



Advancing CMB component separation: HEALPix Parameters' Maps

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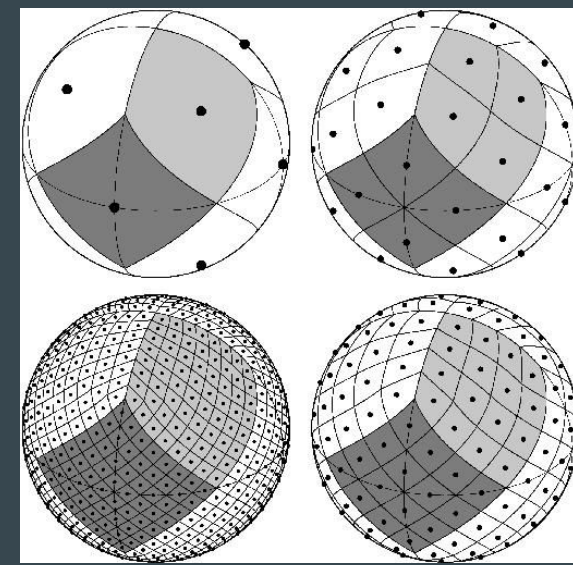
Background

- Use of primordial GW \rightarrow inflation; CMB polarization \rightarrow tracer for inflation

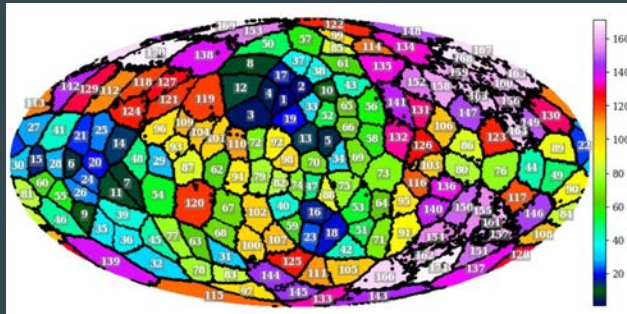
Problem: other phenomena emit in this frequency range of microwaves

- We need to solve component problem to recover CMB signal data
 - Parametric component separation method
 - However, parameter space could be large, so overall uncertainty to recover CMB is large.

Pipeline: clustering pipeline to reduce dimensionality parameter space

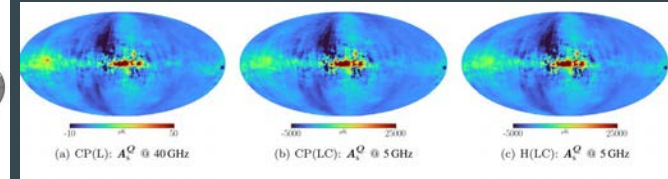
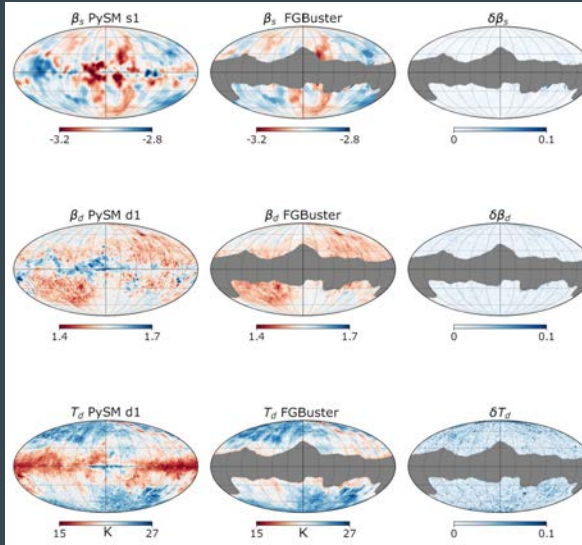


HEALPix - Gorski et al,
<https://arxiv.org/abs/astro-ph/9905275>



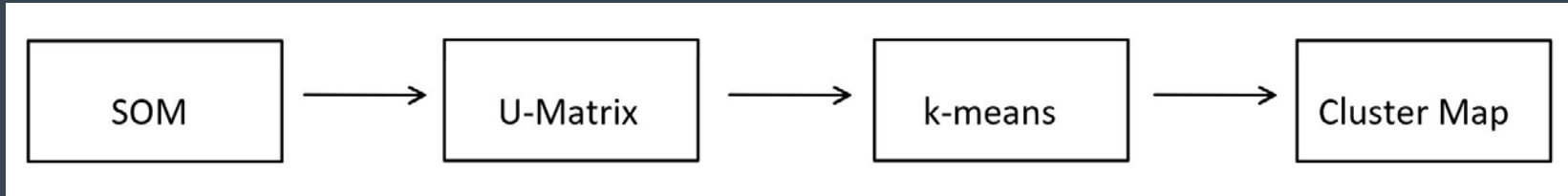
Mean-Shift Clustering Al. - Grumitt et al,
<https://arxiv.org/pdf/1910.14170>

Foreground Parameters - Puglisi et al,
<https://arxiv.org/pdf/2109.11562>

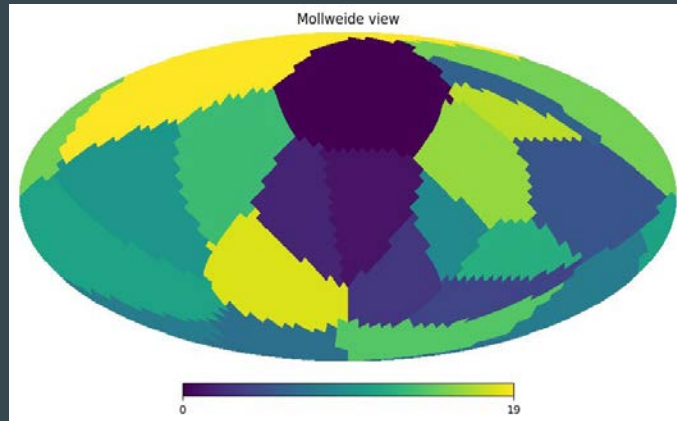


Synchrotron and Dust Amplitude Map Example -
Grumitt et al, <https://arxiv.org/pdf/1910.14170>

Methods



- 1) To train SOM and test method -> simulations using Voronoi tessellation
- 2) U-matrix based on hyperparameters
- 3) K-means is an unsupervised ML algorithm, splits data into clusters
- 4) Cluster Map:



Currently: find the BMU for comparison map from pipeline