INITIATIVE ON
Extreme Weather and Climate
COLUMBIA UNIVERSITY

Fire prediction and uncertainty across temporal and spatial scales

Karin Riley
Matthew Thompson

Uncertainties persist at all scales of fire prediction. At the incident context, the fire's location is known, but weather predictions are uncertain and landscape data has inherent errors. At the midterm context (10-year horizon), these uncertainties are compounded: fire locations are unknown, climate predictions are somewhat uncertain, and the landscape is undergoing change from natural disturbance, human activity, and succession. At the long-term context (10-50 year horizon), the uncertainty increases further due to possible changes in weather patterns and climate related to anthropogenic emissions, vegetation type shifts, etc. We classify uncertainties in fire modeling based on their nature (knowledge or variability), location in the modeling process, and level (ranging from total determinism to total ignorance). We illustrate how these uncertainties manifest and may be handled in models commonly used at the incident, midterm, and long-term contexts.