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Ignition from a Fire Perimeter in a WRF Wildland Fire Model

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The current WRF-Fire model starts the fire from a given ignition point at a given time. We want to start the model from a given fire perimeter at a given time instead. However, the fuel balance and the state of the atmosphere depend on the history of the fire. The purpose of this work is to create an approximate artificial history of the fire based on the given fire perimeter and time and an approximate ignition point and time. Replaying the fire history then establishes a reasonable fuel balance and outputs heat fluxes into the atmospheric model, which allow the atmospheric circulation to develop. Then the coupled atmosphere-fire model takes over. In this preliminary investigation, the ignition times in the fire area are calculated based on the distance from the ignition point to the perimeter, assuming that the perimeter is convex or star-shaped. Simulation results for an ideal example show that the fire can continue in a natural way from the perimeter. Possible extensions include algorithms for more general perimeters and running the fire model backwards in time from the perimeter to create a more realistic history. The model used extends WRF-Fire and it is available from openwfm.org.

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