

Develop the capabilities of Fire Risk Forecasts and Assessment Based on the Operational Island-Scale Models

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Challenges for numerical weather prediction for Hawai'i:

- Lack of conventional observation data over mid-Pacific
- Dramatic and steep terrain
- Large variations in land surface cover and soil types
- Sharp land-sea thermal gradients
- Variety of microscale weather and climate phenomena

How UH-WRF addresses these challenges:

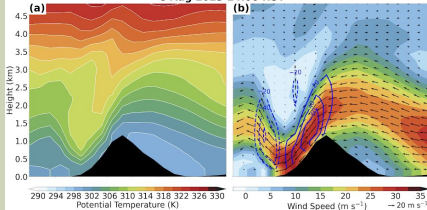
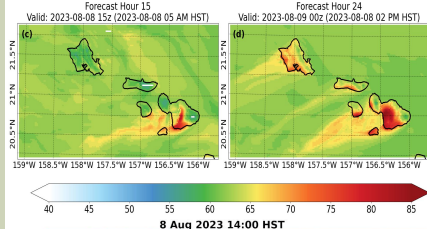
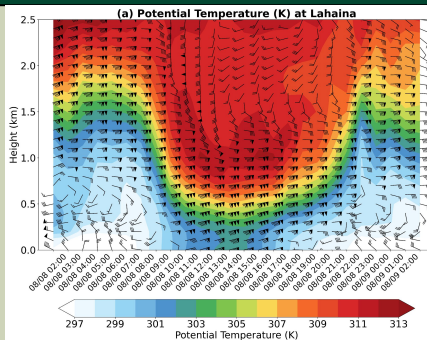
- Scale-controlled data assimilation on regional domain to provide better initial conditions for the island environment
- Updated lower boundary conditions for island scale flow response for enhanced environmental conditions to properly simulate micro scale circulations over the island during the diurnal heating cycle.

Model validation:

Since 2008, our twice daily 72-h output from two different models have been approved by NCEP and ingested into the NWS HFO Advanced Weather Interactive Processing System (AWIPS), where it is available operationally to provide additional numerical guidance for island-scale and coastal weather conditions

UH-WRF for fire risk forecasts:

- Dryness index (Fujioka et al., 2021): Function of hourly temperature, RH, cloud cover, and precipitation derivable from model output.
- Real time model was able to replicate strong downslope winds under strong trade winds with low trade inversion for Lahaina fire case.



System Components:

1. Integrated high resolution weather model and fire danger rating system (Operational)

Gridded atmospheric variables are generated daily and provided to the National Weather Service. Post processing variables are created from the model to quantify ignition, spread, and energy release potential of fires due to weather, fuel, and terrain conditions.

2. Fire behavior modeling system (To be developed)

Once a fire is located, a very fine resolution fire behavior modeling system called *Fire Area Simulator* (FARSITE) which can simulate the spread of the fire given the weather, fuel, and terrain data.

3. Web-based GIS (To be developed)

High resolution weather and fire risk forecasts up to 3 days are created and updated twice daily for public use.

Future plan:

- Collaboration with NASA JPL to use satellite derived 1km offshore wind data to improve fire weather forecasting and offshore wind assessment for Hawaii.
- Integrate data from NASA-ISRO Synthetic Aperture Radar (NISAR) for high resolution (10-100m) soil moisture and surface water to better simulate critical surface fluxes.

References:

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