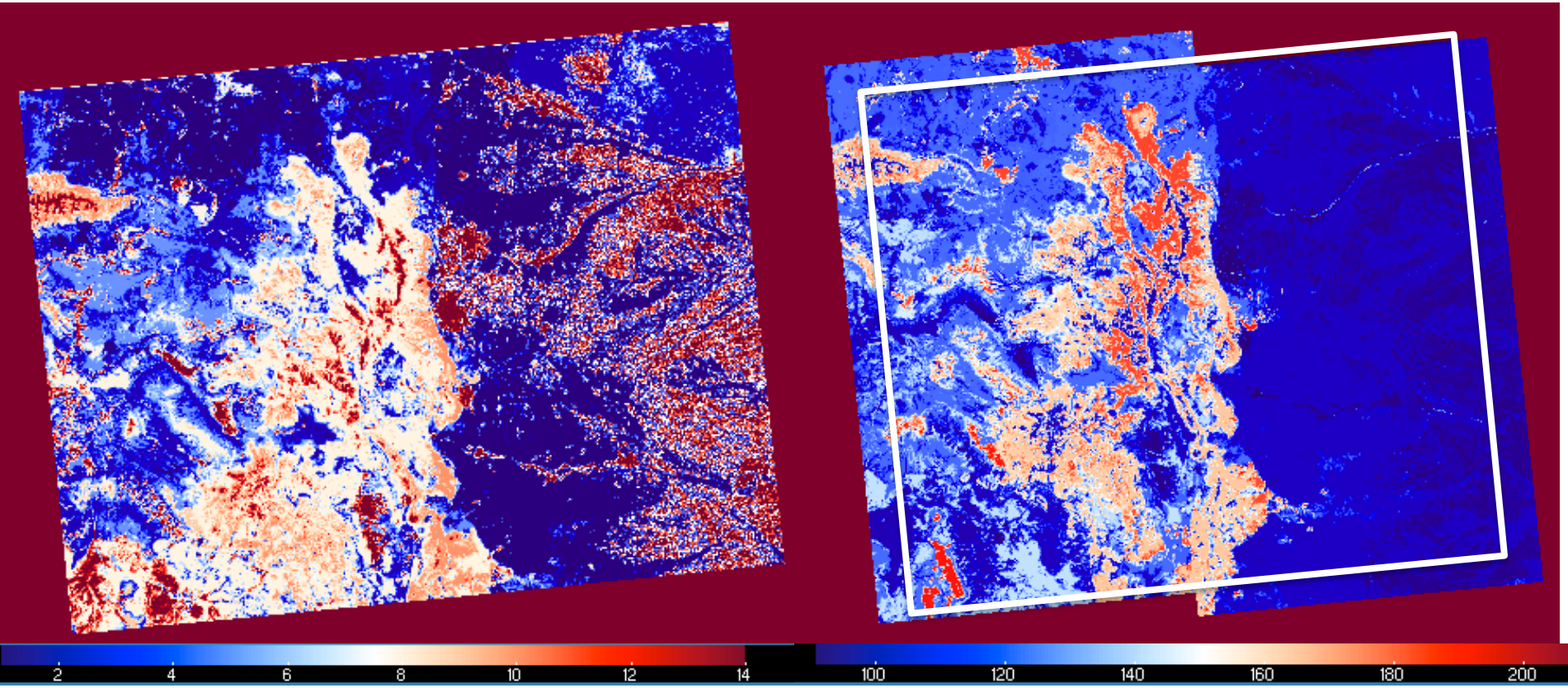
Implementation of Scott and Burgan Fuel Model in CO-FPS

Branko Kosovic, Domingo Muñoz Esparza, Pedro Jimenez Muñoz

Fuel Model Maps for The State of Colorado

Anderson Fuel Model

Scott and Burgan Fuel Model

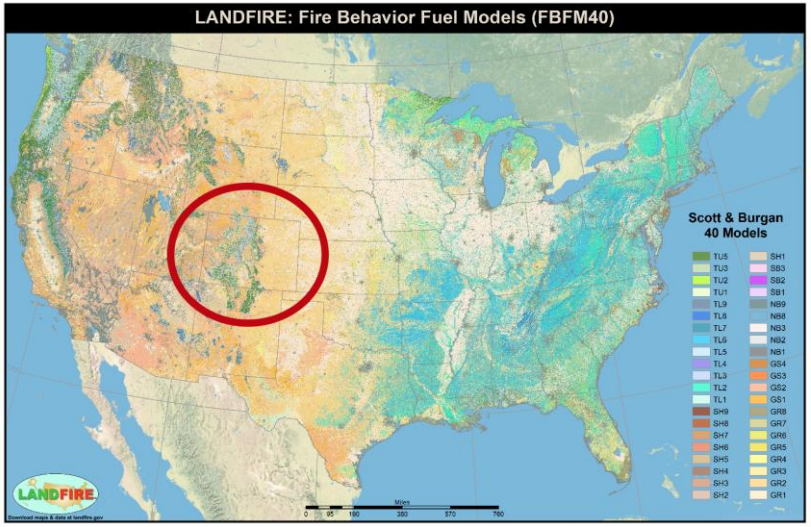


We Implemented Scott and Burgan Fuel Model In CO-FPS

- Scott and Burgan fuel model is implemented in addition to Anderson fuel model
- Anderson fuel model is still an option in CO-FPS (however default is Scott and Burgan – not controlled by the user)
- Initial implementation of Scott and Burgan fuel categories through fuel model crosswalk table in Scott and Burgan (2005) using the smallest change from Anderson (1982) to select the best matching category [uses Anderson model parameters]
- Fuel burnout parameters are not available for Scott and Burgan model
- Real time fuel moisture data are not not available at this point - it is not possible to take full advantage of all the Scott and Burgan model 40 fuel categories

Scott and Burgan (2005) fuel model in CO-FPS

- Next step is to implement new fuel classes with different “fuel load”, “surface-area-to-volume (SAV) ratio”, “fuel depth” and “moisture content of extinction” [fuel burnout parameters will be based on Anderson model due to lack of information]



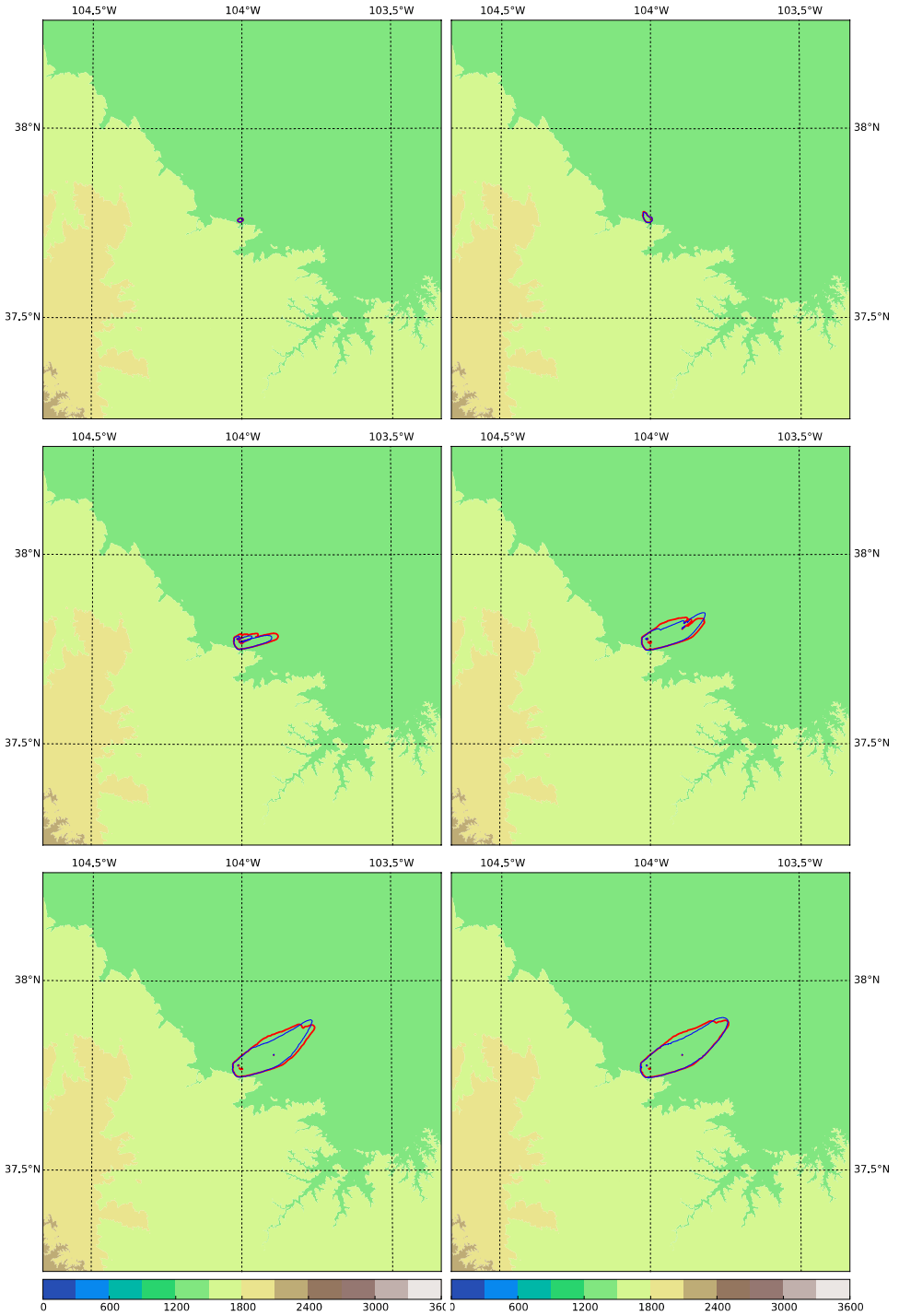
- Fuel moisture content is currently constant. However, future implementation can incorporate FMC as an input parameter from the user in real time in CO-FPS -> Likely a significant improvement in rate of spread & model performance
- If live herbaceous moisture content is available (e.g., from satellite index like NDVI), dynamic models could be applied to modify fuel load of dead fuel

18 – hour forecast
Perimeters shown every 3 hours

Comparison of Nowcasting Simulations with Anderson and Scott and Burgan Fuel Model

Red – Anderson

Blue – Scott and Burgan



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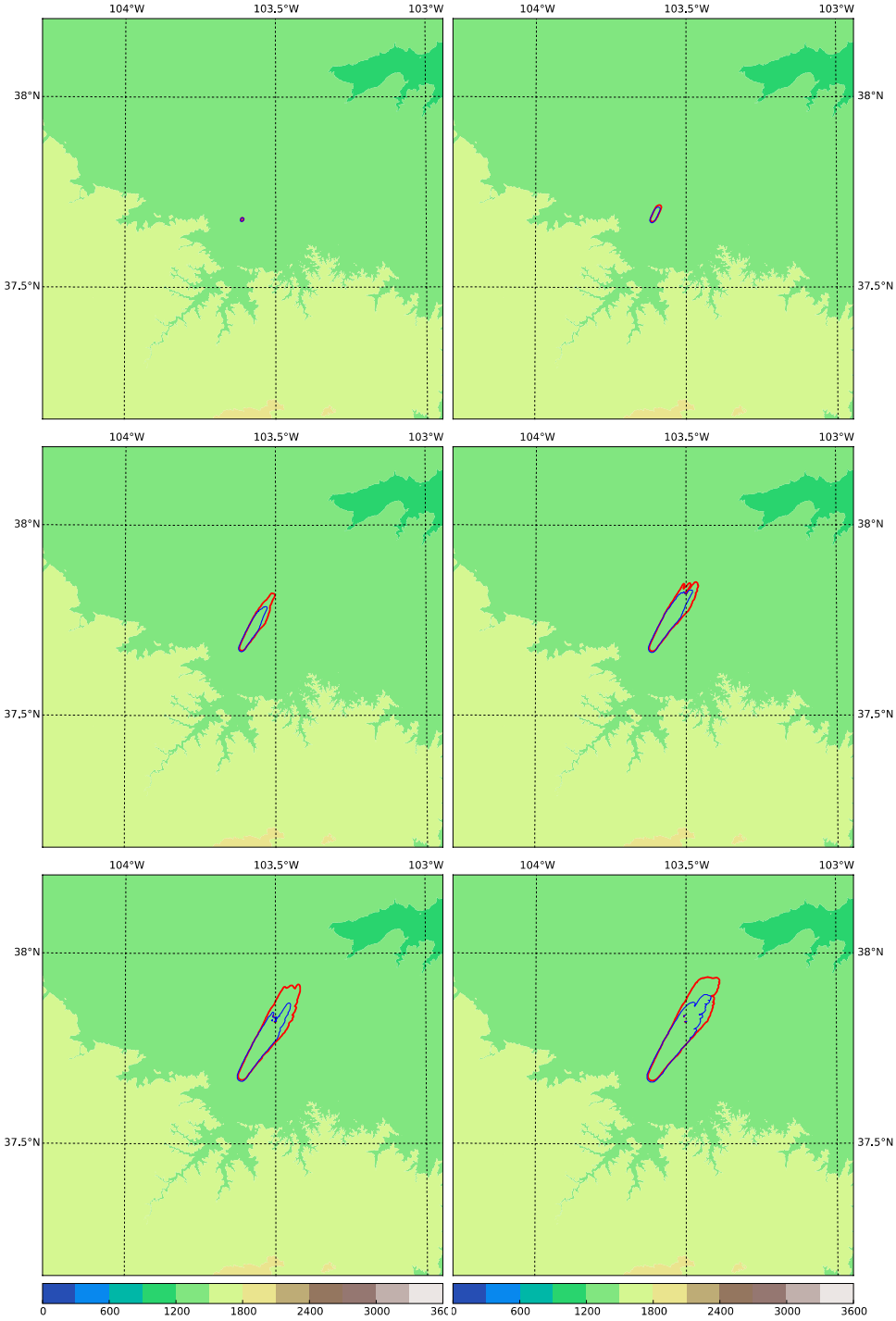

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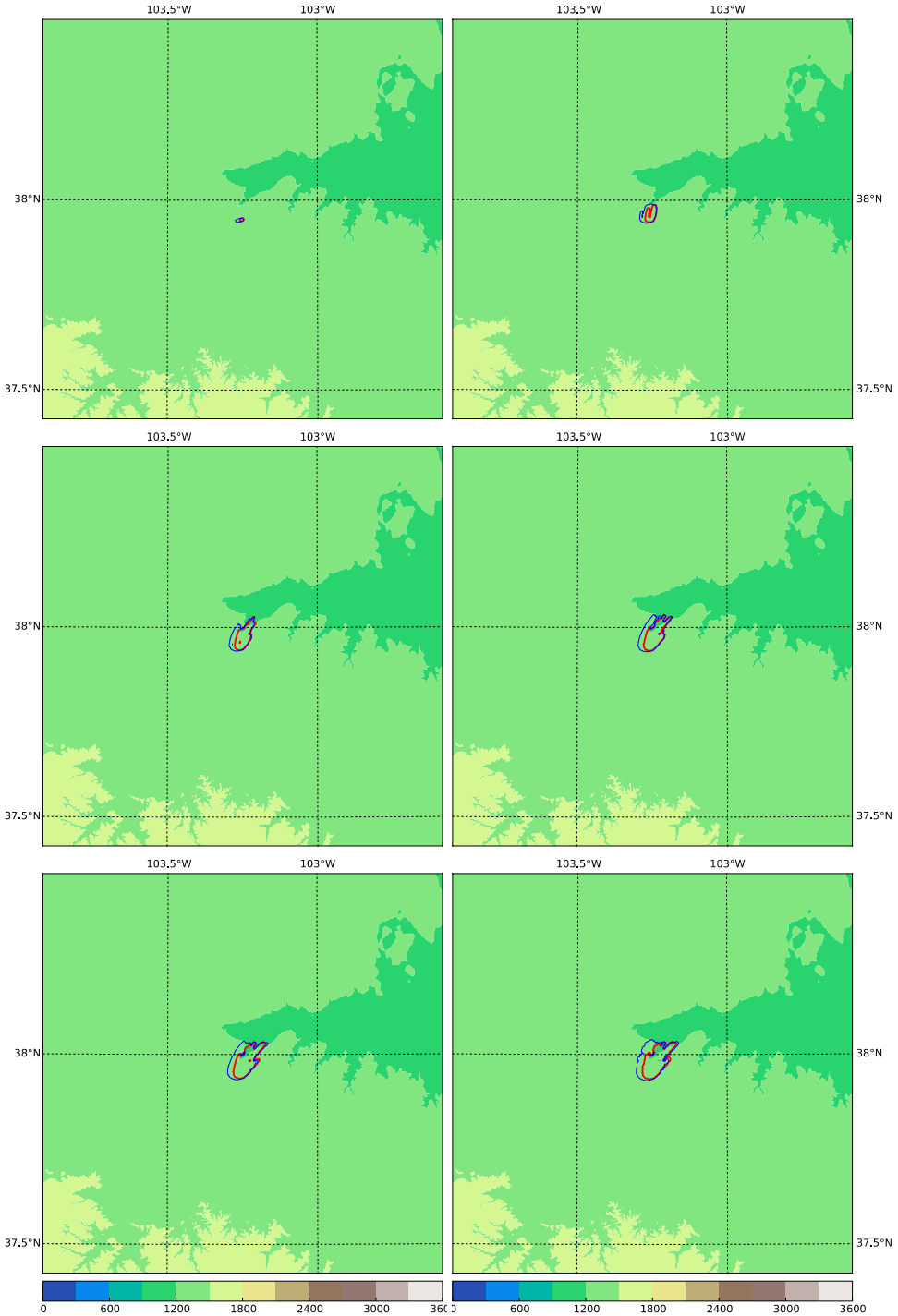

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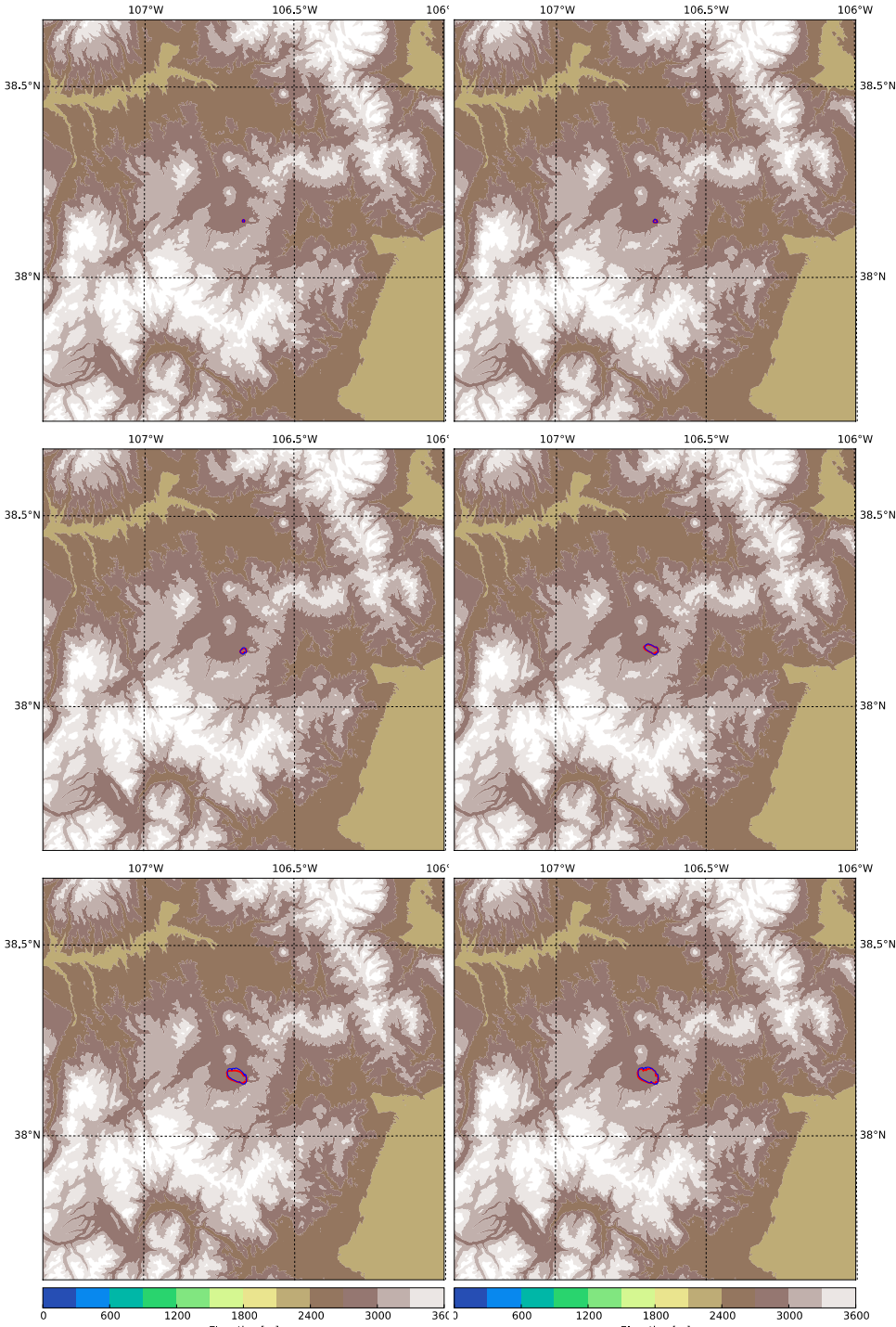

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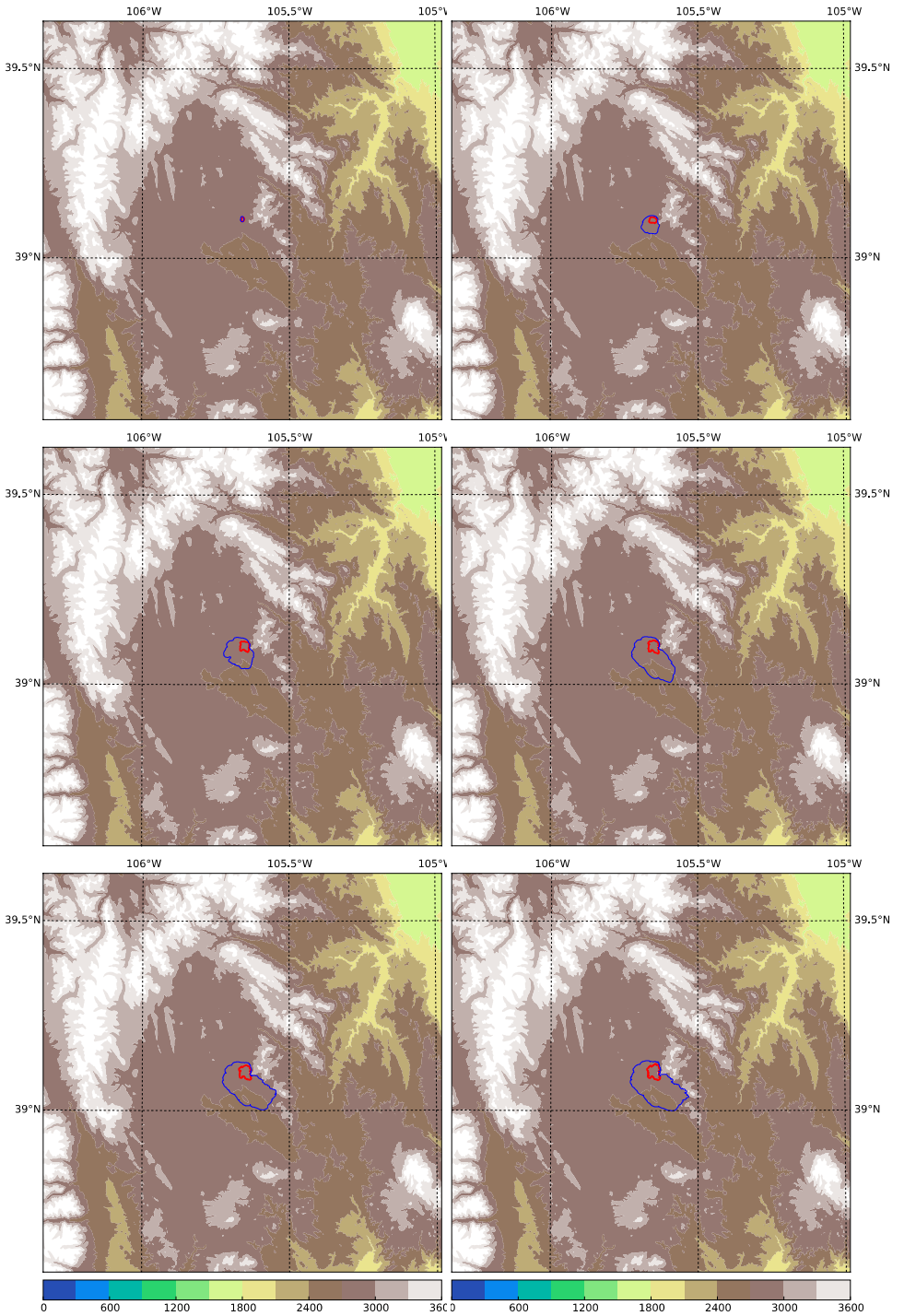

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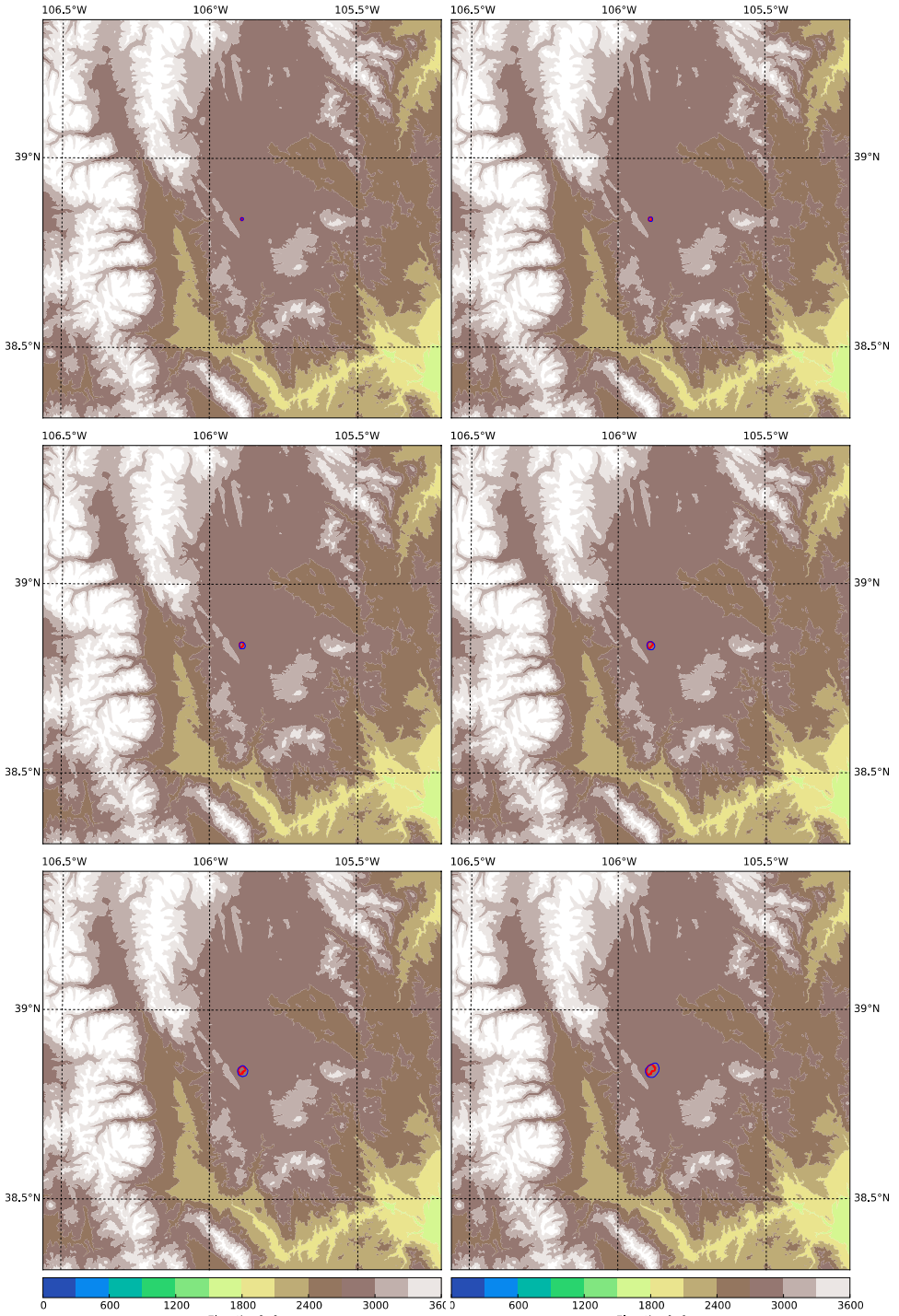

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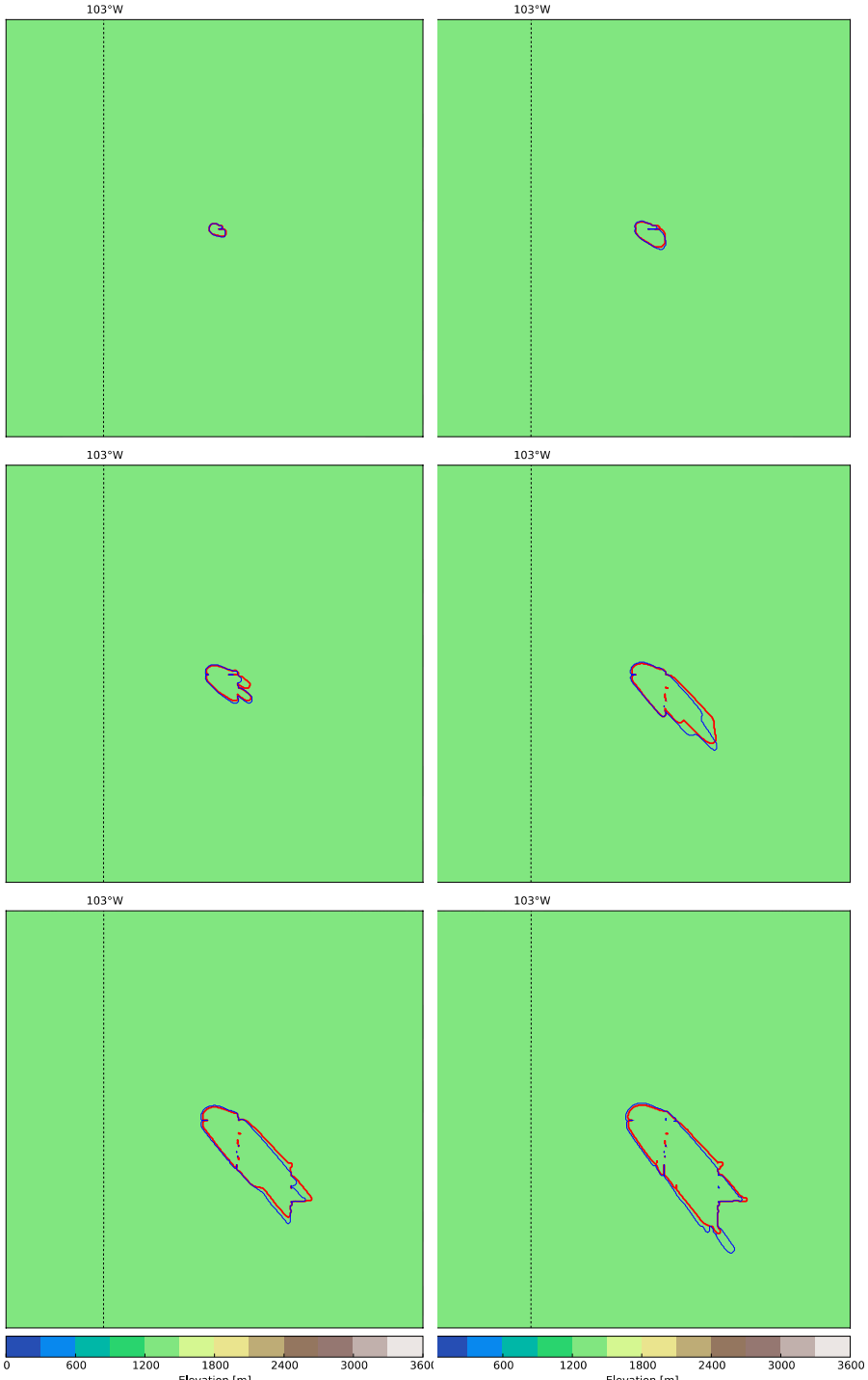

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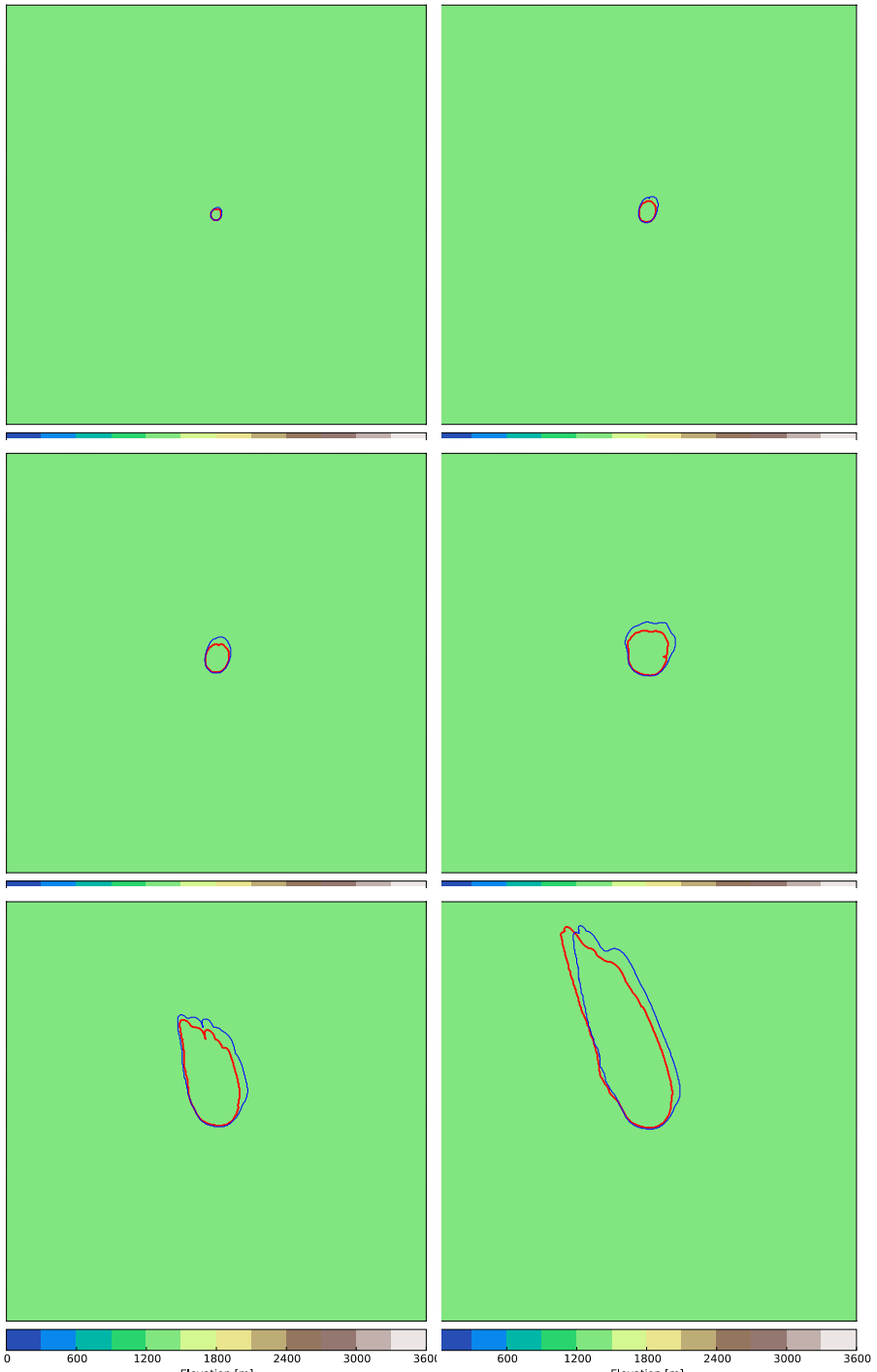

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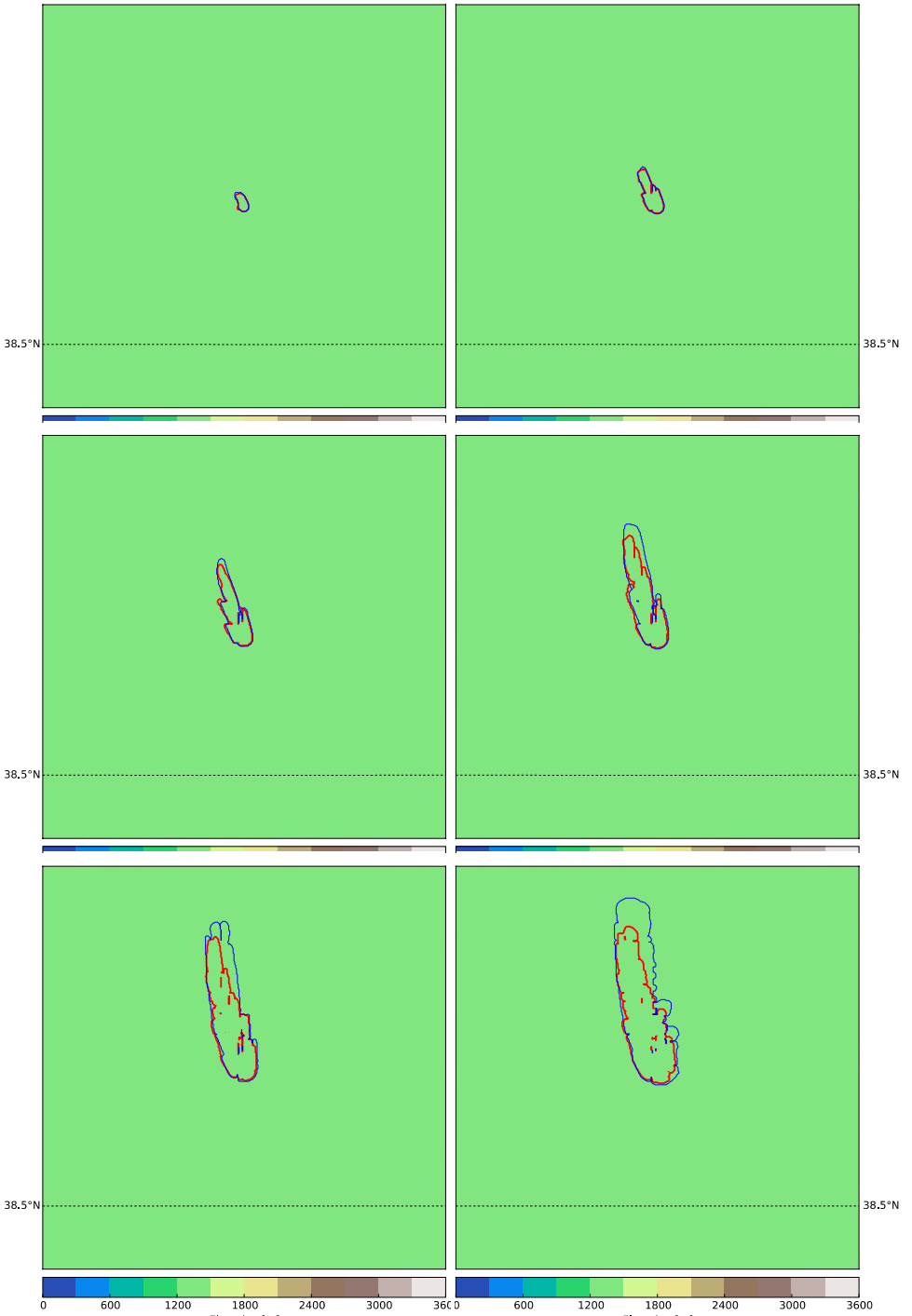

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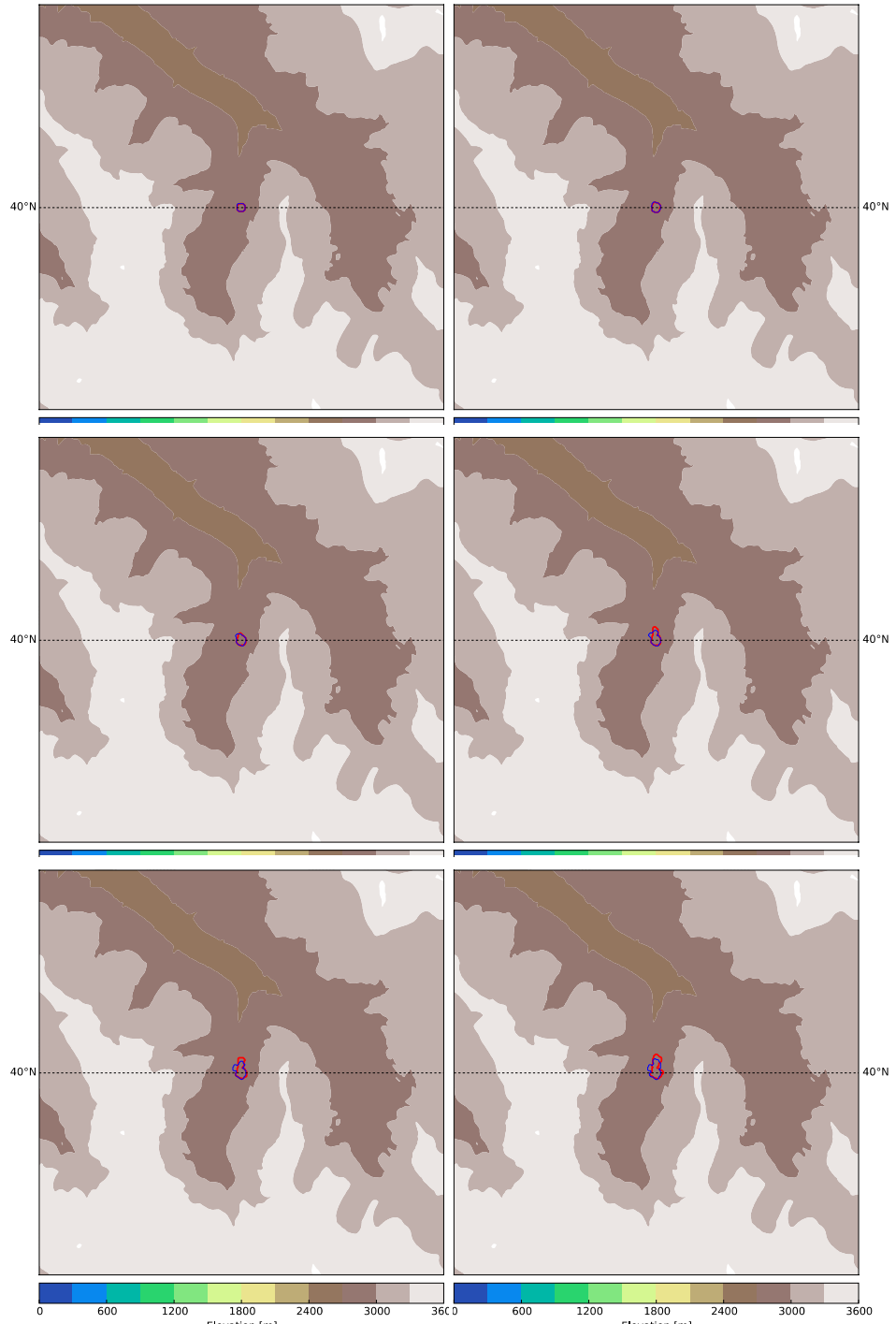

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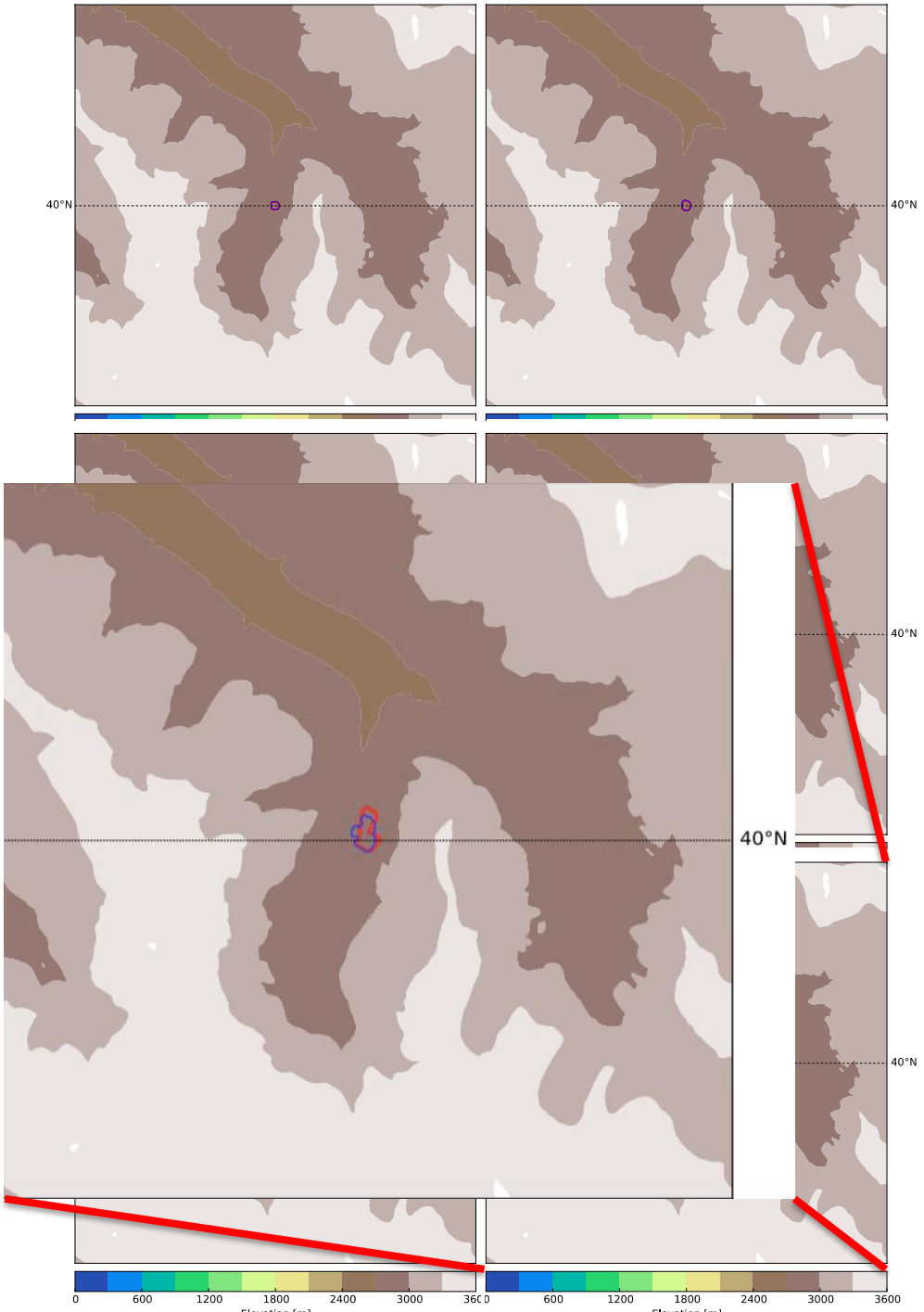

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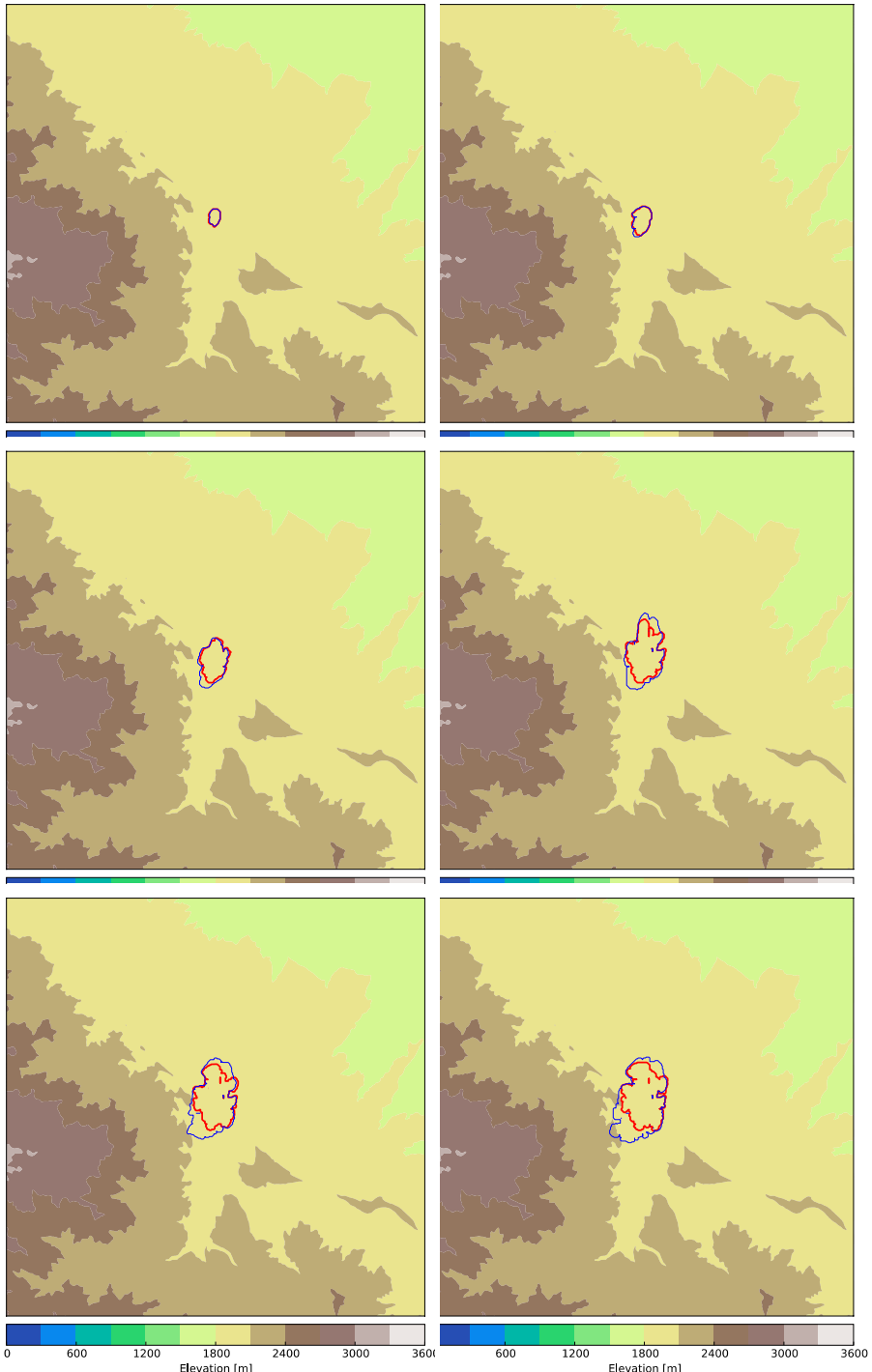

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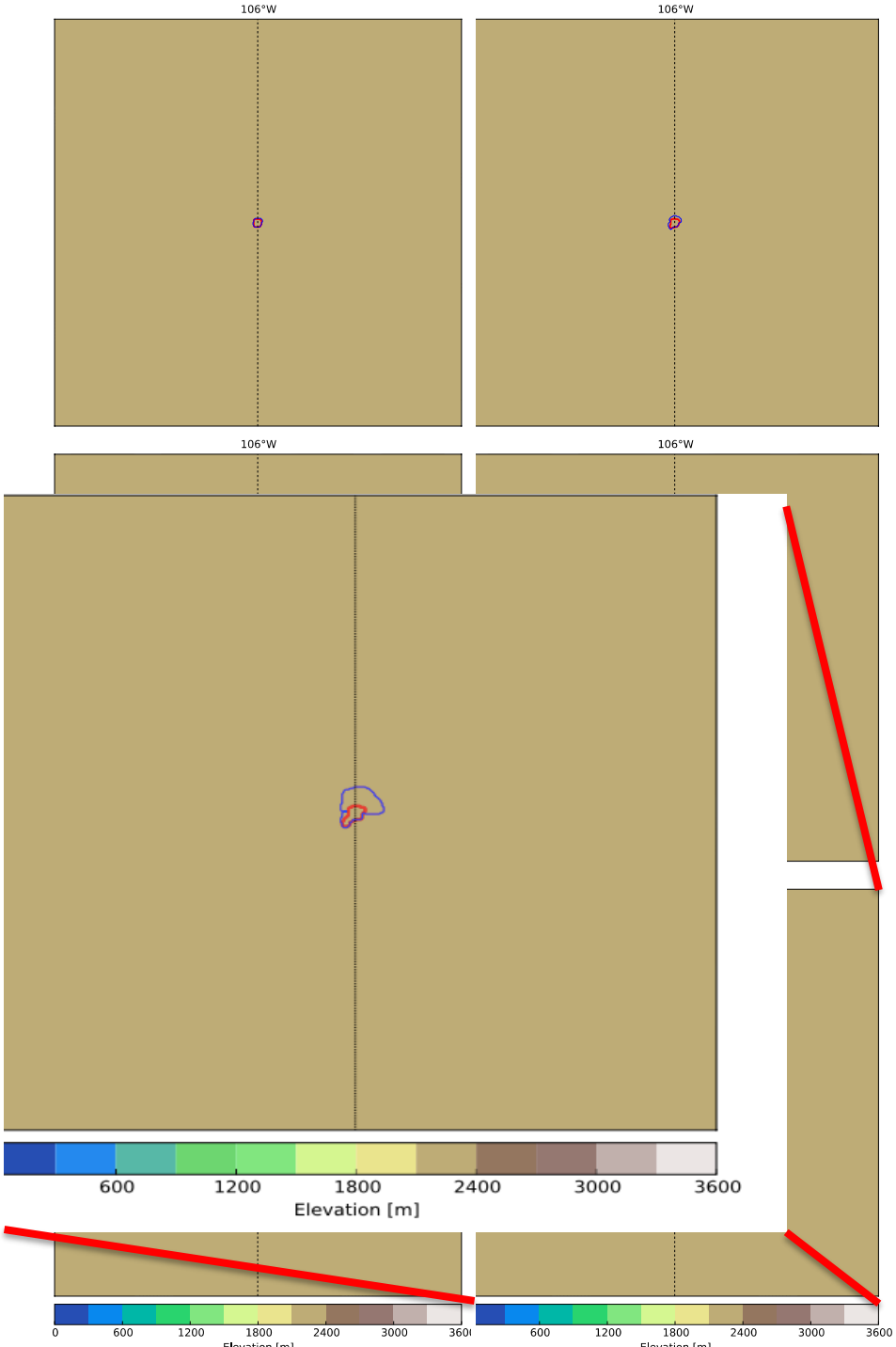


Summary

- We carried out simulations using the nowcasting system and the high-resolution CO-FPS system with the Scott and Burgan and Anderson fuel models
- We carried simulations over flat and mountainous terrain
- The results are in general similar
- Main differences can be attributed to the differences in the underlying fuel maps and not to the way coupled wildland fire prediction model uses these data
- We will be working on adjusting fuel burnout parameters for the Scott and Burgan fuel model
- The goal of the new NASA funded project is to develop a real time fuel moisture maps based on satellite observations calibrated with RAWS data.

Estimations of fuel moisture content for improved wildland fire spread prediction

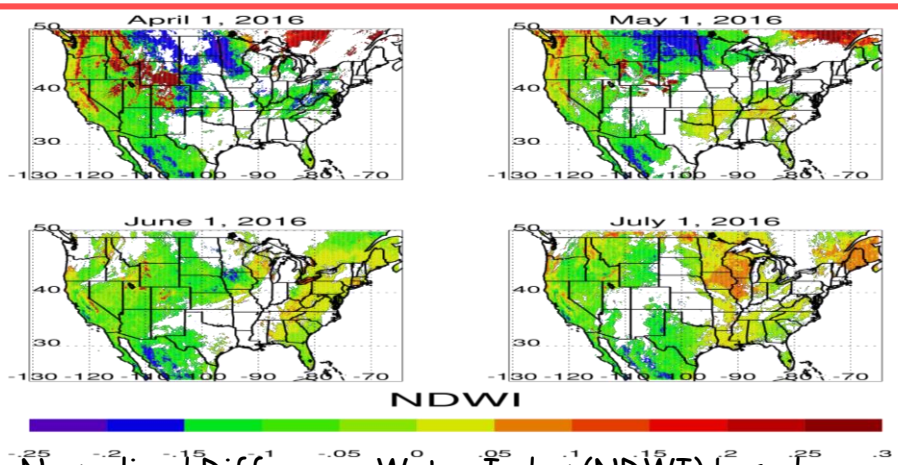
PI: Branko Kosovic, NCAR

Objective

The objective of the proposed project is to develop a dynamic, real-time FMC data set for use in the operational wildland fire spread model WRF-Fire that will enable skillful fire spread prediction under a wide range of environmental conditions.

The goal is to significantly improve accuracy of an operational wildland fire spread model based on the Weather Research and Forecasting (WRF) – Fire model through assimilation of a dynamic, real-time FMC data.

The impact and effectiveness of this FMC data set will be demonstrated and verified using data from eleven historical fires.



Normalized Difference Water Index (NDWI) based upon an analysis of MODIS Terra surface reflectance, cloud mask and land surface temperature.

Approach:

The high temporal and spatial resolution gridded FMC product will be:

- derived using vegetation index products from the remote sensing MODIS Terra and Aqua satellite instruments,
- developed using machine learning algorithms and calibrated using surface Remote Automatic Weather Station (RAWS) observations, and
- assimilated in the WRF-Fire, the core component of an operational wildland fire prediction system.

CoIs: Pedro Jimenez Muñoz, Domingo Muñoz Esparza, Sue Ellen Haupt, Amanda Anderson, William Petzke, NCAR; Brad Schmidt, Colorado Center of Excellence for Advanced Technology Aerial Firefighting

Key Milestones

- Data acquisition and test case selection 10/17
- Data analysis, algorithm implementation, and FMC data set creation (TRL 5) 10/18
- Verification of the dynamic real-time FMC data 05/19
- Implementation of the FMC data set in the operational system (TRL 6) 06/19

$TRL_{in} = 2$

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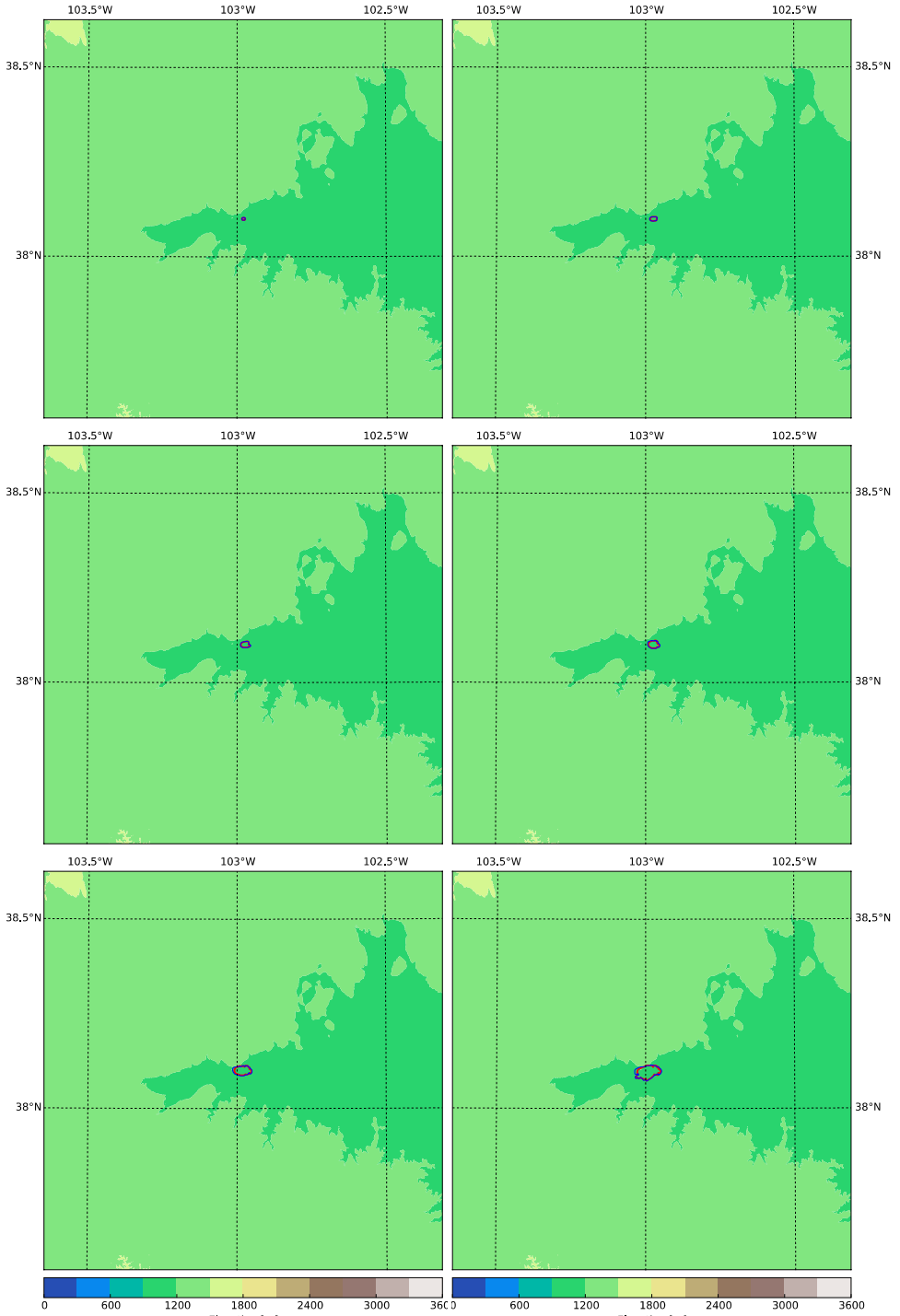

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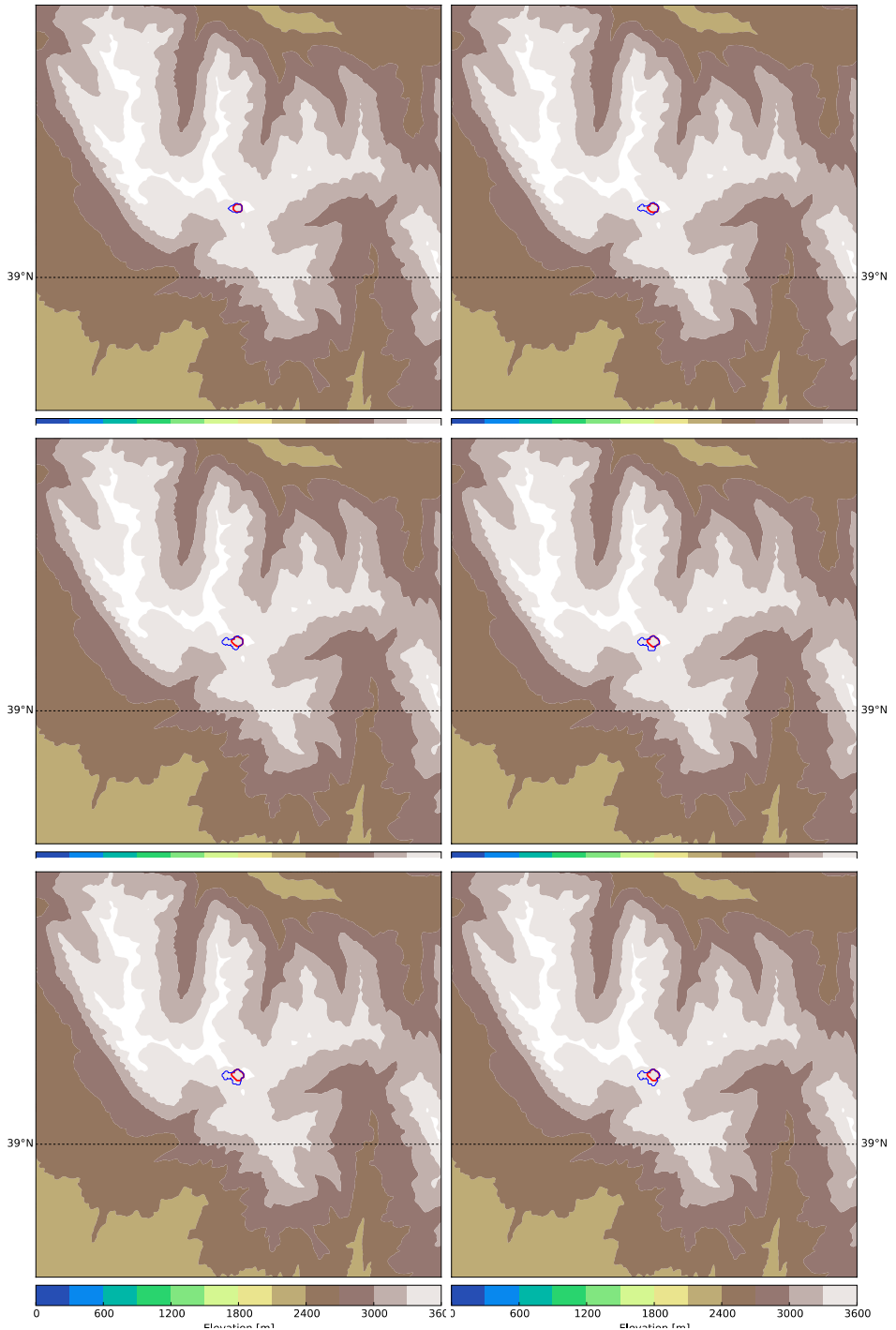

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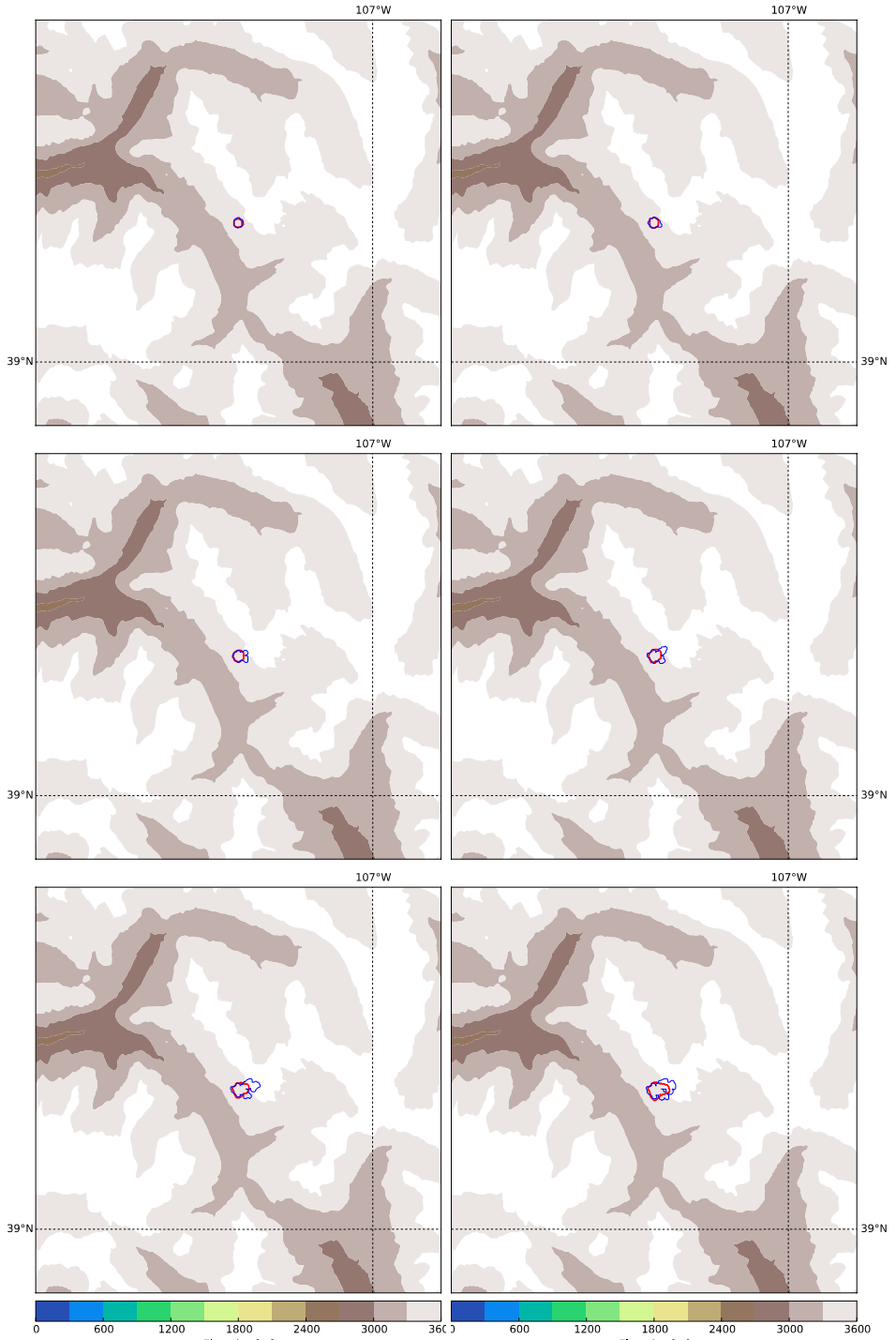

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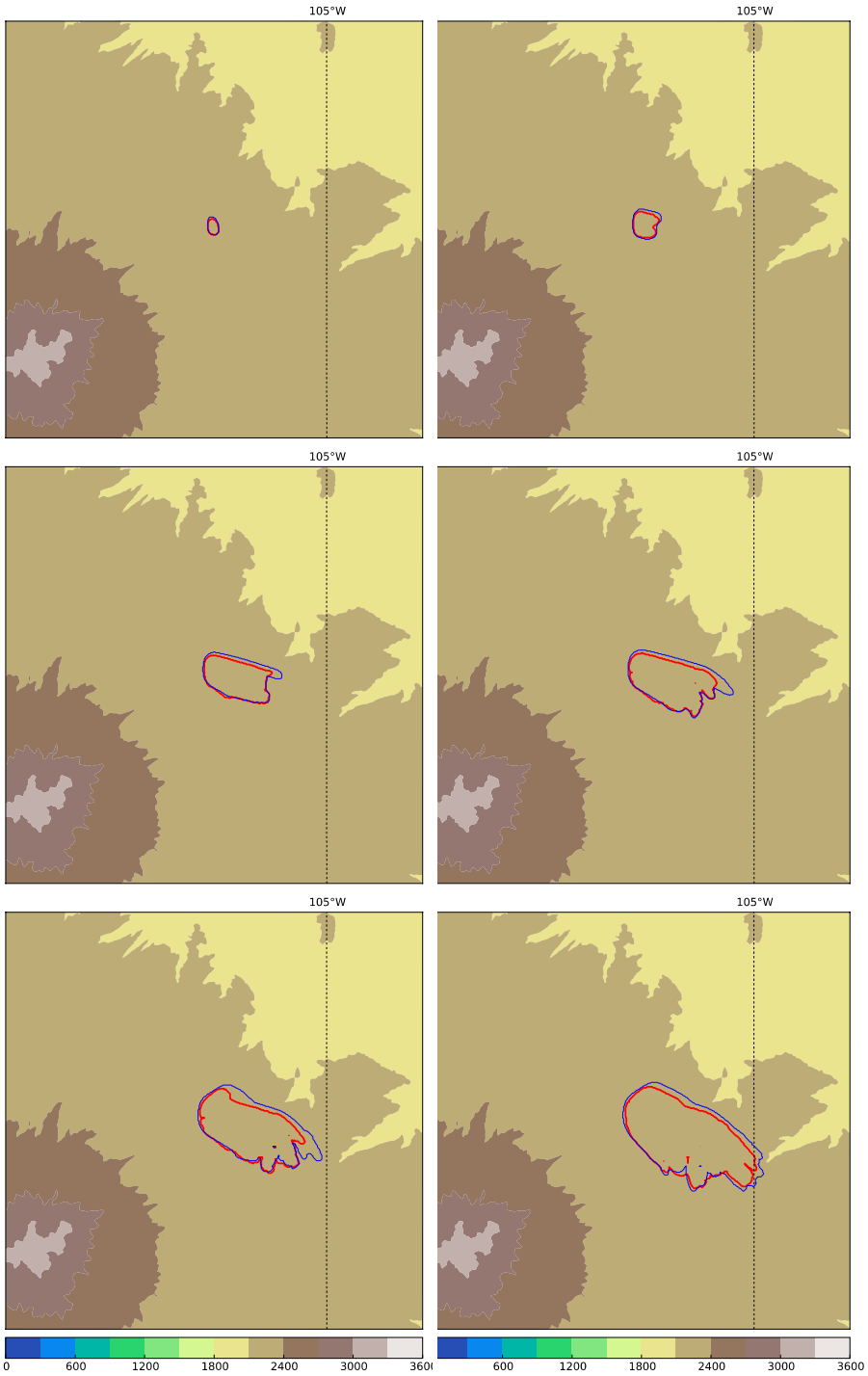

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