3D Reconstruction of PUNCH radial structures with the CROBAR Method

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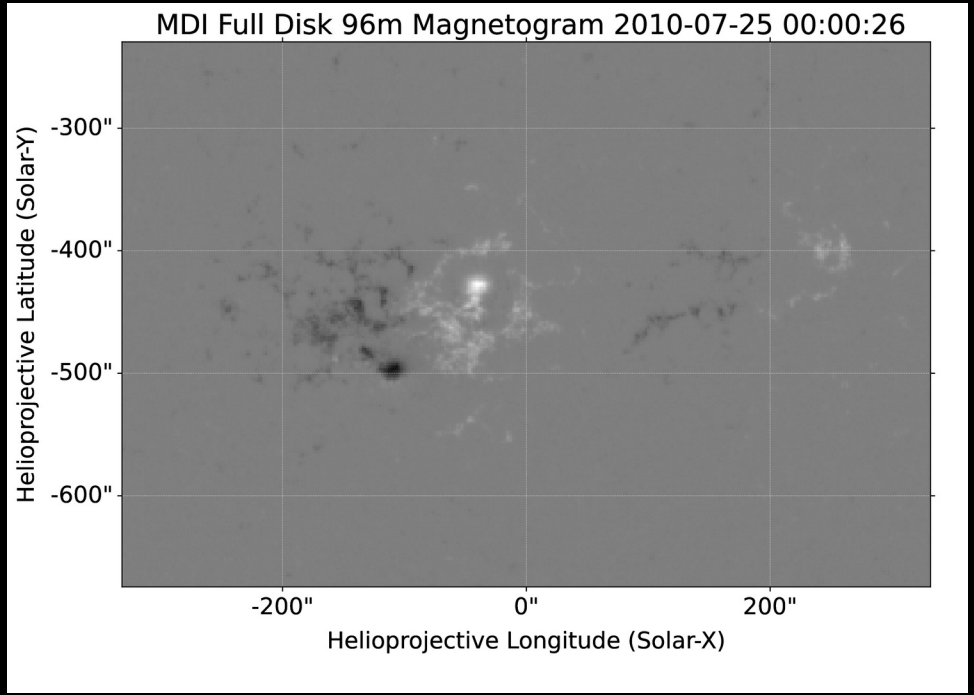
What is CROBAR?

- Method to reconstruct 3D structure from 2D images
  - ‘Coronal Reconstruction Onto B-Aligned Regions’
  - Works with one perspective snapshot in some cases
  - Developed for lower corona using EUV+magnetograms, works well in that application
- This talk shows initial application to synthetic PUNCH data

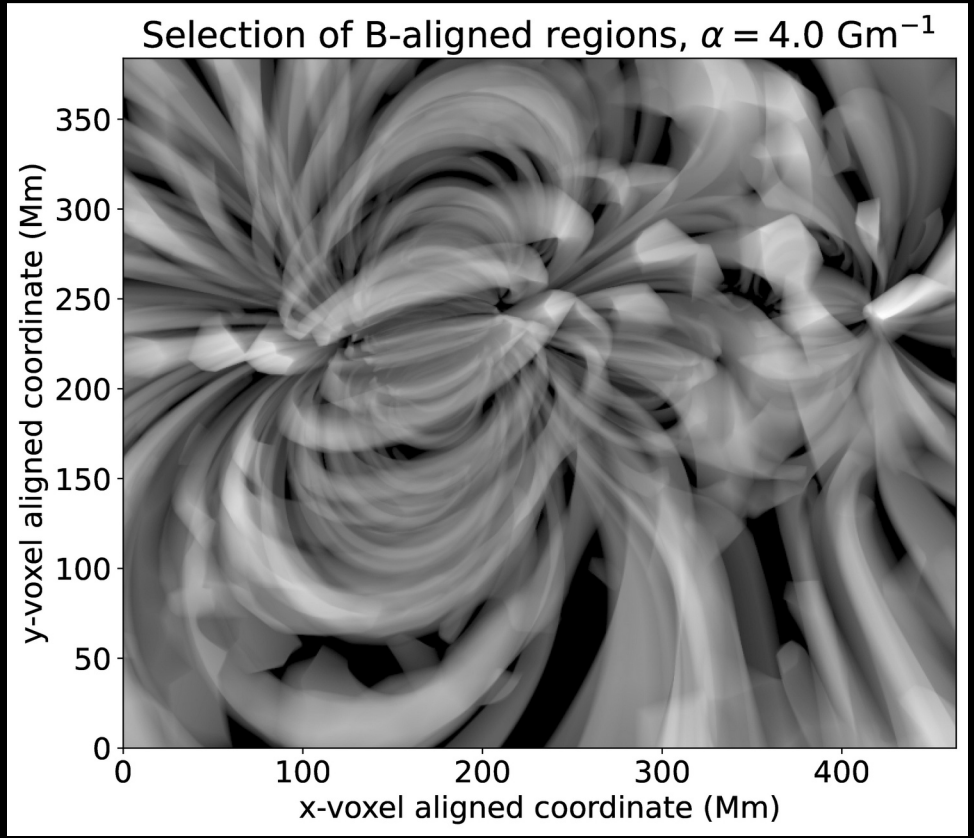
How does it work?

- 3D reconstruction an underconstrained problem in corona
- Need physics-based constraints
- In low EUV corona, this is provided by magnetic field



How does it work?

- For EUV, Field extrapolations provide B-aligned regions
- Each of these has its own emission profile
- Emission following this structure in image must be at its 3D location



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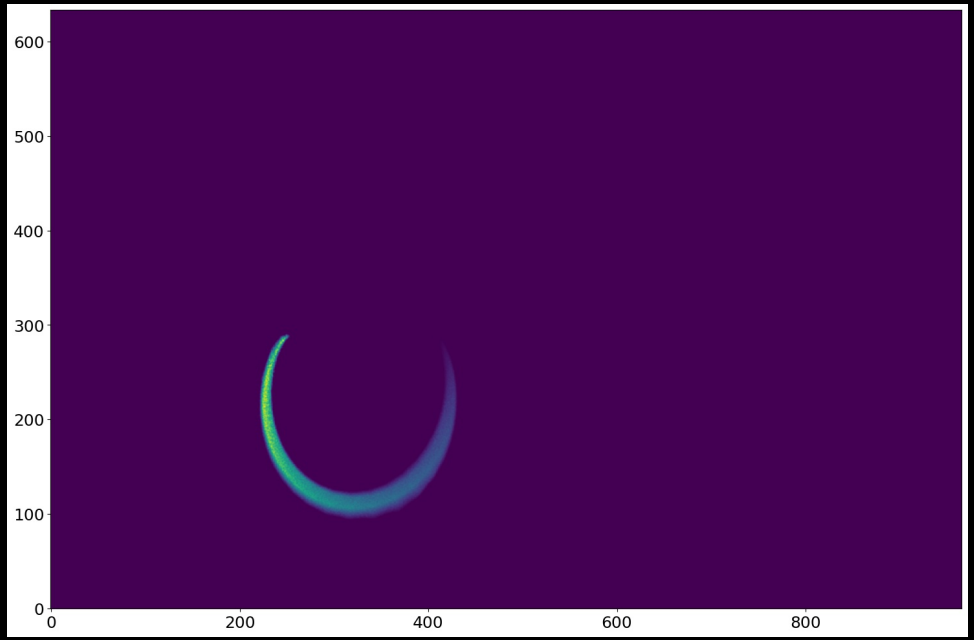

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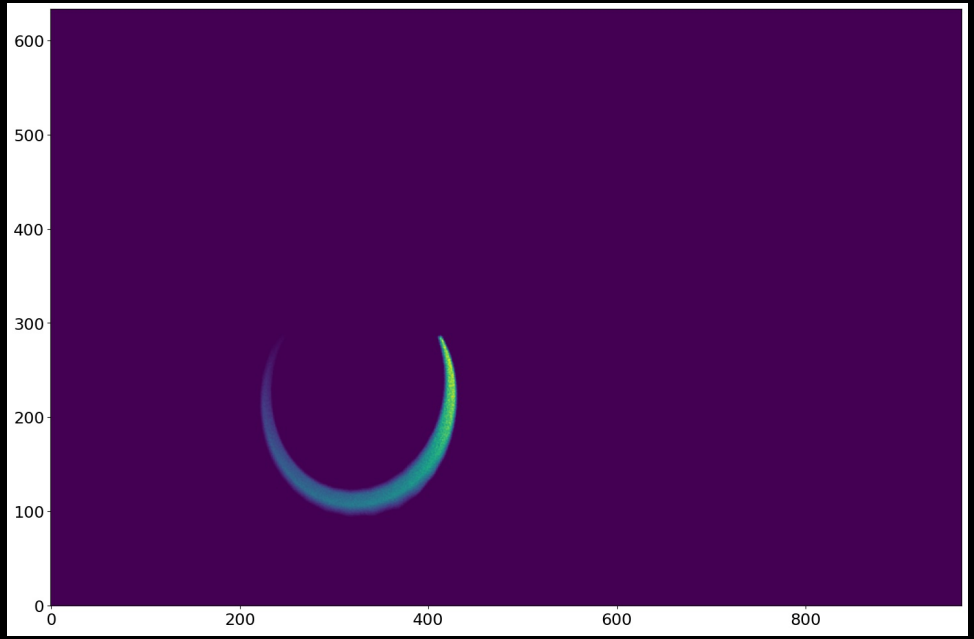

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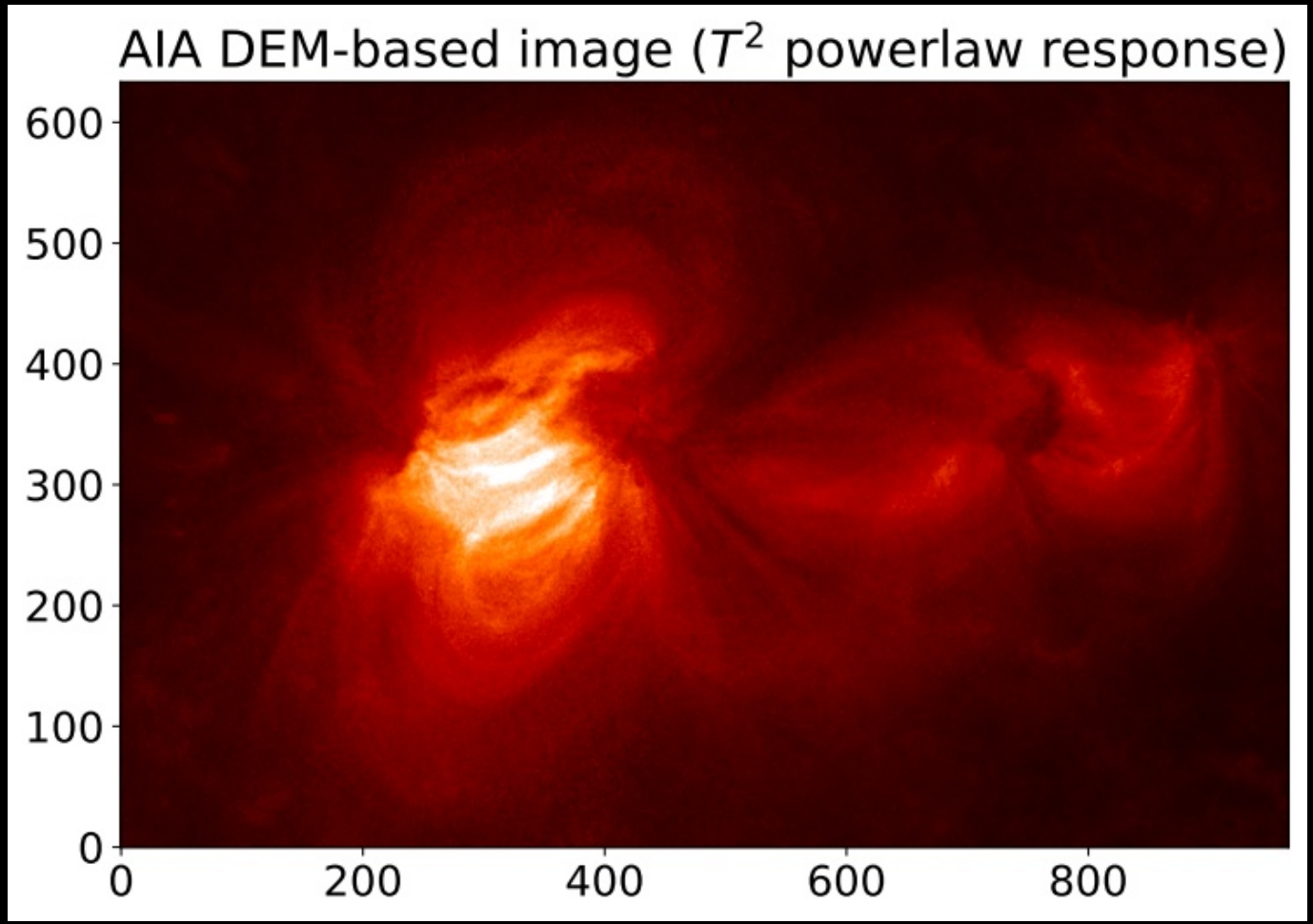

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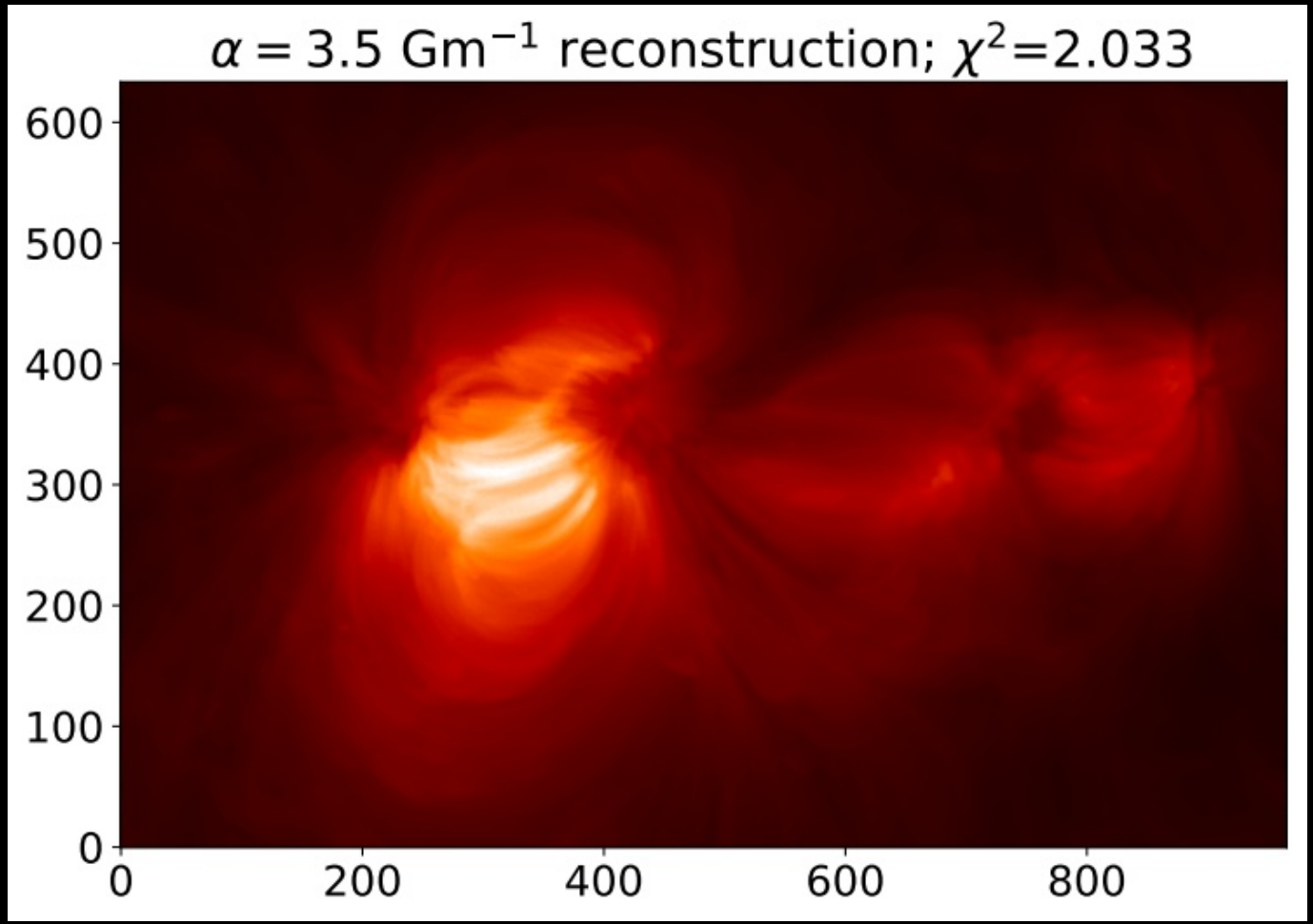

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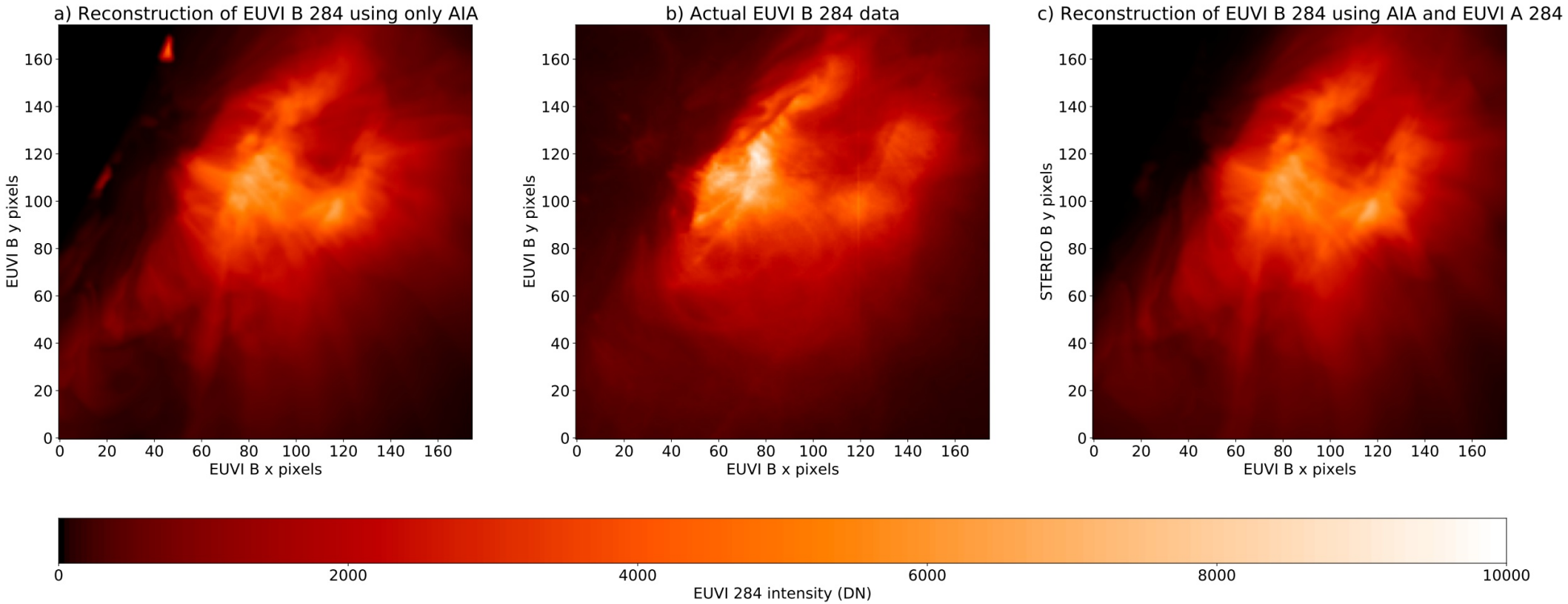

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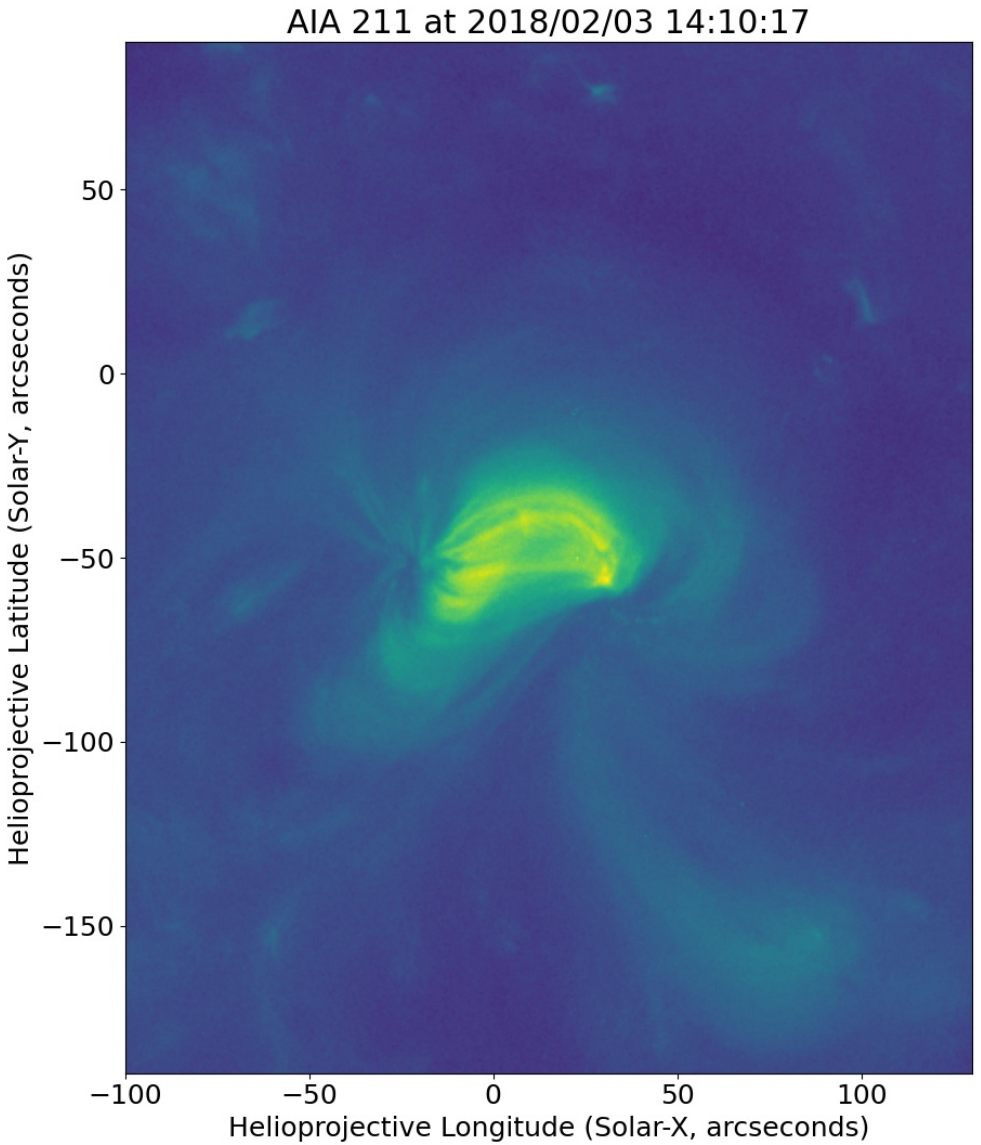

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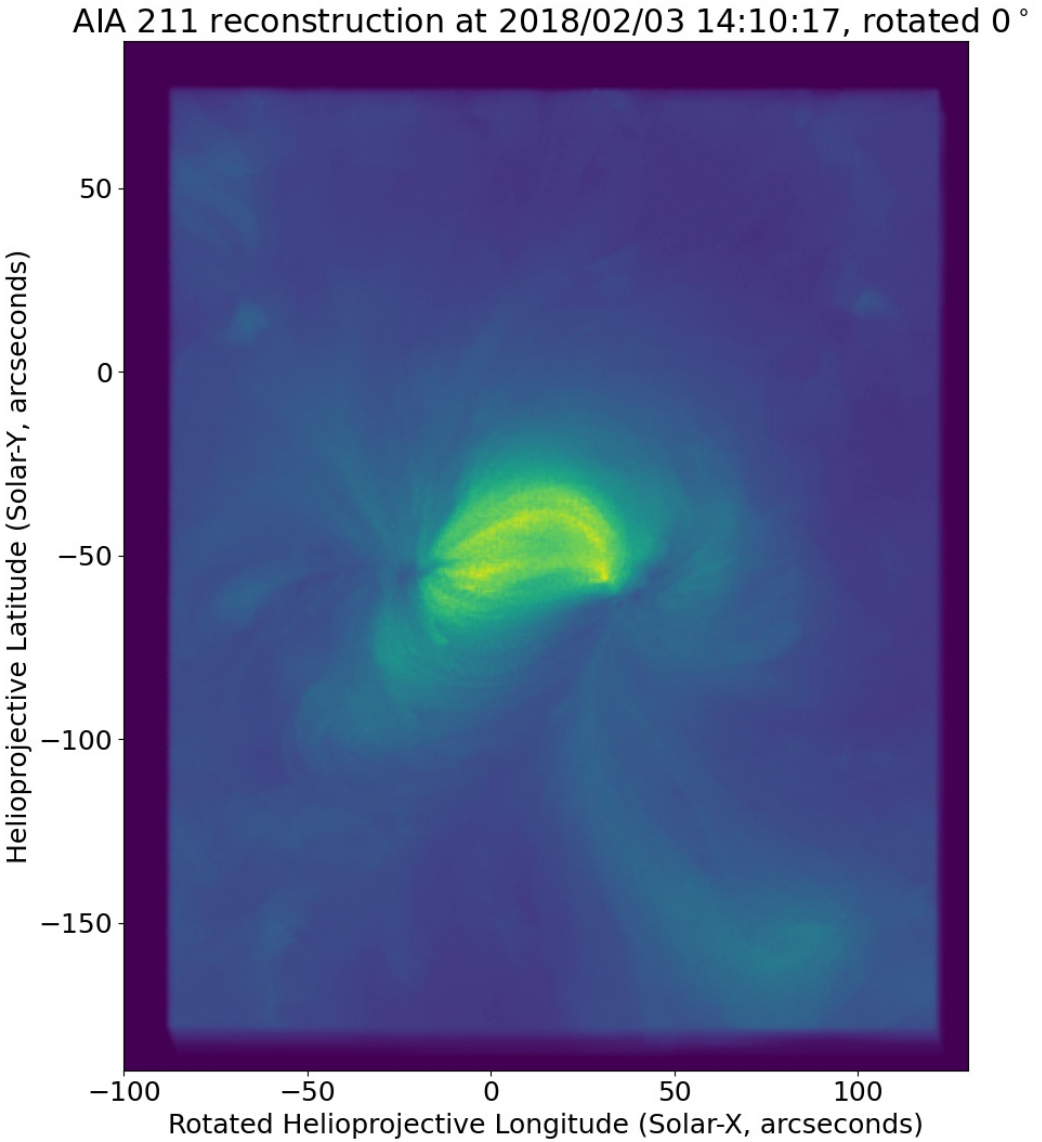

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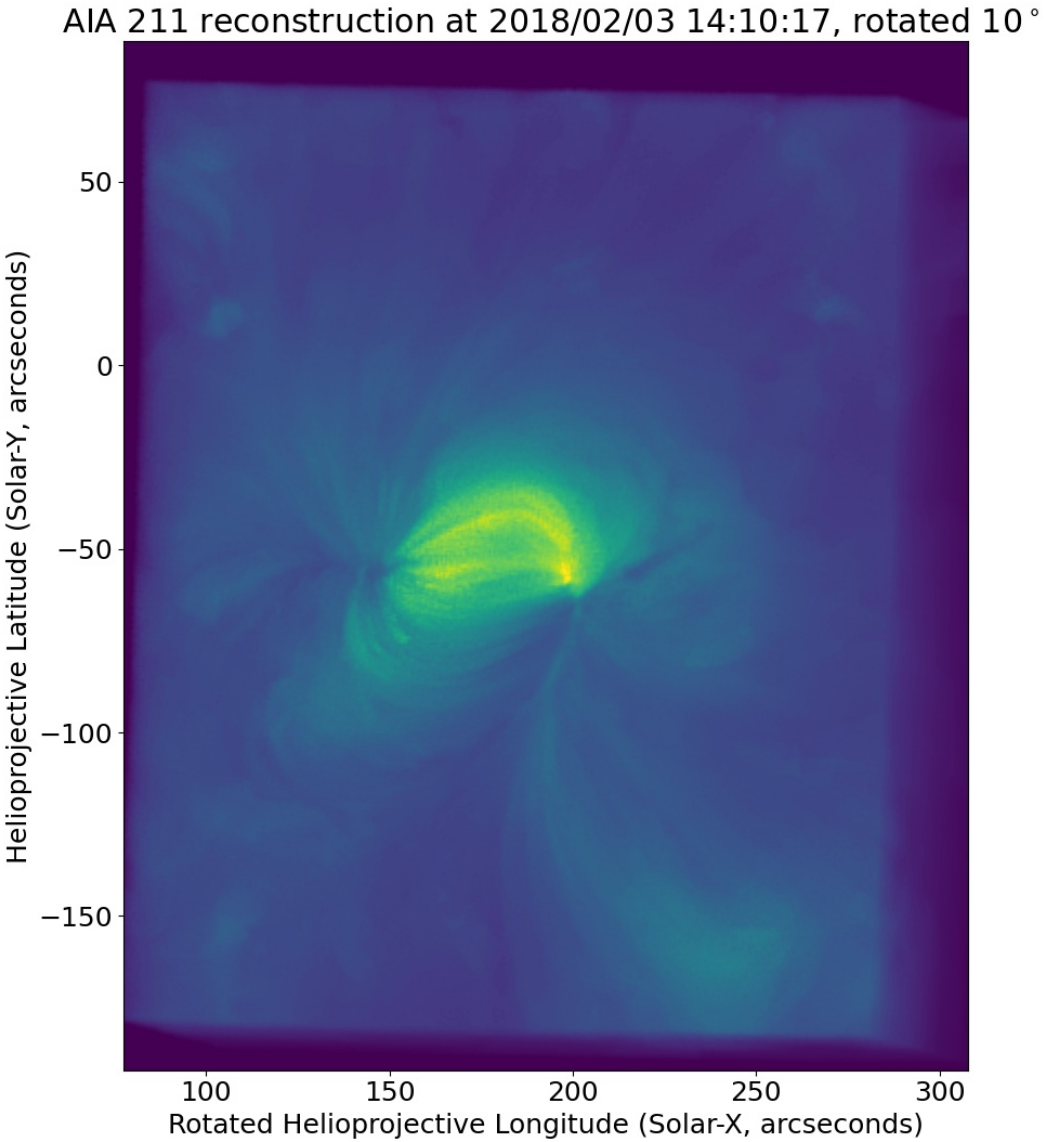

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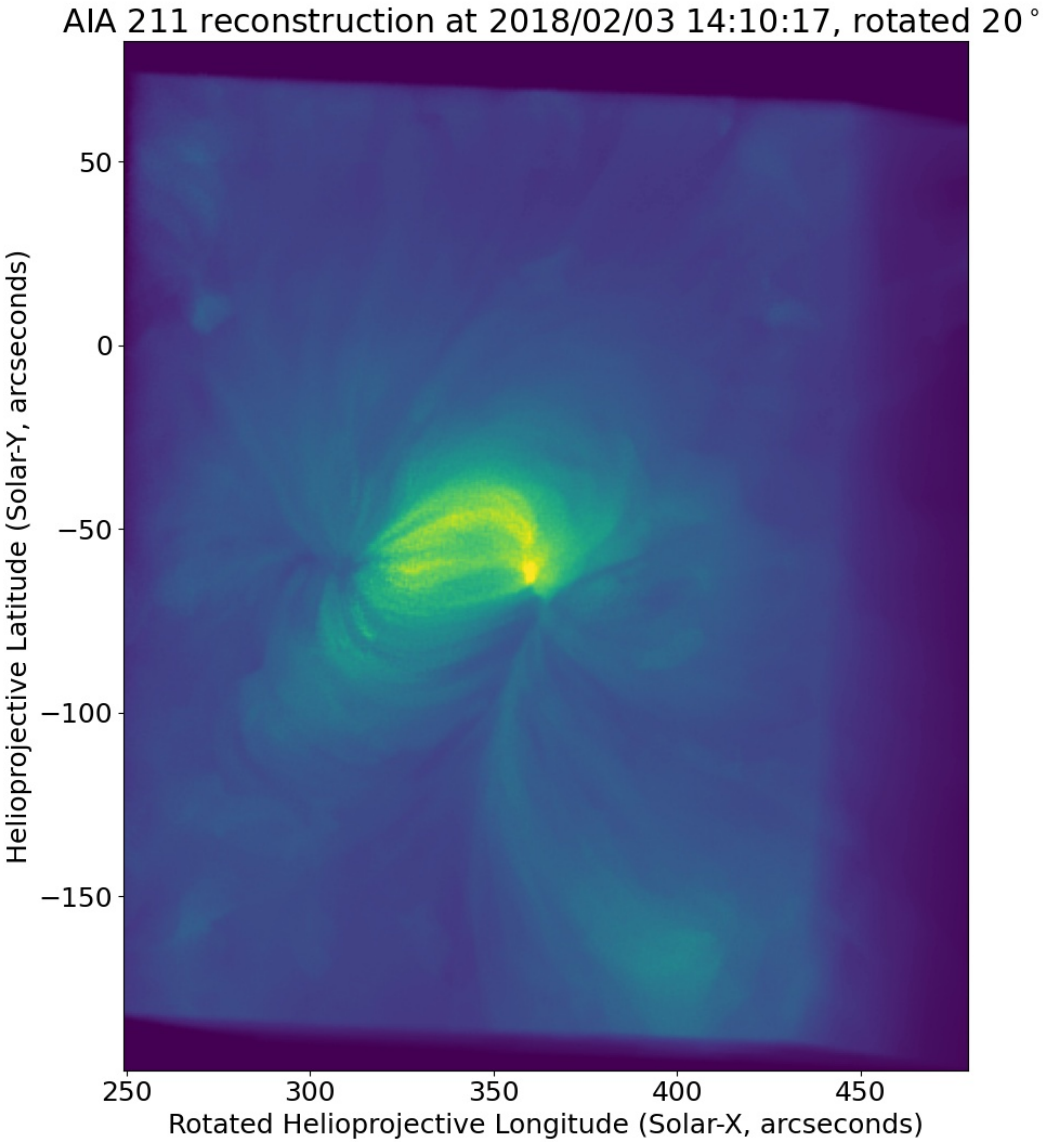

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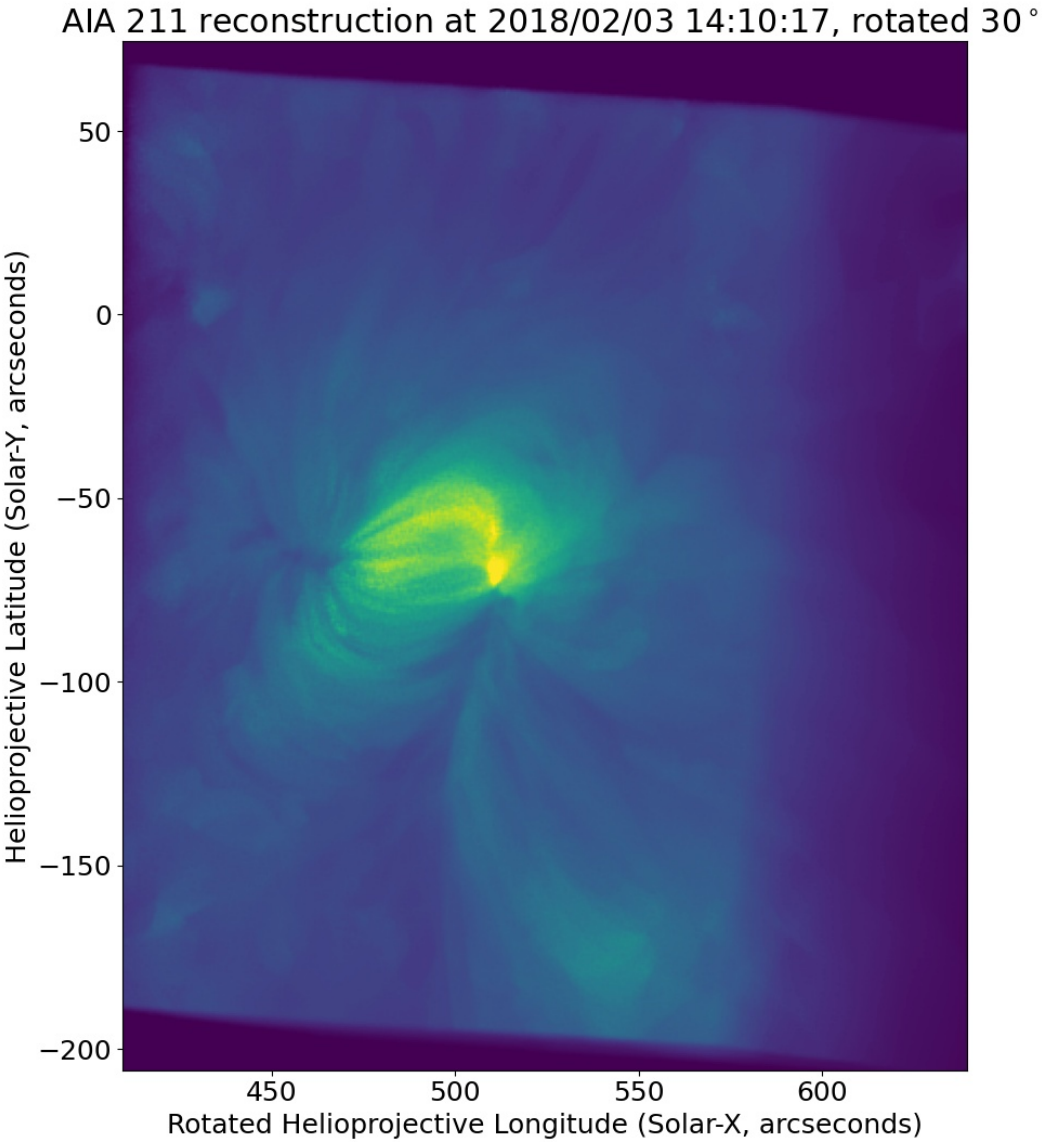

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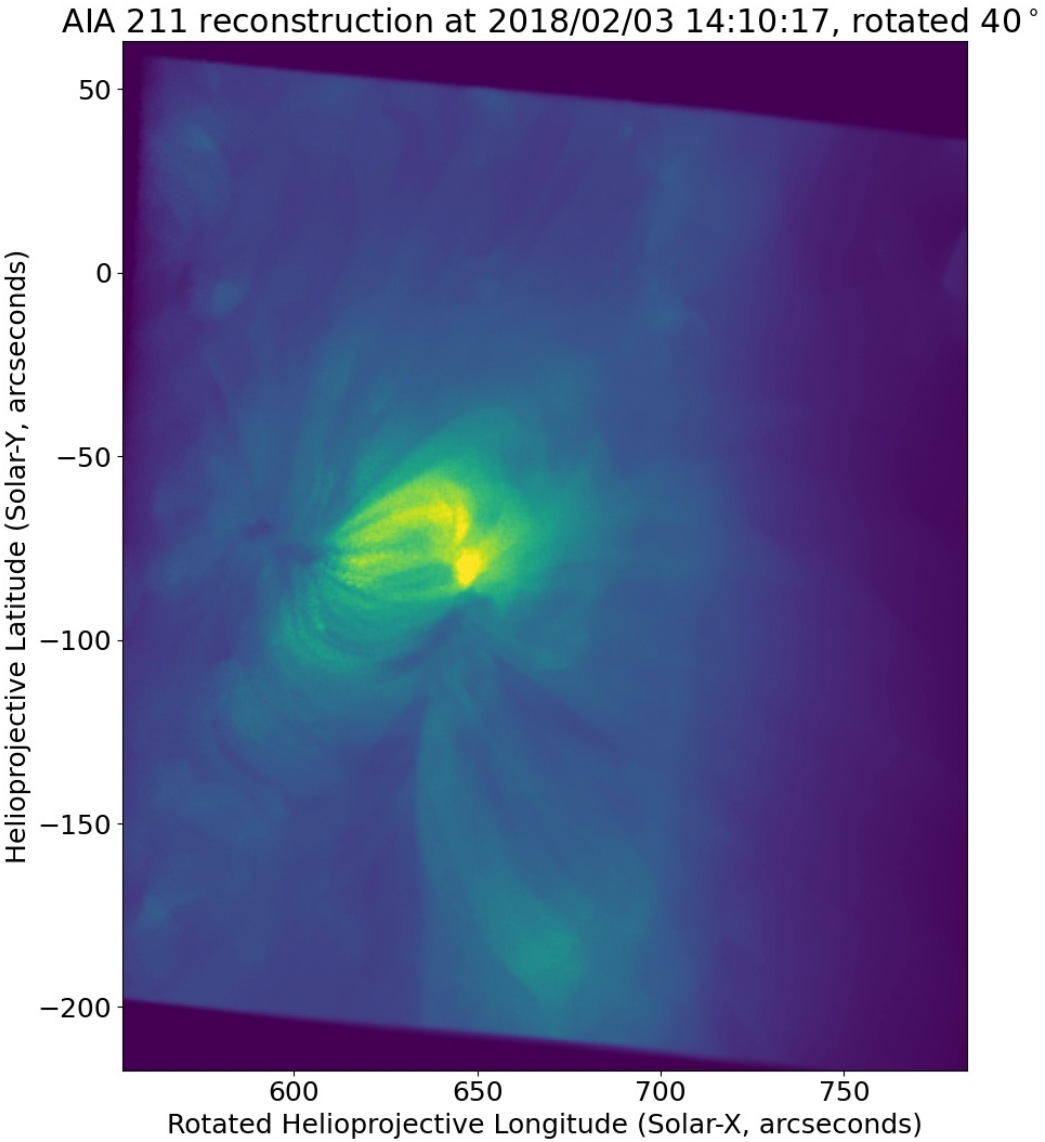

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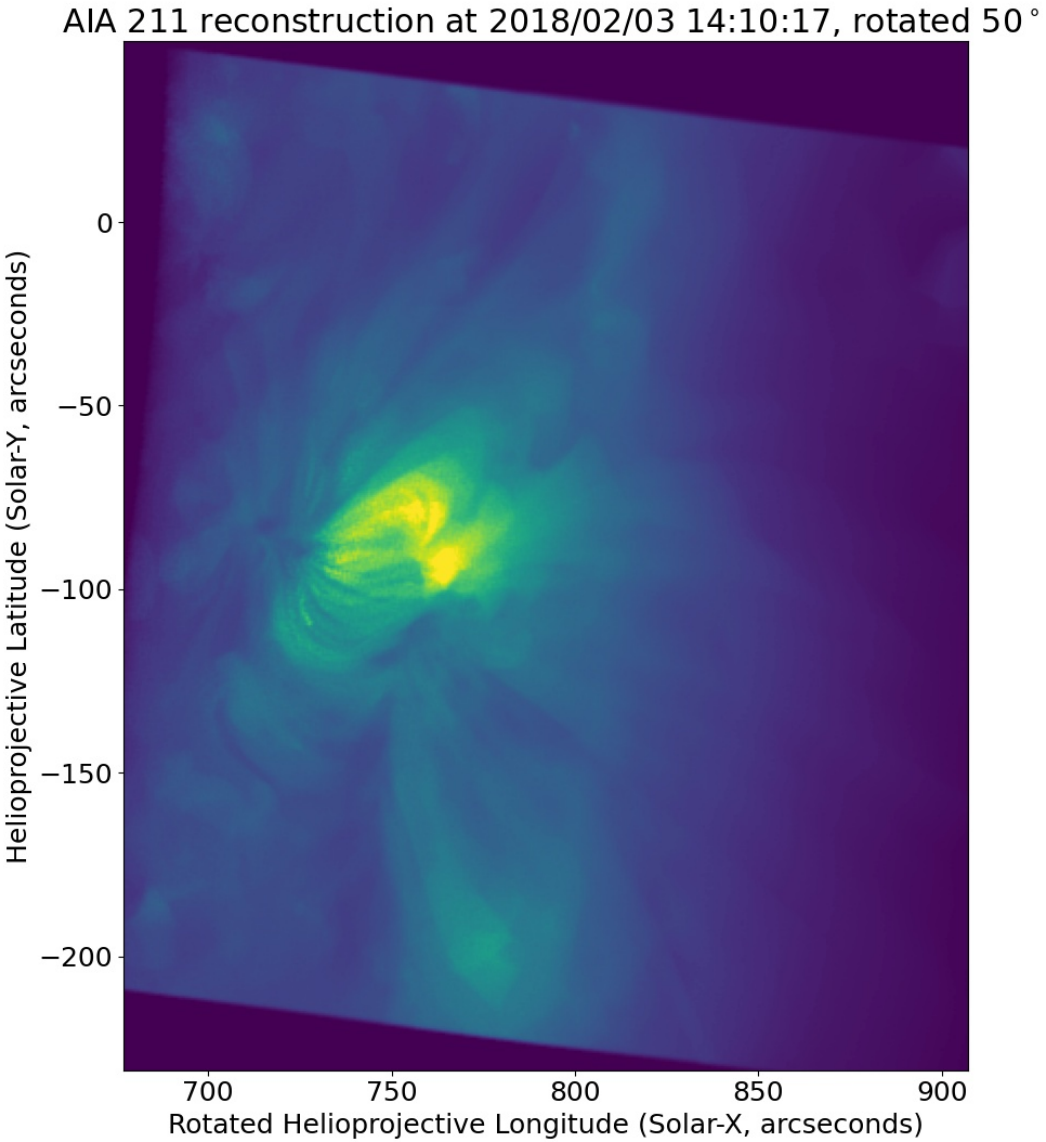

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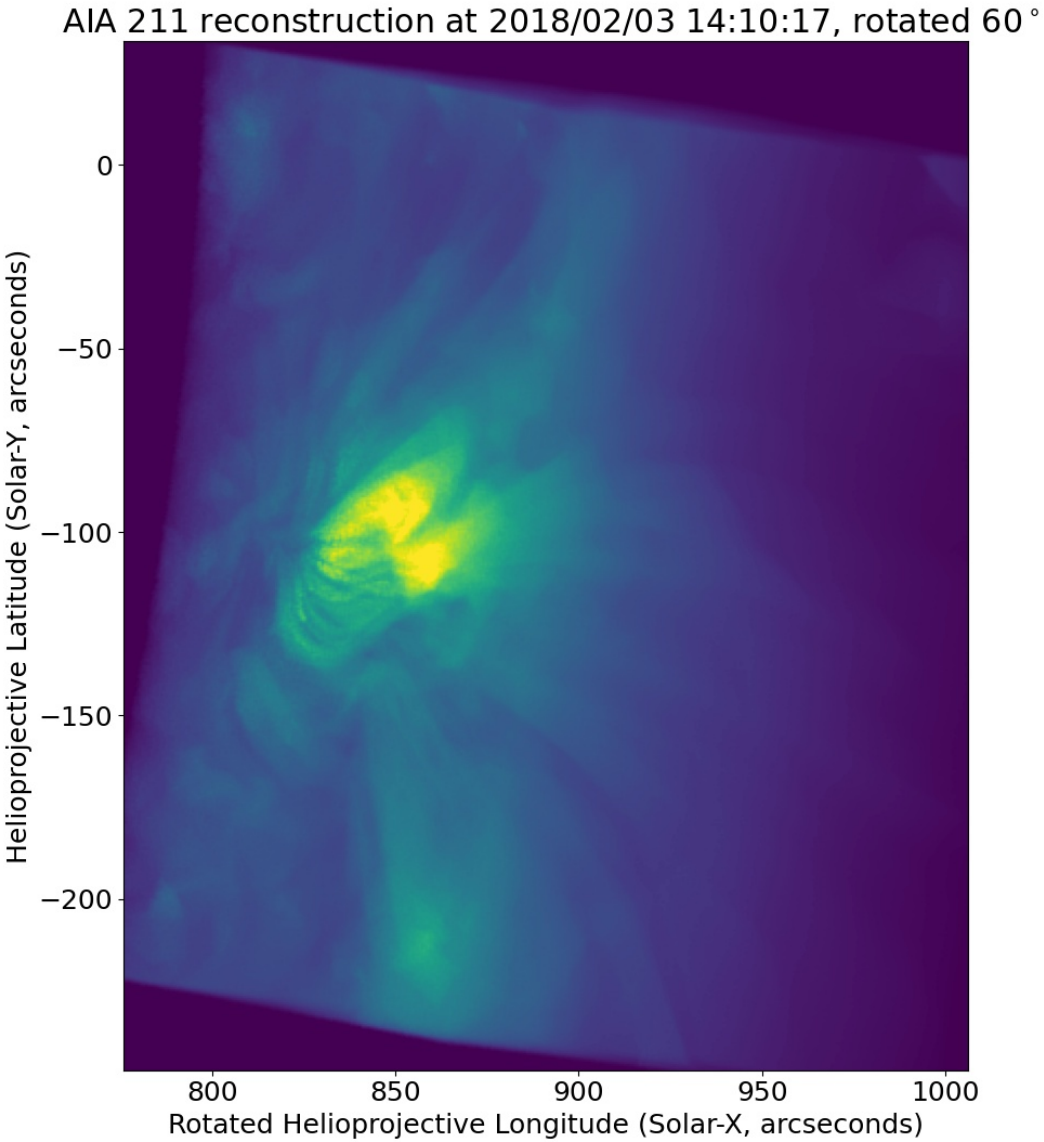

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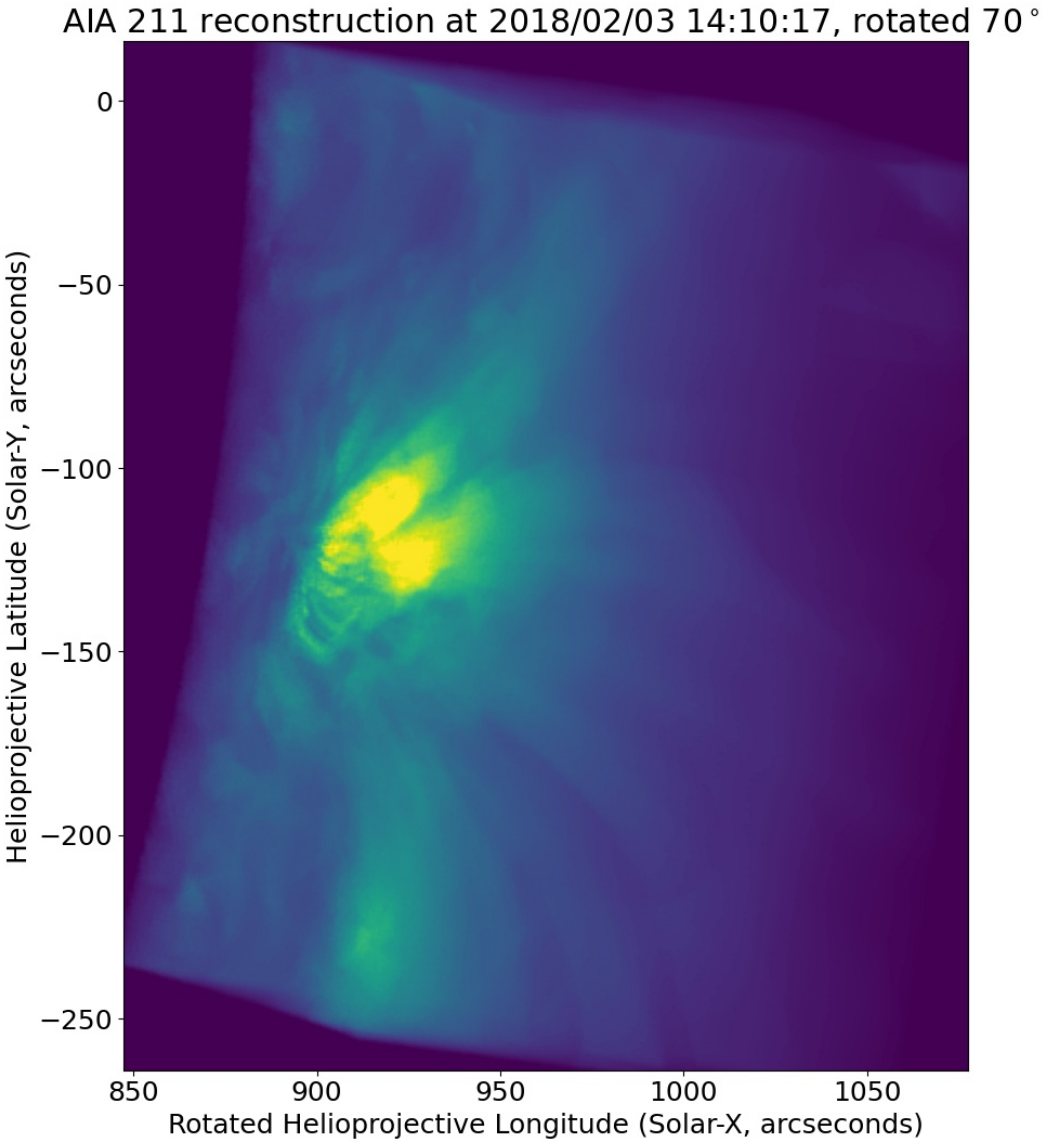

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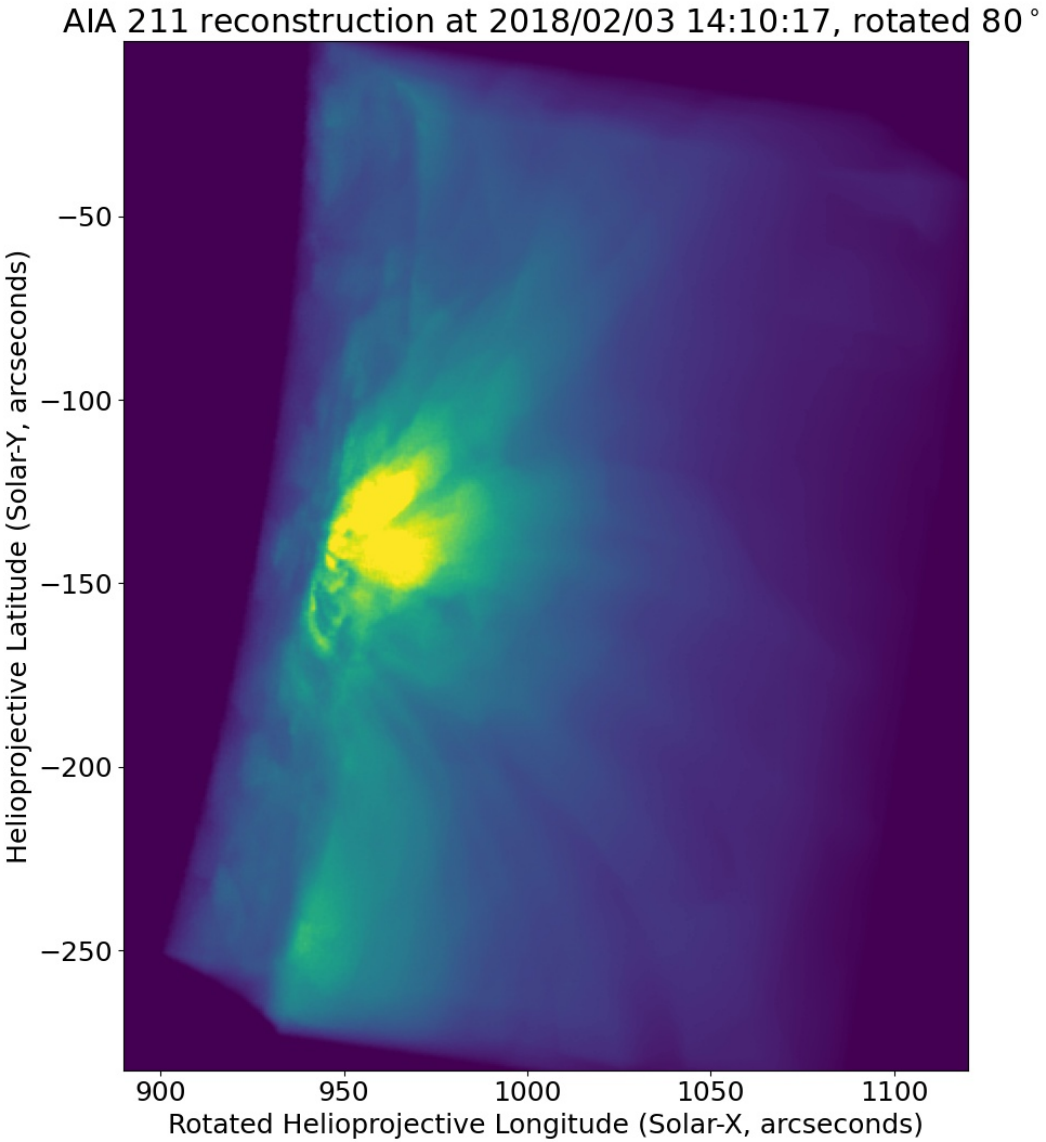

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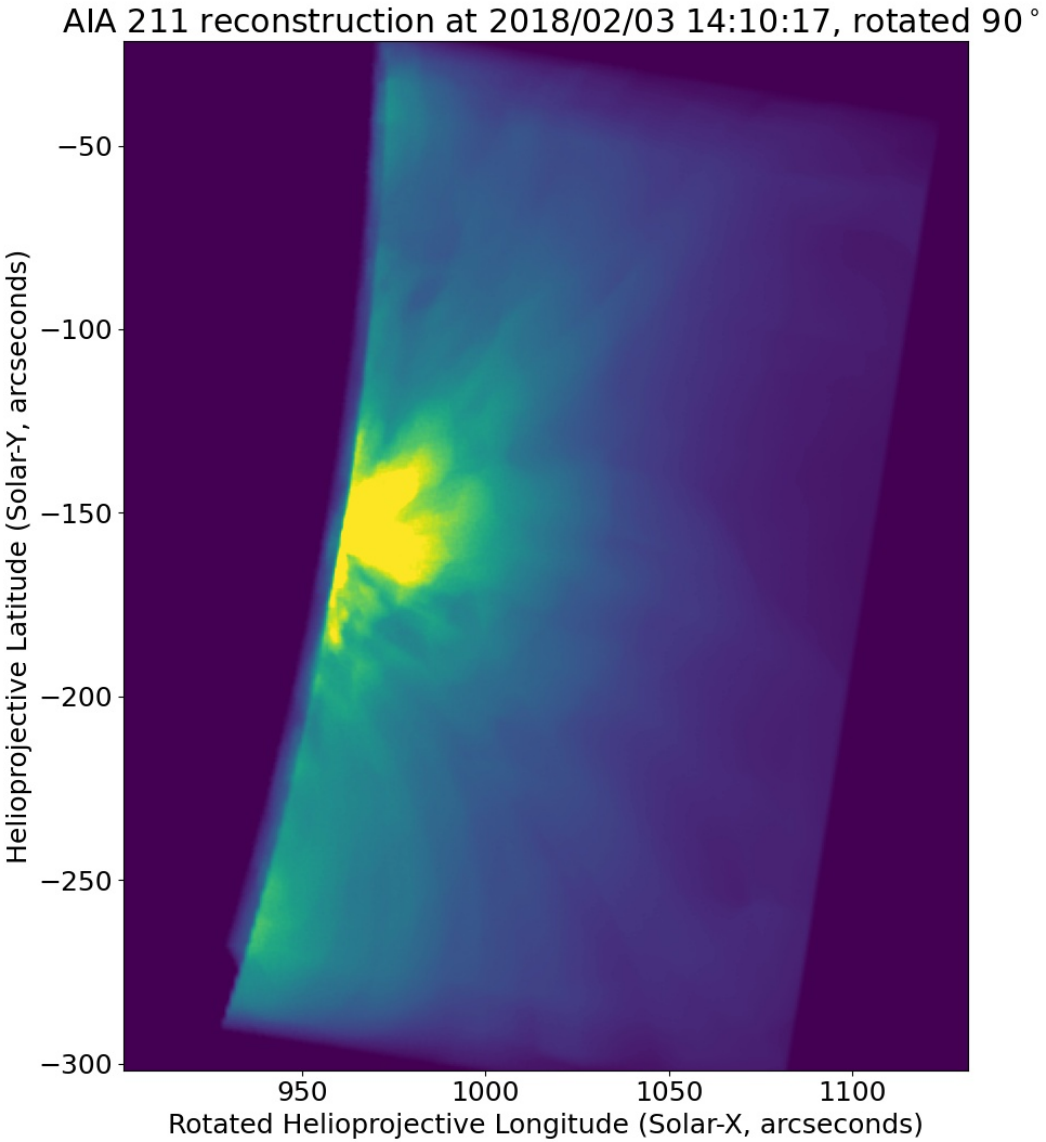

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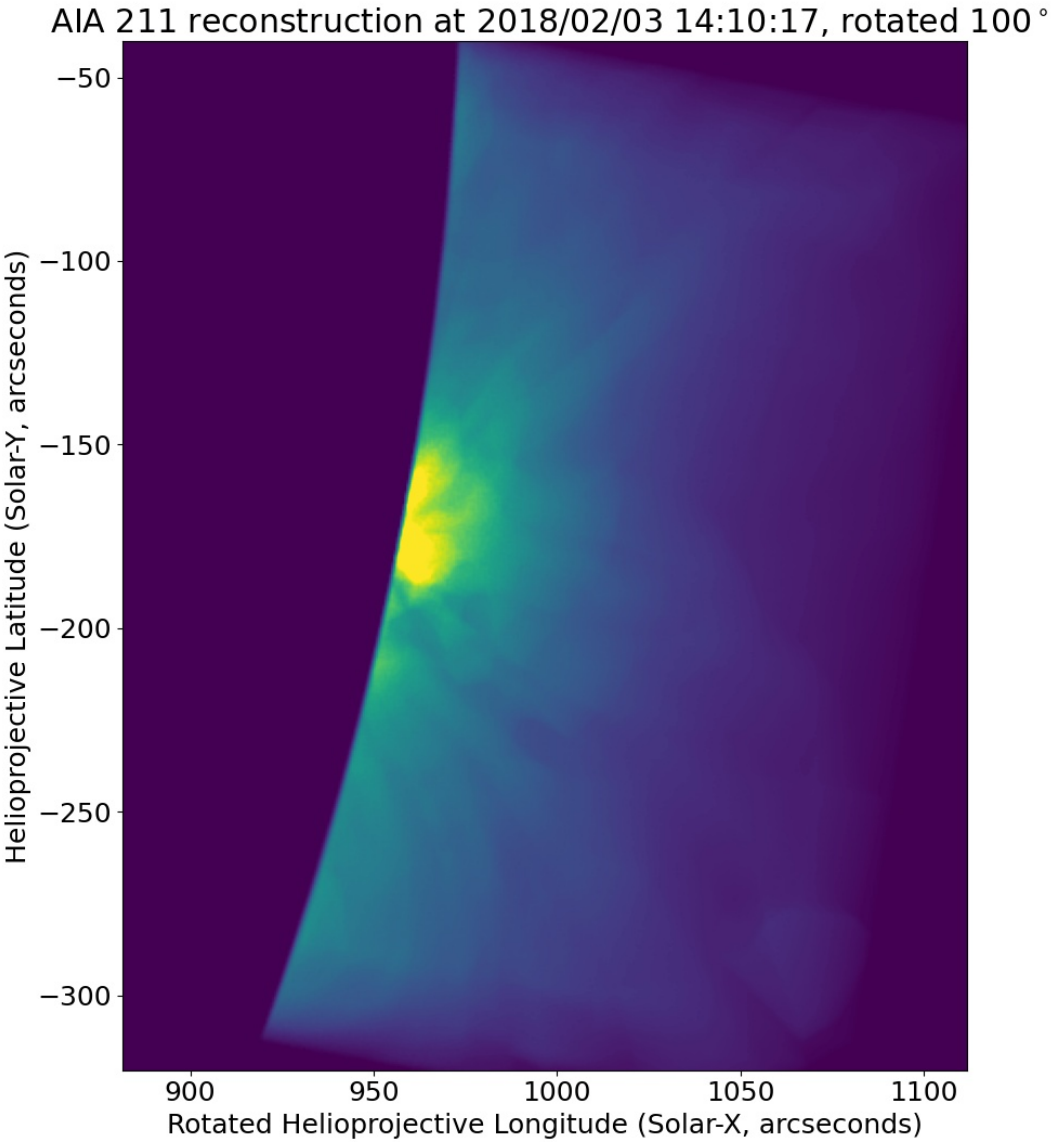

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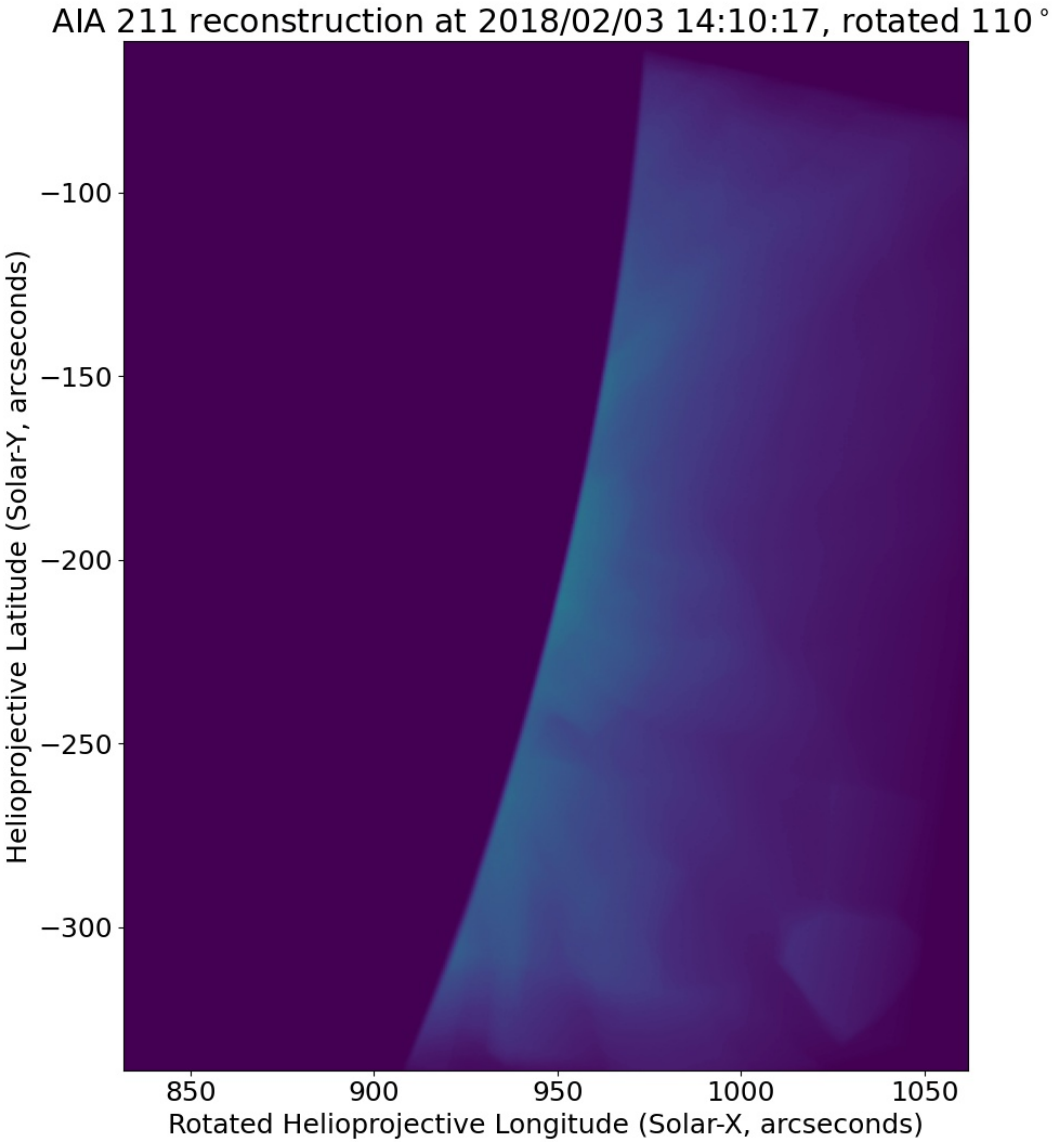

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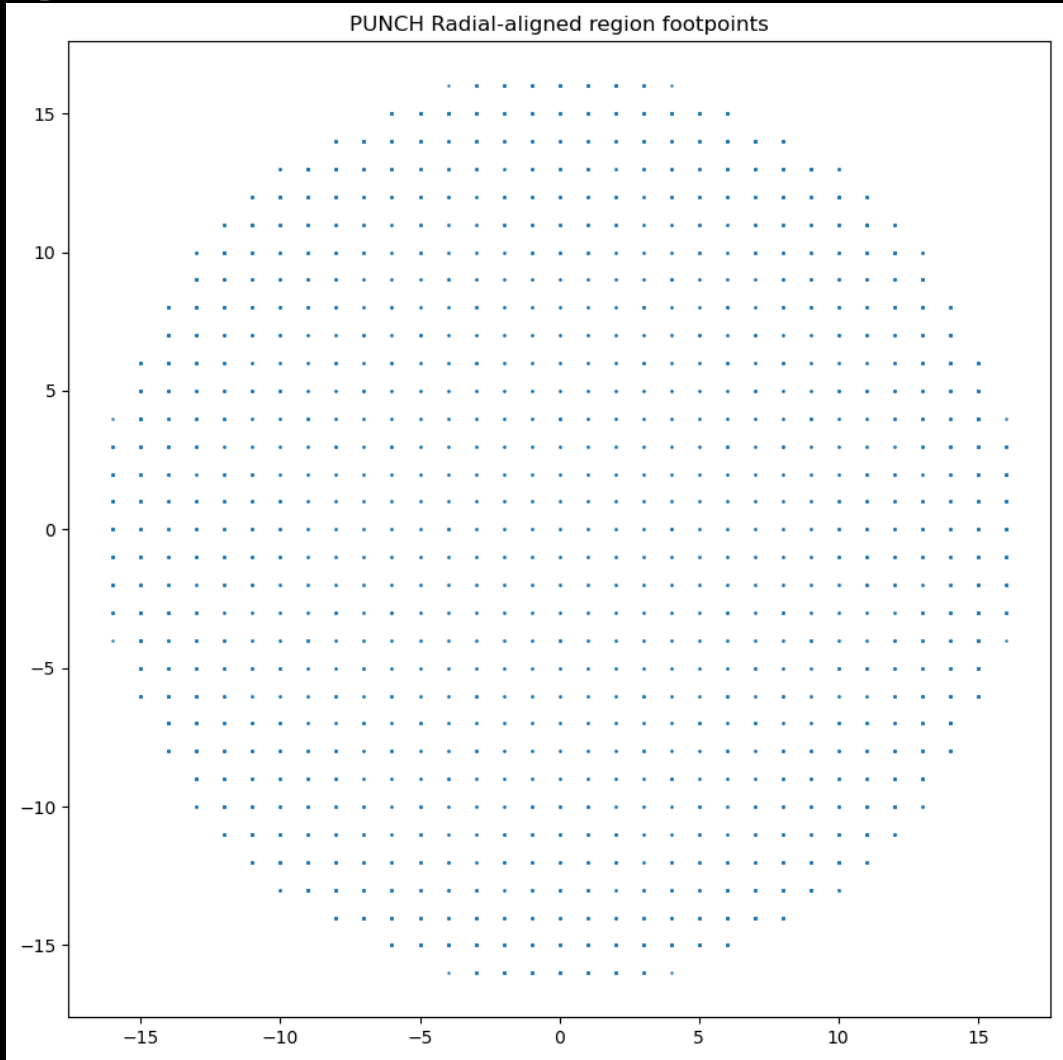
CROBAR with PUNCH

- PUNCH structuring is fluid dominated, not magnetic dominated
- We focus on inner FOV and assume radial aligned regions
- Each region has inverse square density profile, B & pB from Deforest 2013



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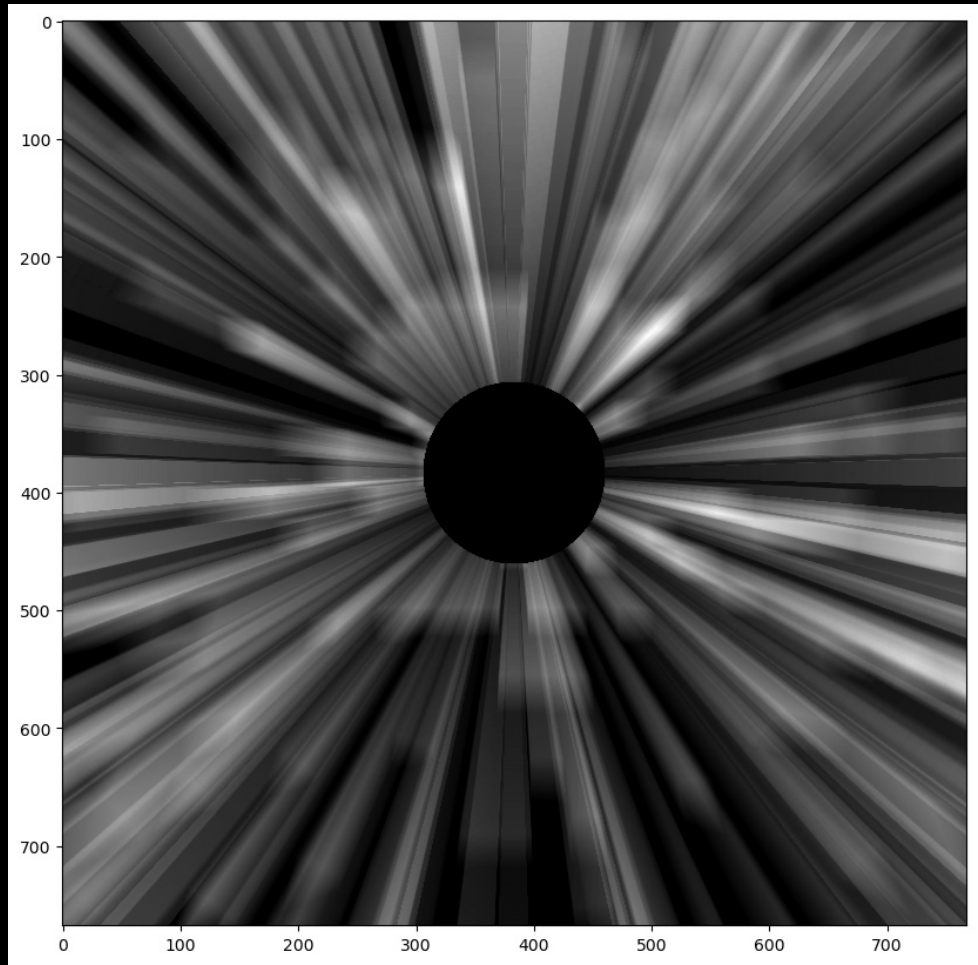
Radial Aligned regions for PUNCH



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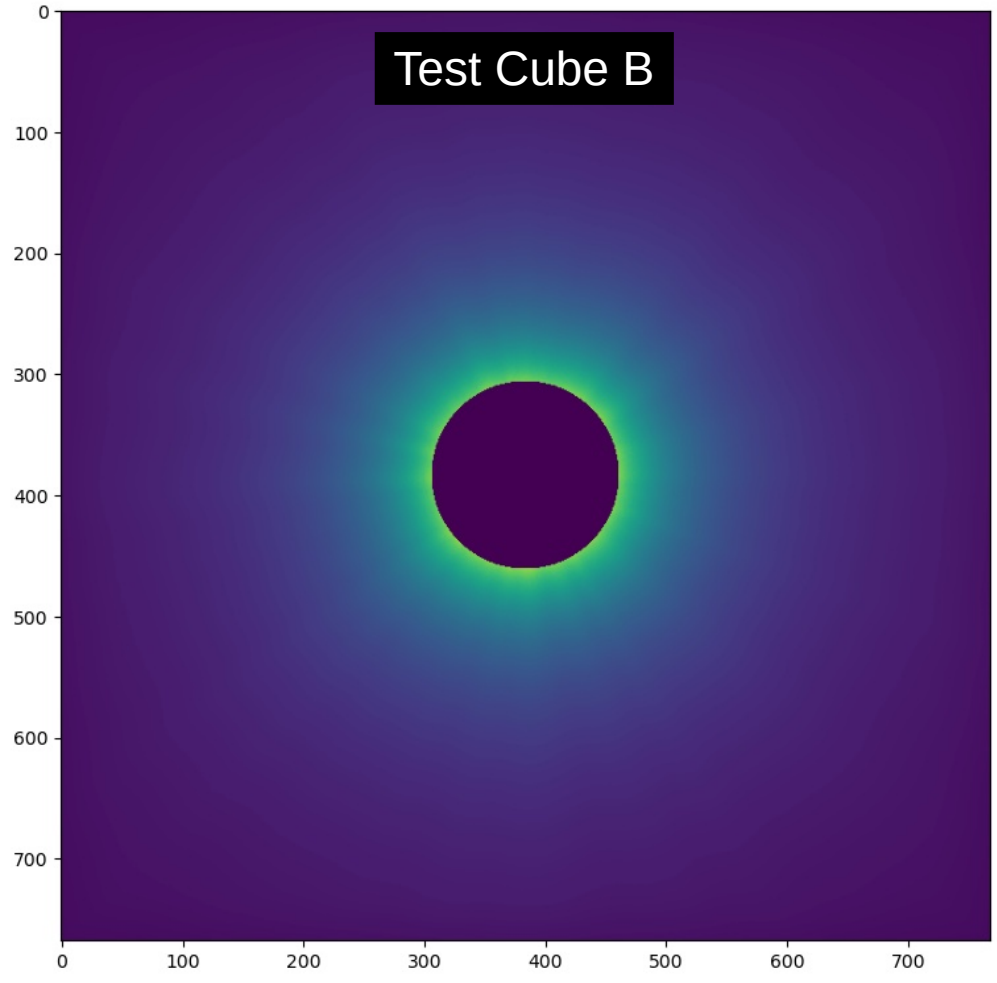
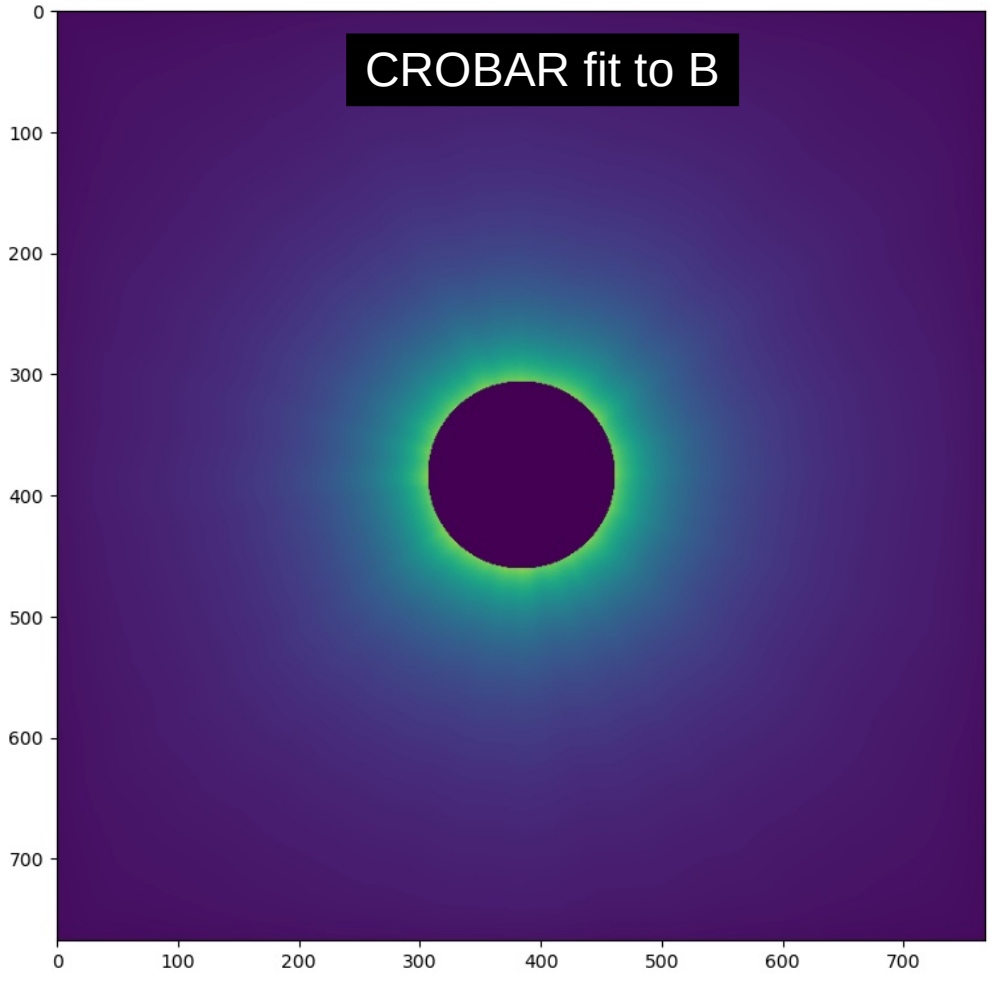
Test reconstruction, PUNCH POV





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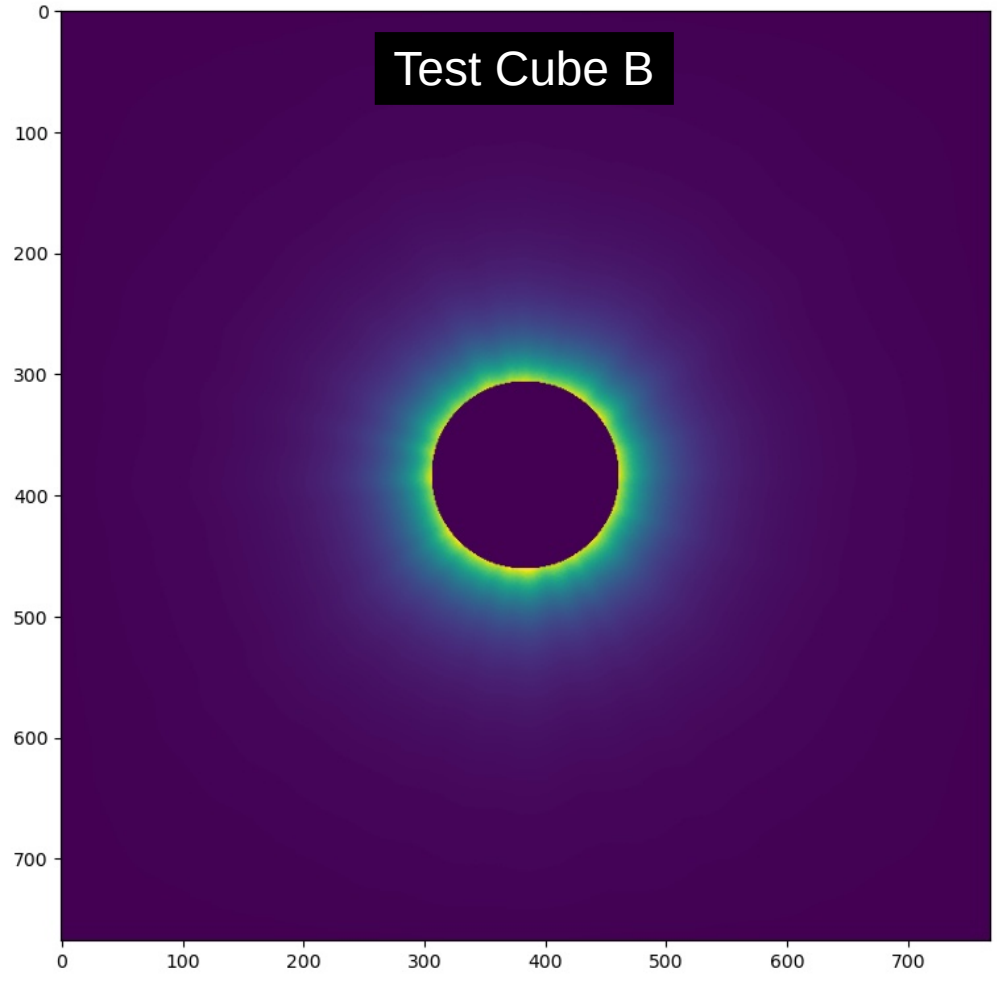
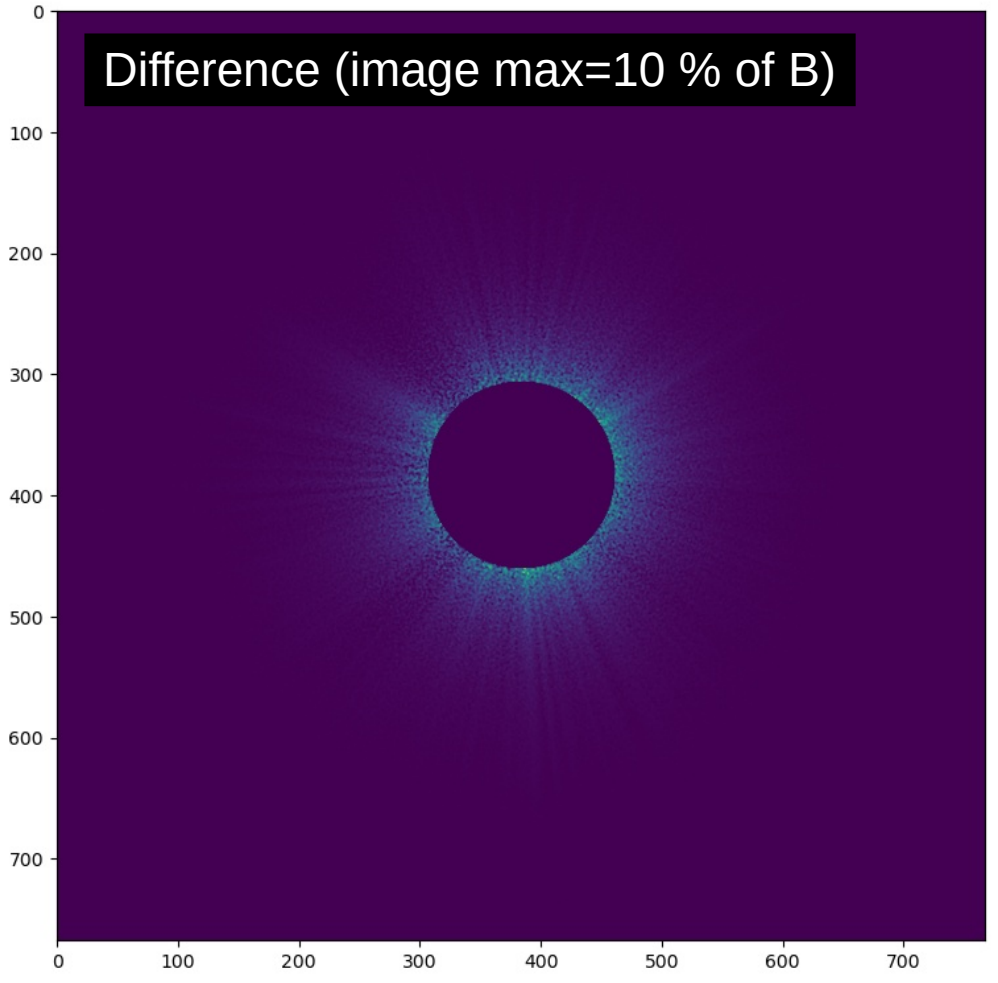
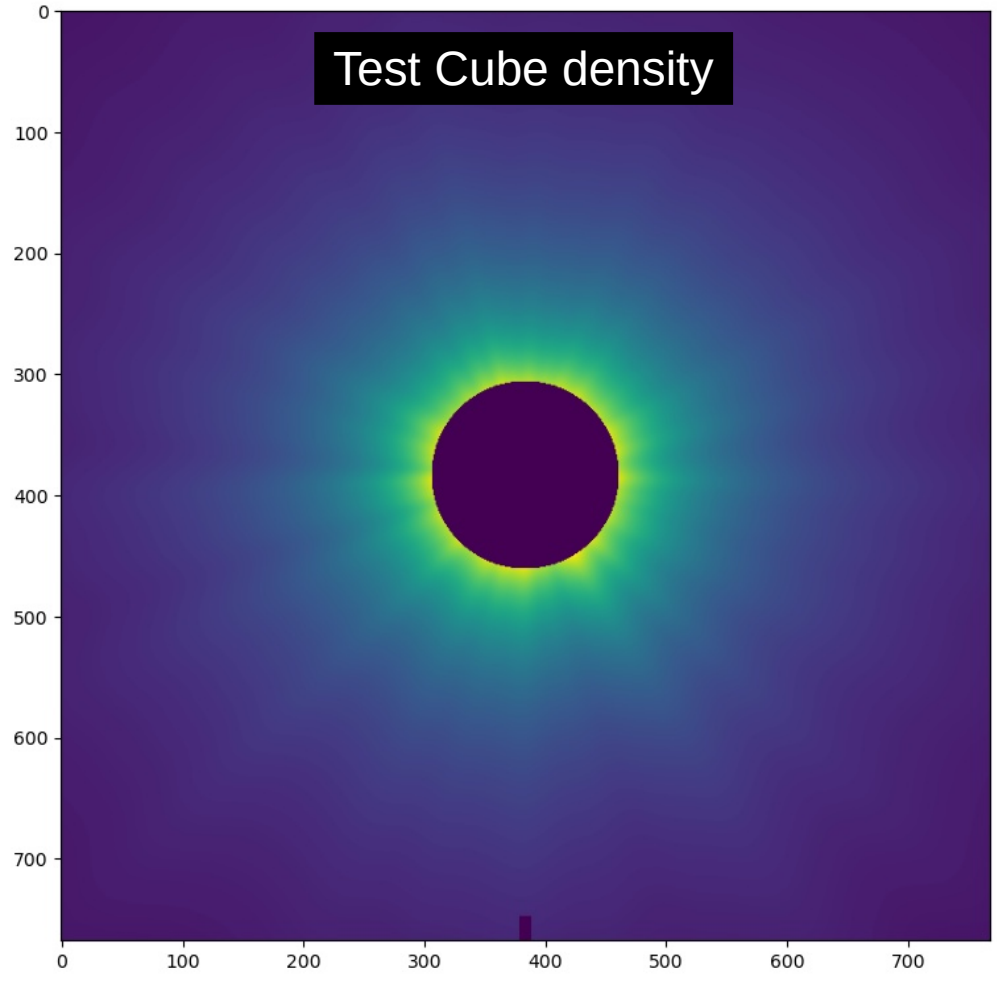
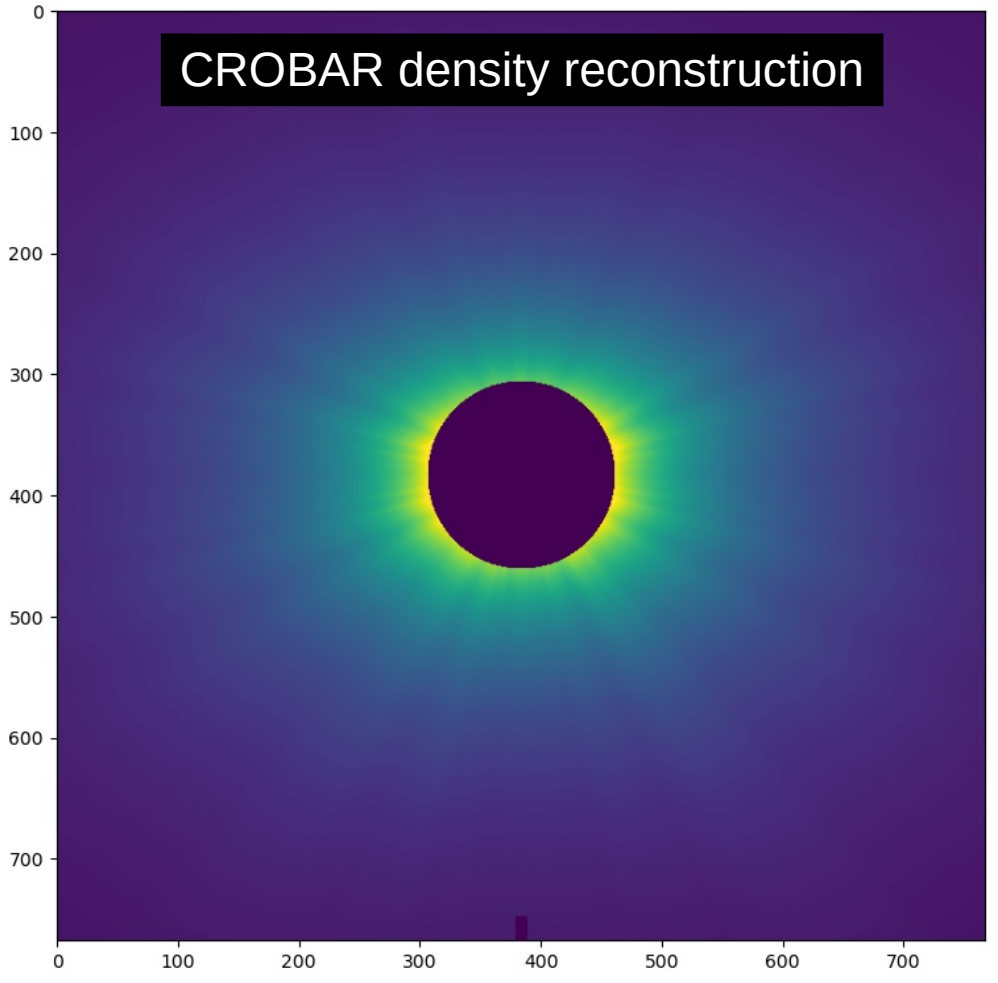


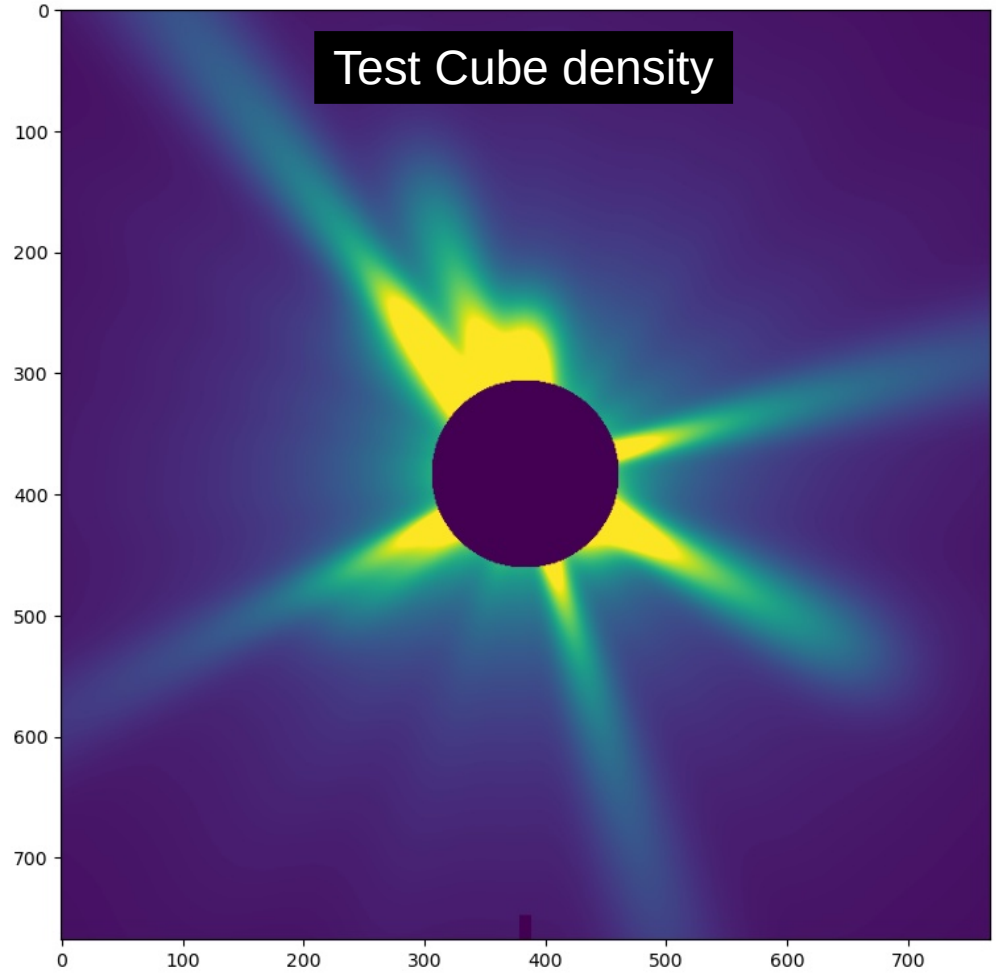


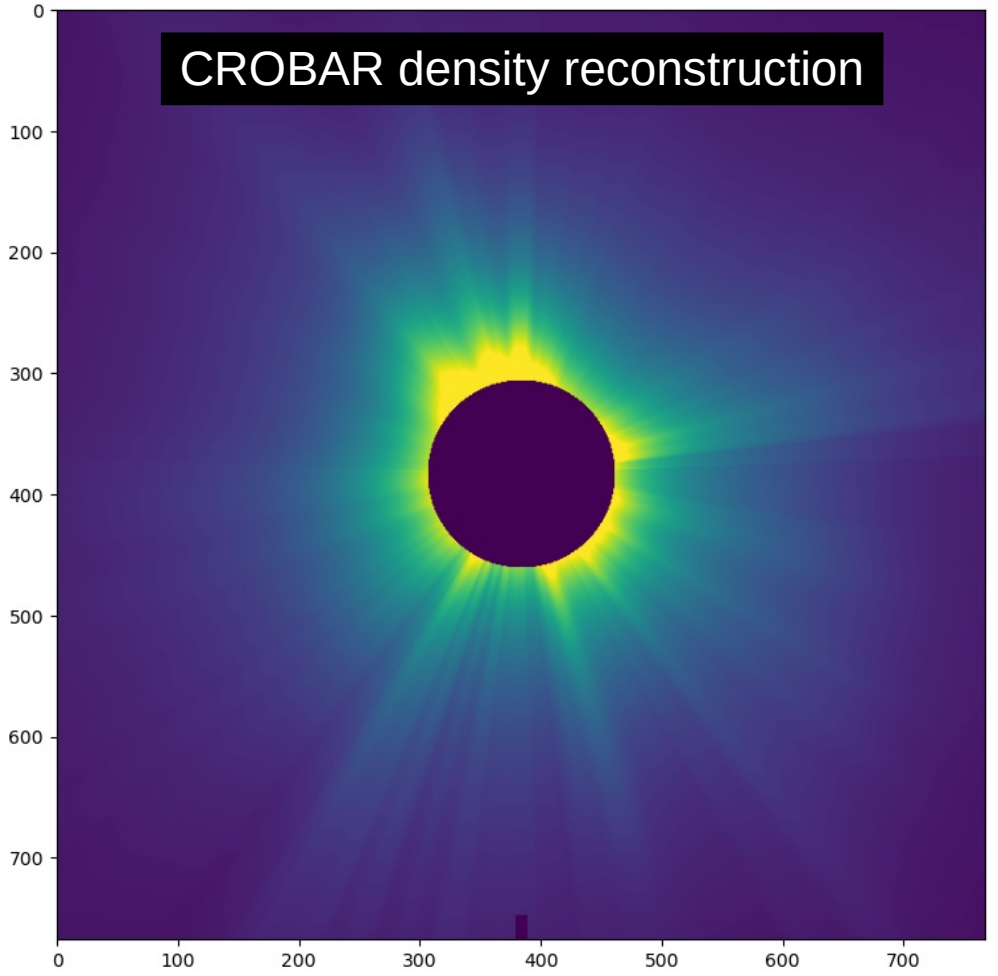
Test reconstruction, Orthogonal POV





What if simpler cube structure?





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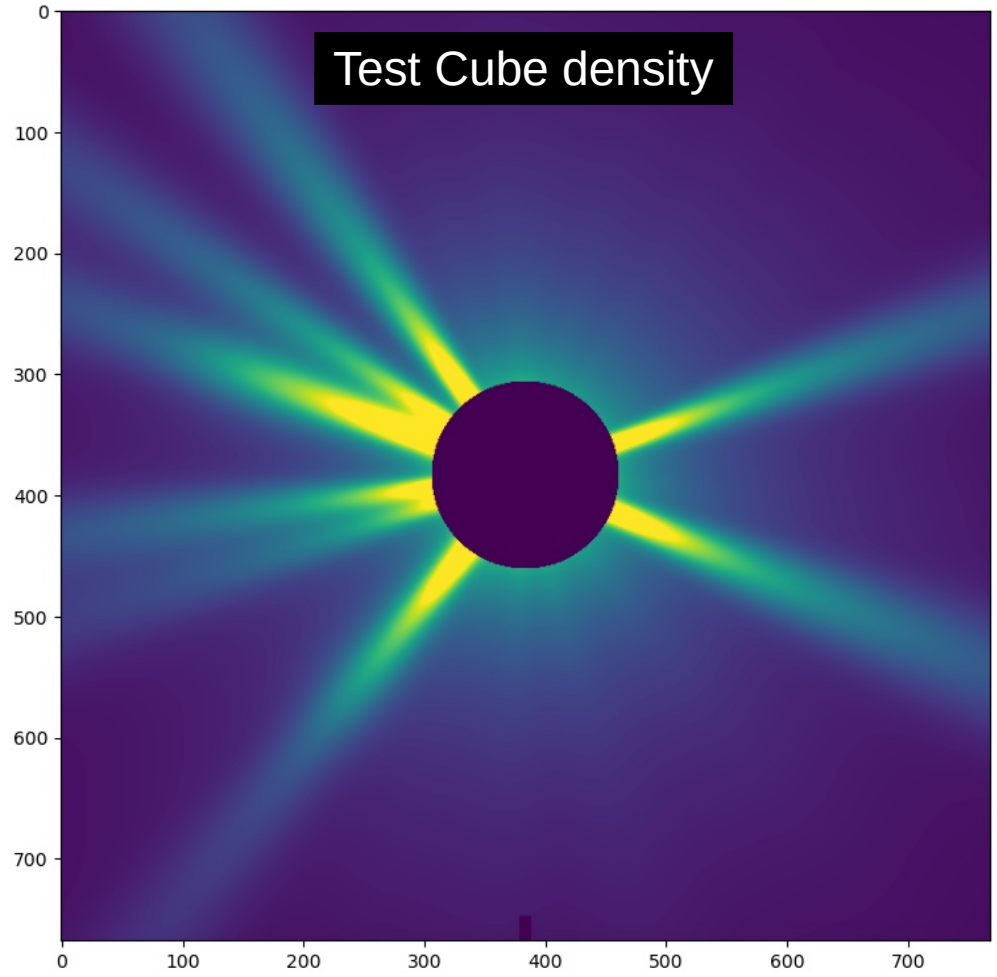
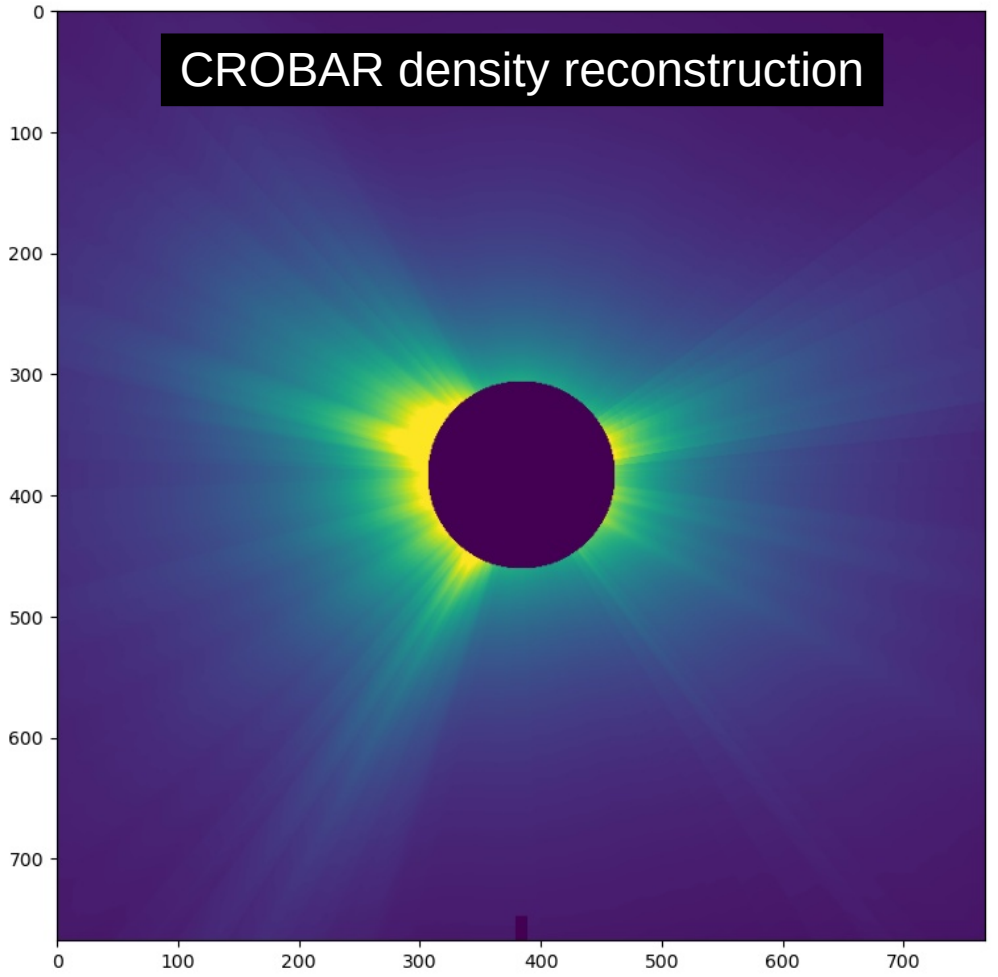
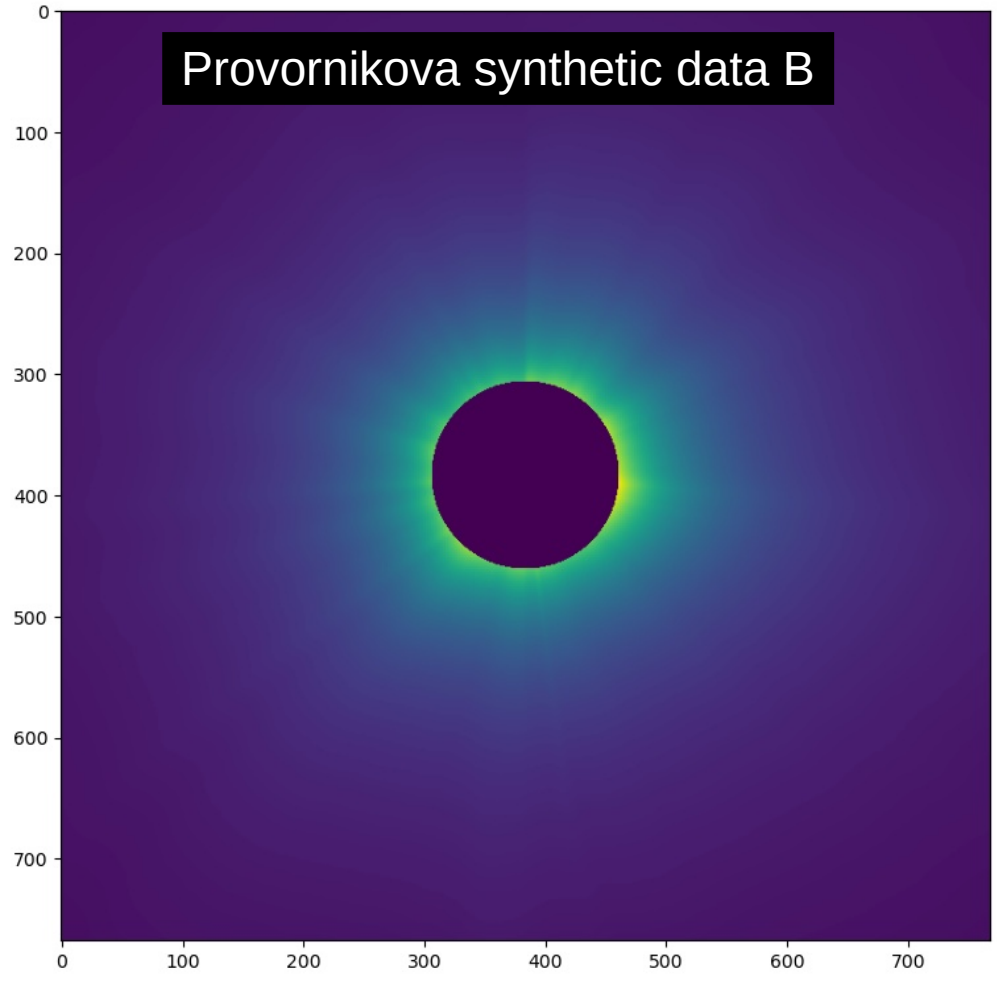
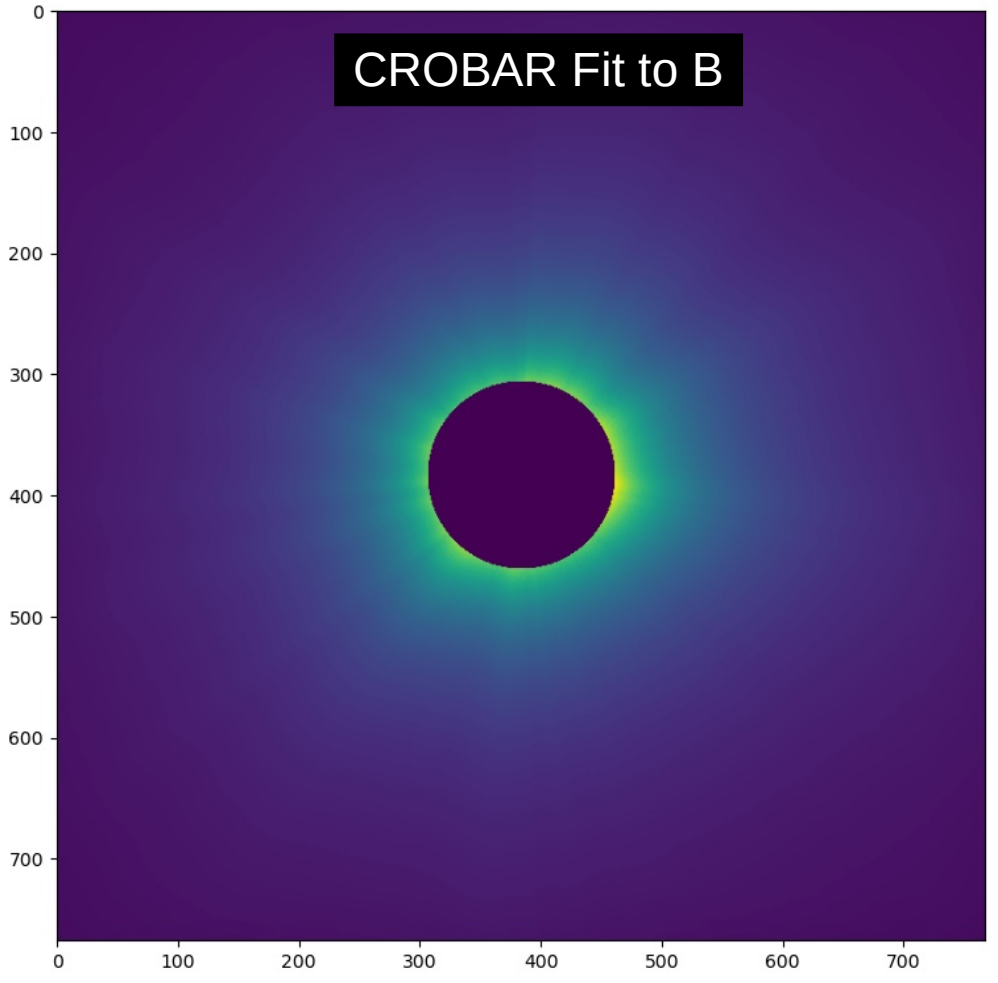




MHD reconstruction, PUNCH POV





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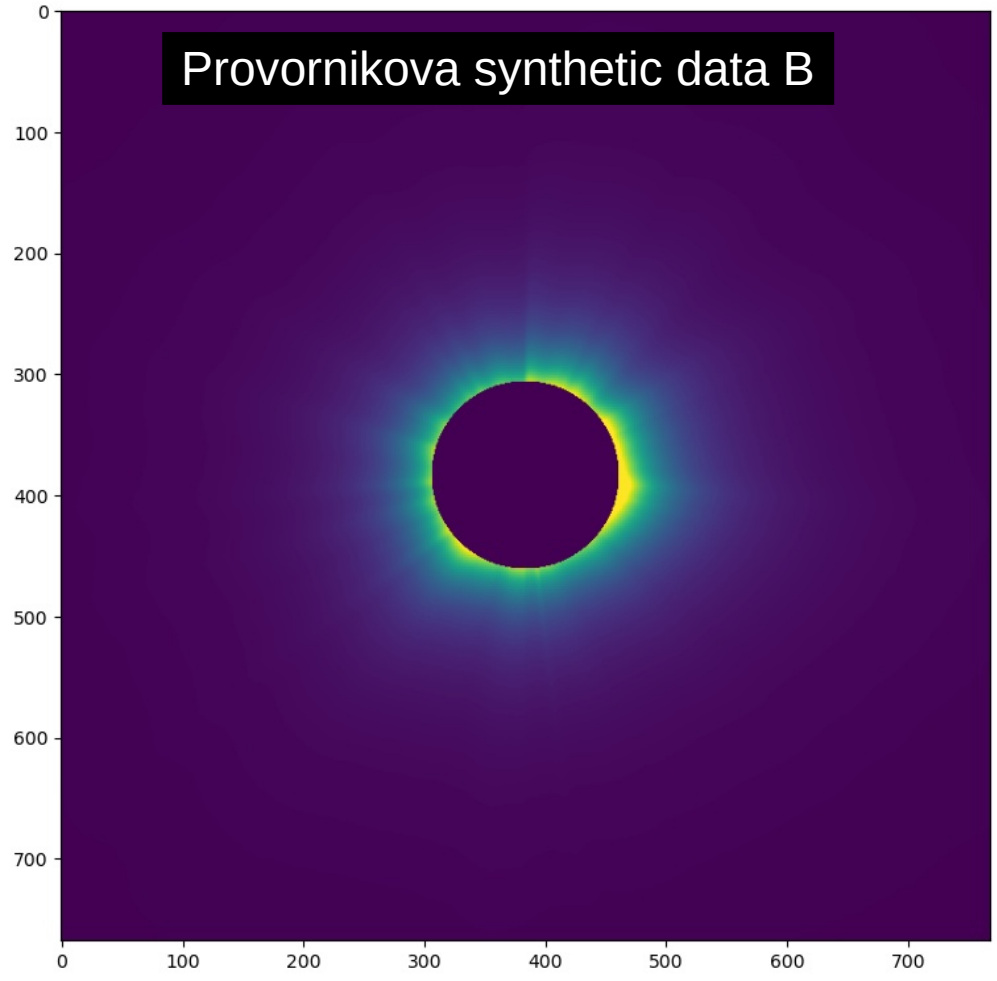
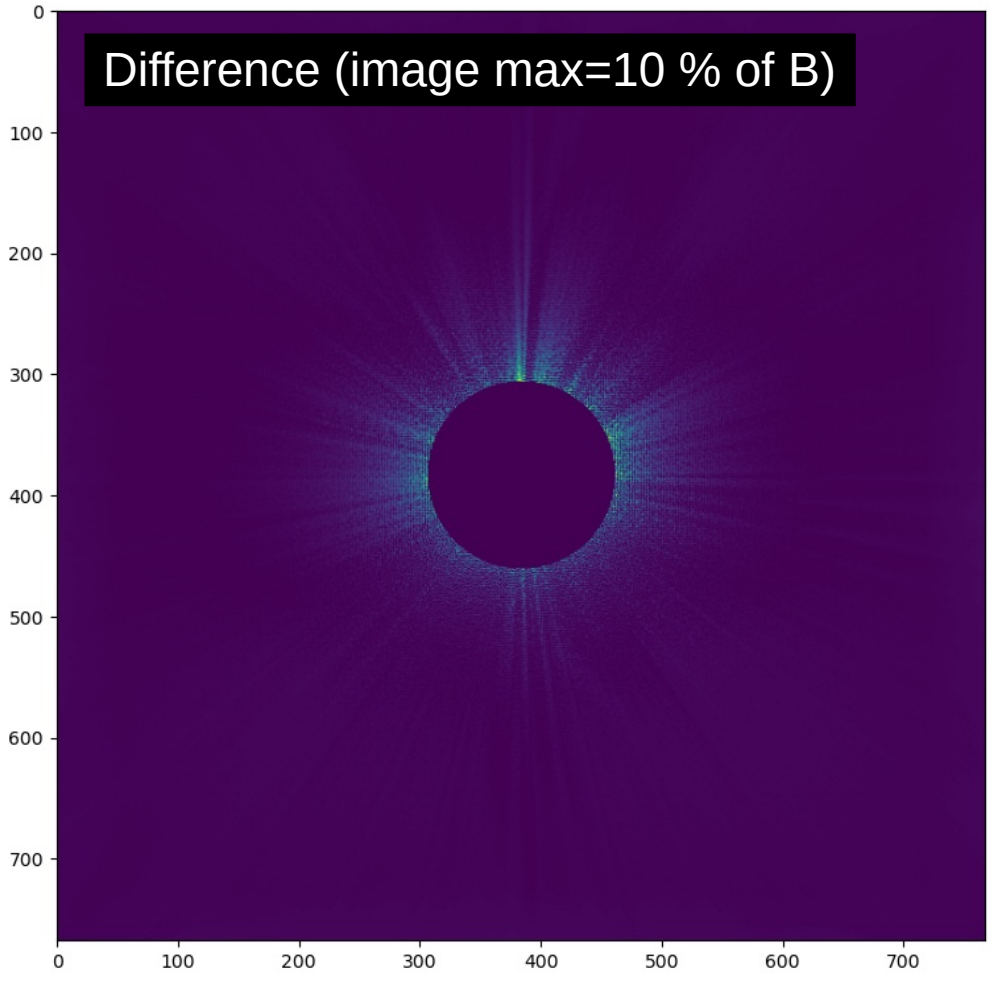
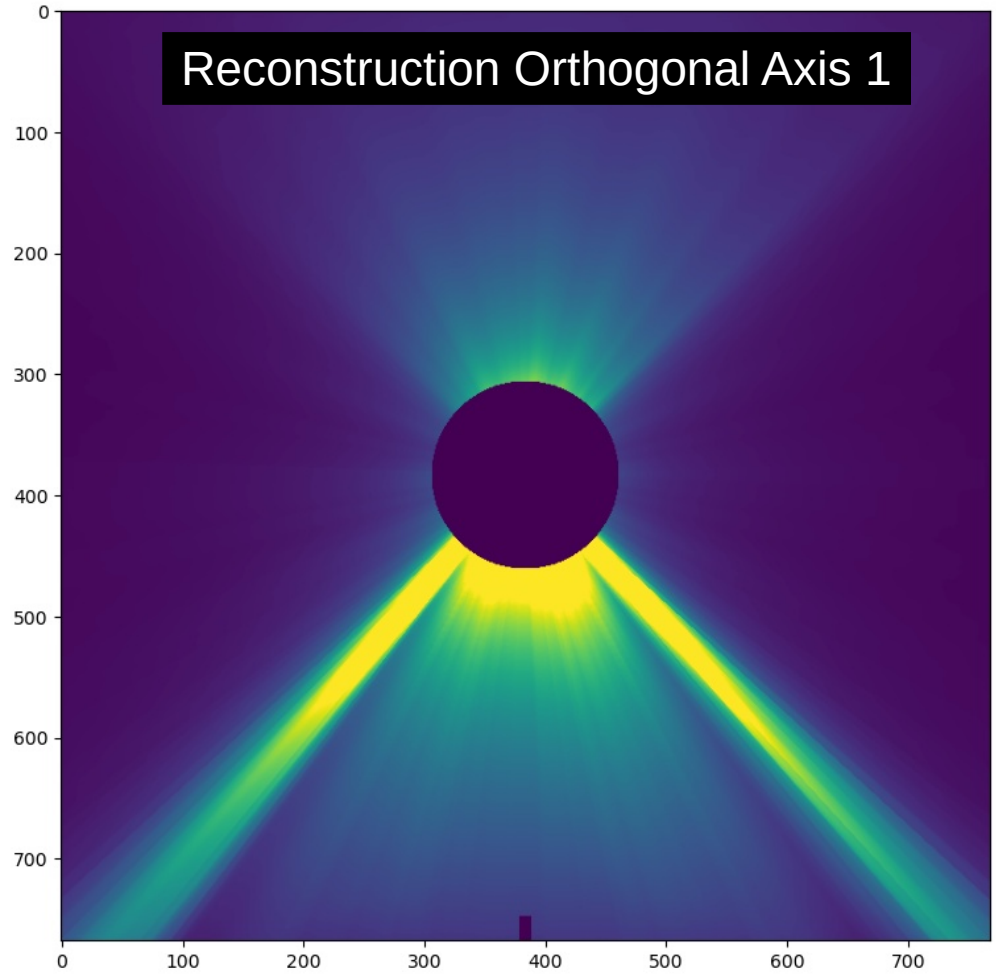
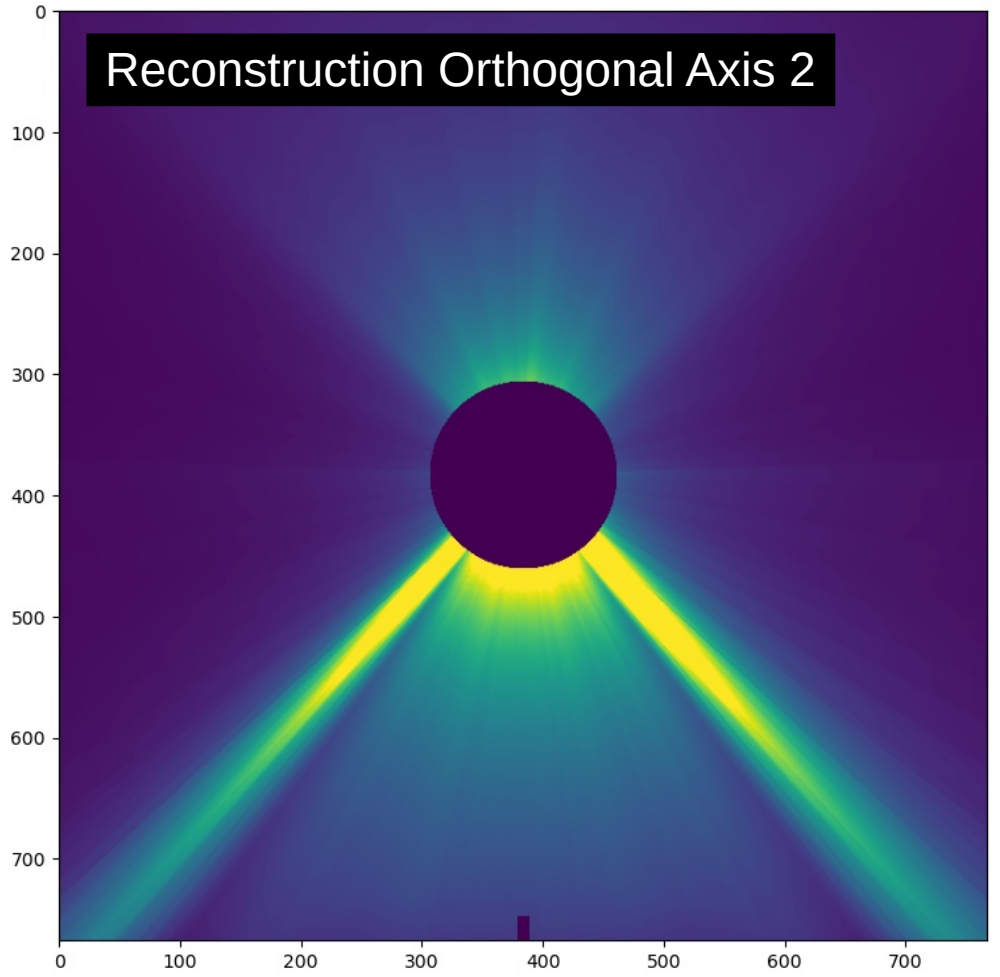




MHD reconstruction, Orthogonal POV





Discussion and Conclusions

- Demonstrated Application of CROBAR method to radial structure in inner PUNCH field of view
  - Both B and pB information incorporated
- Ability to recover features depends on how complicated/homogeneous LOS structure is
  - Additional physical constraints/dynamics can help improve this
- Forward model consistency must be done carefully

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