical experiments are conducted with the ARPS-CANOPY model to help guide the deployment of a monitoring network for a management-scale prescribed fire experiment planned for spring 2019 in the New Jersey Pine Barrens. This work is part of a larger Department of Defense - Strategic Environmental Research and Development Program (SERDP)-funded project to study multi-scale atmosphere, fuels, and canopy processes affecting fire spread during low-intensity fires in forested environments. This study proceeds in two stages. In the preliminary stage, a 3D lidar-derived plant area density dataset is obtained for the area in and around the planned burn site, and a backing fire within the burn site is prescribed in the ARPS-CANOPY model with a spread rate and sensible heat flux profile informed by previous low-intensity prescribed fires in the Pine Barrens. Following this preliminary work, a series of simulations are performed with background wind speed, wind direction, and atmospheric stability varied across a range of values appropriate for prescribed burning in the Pine Barrens region in early spring. This step is performed to gauge the sensitivity of simulated local mean and turbulent flows at the burn site to variations in background atmospheric conditions. Instrument position recommendations are made based on two factors: (1) identification of areas of the burn site exhibiting stronger gradients in simulated variables and (2) areas of the burn site exhibiting overall lower sensitivity of the simulated variables to background atmospheric conditions.

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