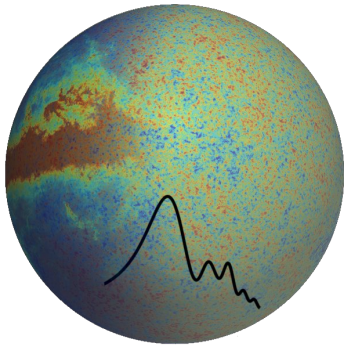
ILC on DC06 maps

Low-ℓ BB - Caterina Umiltà

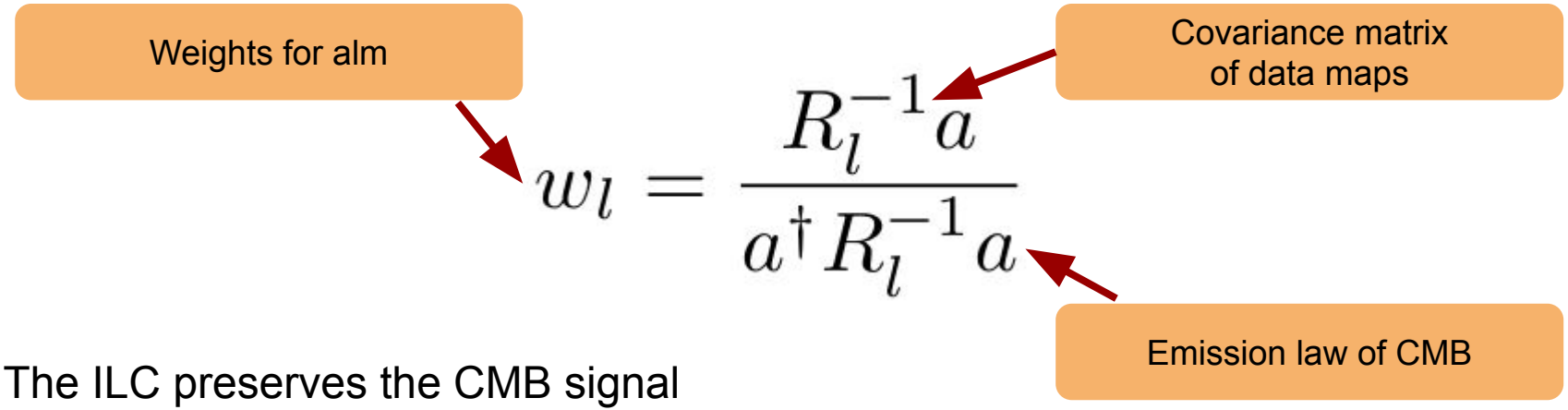


LBNL Tue Mar 31st, 2020

What is the ILC

The Internal Linear Combination is a foreground removal method that works by mixing all the input maps through a set of weights to minimize the foregrounds

It is widely used in the literature. We implement it here in spherical harmonics.

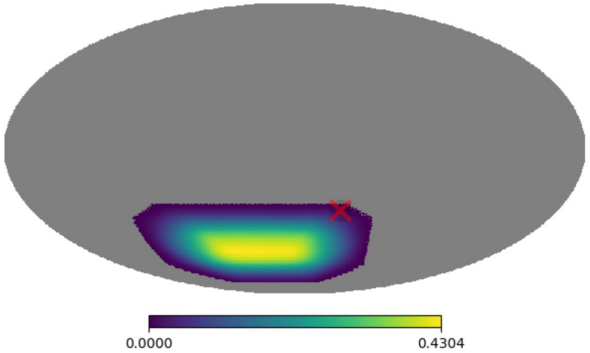


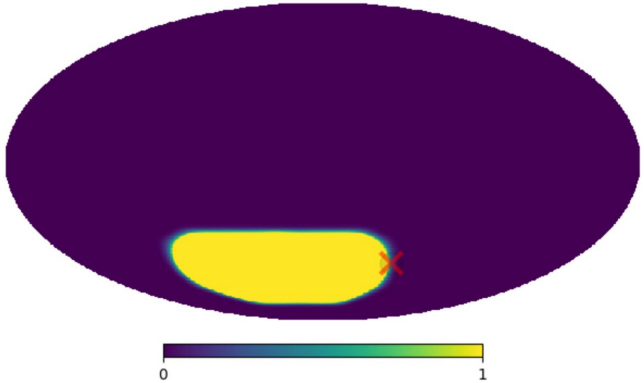
The ILC preserves the CMB signal

Masks

We tested a few different masks, finally using only two:

- The hit map
- A Gaussian smoothed mask with FWHM=2.5°





Product details

There are currently 10 foreground cleaned maps

All these maps are masked: they are produced by linear combination of spherical harmonics which are themselves masked

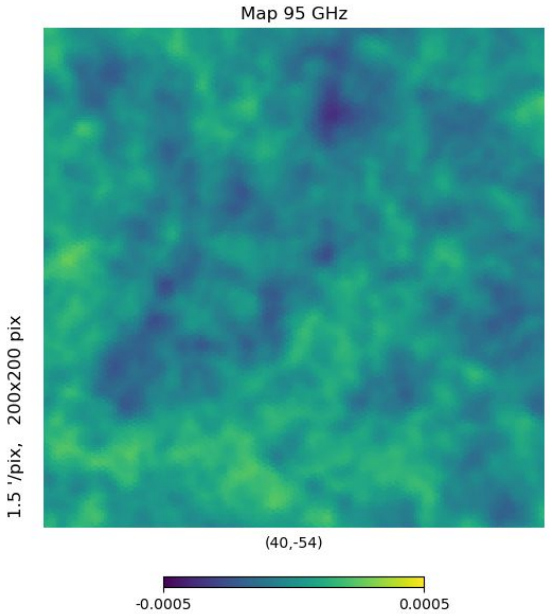
Maps are beamed to the 95 GHz beam

Noise spectra weighted through the ILC are also available

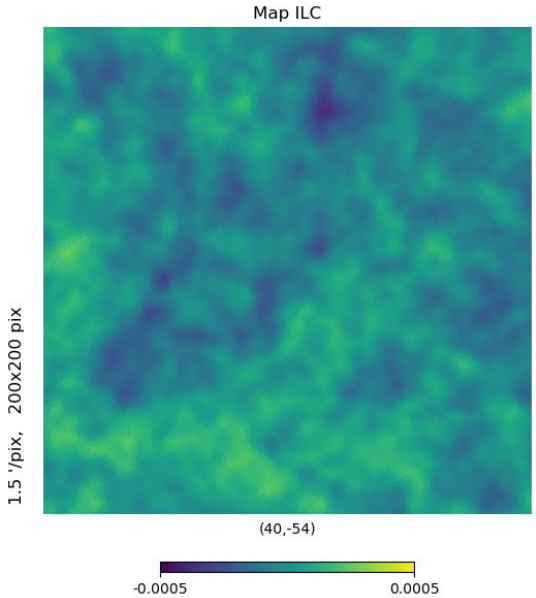
Very computationally intensive so no intermediate product stored unless there is a particular request

Maps comparison - Chile deep, Vansyngel model

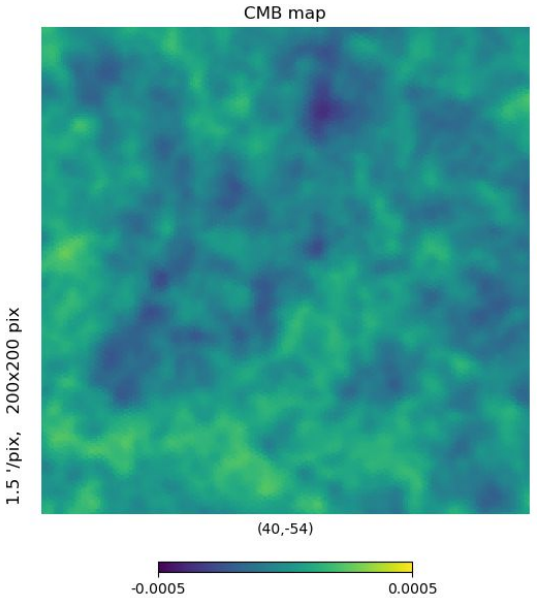
95 GHz



ILC map

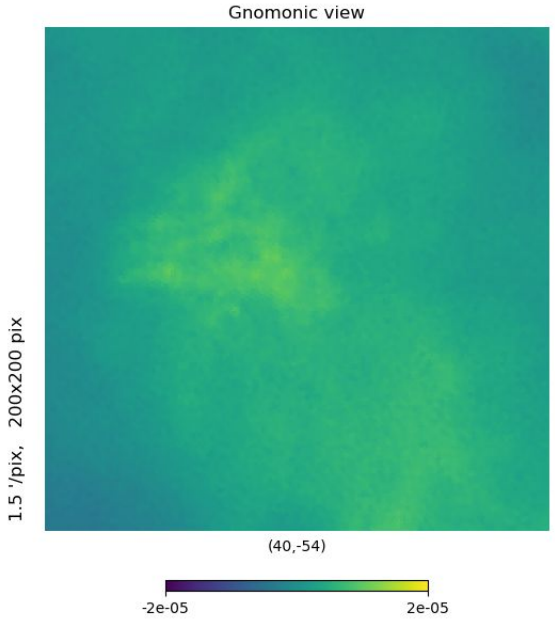


CMB input

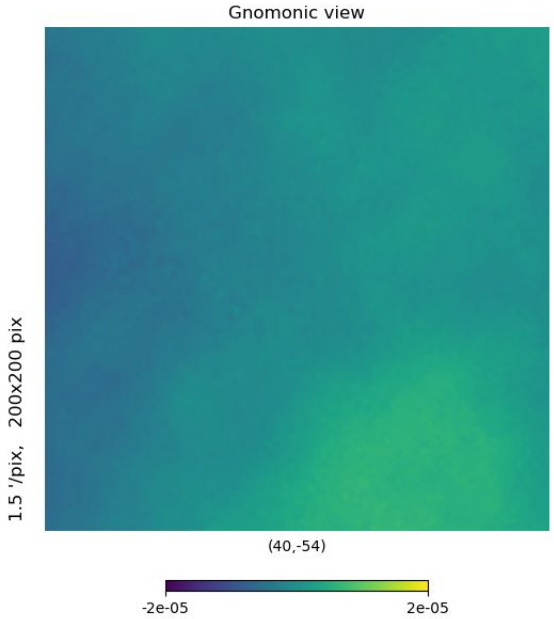


Maps comparison- Chile deep, Vansyngel model

95 GHz - CMB input



ILC map - CMB input

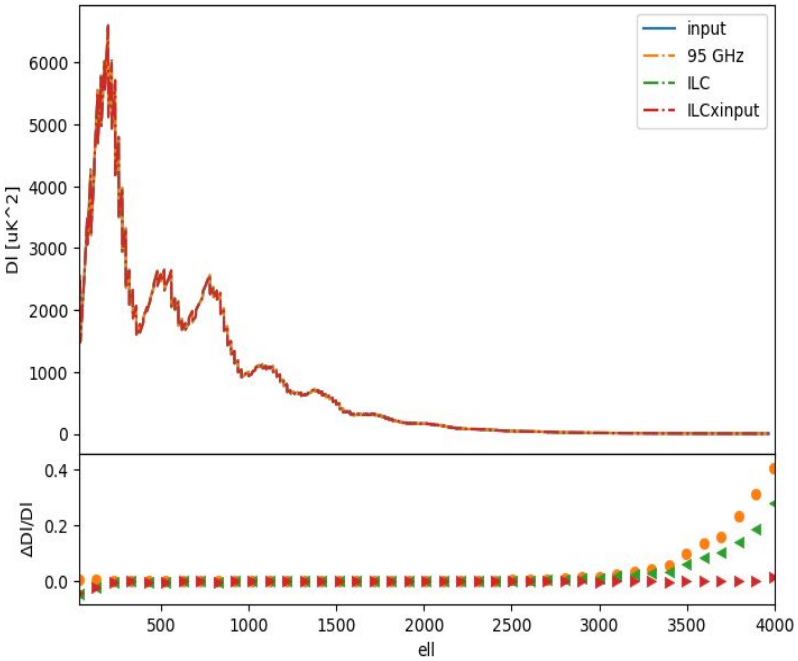


This compares a small patch in the ILC, 95 GHz and input CMB map

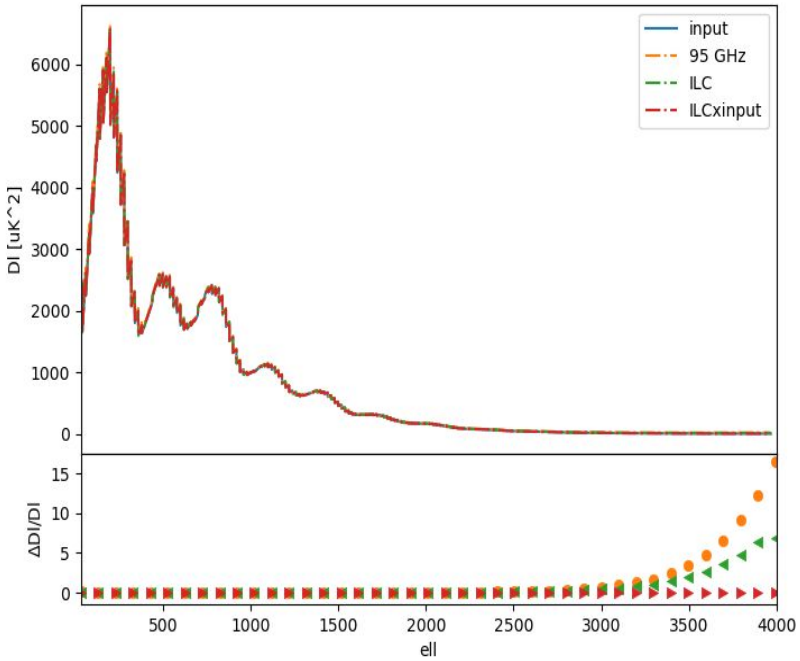
The 95 GHZ residual is the plain noise and fg @ 95 GHz, while the ILC residual is a mixture of all fg and noise weighted differently at all scales

TT Spectra - Chile map, Vansyngel model

Hit map

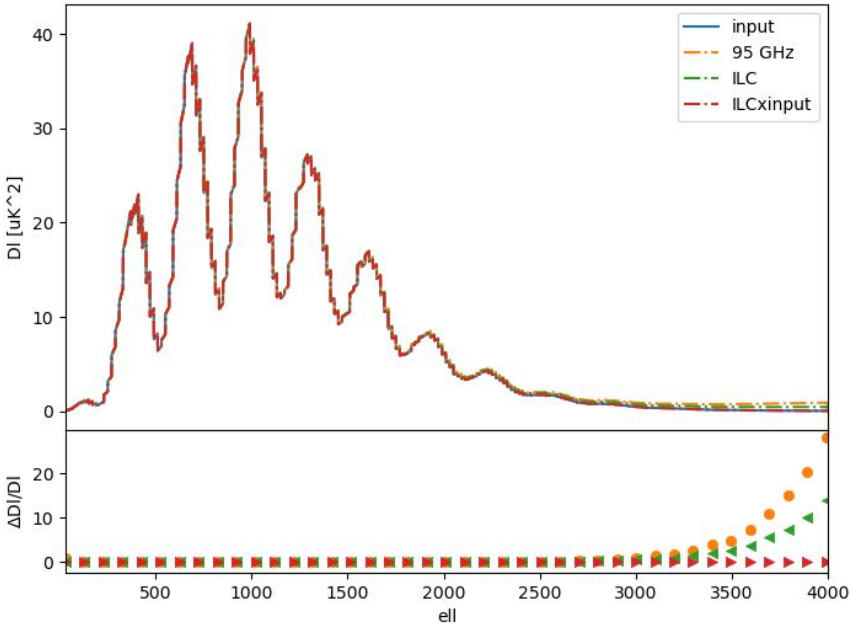


Smoothed map

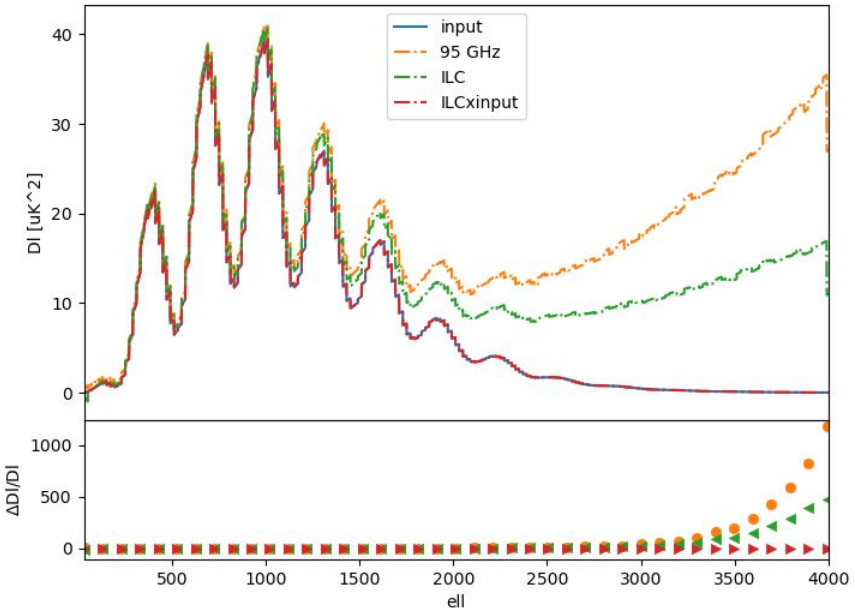


EE Spectra - Chile map, Vansyngel model

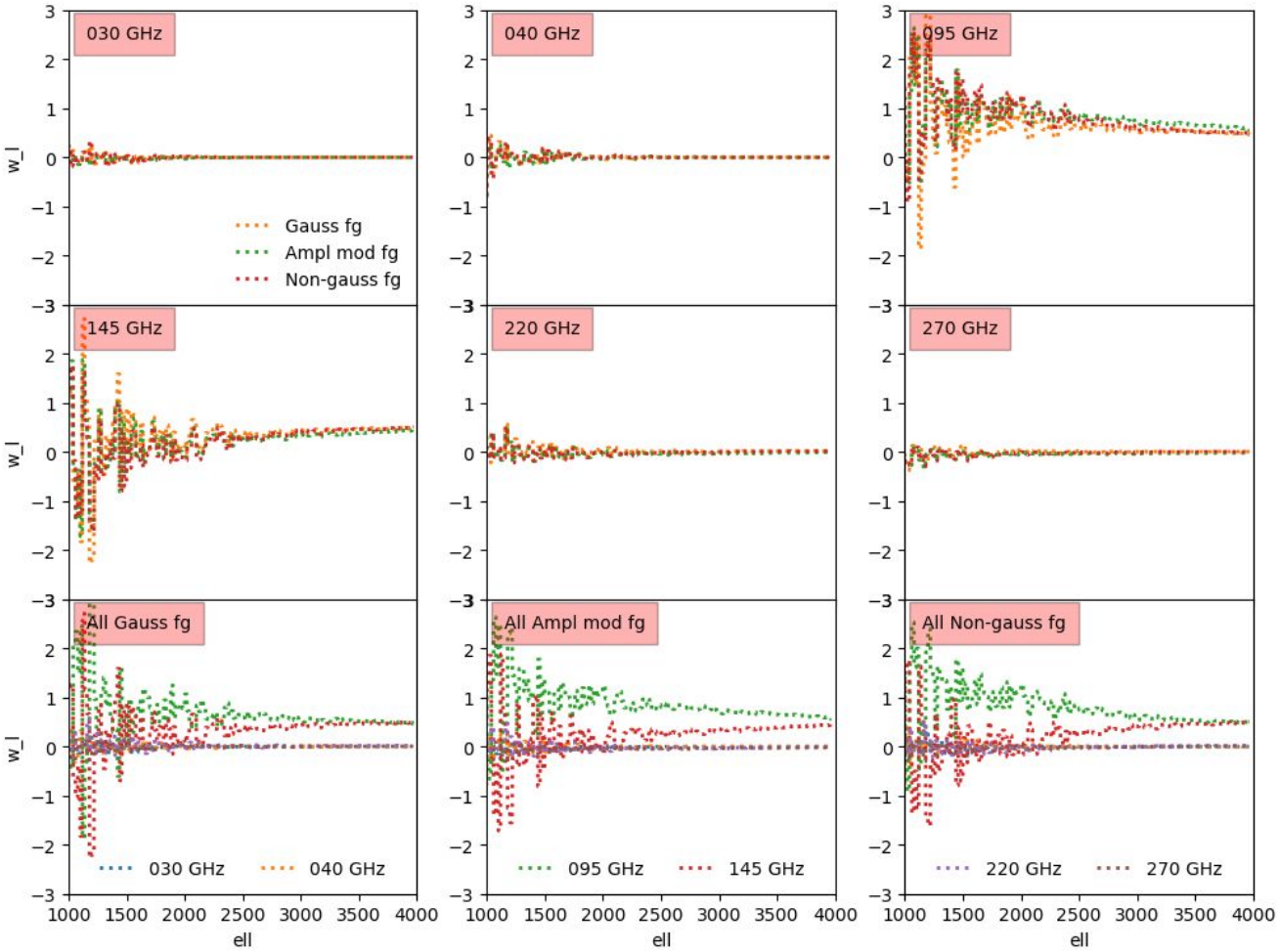
Hit map



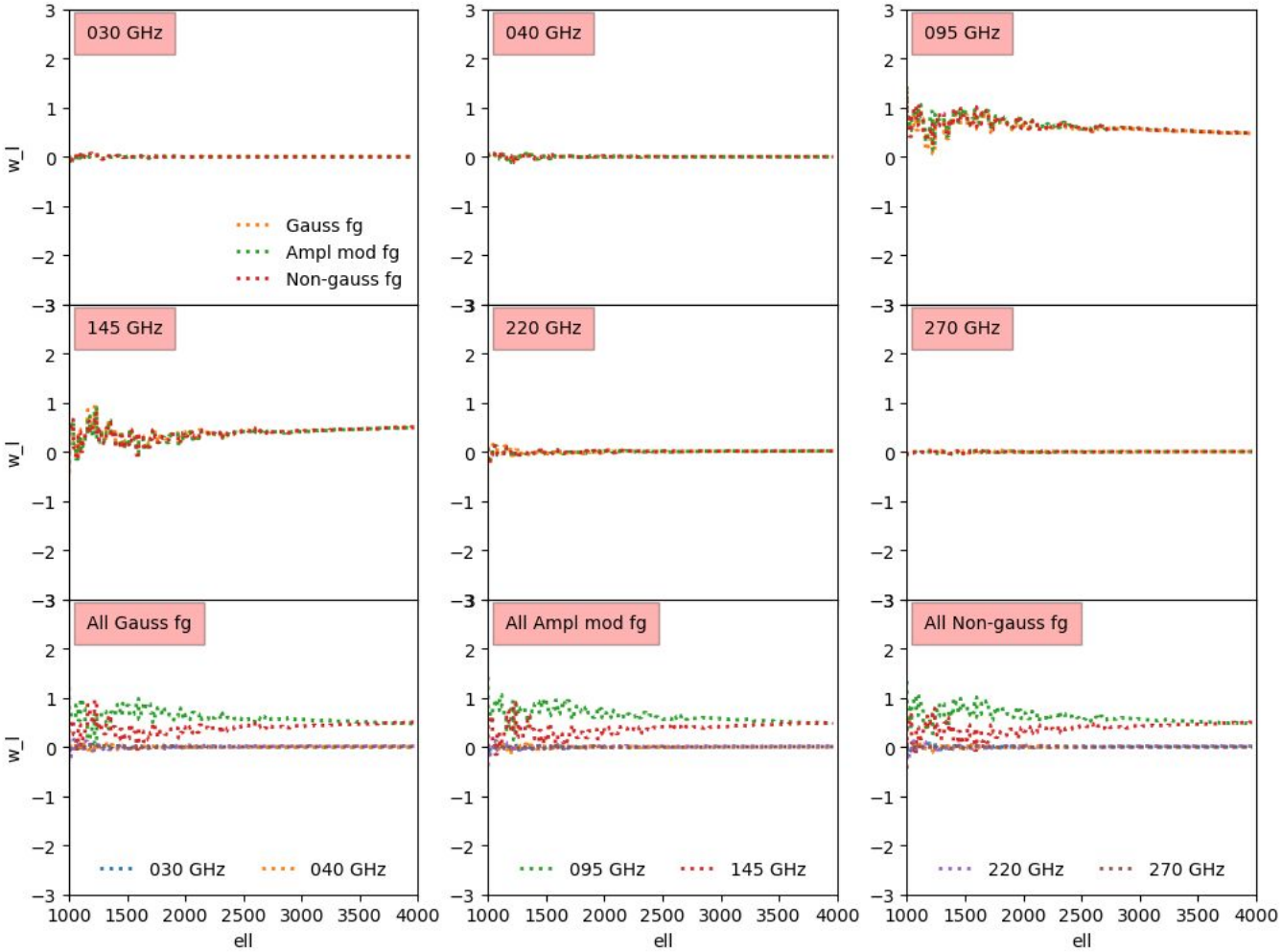
Smoothed map



Weights
Pole wide
T map



Weights
Pole wide
E map



Considerations

1. In TT spectra, performance of ILC and 95GHz map are comparable for Pole wide. For smaller fsky 95GHz has lower residual, while for larger fsky, ILC performs better.
2. In polarization spectra, ILC always has lower residuals then 95 GHz spectra at high-ℓ
3. The only issues appear at low fsky and low multipoles (the hit map here seems to give better results)
4. Looking at the weights, we see that the reconstruction is dominated by 95 and 145 GHz. The smoothed mask seems to give smoother weights, which are in general preferable for ILC reconstruction. However the spectra are the one with highest residuals (in polarization).

Moving forward

- Maps are at NERSC, contacted both M. Millea and J. Carron to make lensing templates from them
- If the first set of templates produces good results, iterate and make full set of 100 templates. Also, while ILC might not be necessary now, more complex simulations might require some degree of foreground cleaning
- Given lensing template results, possibly dropping one of the two masks
- Can try different component separation techniques too
- Any request for more intermediate products (weights?...)

Relevant postings

Preliminary ILC maps - part 2

Preliminary ILC maps - part 3

ILC maps - first 10 sims (posting still in progress, the essential is there)