World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:17, No:11, 2023

Preliminary WRF SFIRE Simulations over Croatia during the Split Wildfire in July 2017

Authors : Ivana Čavlina Tomašević, Višnjica Vučetić, Maja Telišman Prtenjak, Barbara Malečić

Abstract : The Split wildfire on the mid-Adriatic Coast in July 2017 is one of the most severe wildfires in Croatian history, given the size and unexpected fire behavior, and it is used in this research as a case study to run the Weather Research and Forecasting Spread Fire (WRF SFIRE) model. This coupled fire-atmosphere model was successfully run for the first time ever for one Croatian wildfire case. Verification of coupled simulations was possible by using the detailed reconstruction of the Split wildfire. Specifically, precise information on ignition time and location, together with mapped fire progressions and spotting within the first 30 hours of the wildfire, was used for both – to initialize simulations and to evaluate the model's ability to simulate fire's propagation and final fire scar. The preliminary simulations were obtained using high-resolution vegetation and topography data for the fire area, additionally interpolated to fire grid spacing at 33.3 m. The results demonstrated that the WRF SFIRE model has the ability to work with real data from Croatia and produce adequate results for forecasting fire spread. As the model in its setup has the ability to include and exclude the energy fluxes between the fire and the atmosphere, this was used to investigate possible fire-atmosphere interactions during the Split wildfire. Finally, successfully coupled simulations provided the first numerical evidence that a wildfire from the Adriatic coast region can modify the dynamical structure of the surrounding atmosphere, which agrees with observations from fire grounds. This study has demonstrated that the WRF SFIRE model has the potential for operational application in Croatia with more accurate fire predictions in the future, which could be accomplished by inserting the higher-resolution input data into the model without interpolation. Possible uses for fire management in Croatia include prediction of fire spread and intensity that may vary under changing weather conditions, available fuels and topography, planning effective and safe deployment of ground and aerial firefighting forces, preventing wildland-urban interface fires, effective planning of evacuation routes etc. In addition, the WRF SFIRE model results from this research demonstrated that the model is important for fire weather research and education purposes in order to better understand this hazardous phenomenon that occurs in Croatia.

Keywords : meteorology, agrometeorology, fire weather, wildfires, couple fire-atmosphere model
Conference Title : ICAMS 2023 : International Conference on Agricultural Meteorology and Sustainability
Conference Location : Paris, France
Conference Dates : November 27-28, 2023