**Understanding and Predicting Wildland Fire Growth using Coupled Weather – Wildland Fire Behavior Models and Active Fire Detection Data**

Coupled weather-wildland fire models tie numerical weather prediction models to wildland fire behavior modules to simulate the impact of a fire on the atmosphere and the subsequent feedback of these fire-induced winds on fire behavior, i.e. how a fire “creates it’s own weather”. NCAR’s CAWFETM coupled modeling system contains two-way coupling between two components: (1) a numerical weather prediction model formulated for and with numerical methods optimized for simulating airflow at 100s of m in very complex terrain, and (2) a wildland fire component that is based upon semi-empirical relationships for surface fire rate of spread, post-frontal heat release, and a crown fire model. CAWFE been used in idealized experiments to explain fundamental fire phenomena and, in retrospective simulations, reproduce the unfolding of large fire events and transient events unique to each fire such as locations of sudden acceleration, flank runs up canyons, and bifurcations of a fire into two heads; and locations favorable to formation of phenomena such as fire whirls and horizontal roll vortices. Recent work, in which CAWFE has been integrated with active fire detection data, addresses the challenges of applying it as an operational forecast tool. Results show that using a cycling forecasting approach, in which a sequence of CAWFE simulations initialize the fire 'in progress' with VIIRS data and updated atmospheric analyses can overcome several forecasting issues and allow good representation of fire growth from first detection until extinction.