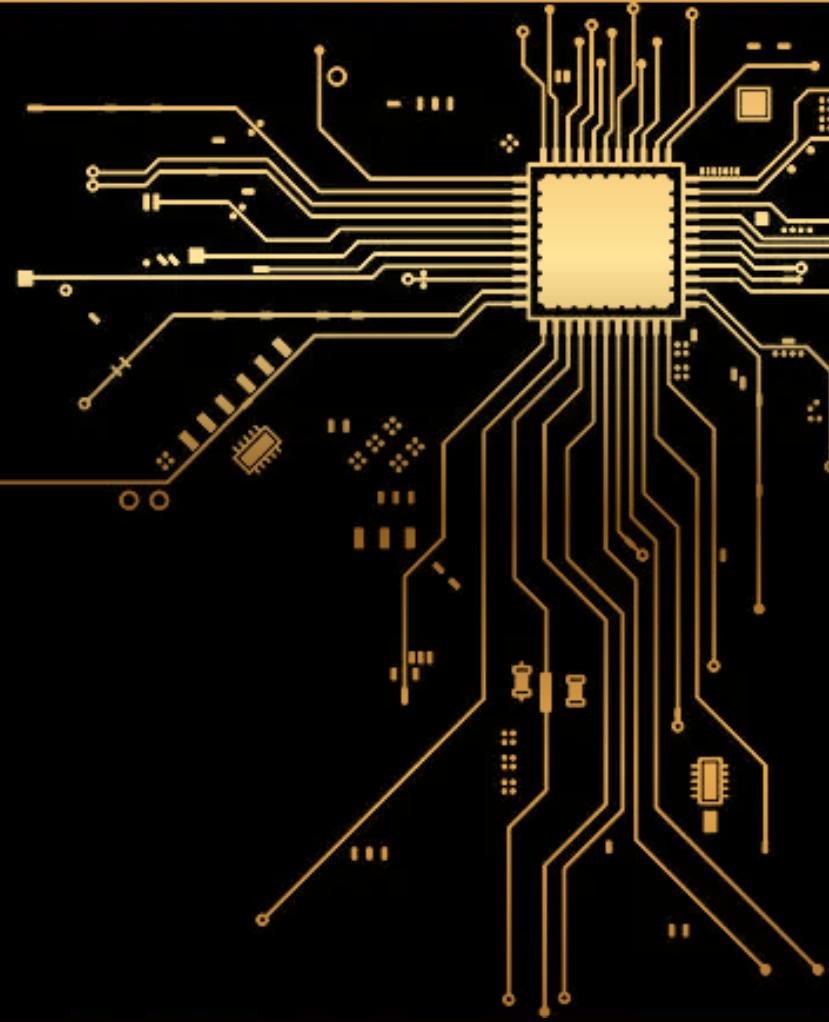


Burn Bright, Scar Deep? Comparing Satellite Fire Radiative Energy to Ecosystem Impact



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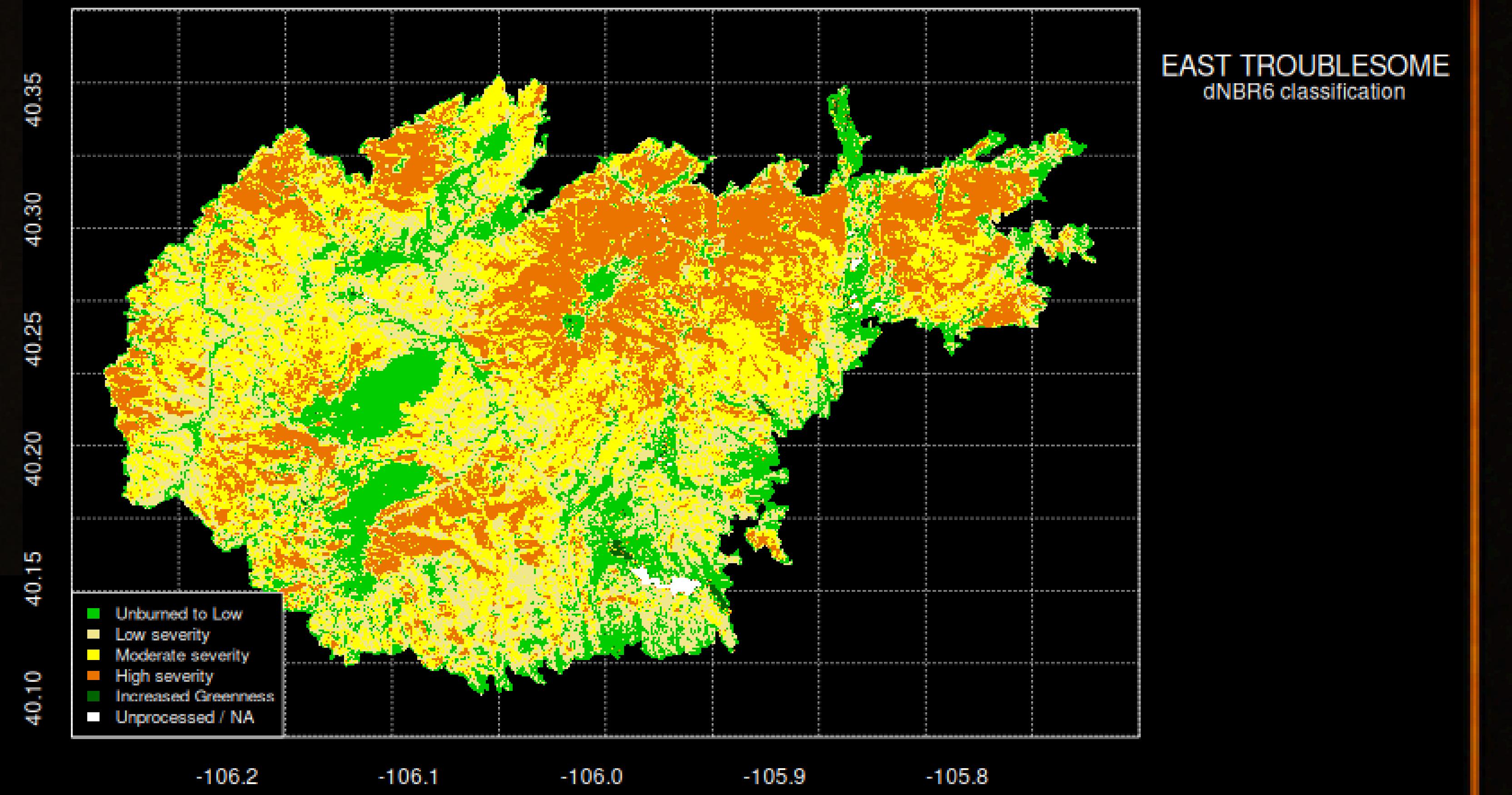
Introduction

Wildfires are burning bigger and hotter, raising urgent questions about how they reshape ecosystems. In 2020, Colorado's East Troublesome Fire alone scorched ~193,800 acres, killed two people, and destroyed 400+ structures—damage driven in large part by the energy a fire releases. We use satellites to track that heat. Fire Radiative Power (FRP) is the moment-to-moment energy a fire throws off; summing FRP over a fire's life yields Fire Radiative Energy (FRE), the total "energy bill." Our study asks a simple question with big implications: do higher-energy fires leave deeper scars on the land? We integrate VIIRS FRP over time to estimate FRE and compare it with burn-severity patterns from Landsat (dNBR). Connecting energy to outcomes can help explain tree mortality, erosion risk, slow vegetation recovery, and habitat disruption—and ultimately guide faster, smarter post-fire decisions.

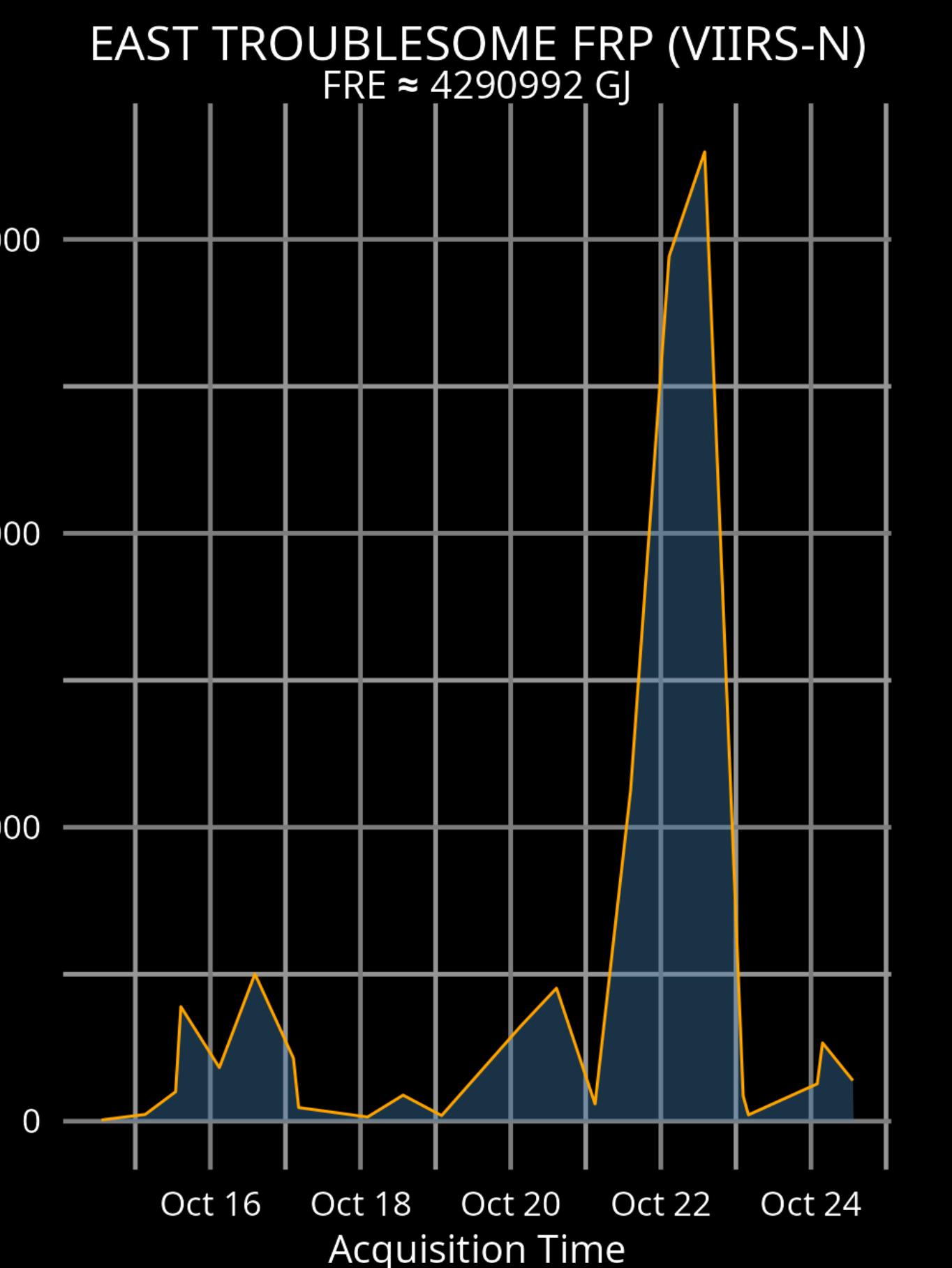
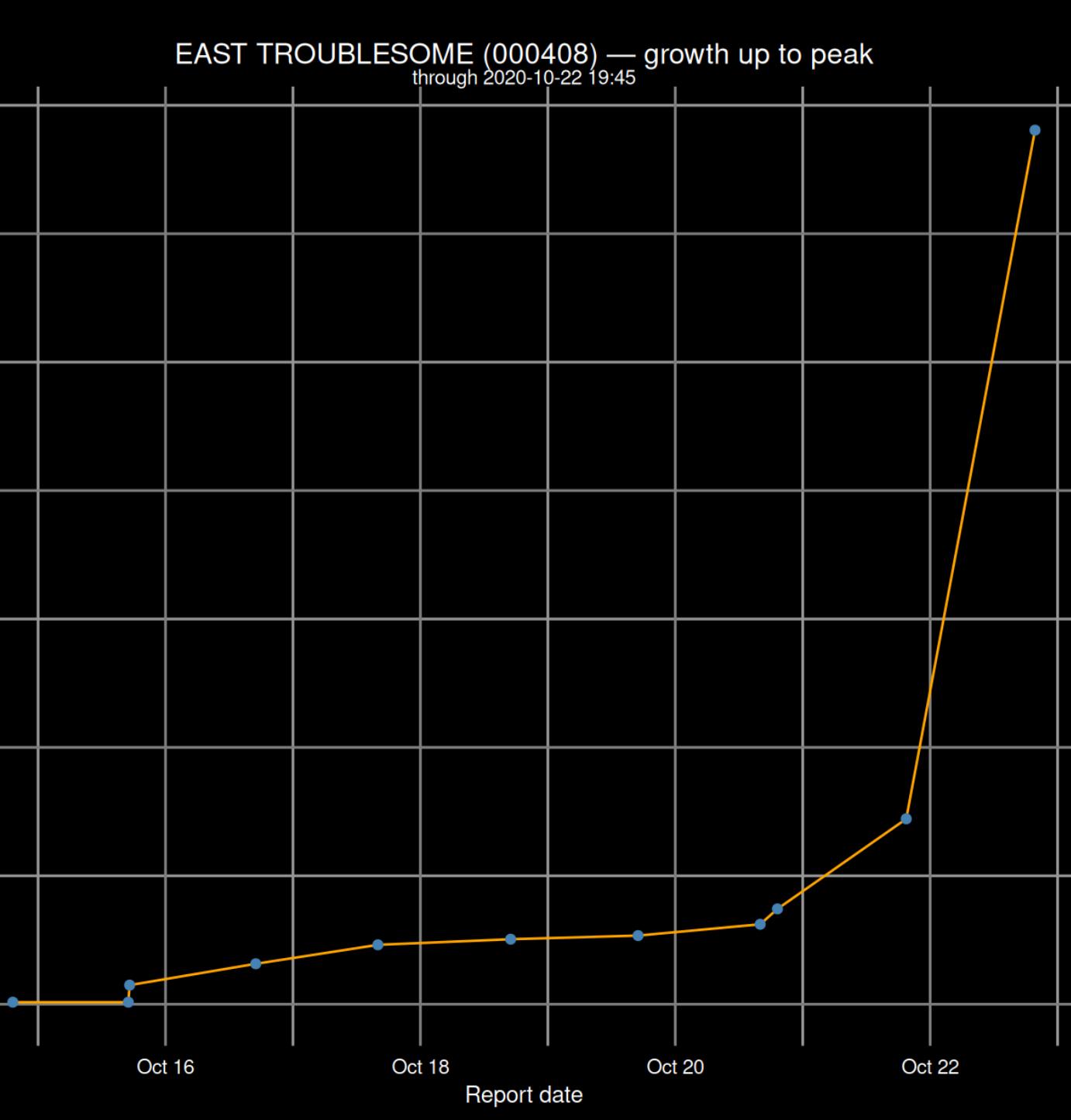
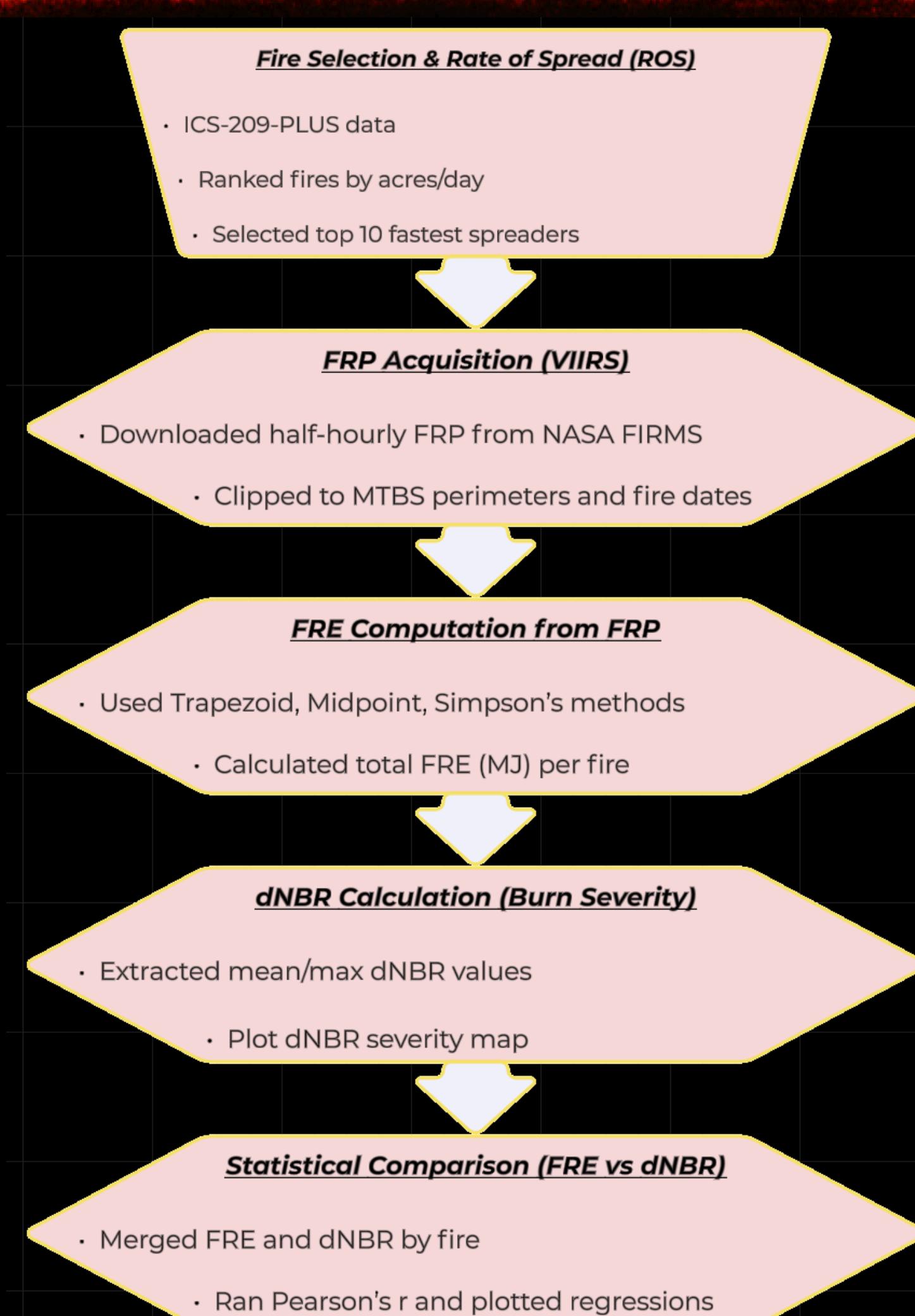


How does fire radiative energy released by a fire compare to its rate of spread?

Results



Methods



Discussion

Reproducible Workflow

- R script from ICS-209 → FRP download → FRE integration
→ dNBR helps with auditability and reuse.

Integration Sensitivity

- Trapezoid, midpoint, Simpson's rules could yield different total FRE. Choose based on accuracy vs. speed.

Scalable Pipeline

- Modular code runs on 10 fires today and 100s tomorrow for regional mapping of energy-severity links.

Next Steps

- Test across diverse fuels (grass, forest)
- Incorporate high-resolution inputs (drone/LiDAR)
- Deliver as an R package or Shiny app for broad adoption

Conclusion

This pipeline converts FRP into total energy and compares it to Landsat dNBR, offering a flexible, scriptable approach that could support scalable, data-driven assessments of wildfire ecological impact across diverse fuels and regions.



Scan for further information, additional results, and references



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