

BICEP / *Keck* XVI: Characterizing Dust Polarization Through Correlations with Neutral Hydrogen (arXiv:2210.05684)

George Halal

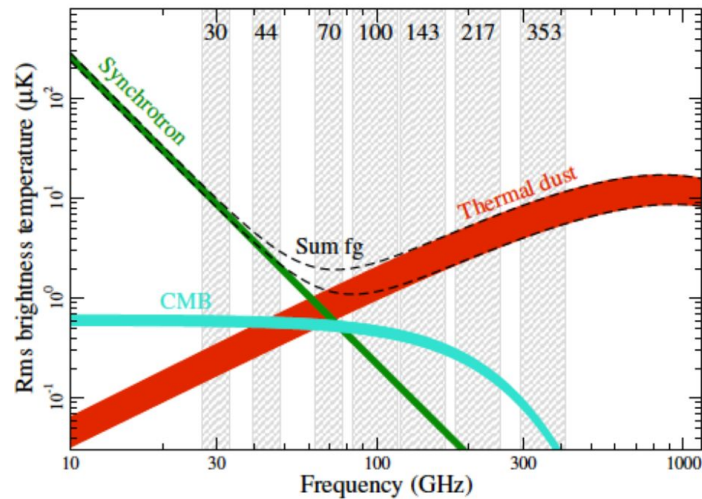
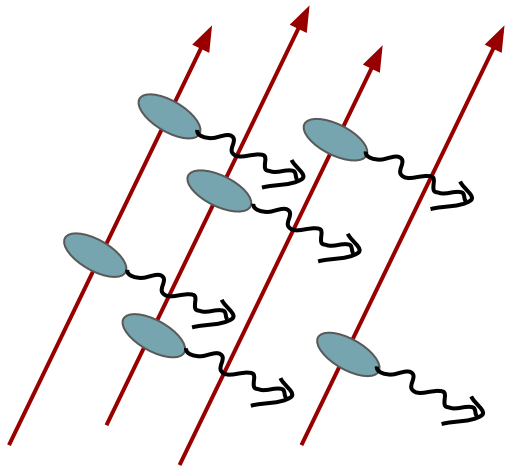
Stanford University

CMB-S4 Collaboration Meeting

April 6, 2023



Polarized
Dust
Emission
Foreground

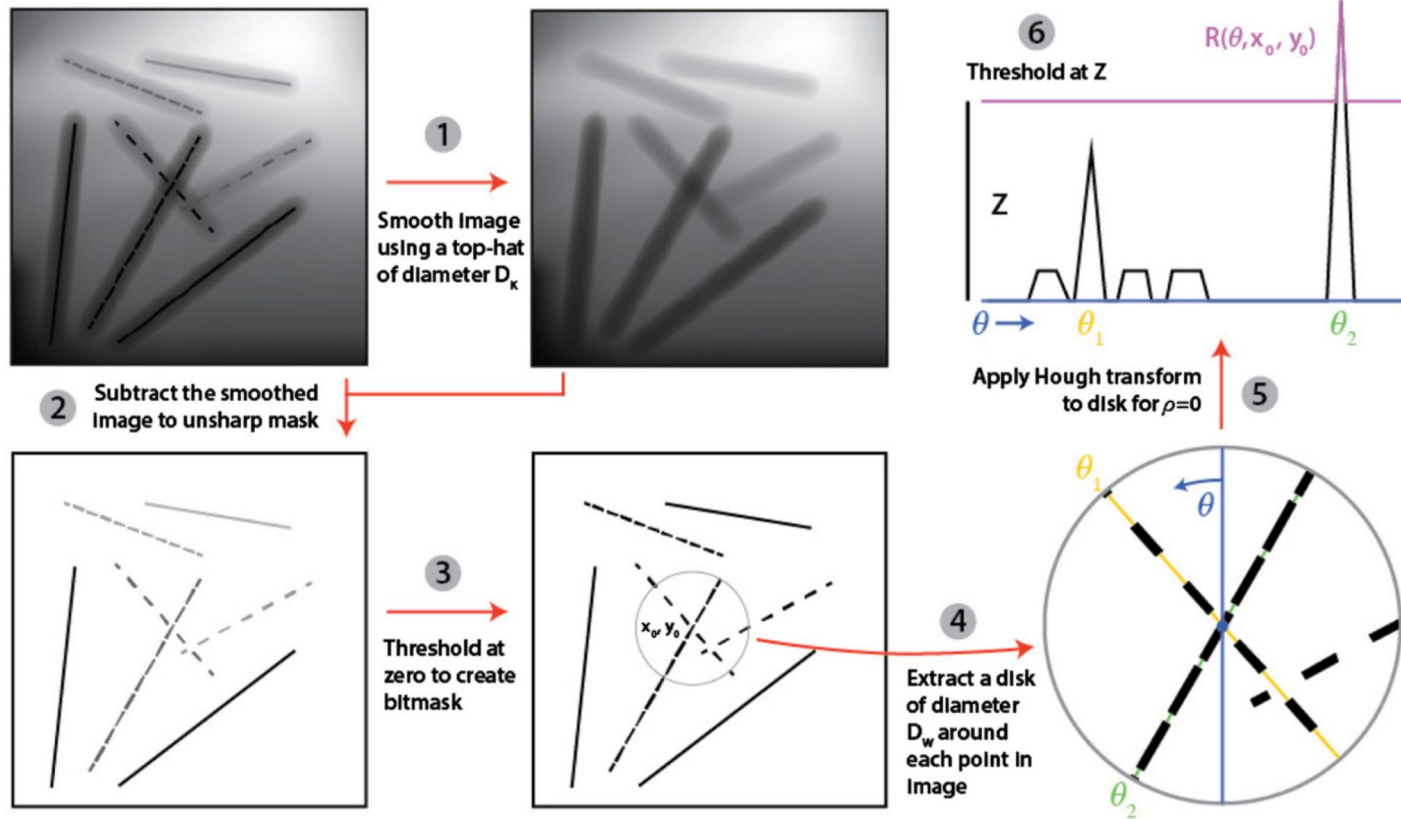


Neutral Hydrogen (HI)

well-mixed with dust + filamentary + aligned with magnetic field + 3D

Rolling Hough Transform

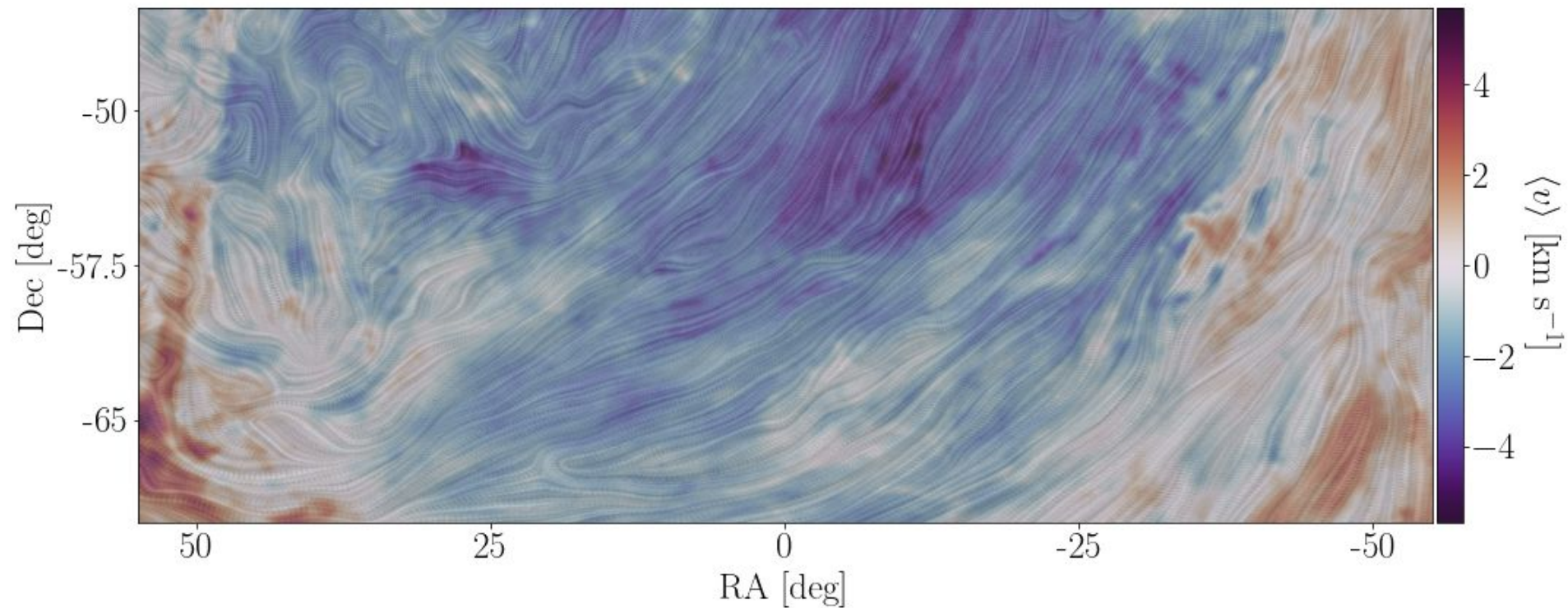
HI intensity \rightarrow HI filaments \rightarrow Magnetic field orientation \rightarrow HI-based polarization template



Clark, et al. (2014)
Clark & Hensley (2019)

Background: 1st moment map of velocity

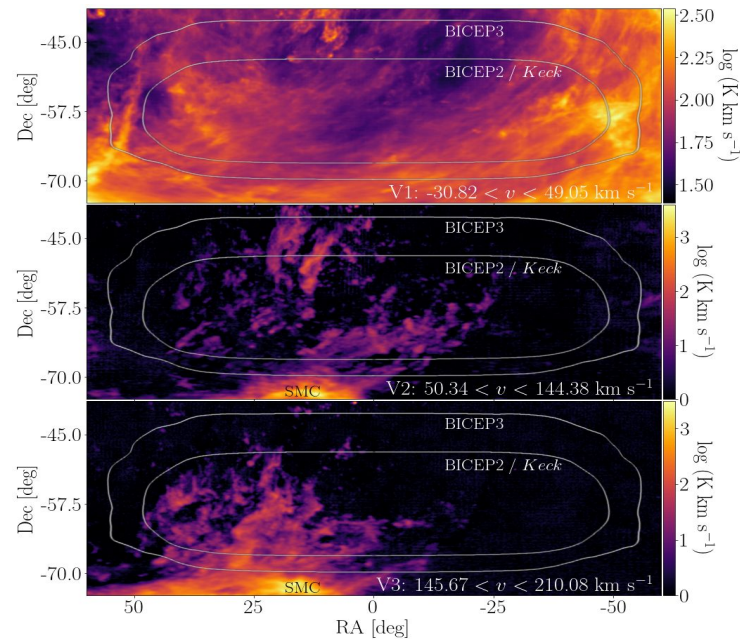
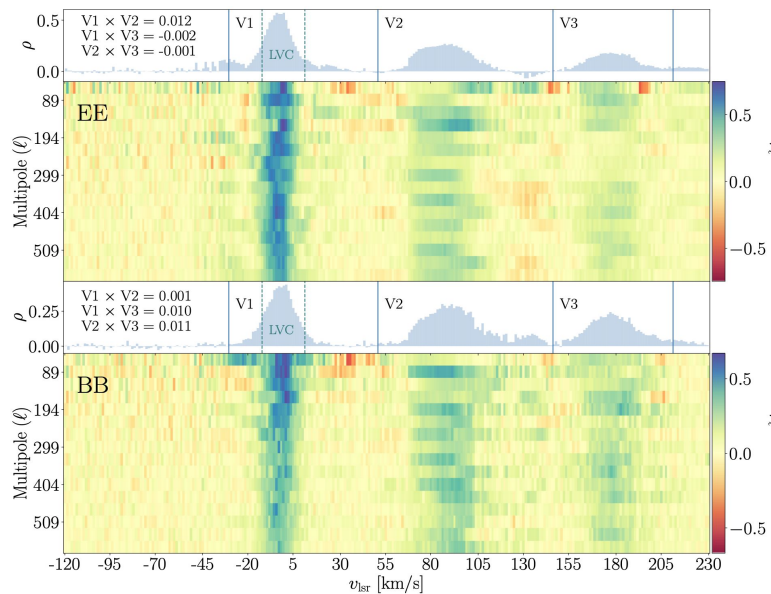
Texture: magnetic field orientation inferred by HI filaments



Takeaways from BK \times HI-based templates

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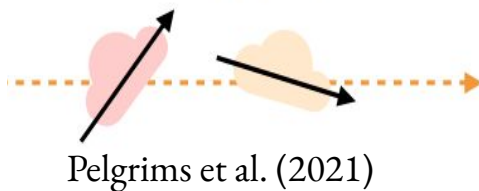
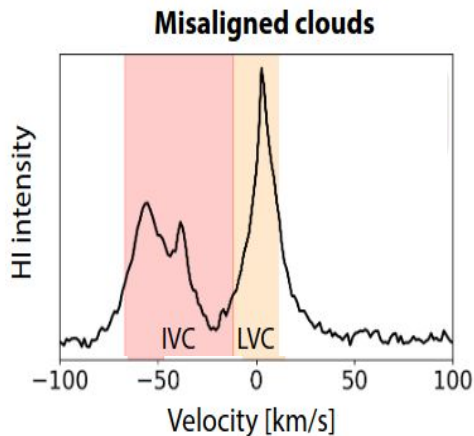
- Separate emission along line of sight (LOS) into velocity components
 - Detection in the **Galactic component of HI** at $\sim 7\sigma$ in BB, $\sim 15\sigma$ in EE, and $\sim 16\sigma$ in EE+BB \rightarrow down to 95 GHz
 - No detection in **Magellanic Stream I**



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- Test for LOS frequency decorrelation
 - No evidence from inclusion of **IVC** in LOS sum

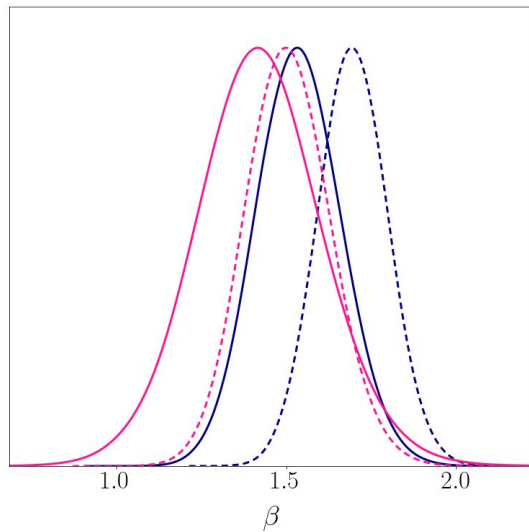


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 - no decorrelation between **filaments** and **total dust**

--- Total Dust Component *EE+BB*
— Filamentary Dust Component *EE+BB*
--- Total Dust Component *BB*
— Filamentary Dust Component *BB*



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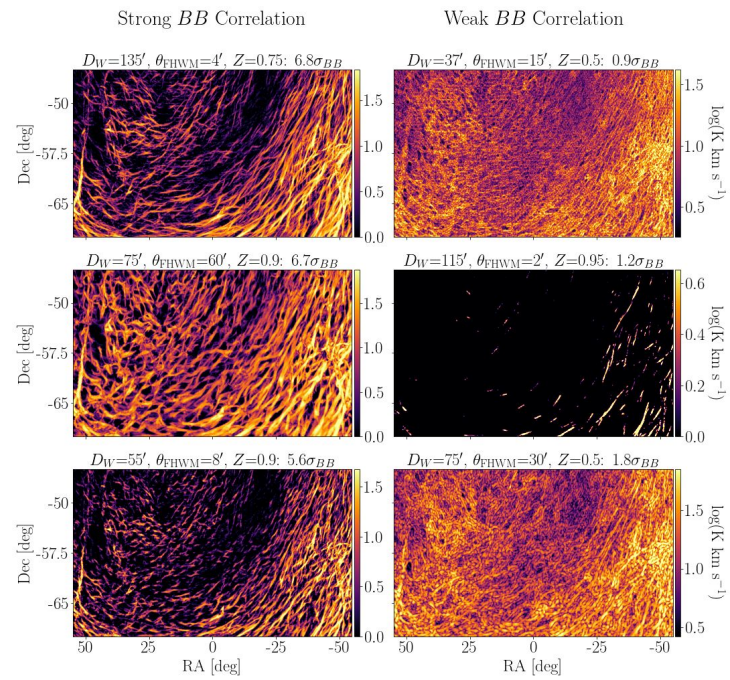
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	<i>BB</i>	<i>EE</i>	<i>BB + EE</i>
• Quantify dust sensitivity of different instruments			
BICEP3 95 GHz	4.53	1.22	4.72
<i>Planck</i> 143 GHz	0.05	0.72	0.12
BICEP2/ <i>Keck</i> 150 GHz	5.31	2.43	5.98
<i>Planck</i> 217 GHz	3.50	2.37	4.02
<i>Keck</i> 220 GHz	5.82	7.13	9.26
<i>Planck</i> 353 GHz	3.18	7.99	8.59

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Thank you
Questions?