

# Coronal Holes

Not As Well Behaved As We Thought

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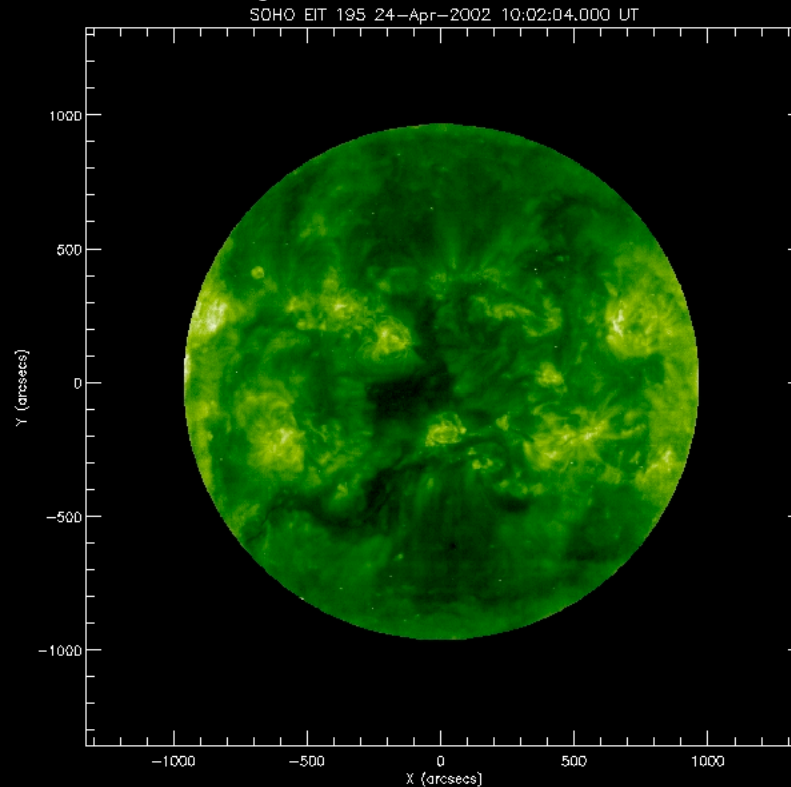
Montana State University Solar REU Program

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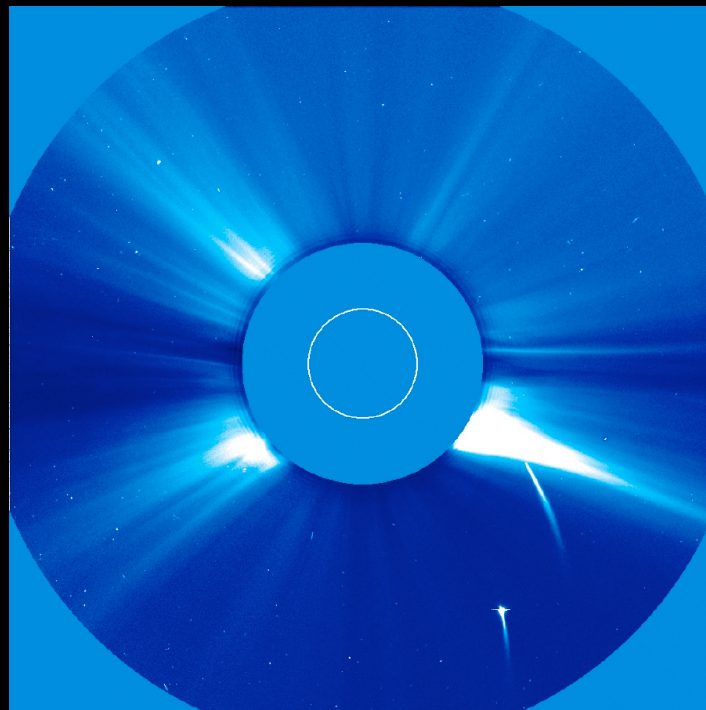
# What is a Coronal Hole?

- Area of Low Density Plasma on the Sun
- Visible only in ultraviolet and xray

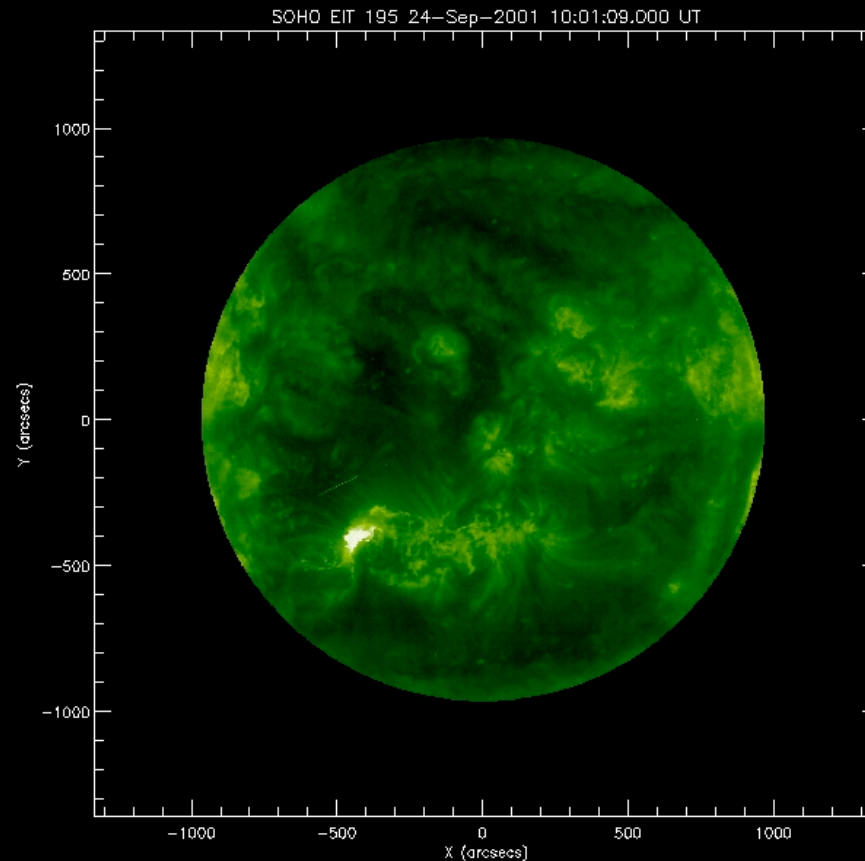


# Relationship to Magnetic Field

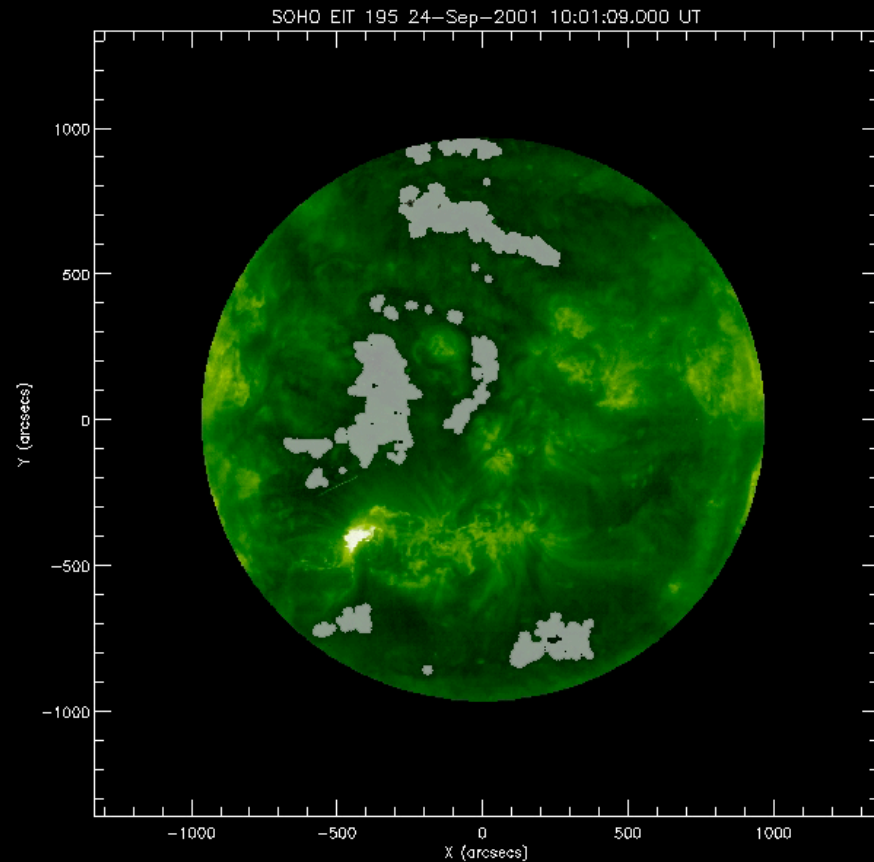
- Thought to be caused by magnetic field lines carrying the plasma into space



# How Well do Coronal Holes and Open Magnetic Field Lines Match Up?

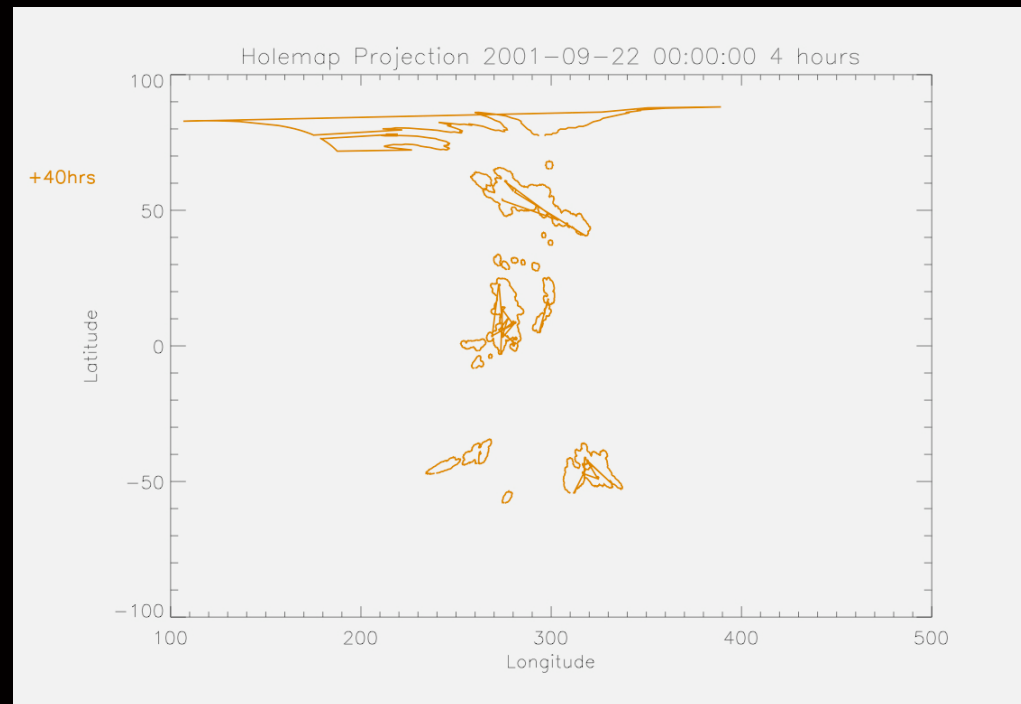


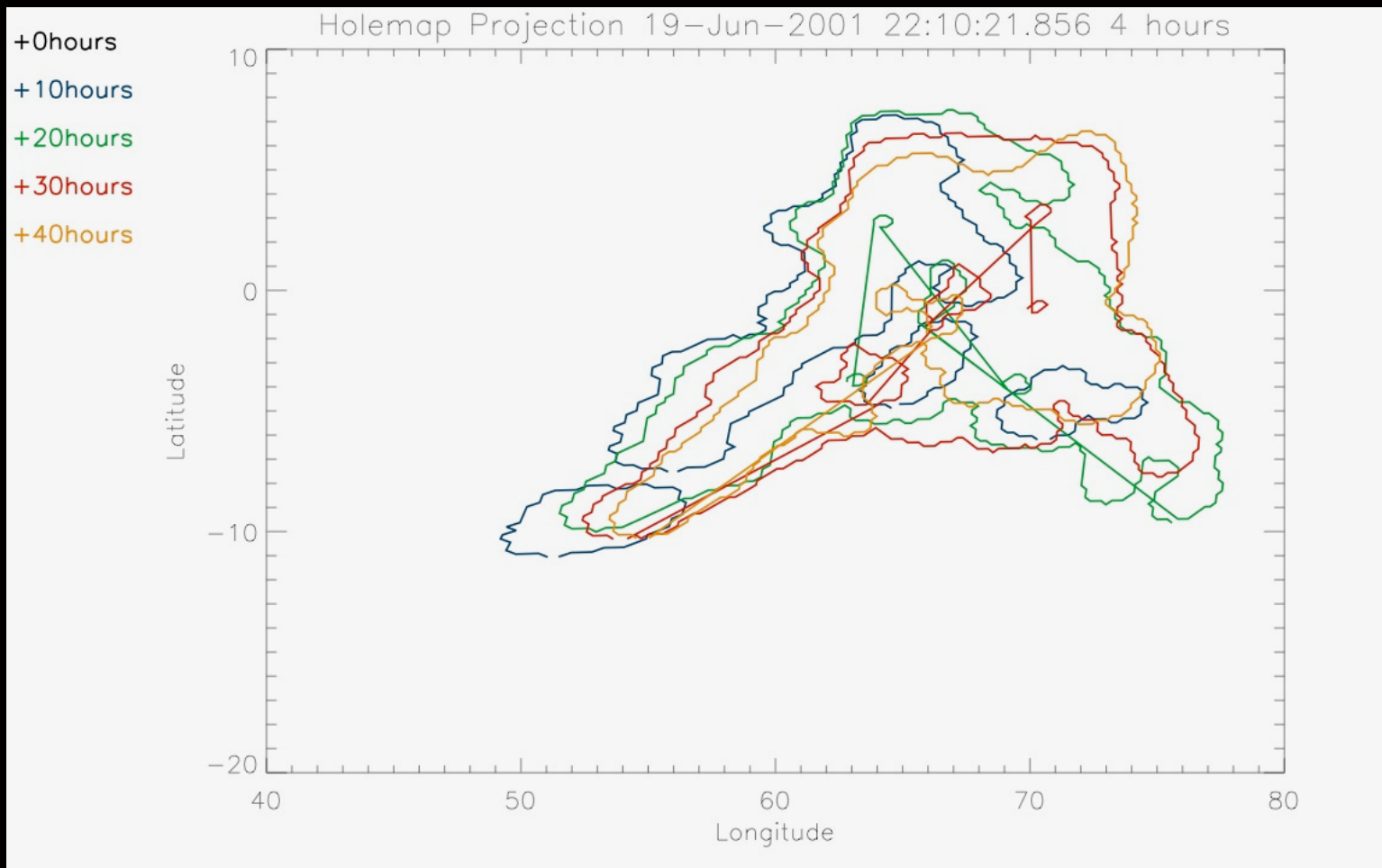
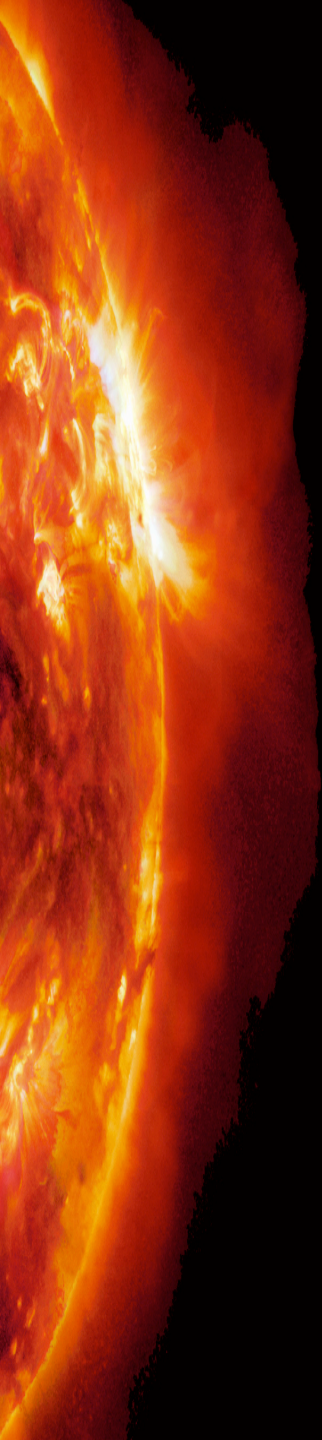
# How Well do Coronal Holes and Open Magnetic Field Lines Match Up?



# Mapping the coronal Holes

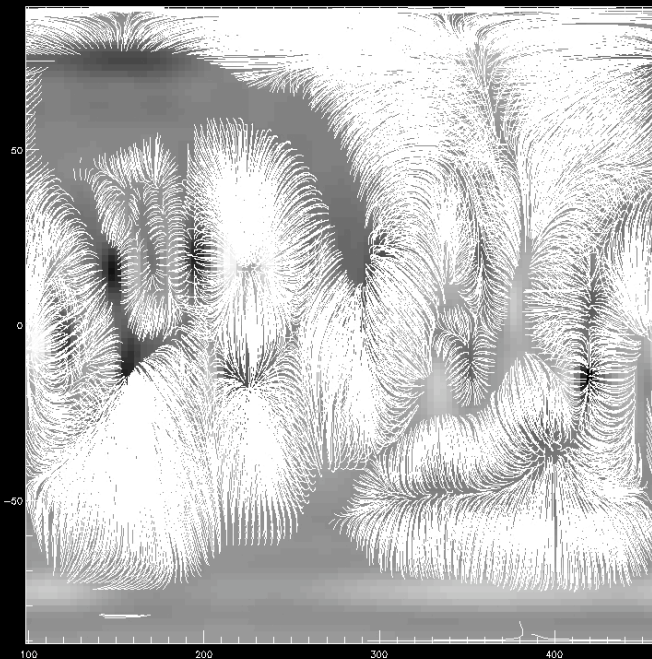
- SOHO EIT images
- Use intensity to find coronal holes
- Project them onto a longitude/latitude map





# Mapping the Open Field Regions

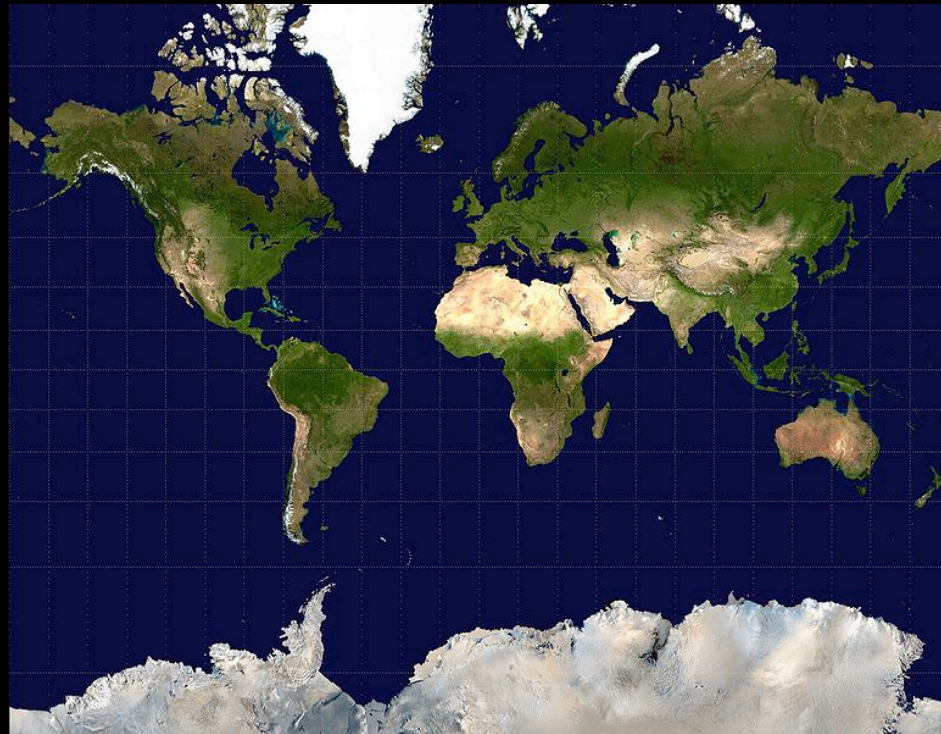
- Magnetograms and Harmonic Coefficients
- Model the magnetic field on the entire sun using a months worth of data





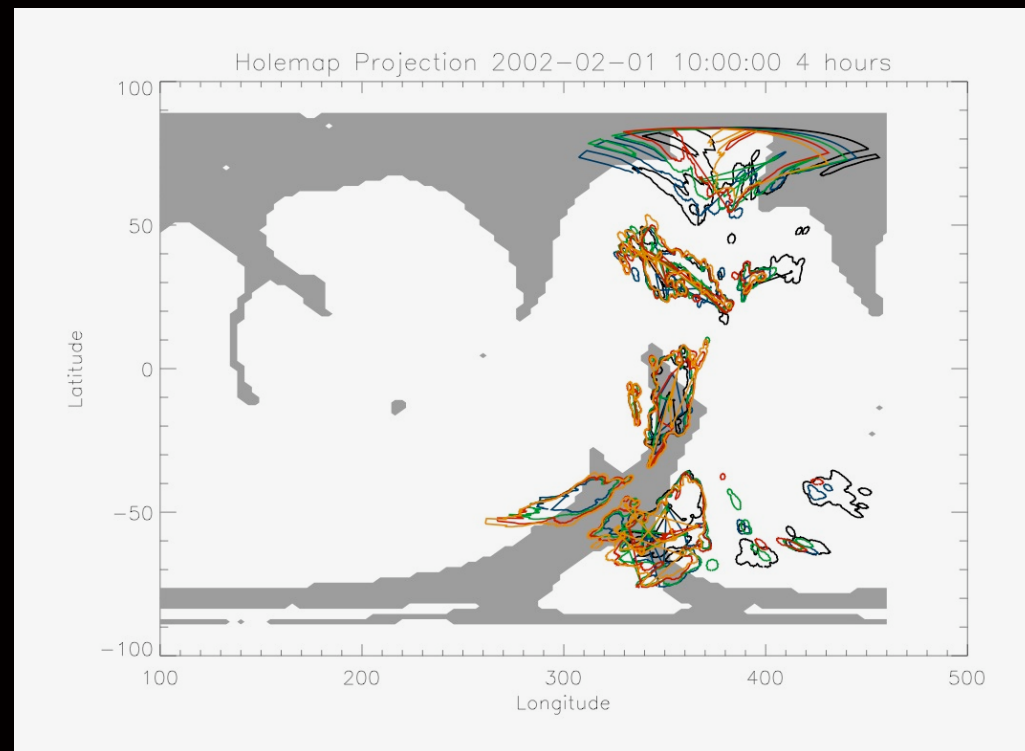
# Mapping Challenges

- Distortion and size changing effects
- Angle of the sun
- Output/input compatibility challenges



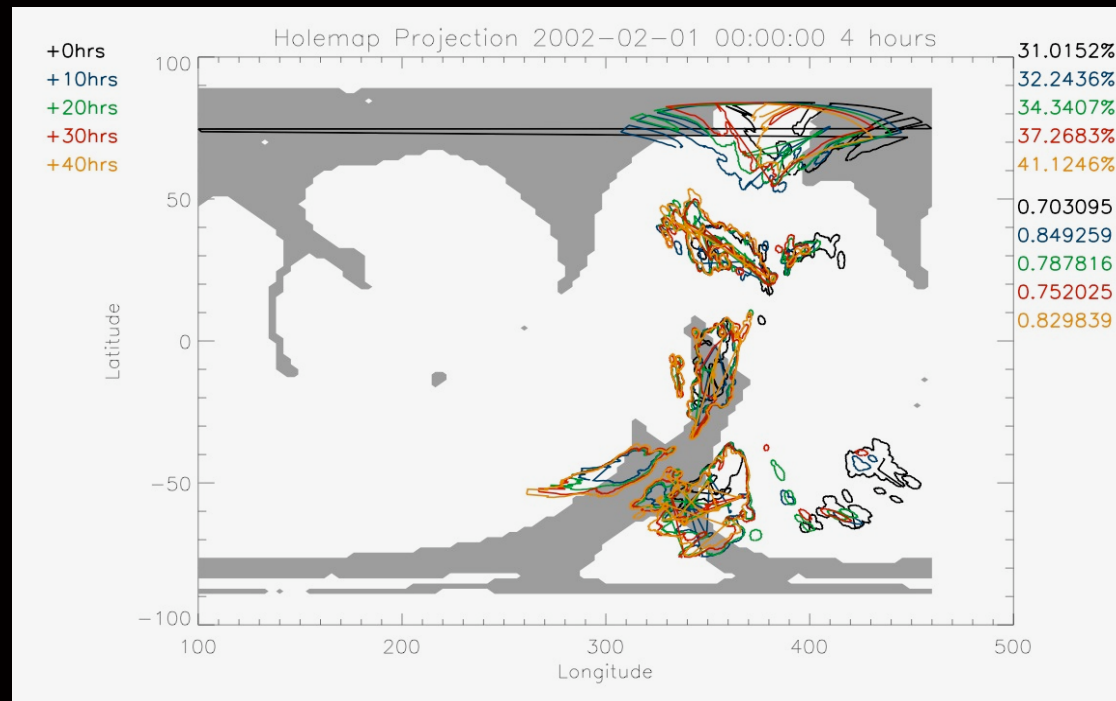
# Interpreting the Maps

- Overlap
- Trends and Patterns
- Consistency

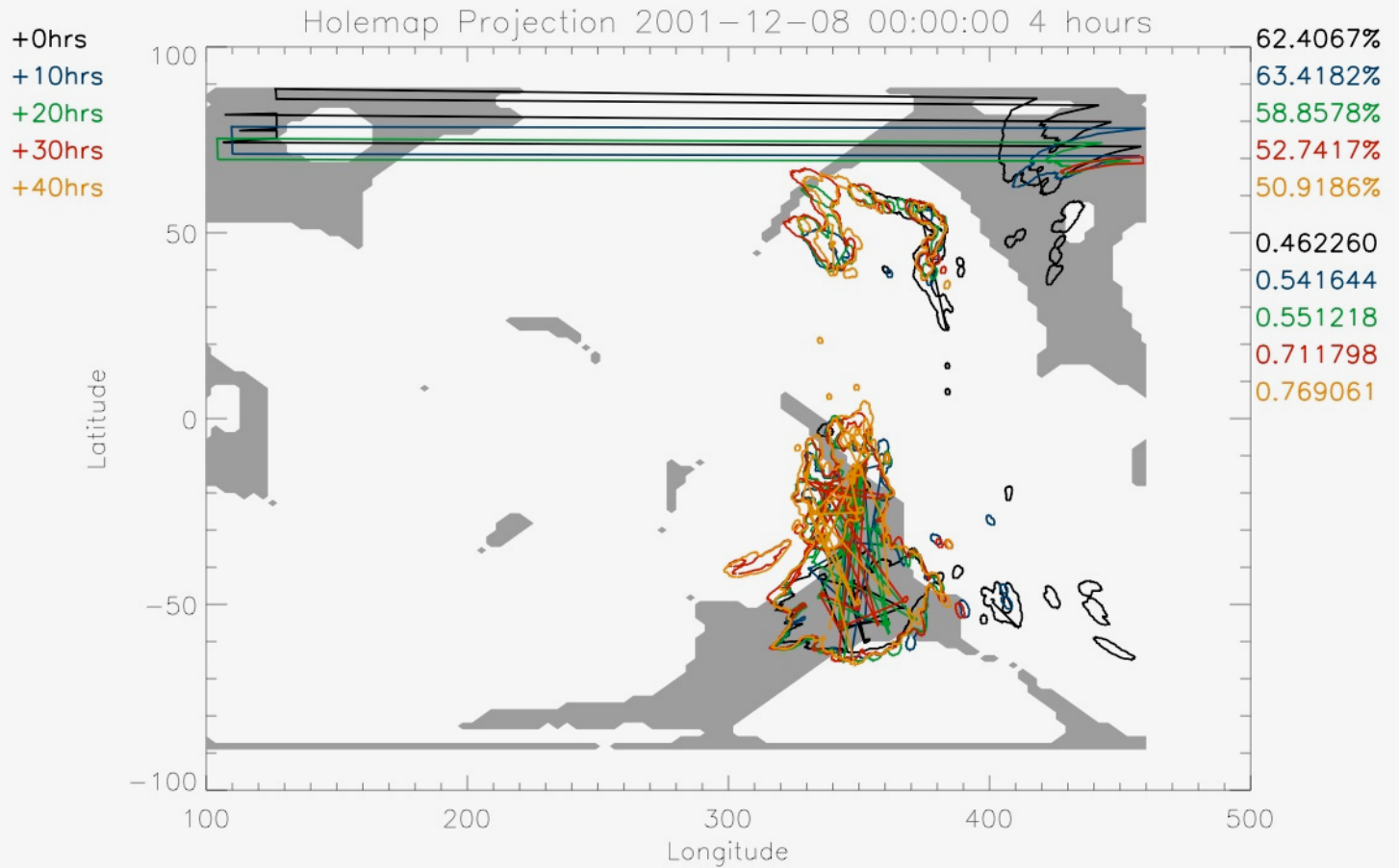


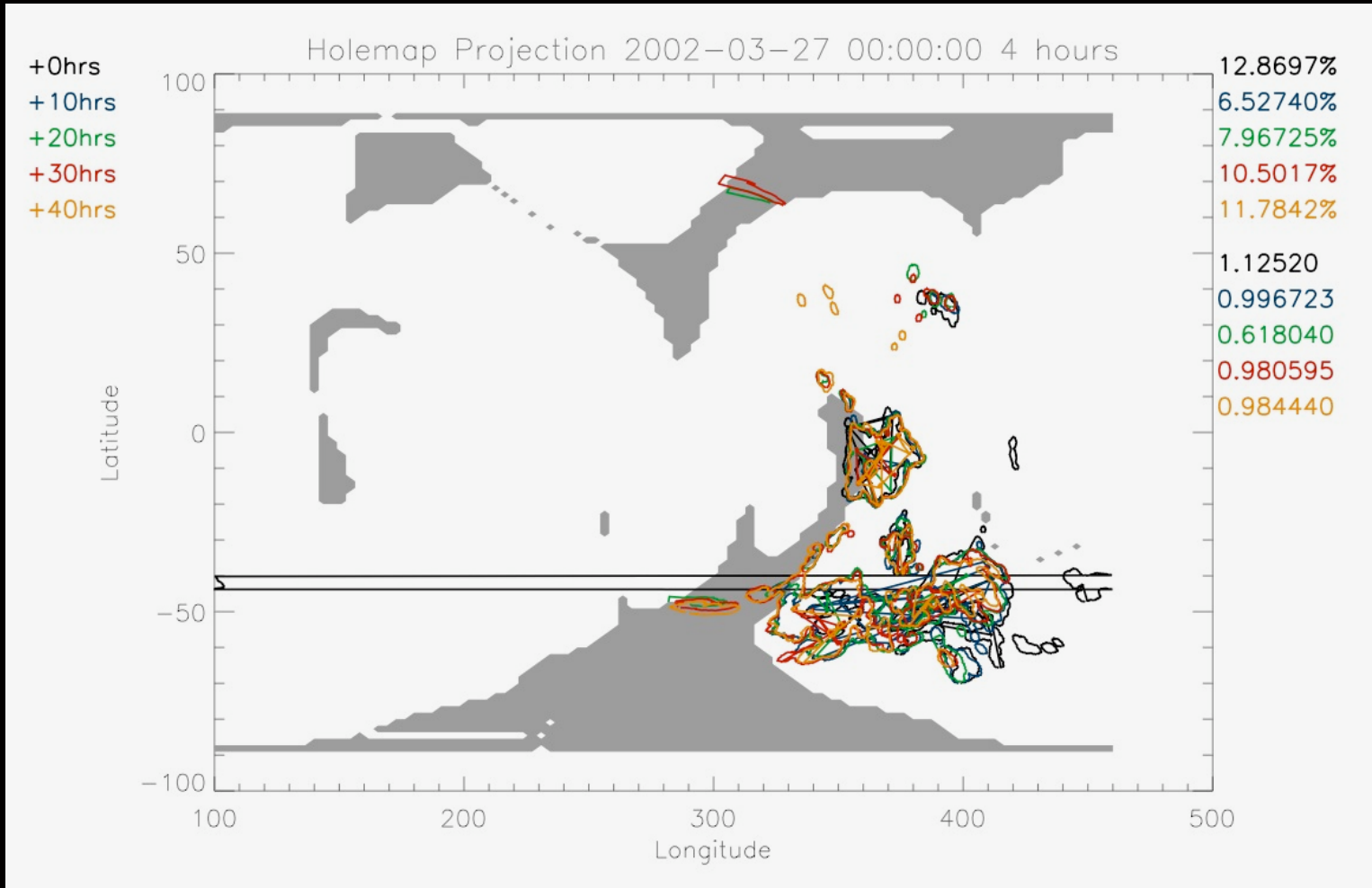
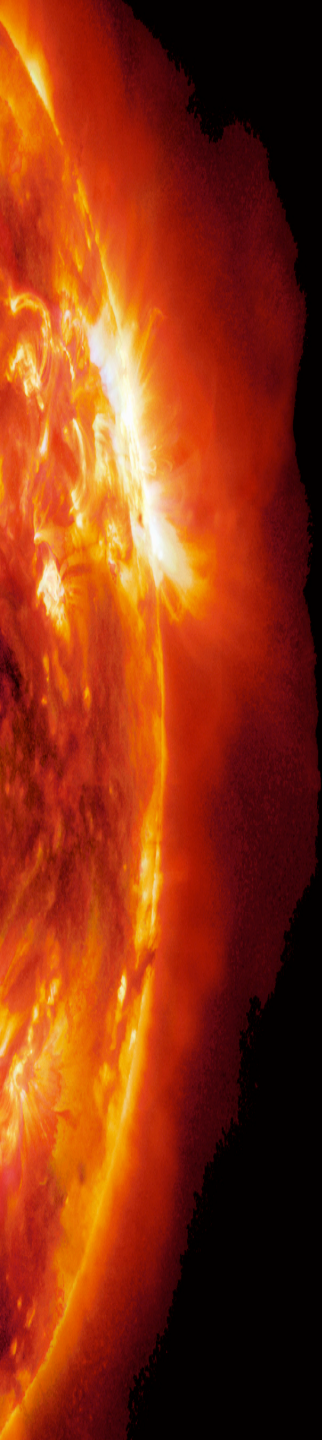
# Getting Some Numbers

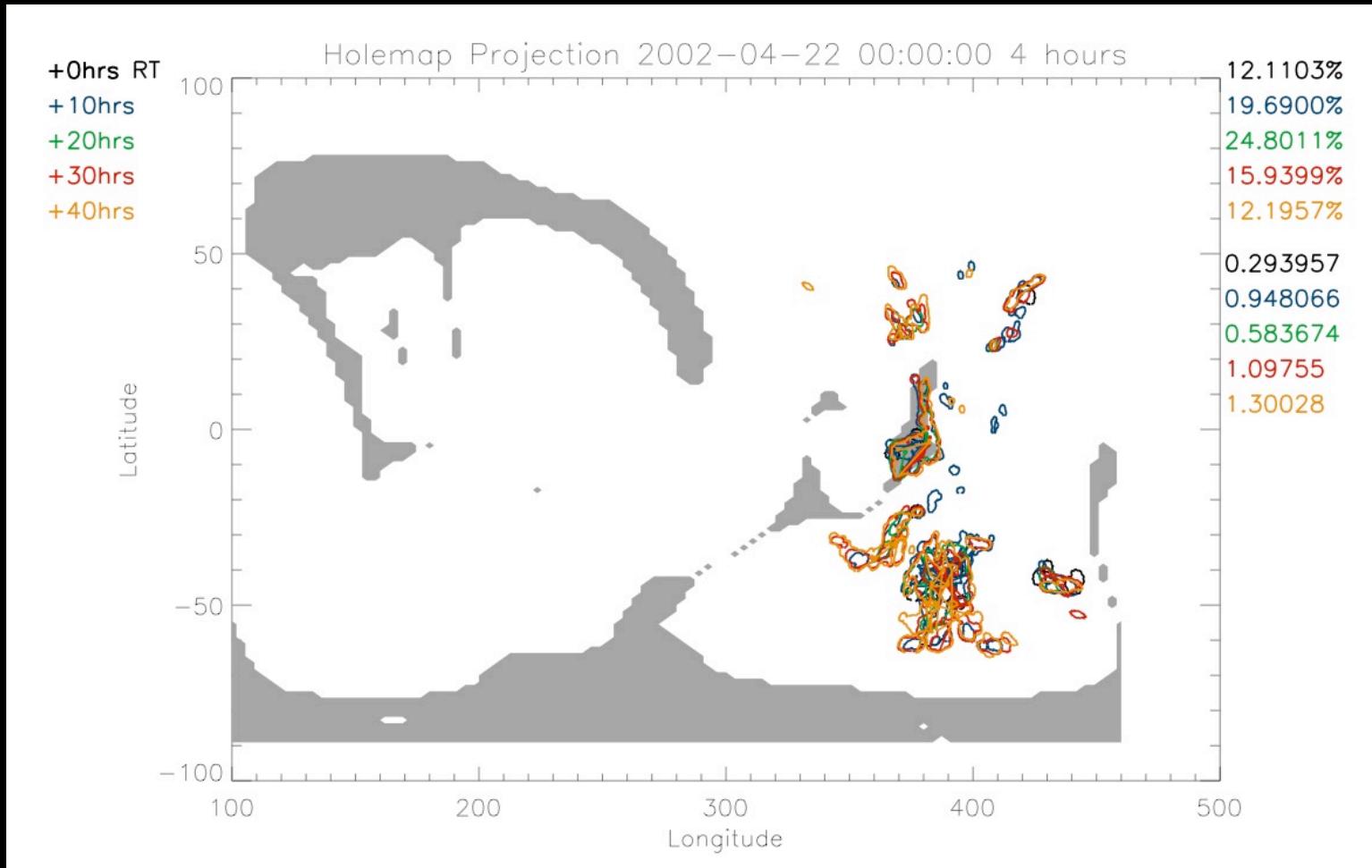
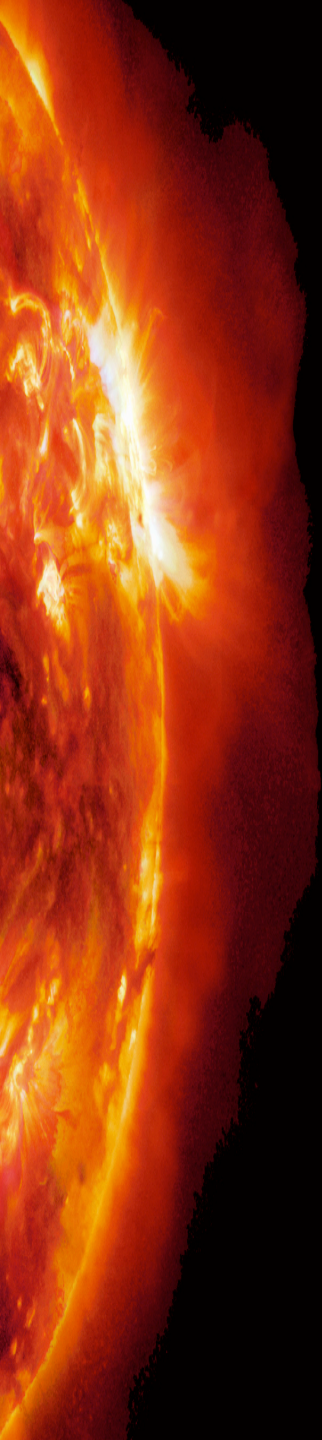
- Percent of coronal holes that overlap with open regions
- Ratio of visible coronal hole area to open region area

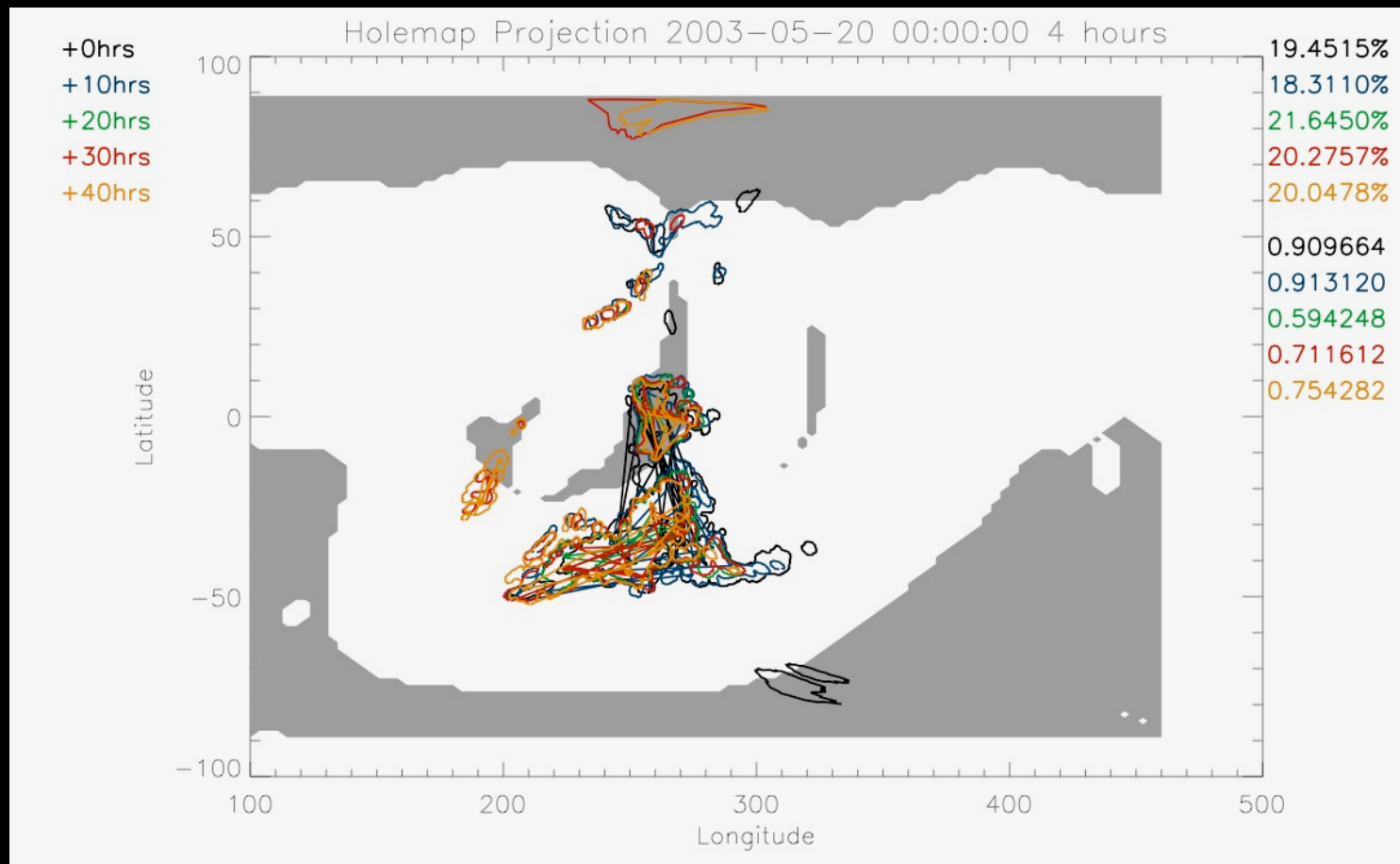
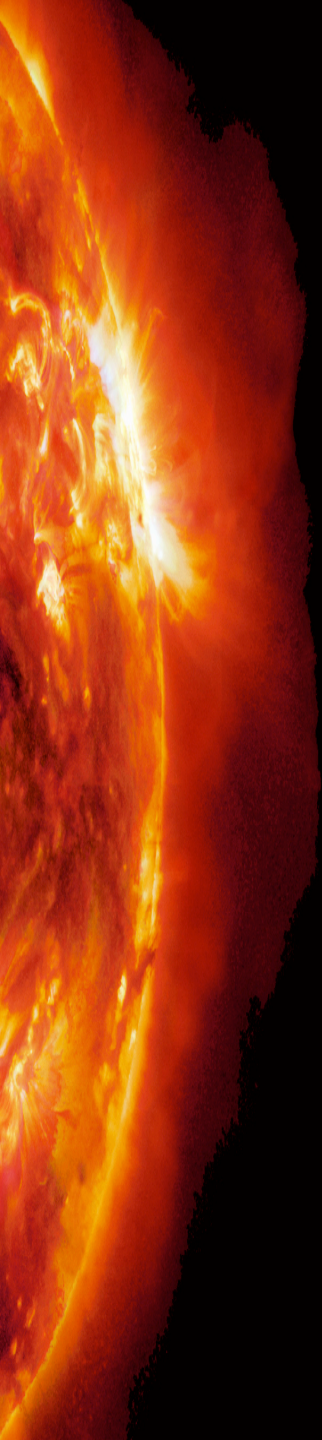


# Results

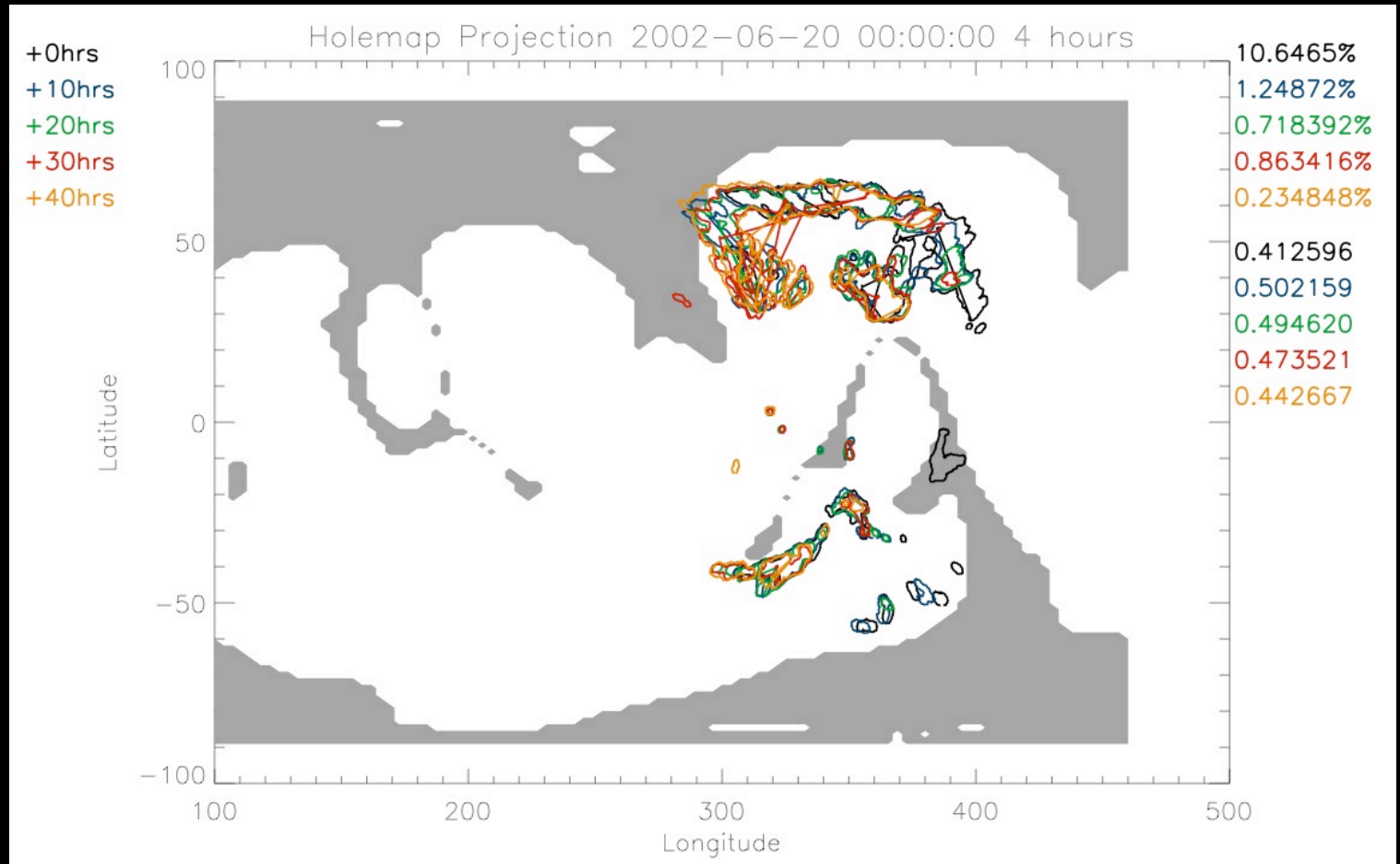






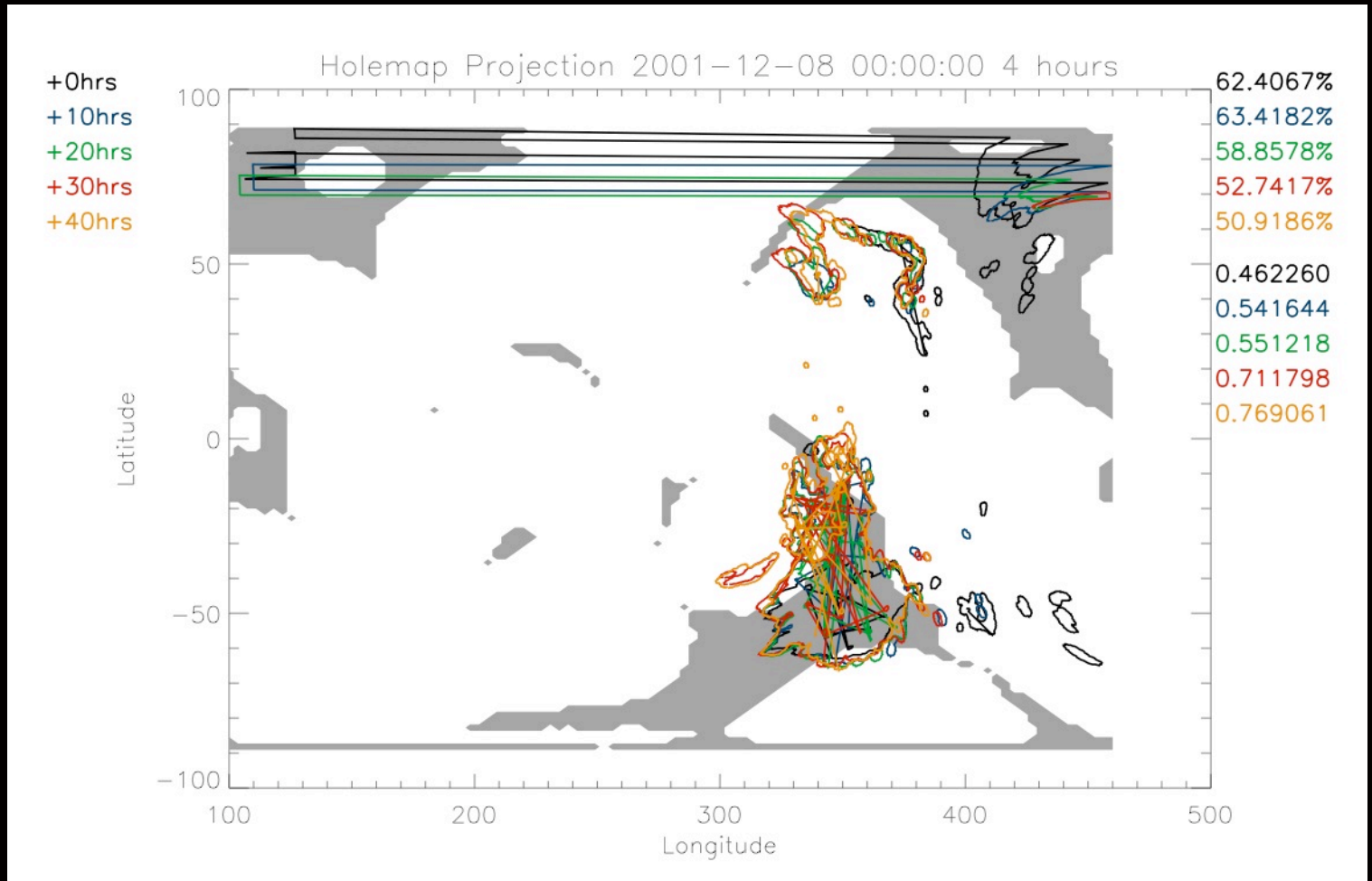


# Low percentage





# High Percentage





# Conclusions

- Coronal holes aren't completely anchored to open field regions
- Best correlation is 60%
- Coronal holes vary over months and hours
- Emerging Patterns



# Acknowledgements

- Dana Longcope
- Chris Lowder
- Montana State University Solar Physics Department
- My Fellow REU Students