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# Combining Parametric Methods and Observation Matrices for Foreground Cleaning in the context of Simons Observatory

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The Simons Observatory (SO) is a new generation CMB experiment located in the Atacama Desert and is currently taking data. One of the main scientific goals of the SO Small Aperture Telescopes (SATs) is to measure traces of inflation in the primordial B-modes in the CMB polarization, whose amplitude is parameterized by  $r$ .

This signal would be extremely faint, and its detection depends on removing contaminating emission from Galactic foregrounds and exercising exquisite control over systematic effects—particularly those introduced when filtering spurious signals from the data, which can distort the reconstructed maps.

I will present the parametric map-based method that we are developing as one of the pipelines for foreground cleaning in the SATs. This approach allows us to handle complex foregrounds, inhomogeneous noise, and is capable of reaching  $\sigma(r=0) \approx 0.003$  (Wolz et al. 2024). To manage the filtering, we are using an observation matrix-based technique (Ade et al. 2016), which is directly incorporated into the foreground cleaning. For a survey as large as SO and observing from Chile, this matrix will be large and complex. This method has never been used under such conditions, necessitating the development of new algorithms to handle it.

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