Project Title and Brief Abstract

Wildland Fire Behavior and Risk Forecasting

NNX13AH59G

Project PI: Sher Schranz, CSU/CIRA/NOAA

Institutional PIs: Adam Kochanski, University of Utah

Jan Mandel, University of Colorado Denver

Consultants: Martin Vejmelka

Collaborators: Ruddy Mell, Forest Service

Ed Delgado, NIFC BLM

Project Summary: Automated fire forecasts on top of weather forecasts and fire danger component maps (ROS, fuel moisture,…) delivered to the field by web or apps (FX-Net).

Earth Observations applied: MODIS/VIIRS Active Fires, MODIS/VIIRS NDWI/NDVI, RAWS fuel moisture

Applied Sciences Program

Wildland Fire Behavior and Risk Forecasting
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PI: Sher Schranz, CSU/CIRA, 303 497-7254, sher.schranz@noaa.gov

Wildland Fire Program
ACTIVE PROJECT
March 1, 2016

Purpose and Objective

Automate WRF-SFIRE with initialization from NASA Earth observations for operational use by NOAA and delivery of model output via FX-Net to operational wildfire response entities such as the National Interagency Fire Center (NIFC). Specific satellite data to be used include MODIS and VIIRS active fires, Normalized Distributed Water Index (NDWI) as a proxy for live fuel moisture, and NDVI used to modify fuel loading in previously burned areas.

The benefit of this system is potentially large for active wildfire responders who need accurate depictions of fire growth and credible predictions of future fire spread.

Societal Benefit Area(s): USGEO: Disasters
Geographic Focus: CONUS
Targeted End-Users: Real-Time Fire fighting decision makers, local and national fire weather forecasters

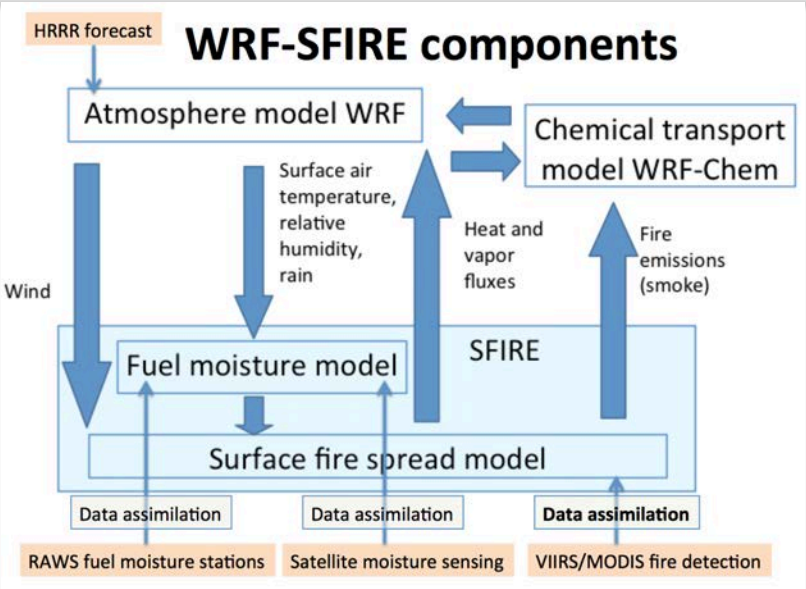

Figure: WRF-SFIRE modeling system.

Approach

Technical Approach: 1) Phase II web interface and model data delivery via web, FX-Net and NOAA Earth Information System (NEIS) system : Risk – NOAA Research policy changes jeopardize data delivery via NOAA operational hardware . 2) Phase II model running in real time: Risk – identifying operational hardware and data feeds at NOAA or USFS agencies to execute model runs.

Scientific Approach: 1) Phase II satellite assimilation and modeling system tuned : Risks – satellite sources for real-time operation. Risk – NOAA researchers needed to do this. 2) Fire danger model validation: Risks – required additional fire cases with adequate observations to validate model. Data from the USFS is available.

Key Milestones

Milestone Statement	Date
Calculate and assimilate NDWI Model	6/15
Acquire fire locations from Satellite fire detection system	8/15
Web portal completed	2/16
Integration and running in real-time (provide a forecast)	6/16
Real-Time SFIRE output available on FX-Net	7/16
Model Evaluation and Testing	6/17

ARL_{Start} = 1 **$ARL_{Most\ Recent}$ = 3** **ARL_{Goal} = 5**

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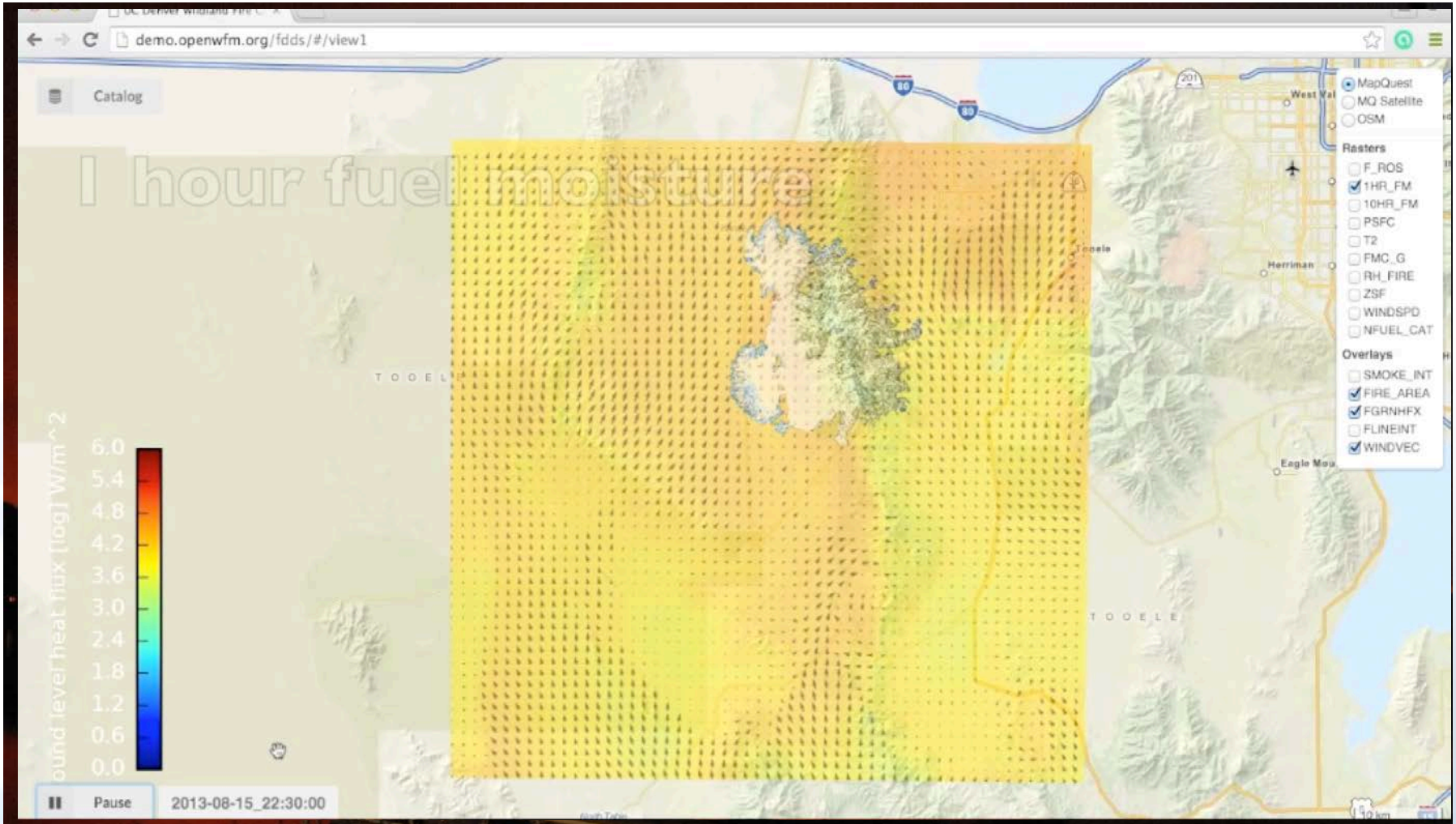

http://demo.openwfm.org/fdds - run anywhere

Interactive web-based visualization, give time/location of ignition

Precomputed domain, pulling weather data automatically

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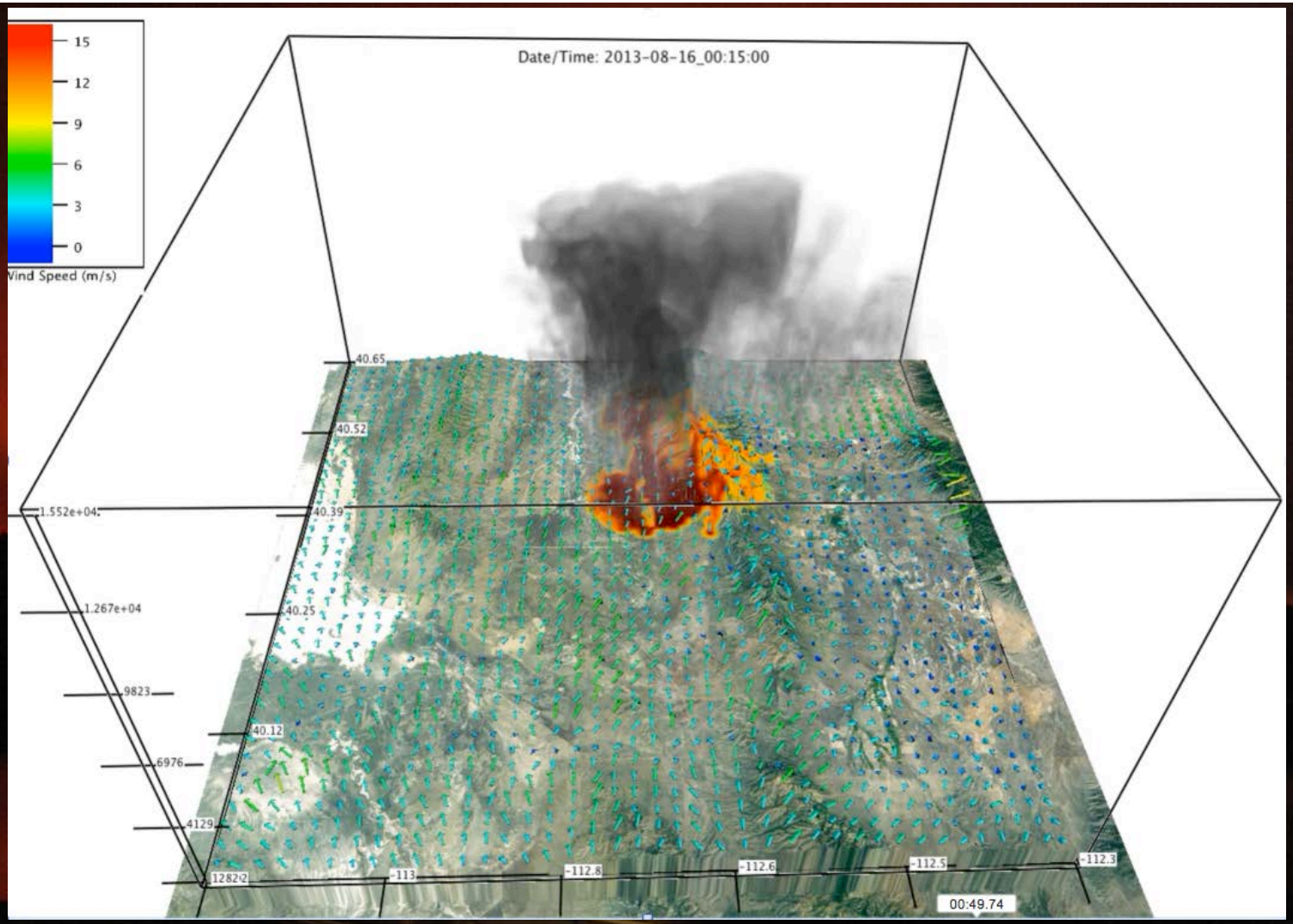

2013 Patch Springs Fire

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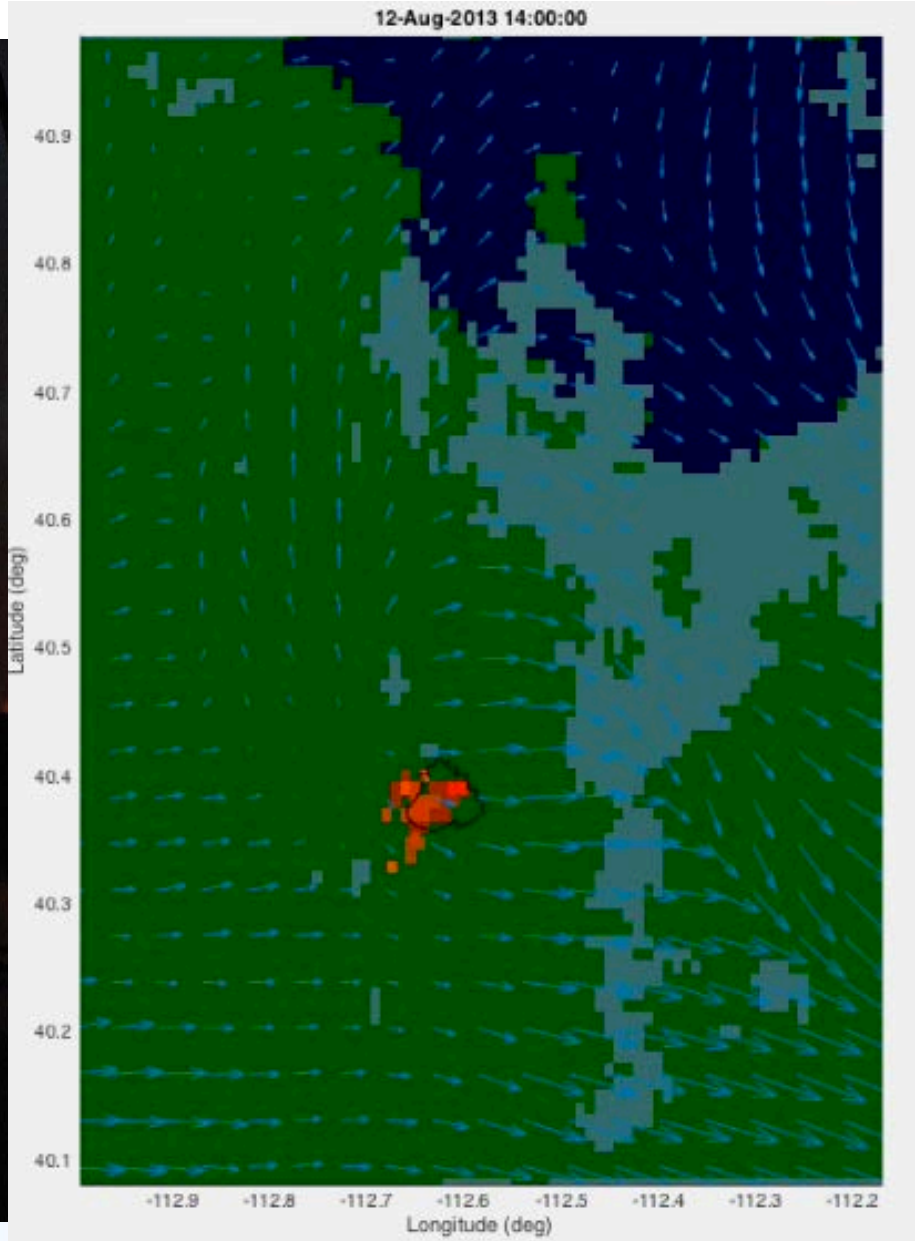
Challenge: Assimilating Active Fires Detection Data

- Level 2 MODIS/VIIRS
- Resolution coarser than fuel and fire models
- False positives, negatives, geolocation errors, artefacts
- Confidence of detection
- No confidence level for no fire
- Cloud mask = missing data
- Improve model statistically
- Fire suppressed or false negatives?

	Fire 0-6 h old	Fire > 60h old
Water	Low confidence	Low confidence
No fire	Nominal	Nominal
Cloud	High confidence	High confidence



PI Overall Assessment

Summary of Challenges; Problems; Objective Analysis

Challenge: Model Data Delivery via FX-Net and NOAA Earth Information System due to policy changes at NOAA resulting in funding being redirected from Fire Weather research. Current funding profile is zeroed out.
Analysis: Delivery of data to NIFC FX-Net system could be accomplished. We would welcome discussions with the NIFC management.
Challenge: Operational Model running at a NOAA facility is no longer an option. Possibility of approaching a USFS or state facility to run the model in real-time.

Summary of Positive Progress

FX-Net data delivery: There are no technical challenges or roadblocks.

Operation Model Runs: The SFIRE system is now a modular, fully packaged system. It can be installed on LINUX servers with the packaged instructions and model runs initiated and visualized via the web interface.

Using a University cluster in a dedicated mode.

Overall Assessment

Operational obstacles can be overcome.

PI Assessment of Future Project Progress

NOAA Earth Information System (NEIS) and FX-Net Data Delivery: Will achieve data visualization with NEIS by May, 2016. FX-Net data delivery still unknown.

Operational Model Runs: Investigating model runs at a USFS facility such as an FCAMM as a possibility. SFIRE system installation is downloadable and documented.

Can you think of any ideas for how we (NASA management and other teams) or our partners can help your teams through challenges to achieve your goals?

- Higher level of communication between NASA and NOAA
- We are applying for continued funding through related fire and remote sensing projects, which will leverage the results.

2015-2016 Funding: $81k remaining ($54k encumbered, not yet paid).
2016-2017 Funding: Will follow proposed spending plan.

Budget progress and future plans to spend down the funding by year.

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Relevant Publications, Awards, Accomplishments

WRF-SFIRE has become a standard choice for graduate students in fire science worldwide. Week-long workshop at International Centre for Theoretical Physic, Trieste, Italy in June 2015 for 40 participants from developing countries.

Team Member Highlight

Martin Vejmelka
Consultant

Role: Fuel moisture data assimilation and web portal development
Formerly Assistant Research Professor at the University of Colorado Denver
Research Specialty: Machine learning
Currently: Head of Development, AVAST (Anti-virus and computer security software)

Looking for collaborations in automated data acquisition and in delivery

Keeping head up
Over the hurdles