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The Use of Multi-scale Fire Predictive Indices for the Yarnell Hill Fire

Jan Ising, North Carolina A&T State University, Greensboro, NC; and M. L. Kaplan and Y. L. Lin

Abstract Text:

The Yarnell Hill fire in Yarnell, Arizona was triggered by dry lightning on June 28th 2013. The environment at the time was particularly hot and dry which helped to spark this historic fire. The fire was initiated by hot and dry winds from the west, which later shifted to be from the north-northeast by means of convective-induced outflows. This likely was instrumental in the unfortunate demise of 19 Prescott firefighters. One of the primary areas for mesoscale investigation lies within the precursor environment and it's predictive potential. More specifically, how the prediction of the role of the local terrain on the atmosphere impacted: 1) the development of convection-induced dry lightning that triggered the fire and 2) the outflow boundary from the convection to the northeast which likely lead to the potentially tragic shift in fire trajectory. In order to answer these questions an analysis will be performed of WRF simulations of the evolving synoptic-meso-β scale environment. We will focus, in particular, on the utility of different fire indices such as the Haines index and the Hot-Dry-Windy Index which will be investigated to determine their role and sensitivity as a predictive tool in the complex Central Arizona terrain within the realm of the early fire triggering and subsequent later fire motion. We will also examine the relationship between terrain-induced circulations and published dry lightning indices. The project is part of a larger fire project that studies four historical fires (three in California and one in Arizona) so results will also be used to compare the environments of the different associated fires. Similarities in organizing environment to this fire also occurred in a record Los Angeles Heat event in September 2010, which will also be briefly compared for this investigation.

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Submitter's E-mail Address:
jising@aggies.ncat.edu

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First Presenting Author

Presenting Author
Jan Ising
North Carolina A&T State University
Applied Science & Technology Program
Rm 301, AST, Gibbs Hall
1601 East Market Street
Greensboro, NC 27411
USA
Email: jising@aggies.ncat.edu
Alternate Email: janising1@gmail.com -- Will not be published

Student? Yes

Second author

Michael Lewis Kaplan
Embry-Riddle Aeronautical Univ.
Applied Aviation Sciences
3700 Willow Creek Rd
Prescott, AZ 86301
USA
Email: kaplanm1@erau.edu
Alternate Email: michael.kaplan@dri.edu -- Will not be published

Student? No

Third author

Yuh-Lang Lin
North Carolina A&T State Univ.
Applied Science and Technology
1601 E. Market St.
Gibbs Hall Rm 303
Greensboro, NC 27411
USA
Email: ylin@ncat.edu
Alternate Email: yuhlang2009@gmail.com -- Will not be published

Student? No

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