Automated Real-Time Fire Spread and Risk Forecasting

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Part 1:

Automated Real-Time Fire Spread Forecasting
Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.
Automated real-time fire spread and risk forecasting system is being developed under a research grant recently awarded by the California Energy Commission.
Automated Real Time Fire Forecasting

\[ \frac{\partial \phi}{\partial t} + U_x \frac{\partial \phi}{\partial x} + U_y \frac{\partial \phi}{\partial y} = 0 \]

\[ U_{x,||}^* = \frac{b^2 \sin(\omega)}{\sqrt{a^2 \cos^2(\omega) + b^2 \sin^2(\omega)}} \]

ELMFIRE

- Weather forecast
- Real-time fire location data
- Fuel & topography
- Fire spread forecast
- https://fireforecast.com
Ensemble Fire Forecasts

• Animation to the right is a series of 24-hour fire spread forecasts condensed to 2 seconds

• Multiple simulations are run with model inputs perturbed from baseline values

• Forecasts are aggregated to calculate burn probabilities

• Tested on over 300 fires during 2019 “fire season”
Part 2:

Automated Real-Time Fire Risk Forecasting
NFDRS Adjective Class during Camp Fire

Observed Fire Danger Class: 08-Nov-18

LEGEND
- Reporting Weather Stations
- Low
- Moderate
- High
- Very High
- Extreme
- Water

{Inv. Dist.? Intarp.}

WFAS-MAPS Graphics  FIRE BEHAVIOR RESEARCH  MISSOULA, MT
Red Flag Warning
Wednesday November 7 - Friday November 9, 2018

**Impacts**
- Easier fire starts
- Potential for rapid spread of fire

**Timing**
- Tonight – Friday morning

**Winds & RH**
- North to east winds 20-30 mph, gusts 30-55 mph
- Minimum daytime humidity 5-15%
- Poor overnight humidity recovery
Fire Risk Forecasting

• Millions of ignitions distributed across landscape at various times in the future
  • Fire spread is modeled under forecasted weather conditions
  • Impacts to assets at risk (structures, sensitive habitat, electrical infrastructure etc.) are quantified
Concluding Remarks

• It’s an exciting time to be working on wildland fire modelling!

• Major improvements to fire spread and risk forecasting are coming

• Thank you to Allison Murray and the Northwest Hydroelectric Association for the opportunity to be here today