

# Pico

Commander updates 4.11.2021

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# Simulations generated by Unni Fuskeland

- Both 90.91 and 90.92 simulations are ready
  - 40 arcmin beam
  - nside 512
  - White noise
- 10 different CMB and white noise realisations
  - With both  $r = 0$  and  $r = 0.003$

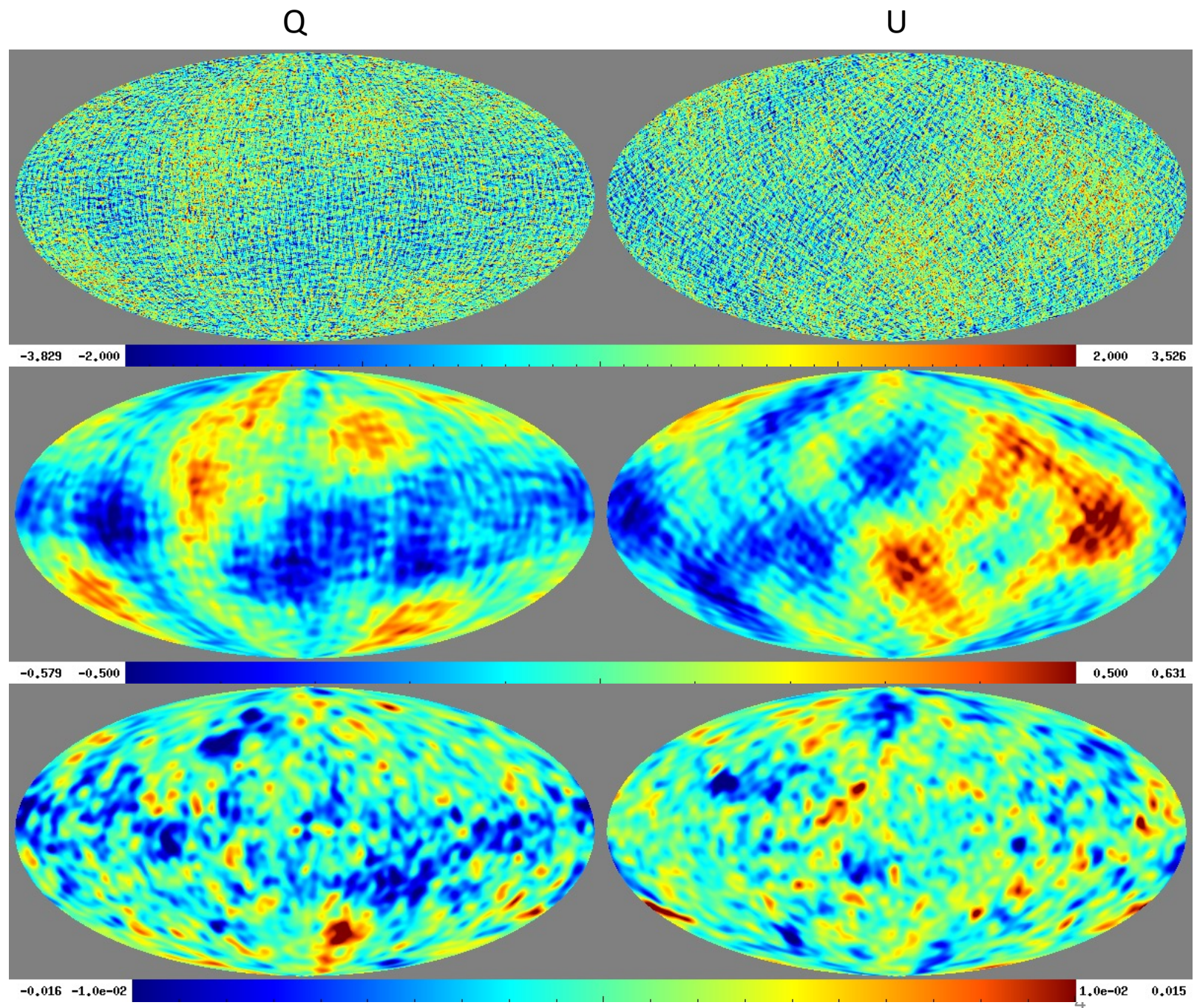
# 90.91

- Running Commander1 fitting 6 parameters pr pixel
  - CMB ( $A_{cmb}$ )
  - One dust model ( $A_{dust}, T_{dust}, \beta_{dust}$ )
  - Synchrotron model ( $A_{sync}, \beta_{synch}$ ) (inside64)
- 10 simulation sets with  $r = 0$  and 10 with  $r = 0.003$
- Mask optimization not 100% done

Resulting CMB  
map 91.91  
 $r = 0$

Smoothed to a  
5 degree beam

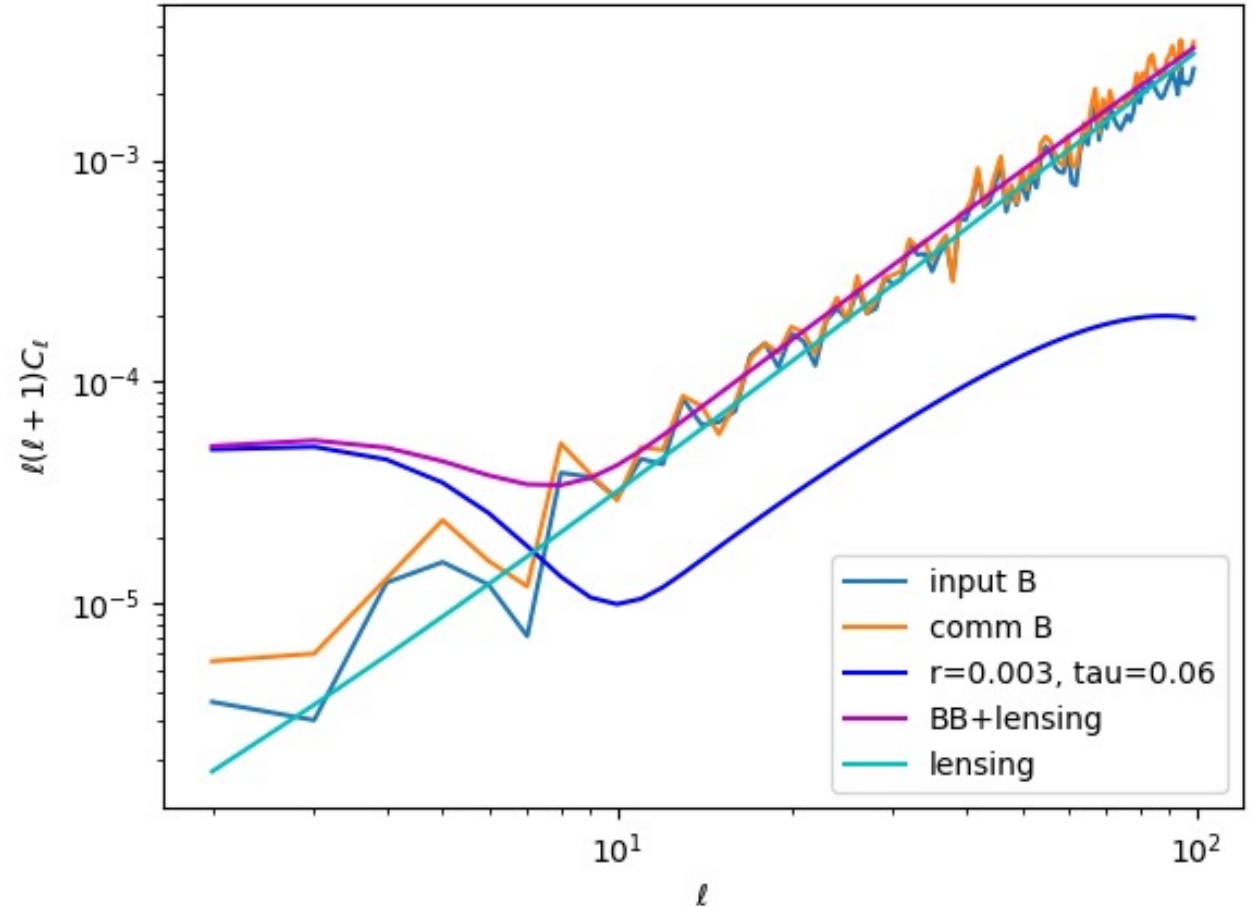
Difference map: CMB  
input – CMB output.  
Smoothed to a 5  
degree beam



# Powerspectrum

Powerspectrum generated from unmasked CMB maps with  $r = 0$

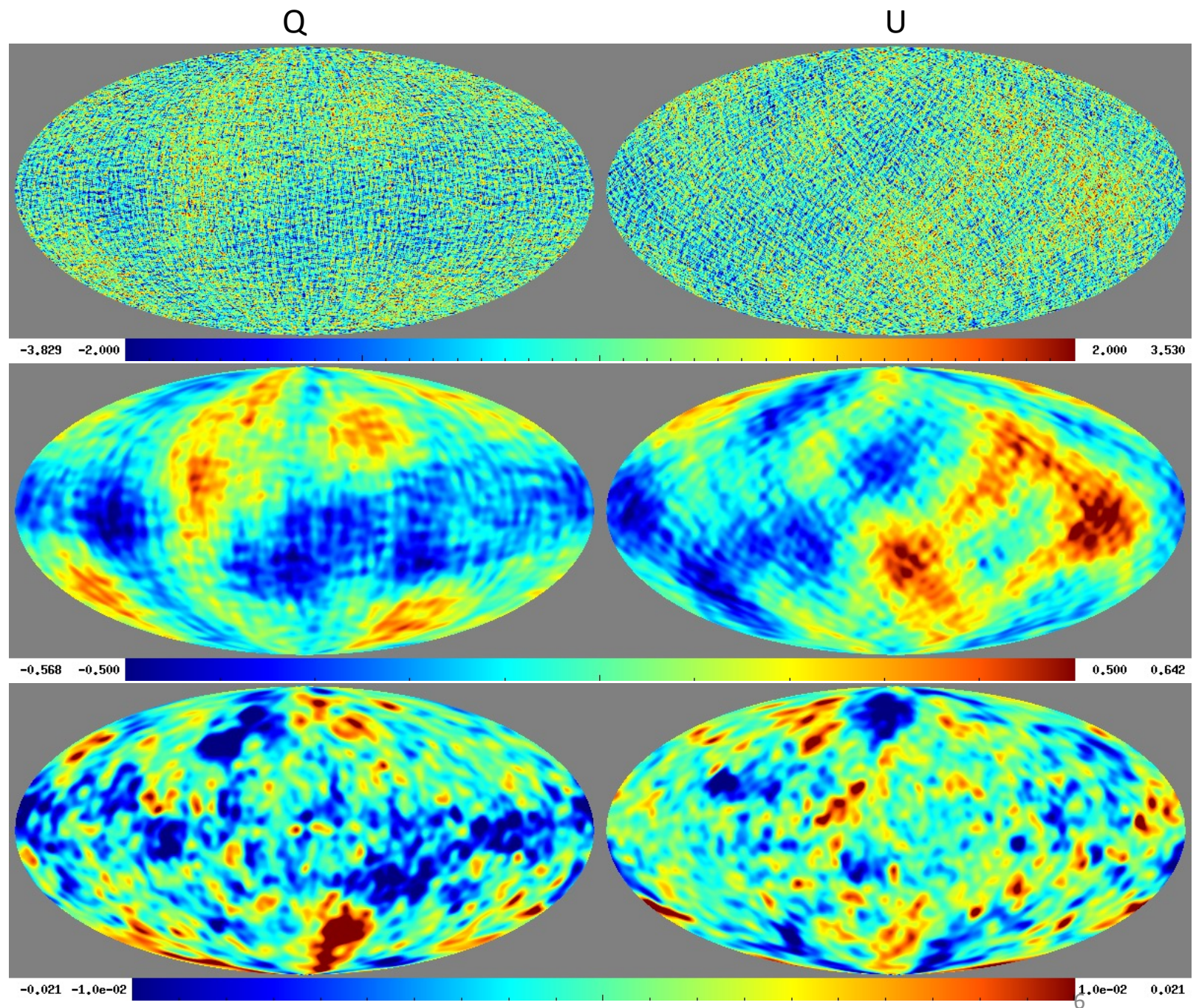
- Orange: Output CMB map from Commander
- Light blue: Input CMB map used to generate simulation



Resulting CMB  
map 91.91  
 $r = 0.003$

Smoothed to a  
5 degree beam

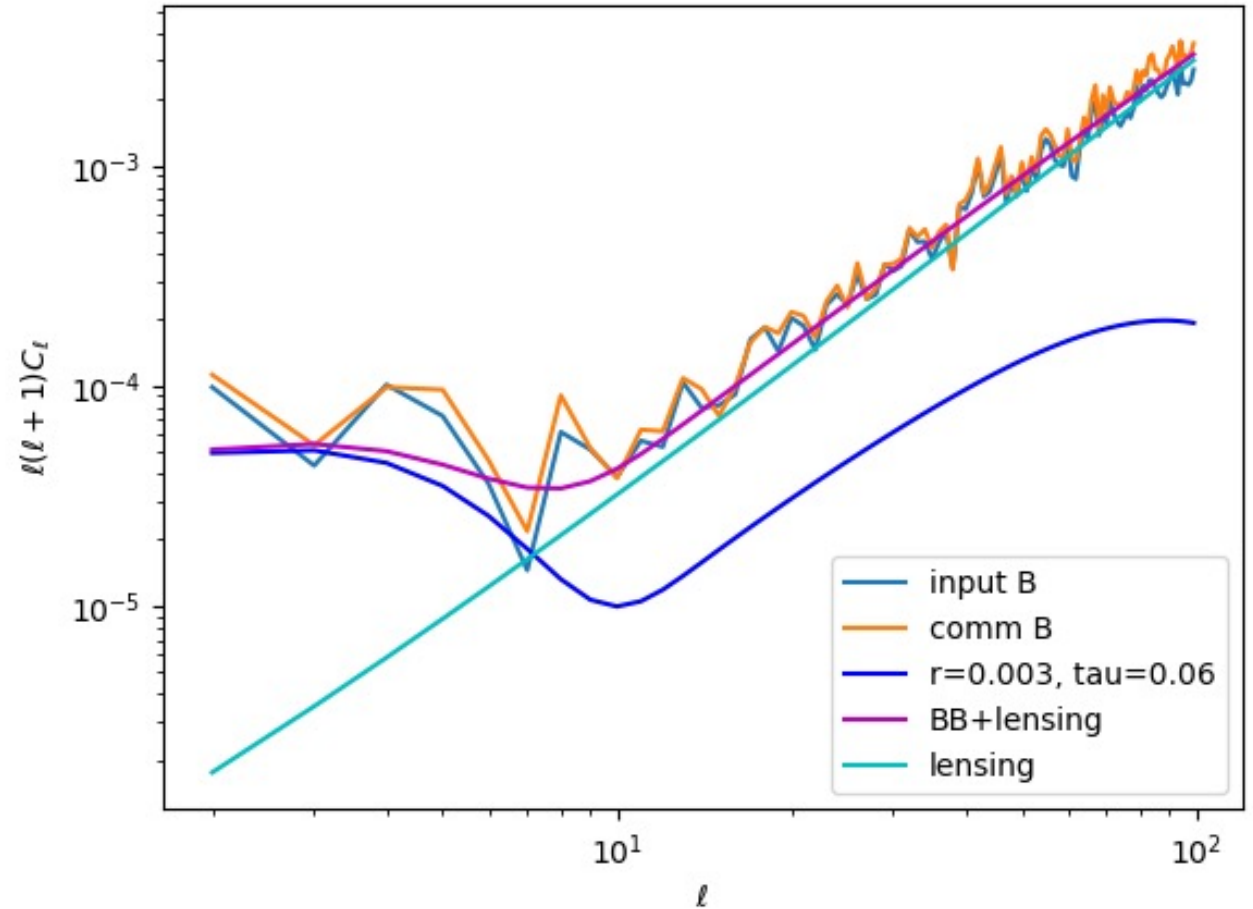
Difference map: CMB  
input – CMB output.  
Smoothed to a 5  
degree beam



# Powerspectrum

Powerspectrum generated from unmasked CMB maps with  $r = 0.003$

- Orange: Output CMB map from Commander
- Light blue: Input CMB map used to generate simulation

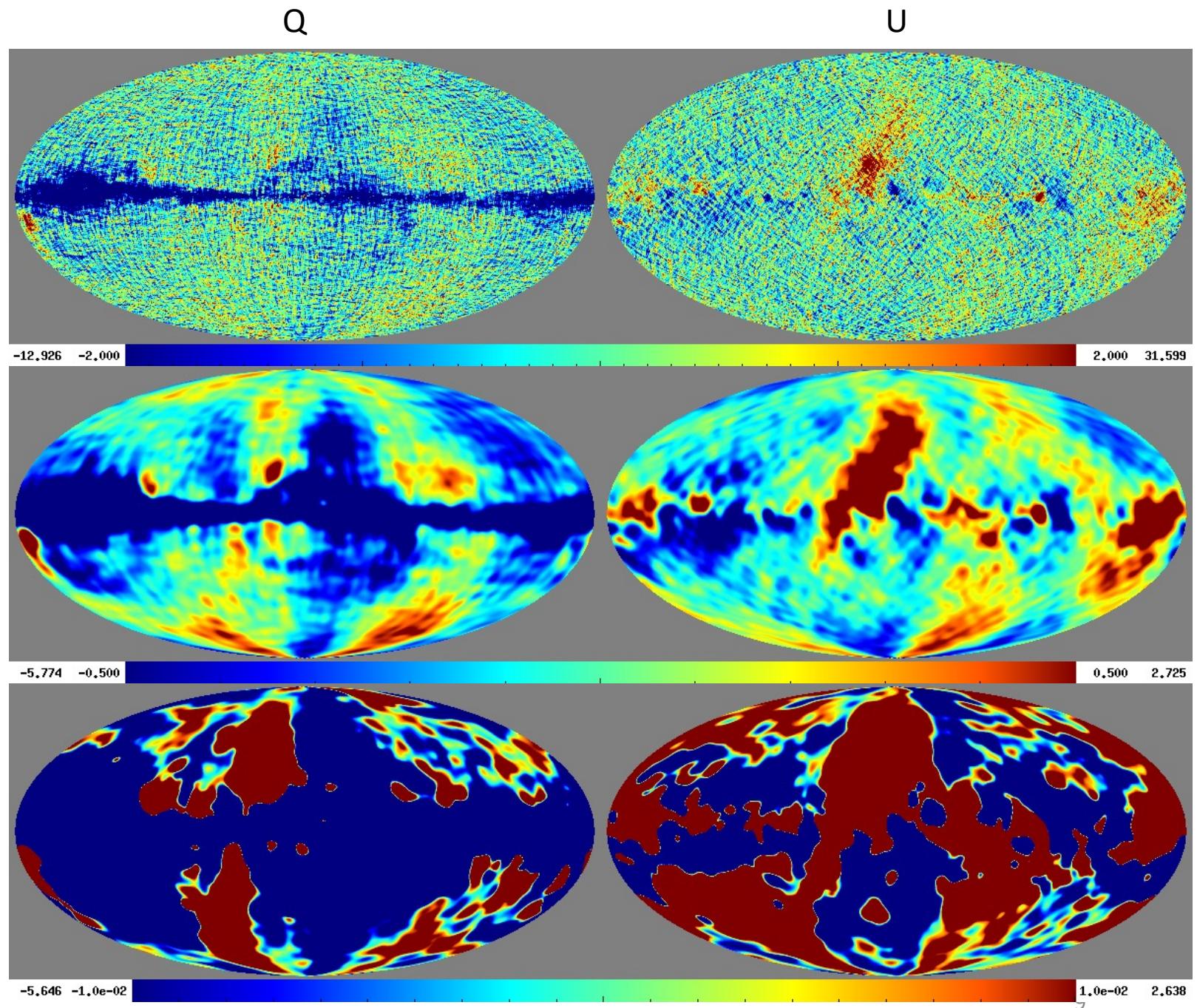


Fitting 90.92 simulations with the 90.91  
data model

Fitting 90.92  
simulations with the  
90.91 data model  
- resulting CMB map

Smoothed to a  
5 degree beam

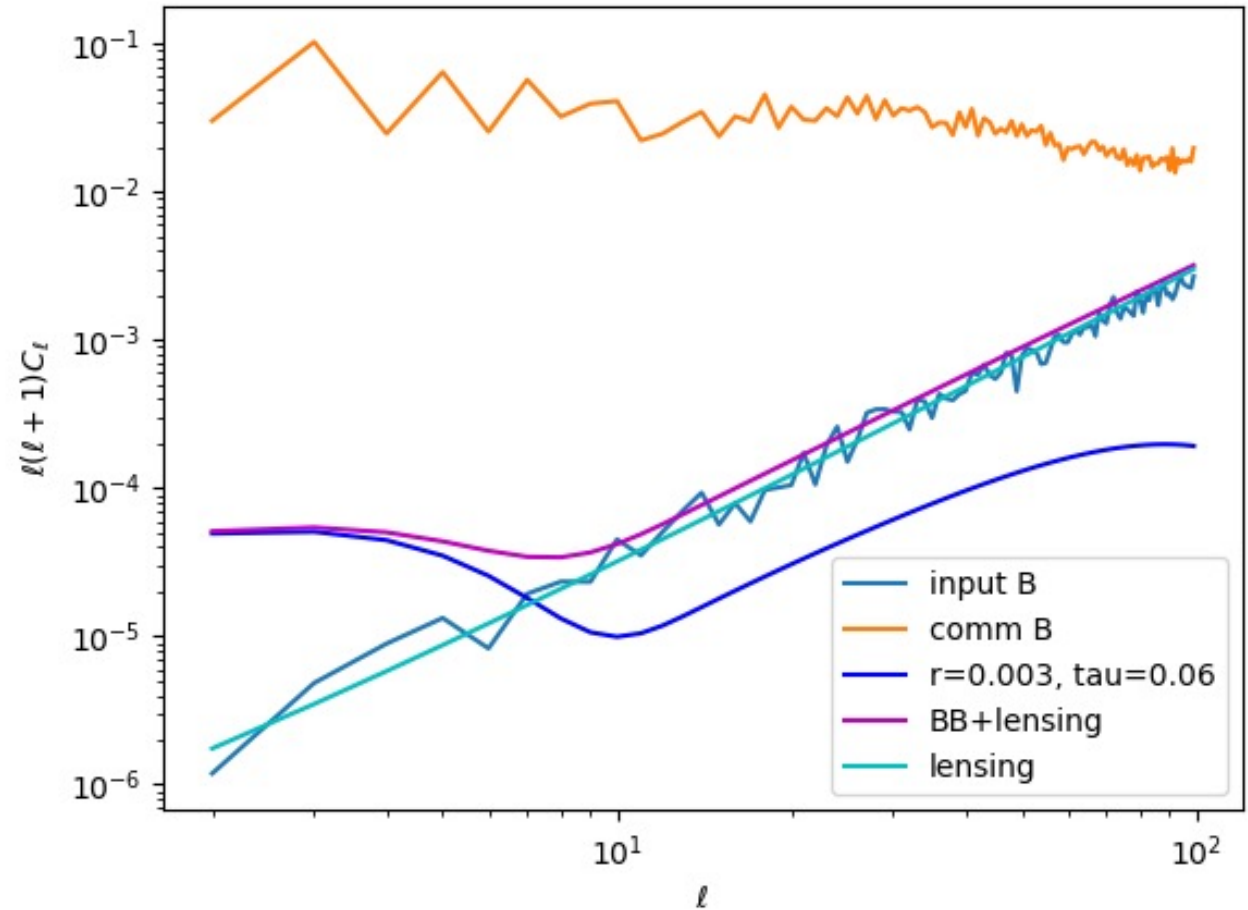
Difference map: CMB  
input – CMB output.  
Smoothed to a 5  
degree beam



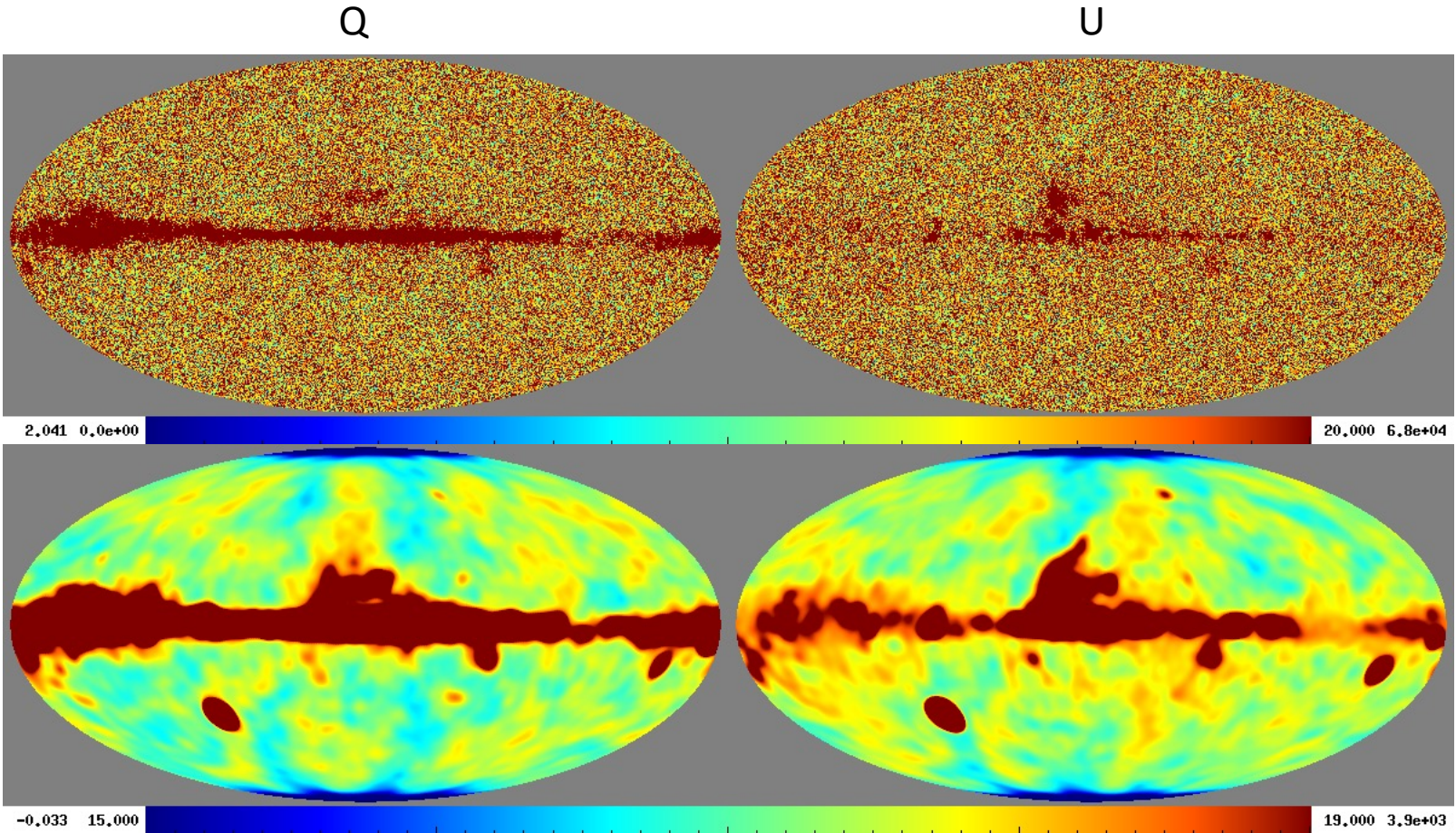
# Fitting 90.92 simulations with the 90.91 data model – Powerspectrum

Powerspectrum generated from unmasked CMB maps with  $r = 0.0$

- Orange: Output CMB map from Commander
- Light blue: Input CMB map used to generate simulation



Fitting 90.92  
simulations with the  
90.91 data model  
- resulting  $\chi^2$  maps

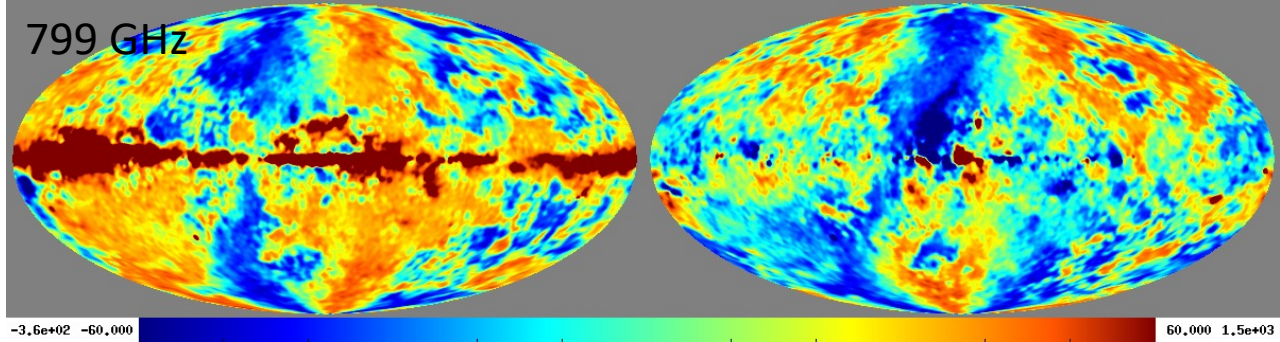
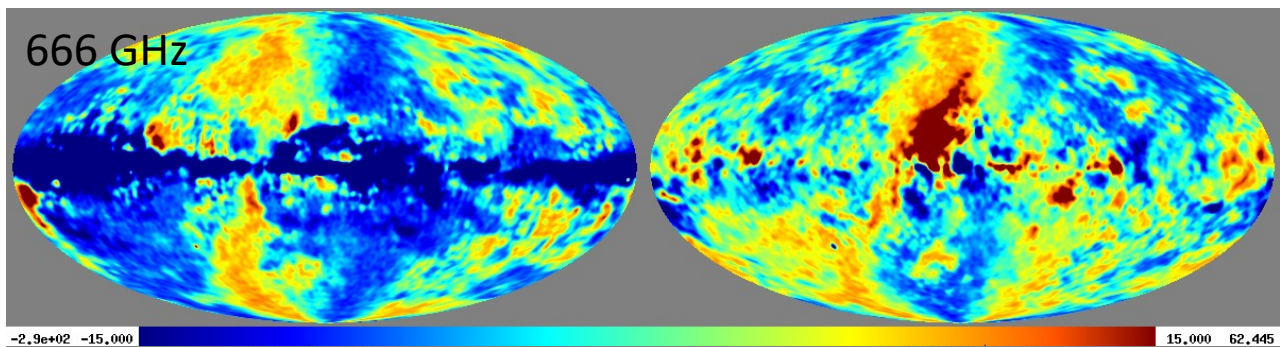
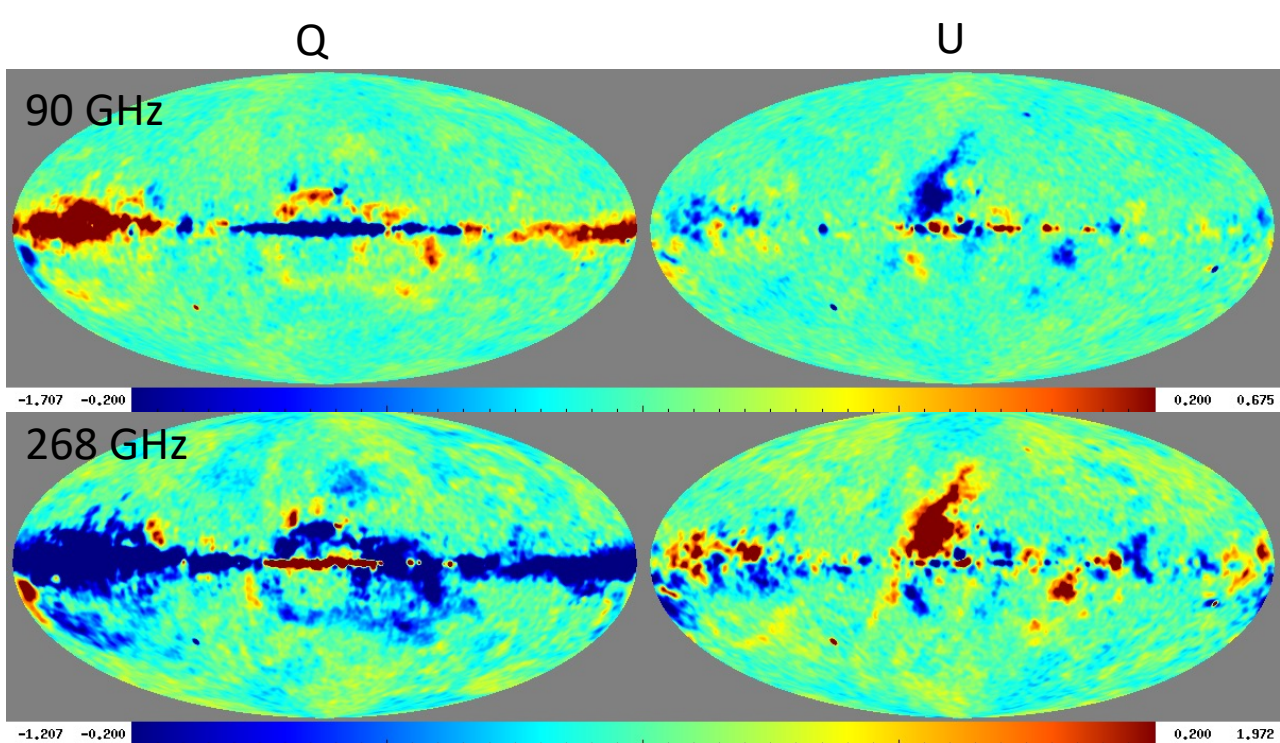
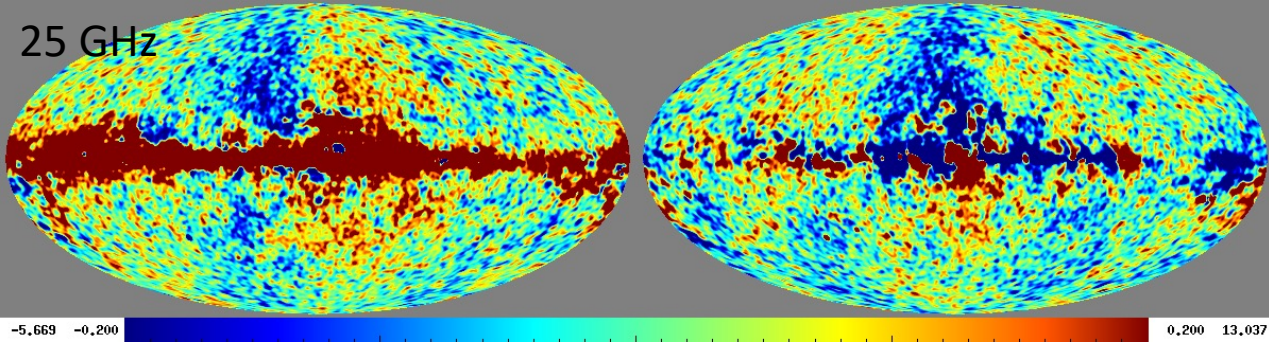
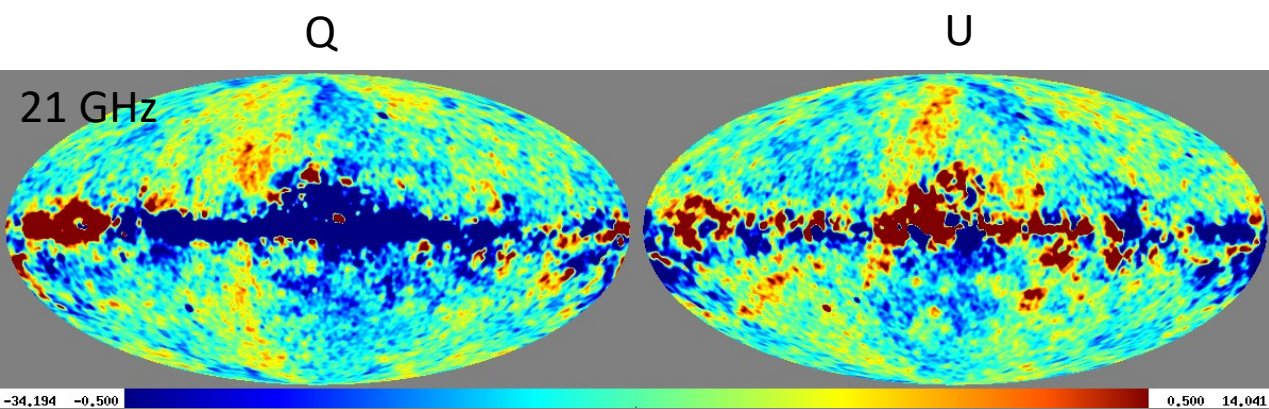


Smoothed to a  
5 degree beam

# Residual maps

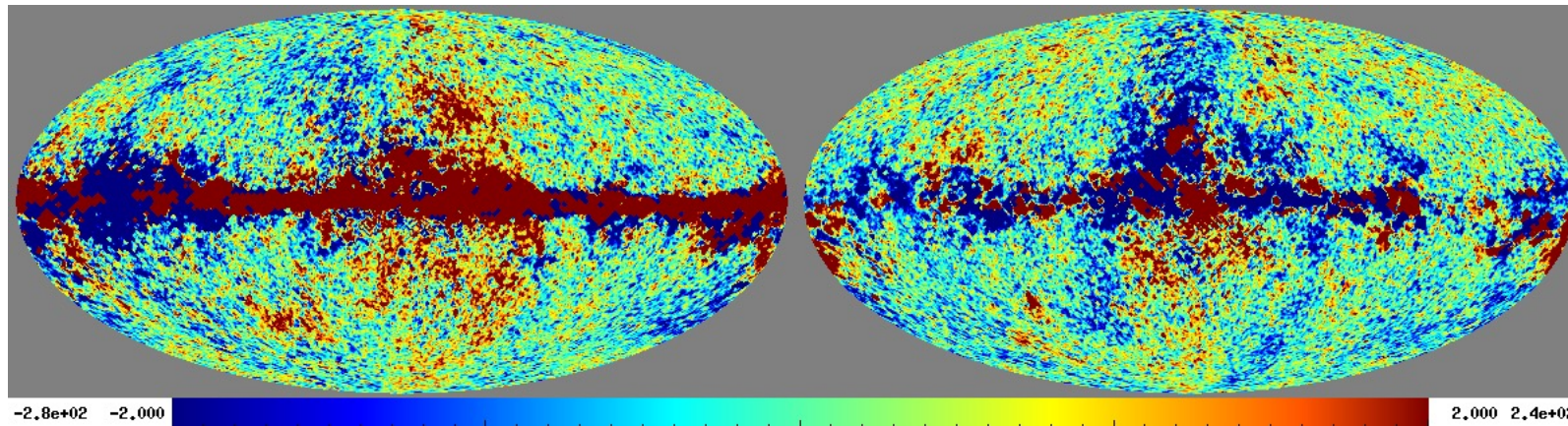
(data – fitted signal)

The alternating pattern in the residuals is a clear sign that there is a mismatch between the model fitted and the sky model.

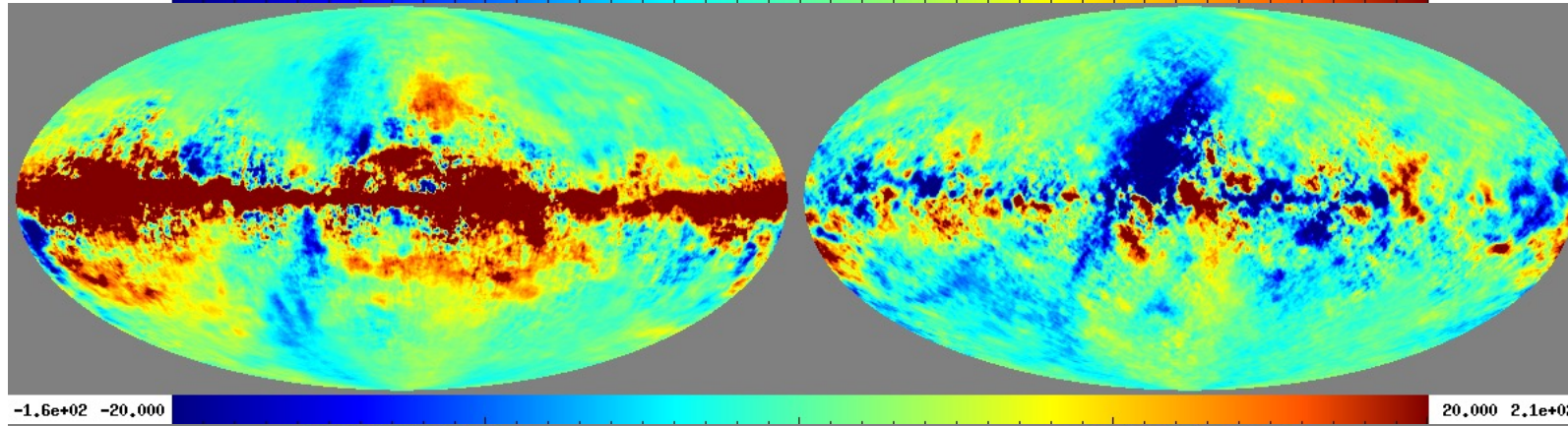


# Foreground amplitude maps for reference

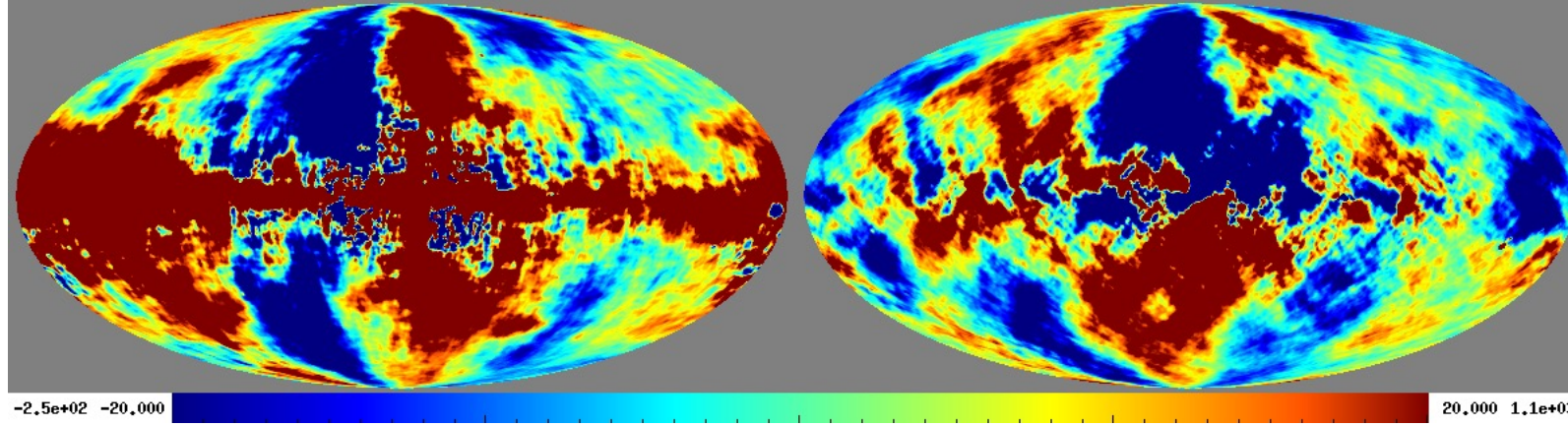
AME



Dust



Synchrotron



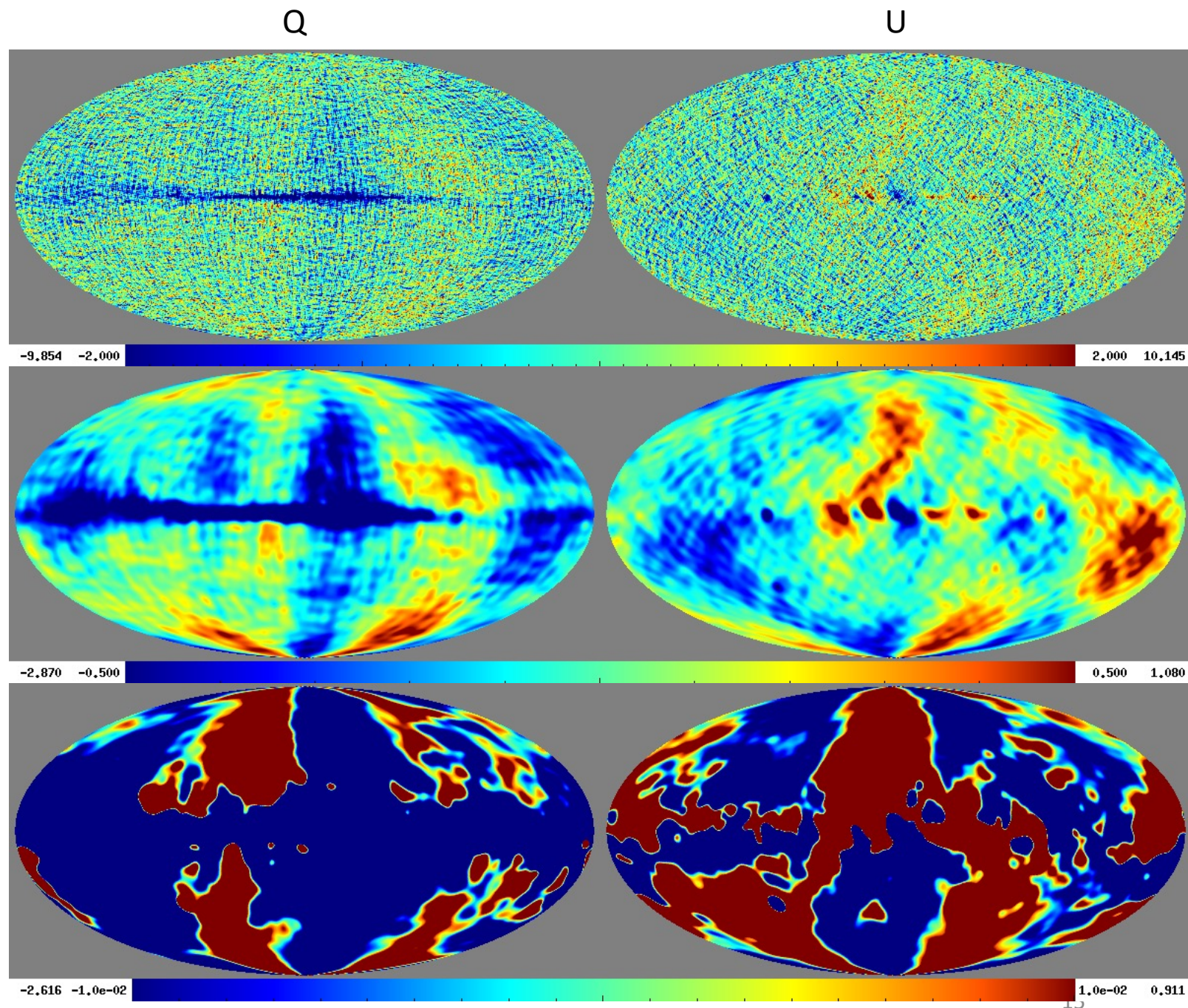
# Adding a second dust model

Fitting 90.92 simulations with 2 MBB models  
(still no AME or synchrotron curvature)

Fitting 90.92  
simulations without  
AME or synch C  
- resulting CMB map

Smoothed to a  
5 degree beam

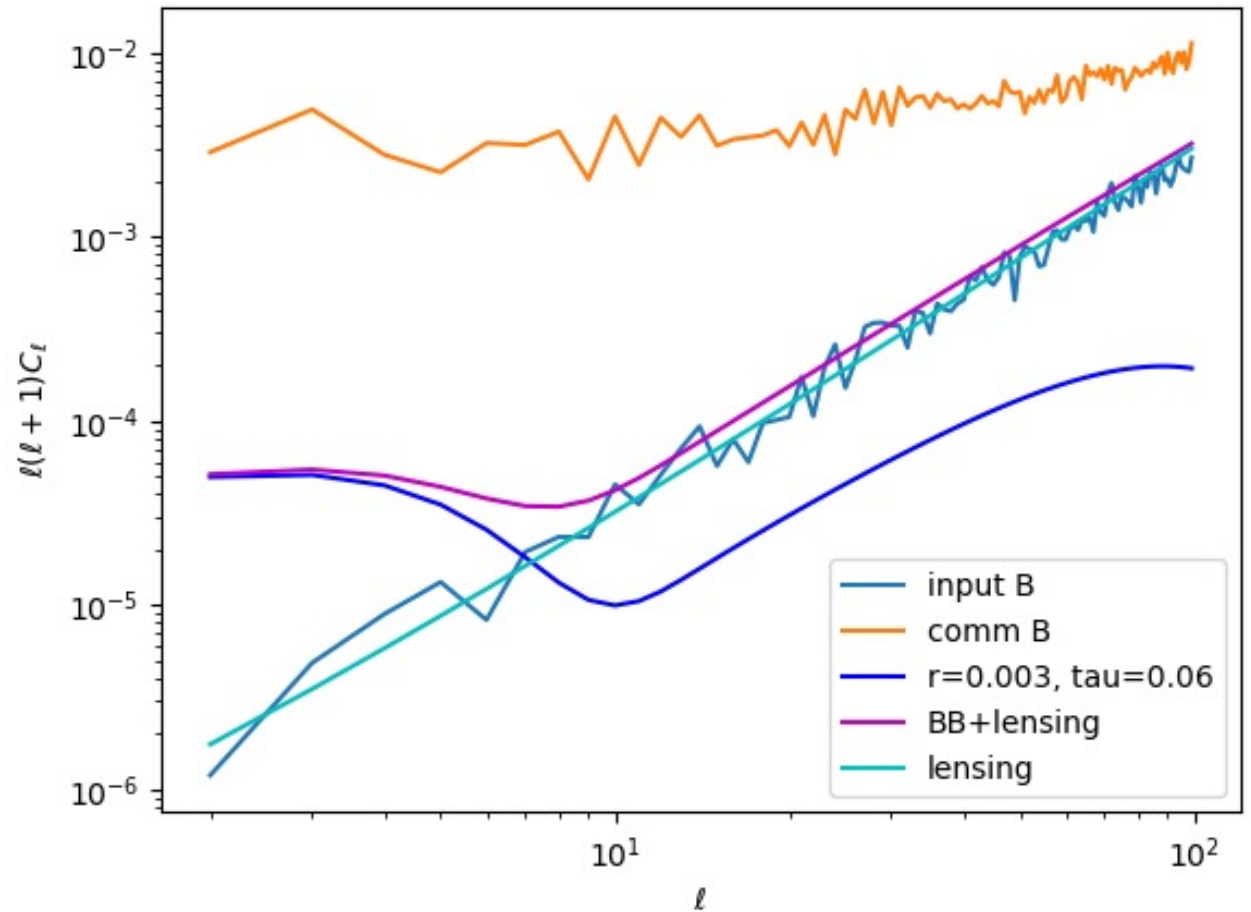
Difference map: CMB  
input – CMB output.  
Smoothed to a 5  
degree beam



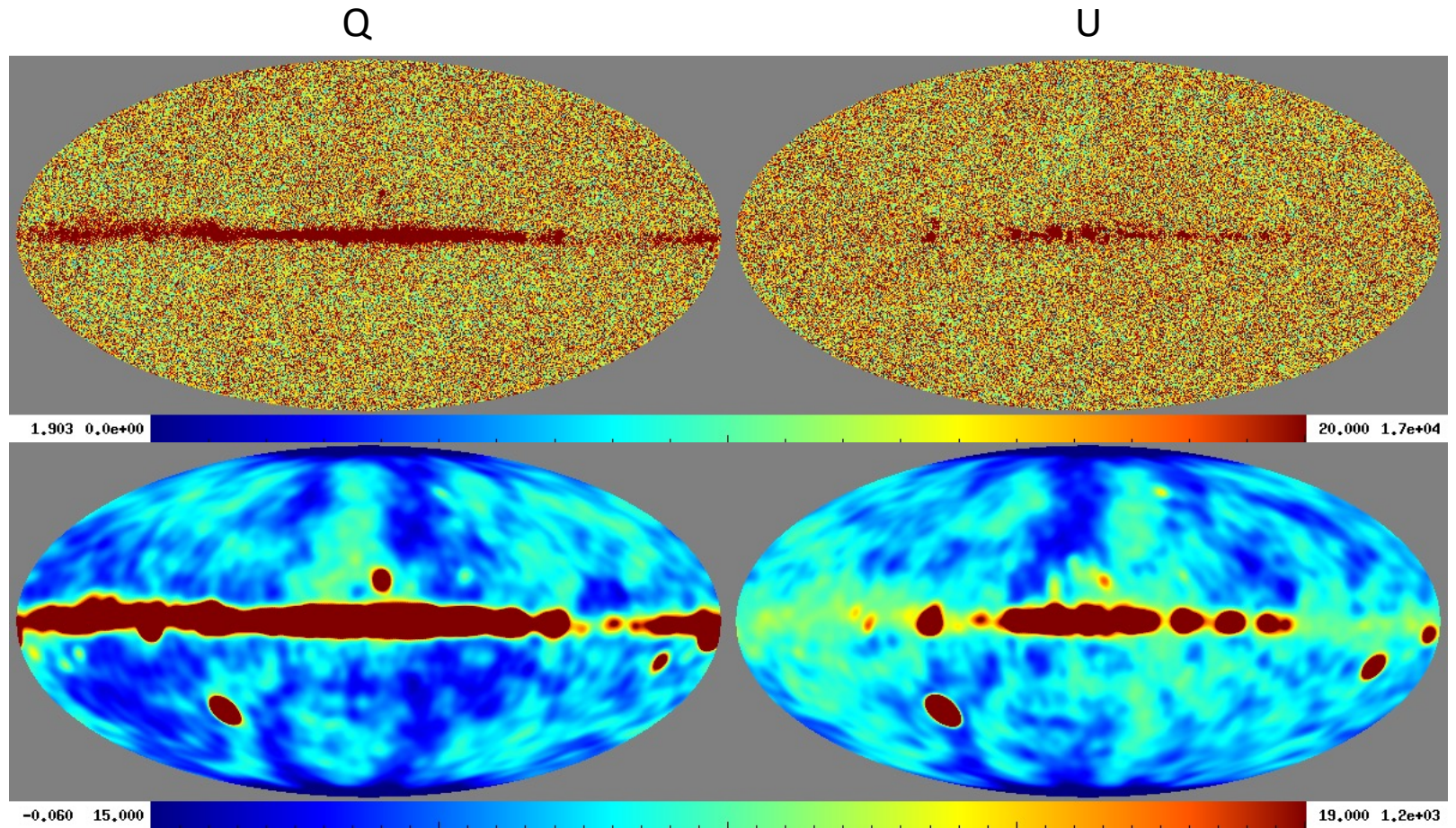
# Fitting 90.92 simulations without AME or synch C – Powerspectrum

Powerspectrum generated from unmasked CMB maps with  $r = 0.0$

- Orange: Output CMB map from Commander
- Light blue: Input CMB map used to generate simulation



Fitting 90.92  
simulations without  
AME or synch C  
- resulting  $\chi^2$  maps

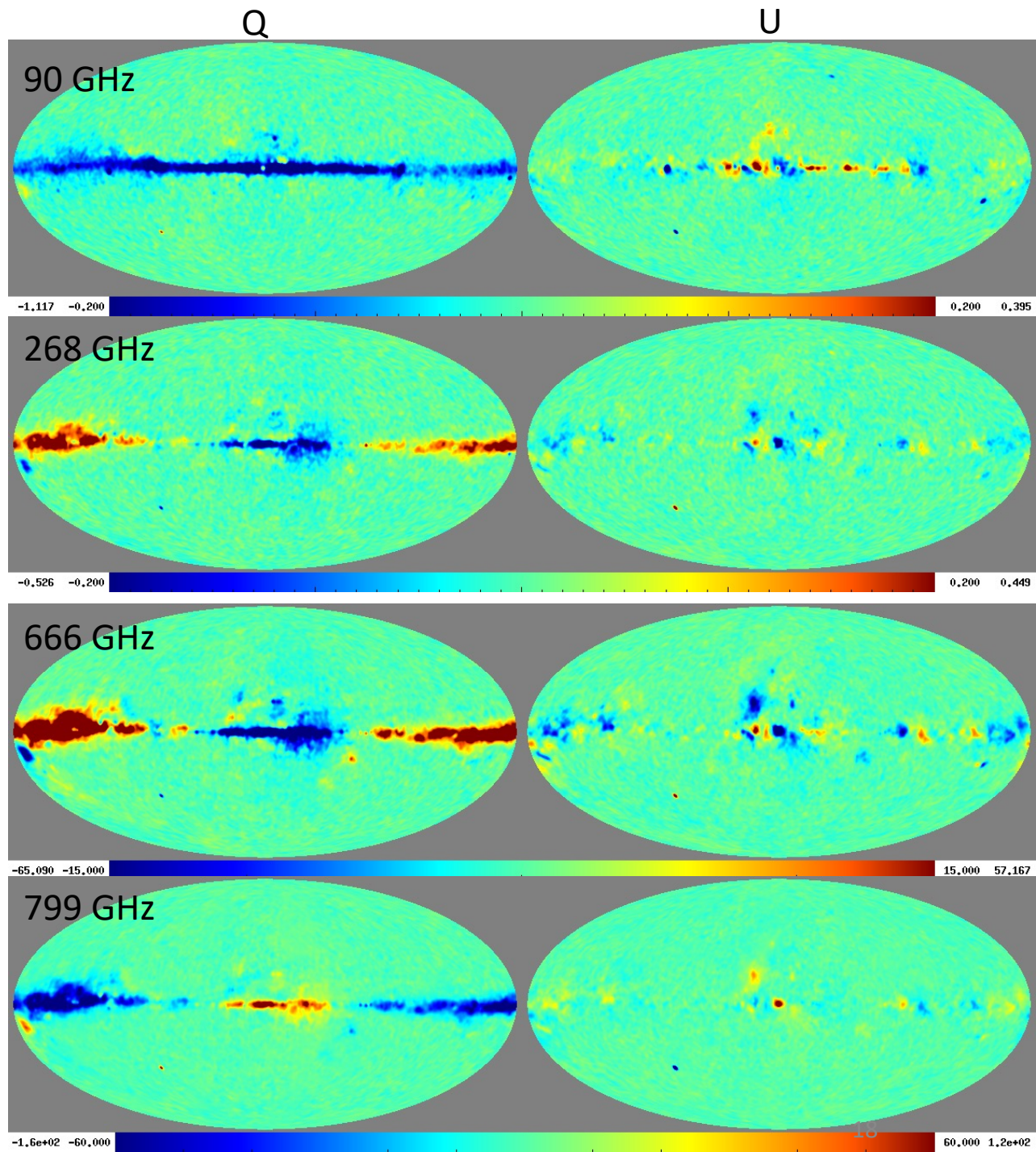
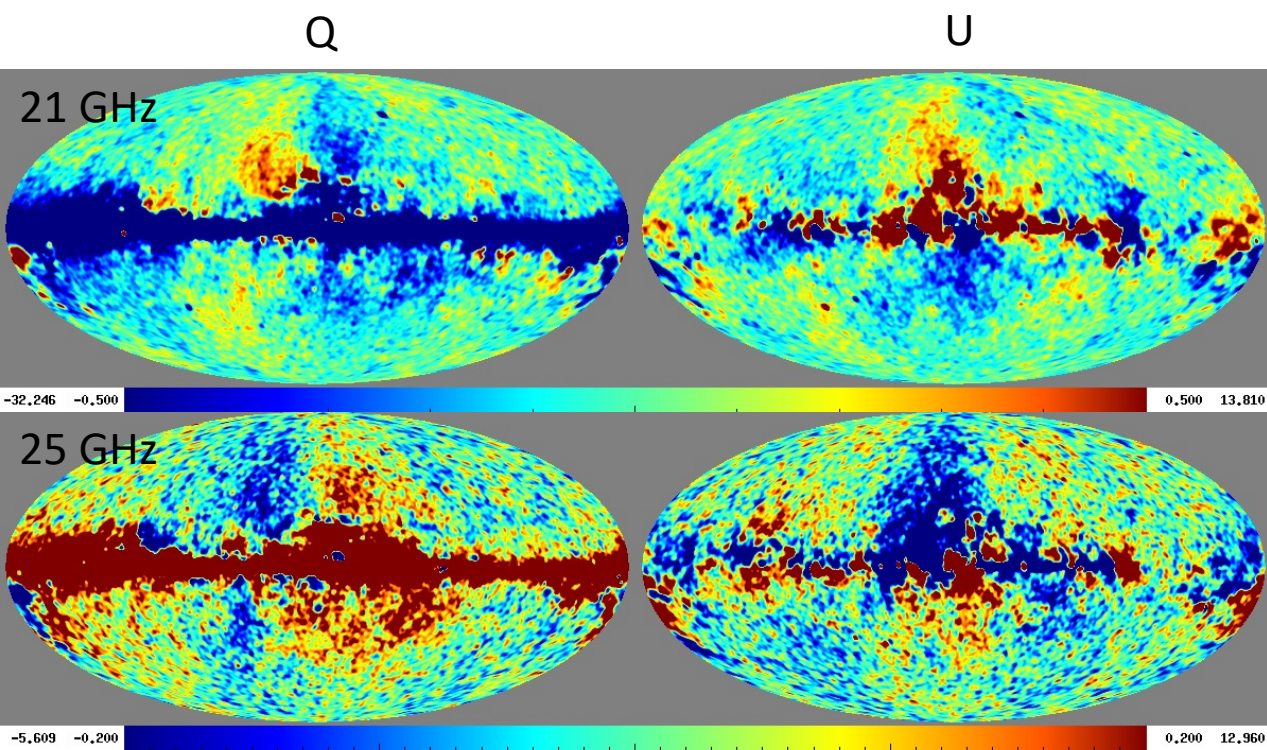


Smoothed to a  
5 degree beam

# Residual maps

(data – fitted signal)

The alternating pattern in the high frequency residuals is almost gone. Fitting 2 instead of 1 dust model gives a better fit.



# Residual maps

(data – fitted signal)

Fitting 2MBB + AME + synchrotron  
with curvature to 90.92 simulations.  
(Fitting correct model)

Not fully  
converged yet

