MANCHESTER 1824

The University of Manchester

WMAP template fitting with 2.3GHz data

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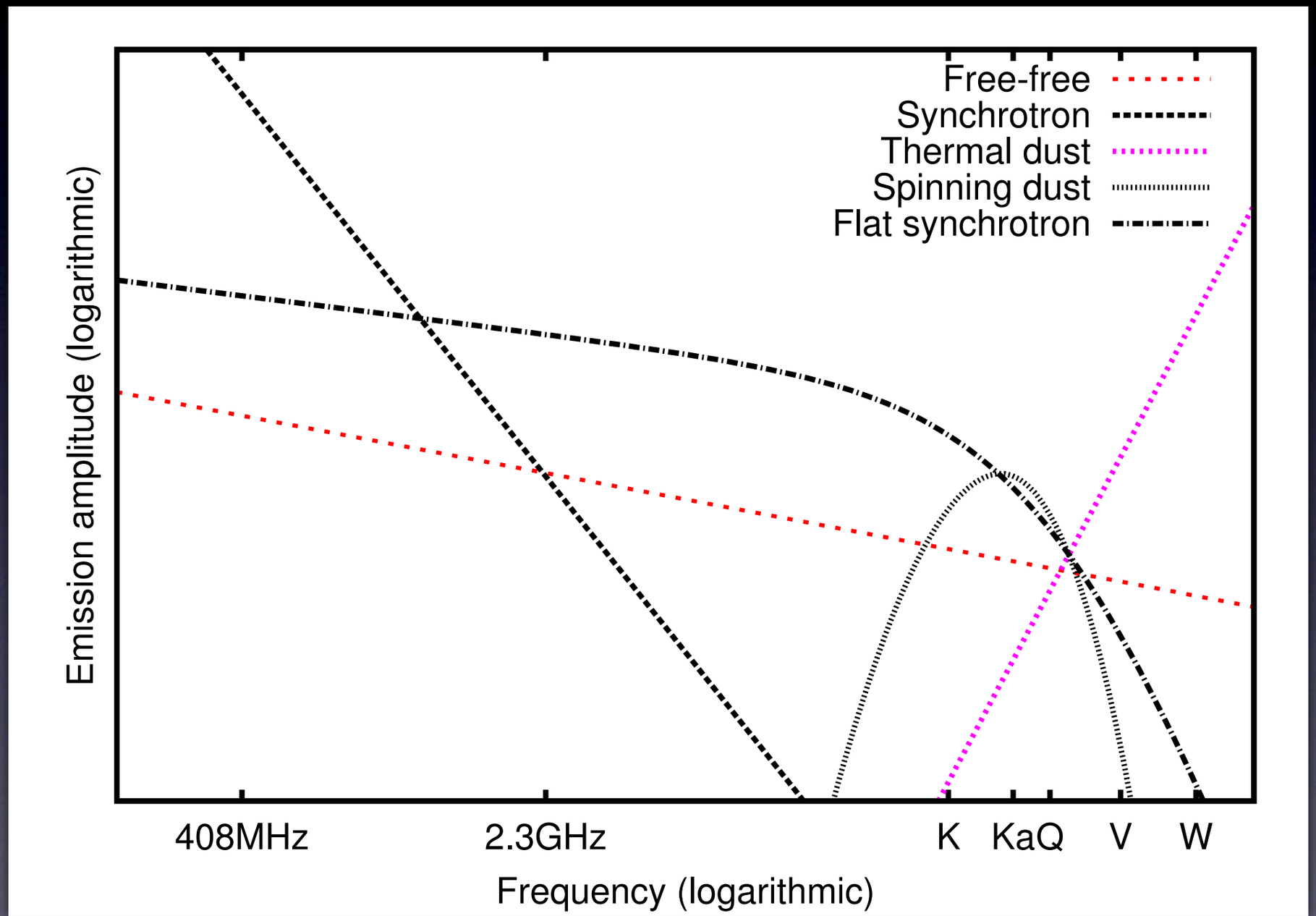
Overview

- Motivation
- Data and method
- Basic results and robustness
- Results in specific regions
- Cross-correlations
- Conclusions and future work

Motivation

- Can diffuse AME be explained with flat spectrum synchrotron emission (as suggested by WMAP/Bennet et al.)?
- How much flat spectrum sync is there?
- Is it in the same locations that AME has been detected?

Motivation

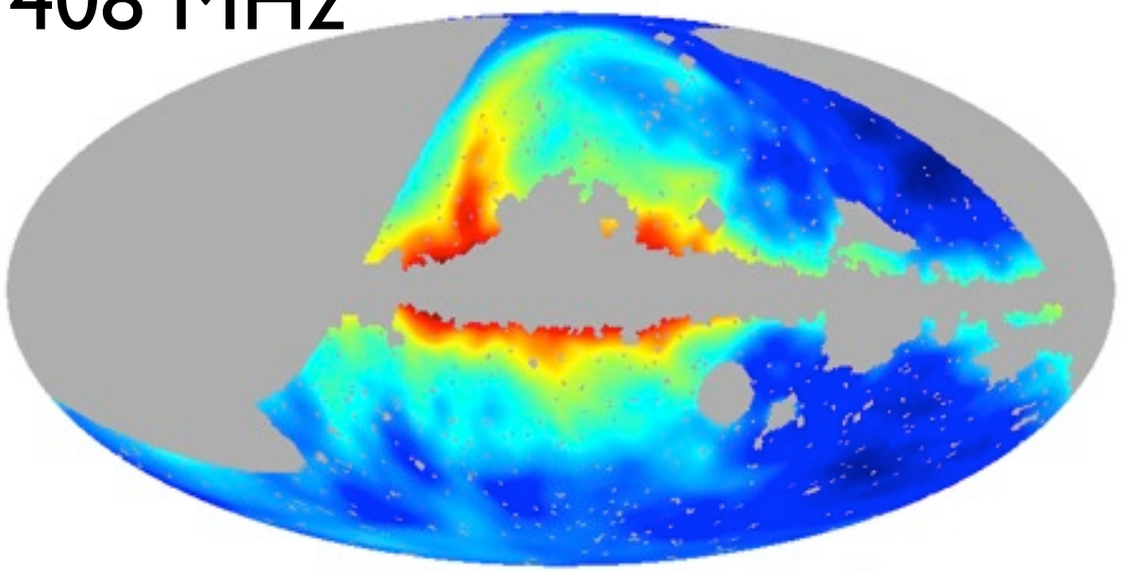

Free-free
Synchrotron
Thermal dust
Spinning dust
Flat synchrotron
Emission amplitude (logarithmic)
408MHz
2.3GHz
K
KaQ
V
W
Frequency (logarithmic)

Data

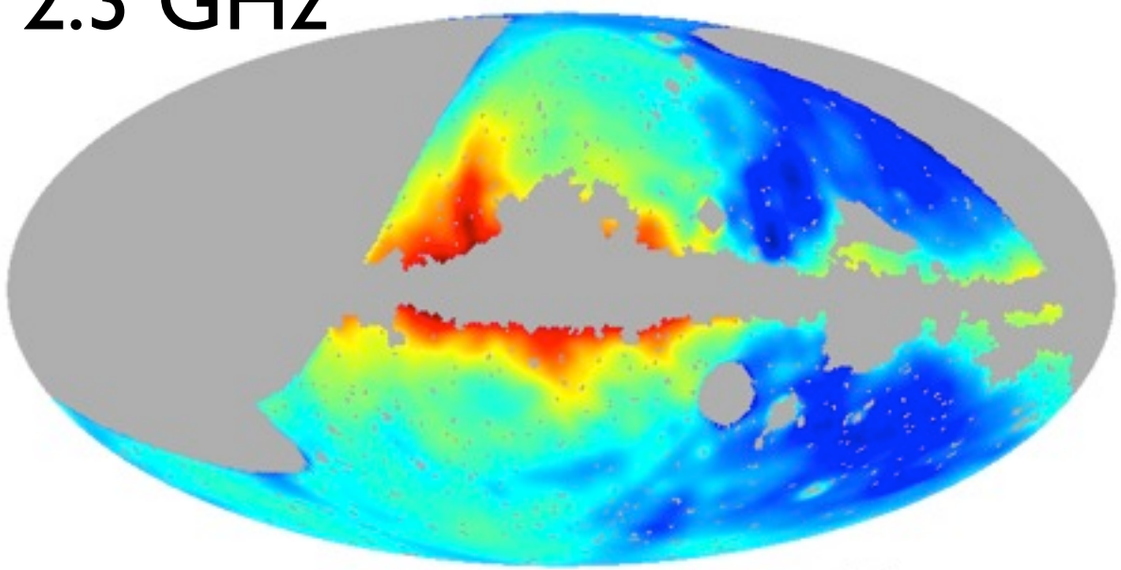
- Sync: Haslam 408MHz, Jonas 2.3GHz
- Hα: Finkbeiner (2003), DDD (2003)
- Dust: Finkbeiner et al. (1999) model at 94GHz
- Correlating with WMAP 7-year data
- All smoothed to 3° and N_{side}=64
- Mask determined by 2.3GHz data + plane

Data

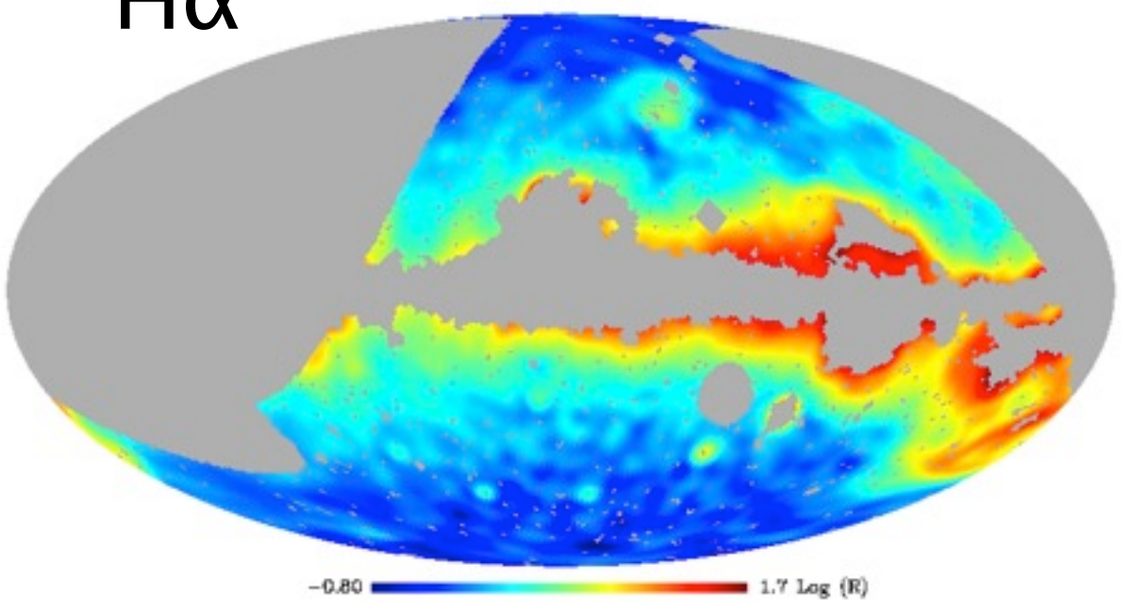
408 MHz



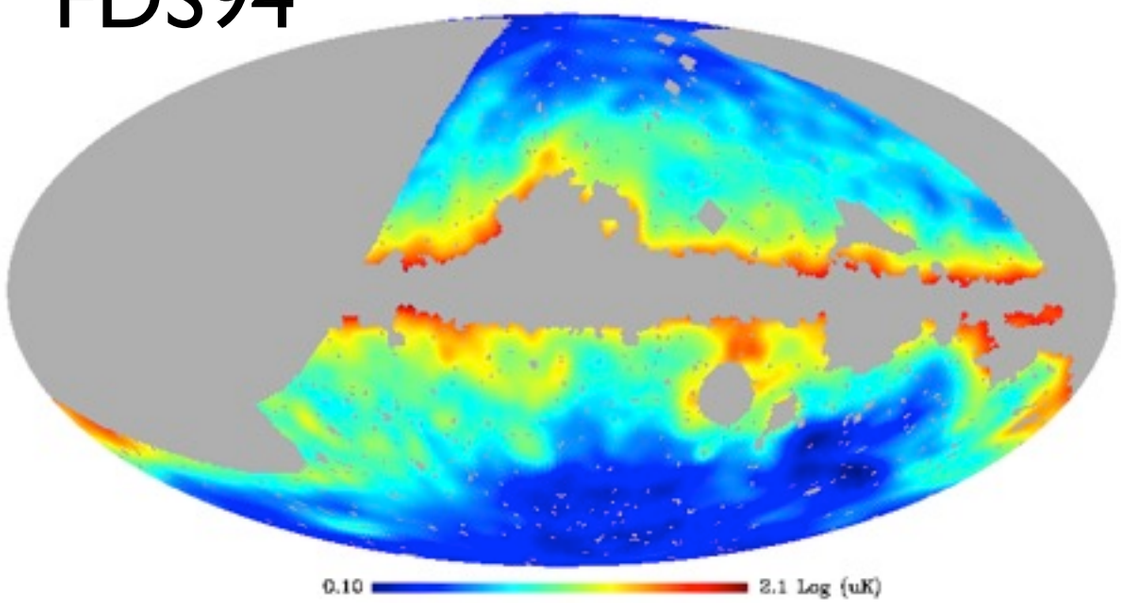
2.3 GHz



Hα



FDS94

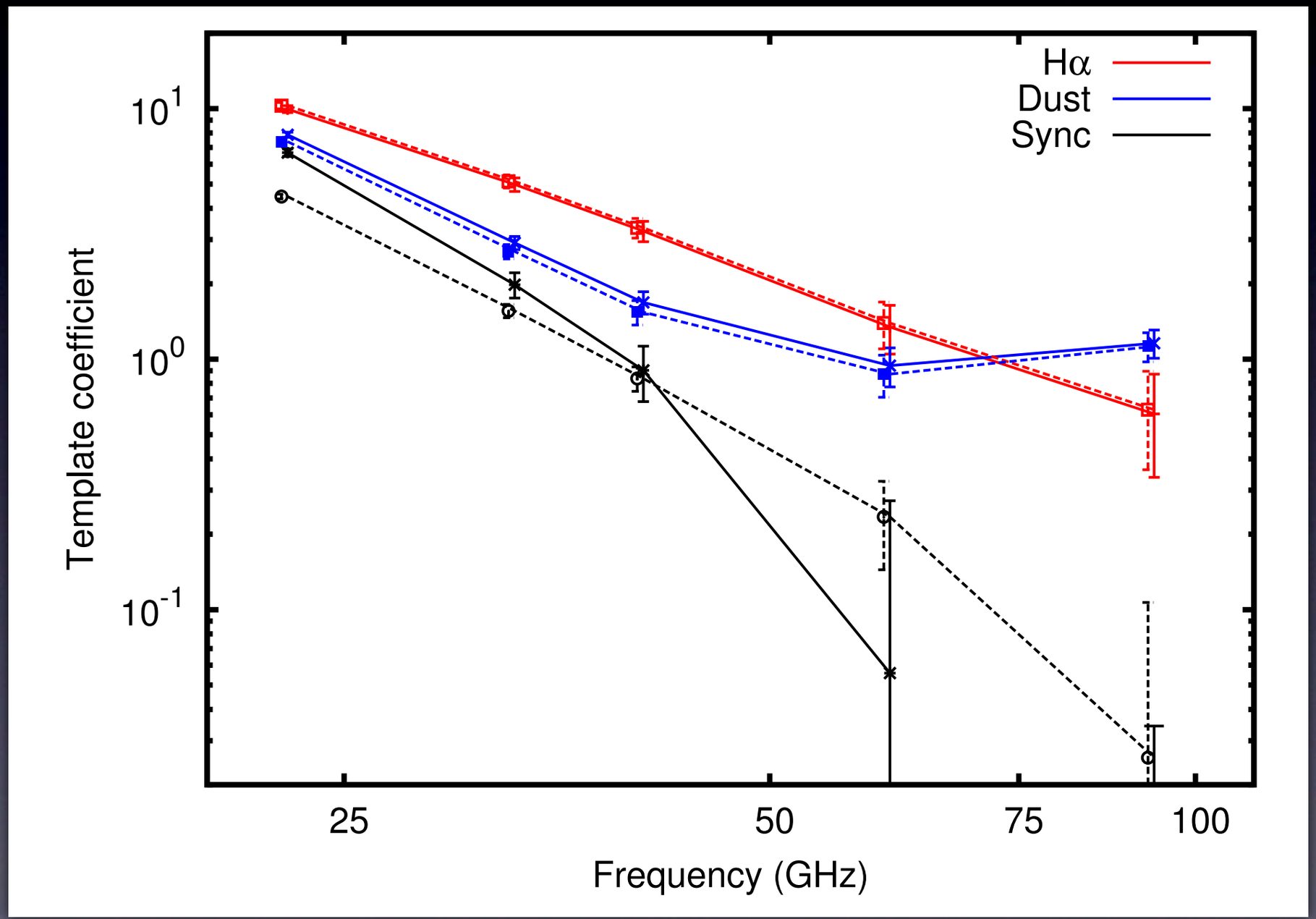


Method

- Cross-correlate templates with WMAP data
- Minimize χ^2 via least-squares fitting
- Use full covariance matrix for uncertainties

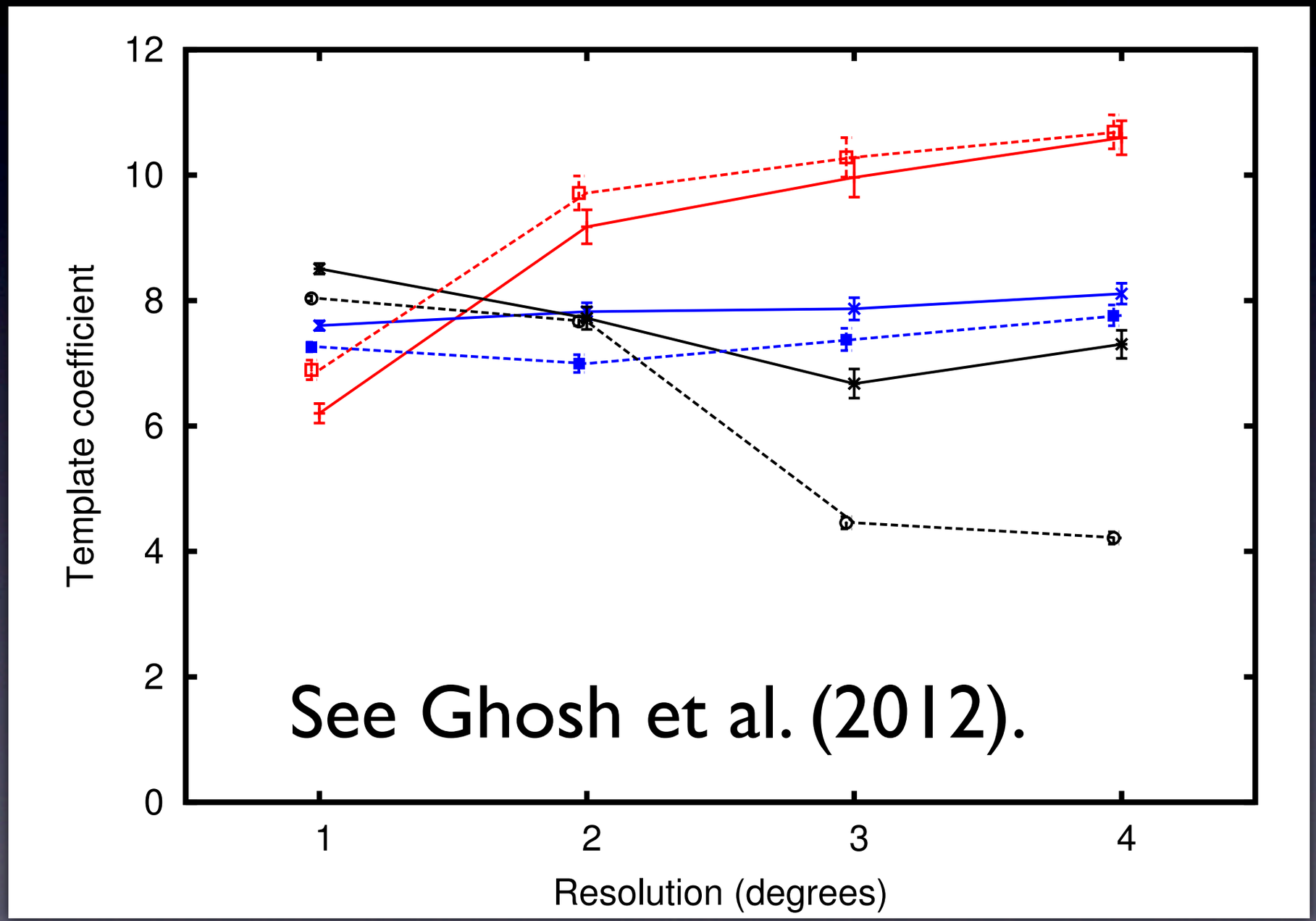
- CMB taken into account statistically using WMAP-7 best-fit theoretical spectrum (CMB dominates the uncertainties)
- NB: maps are significantly correlated with each other due to large-scale structures.

Nominal results



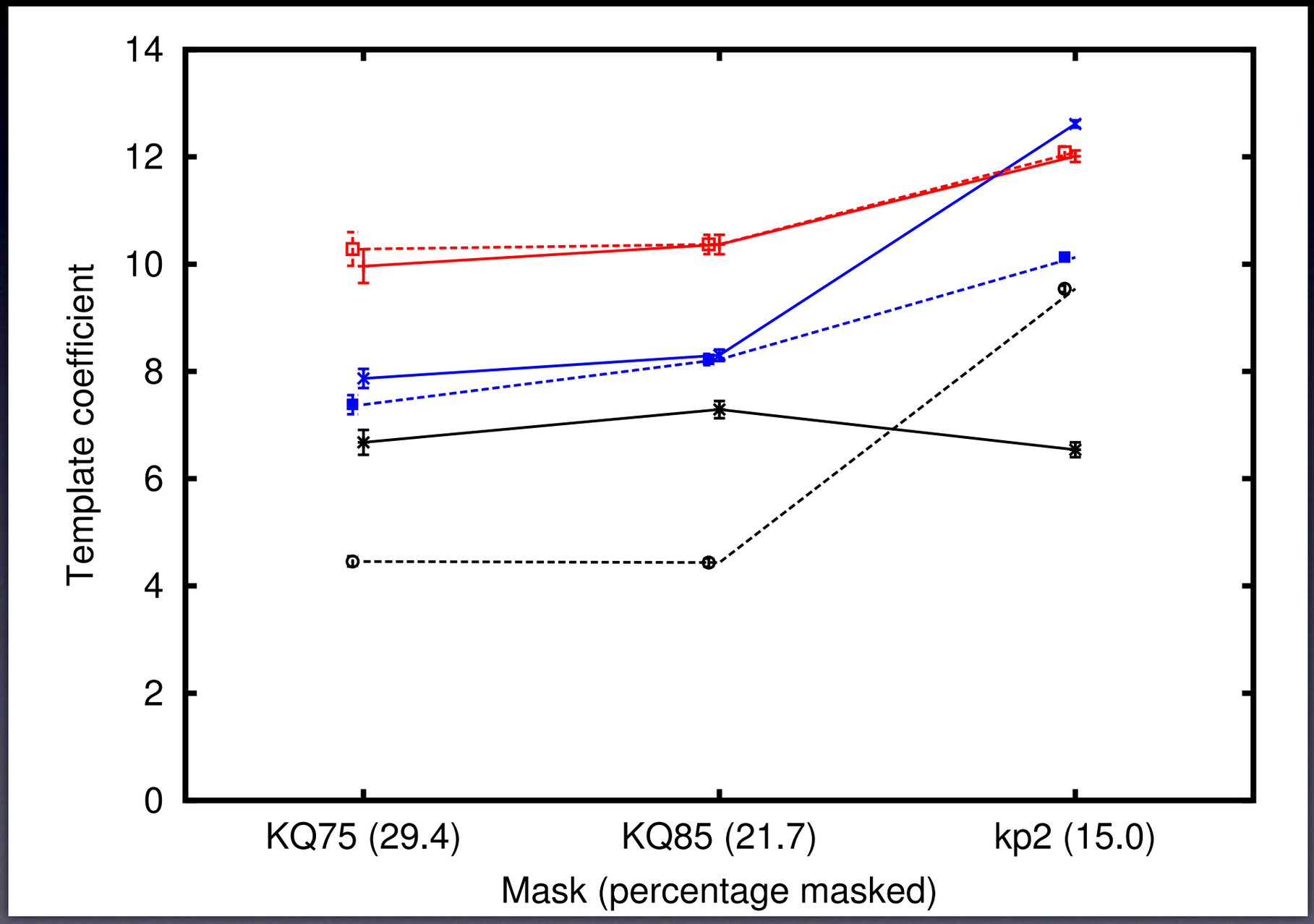
2.3GHz rescaled by 5.4 (assuming an index of -3.0)

Robustness



(22.8GHz, black sync, red free-free, blue dust)

Robustness



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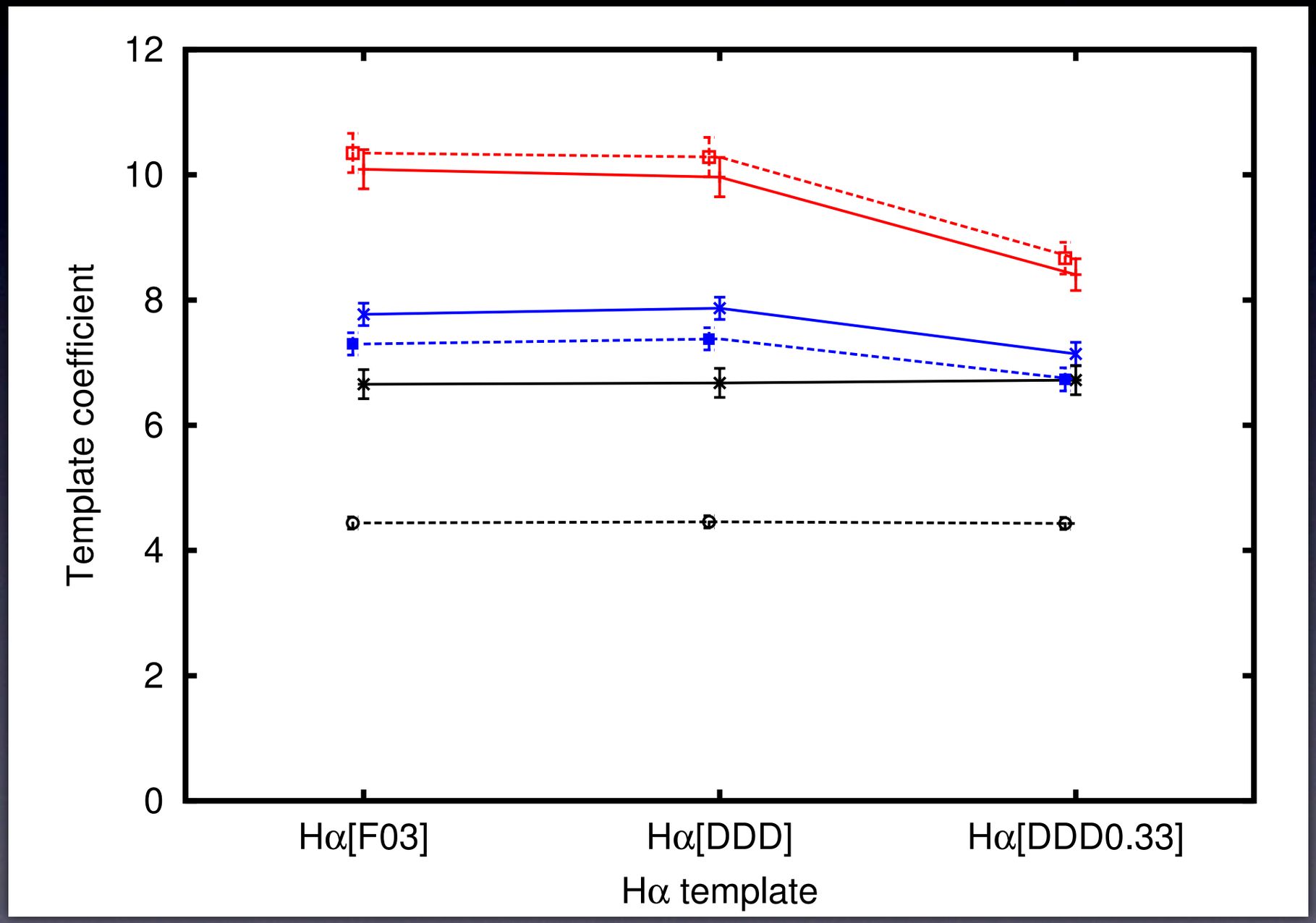
Robustness



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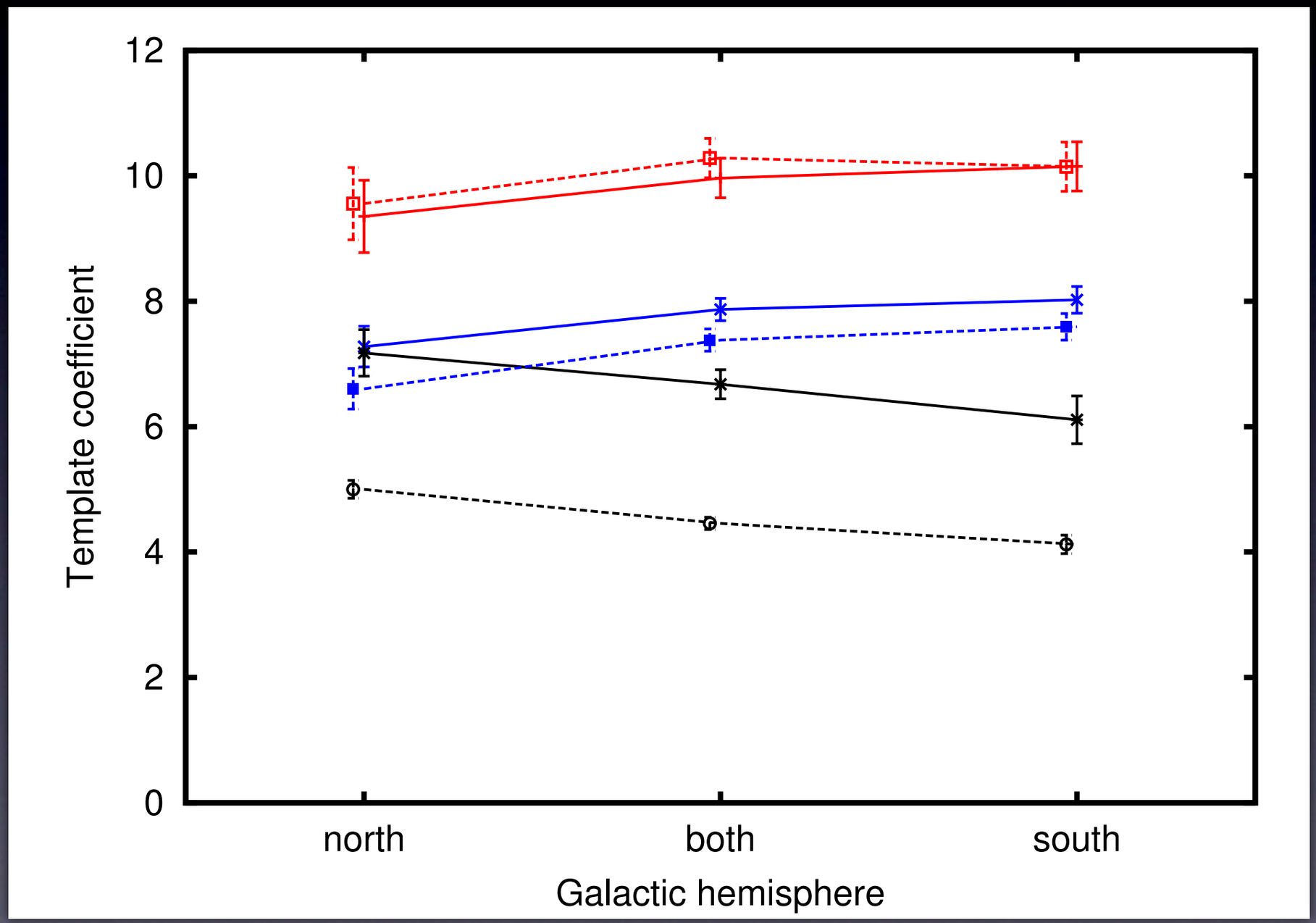
Robustness



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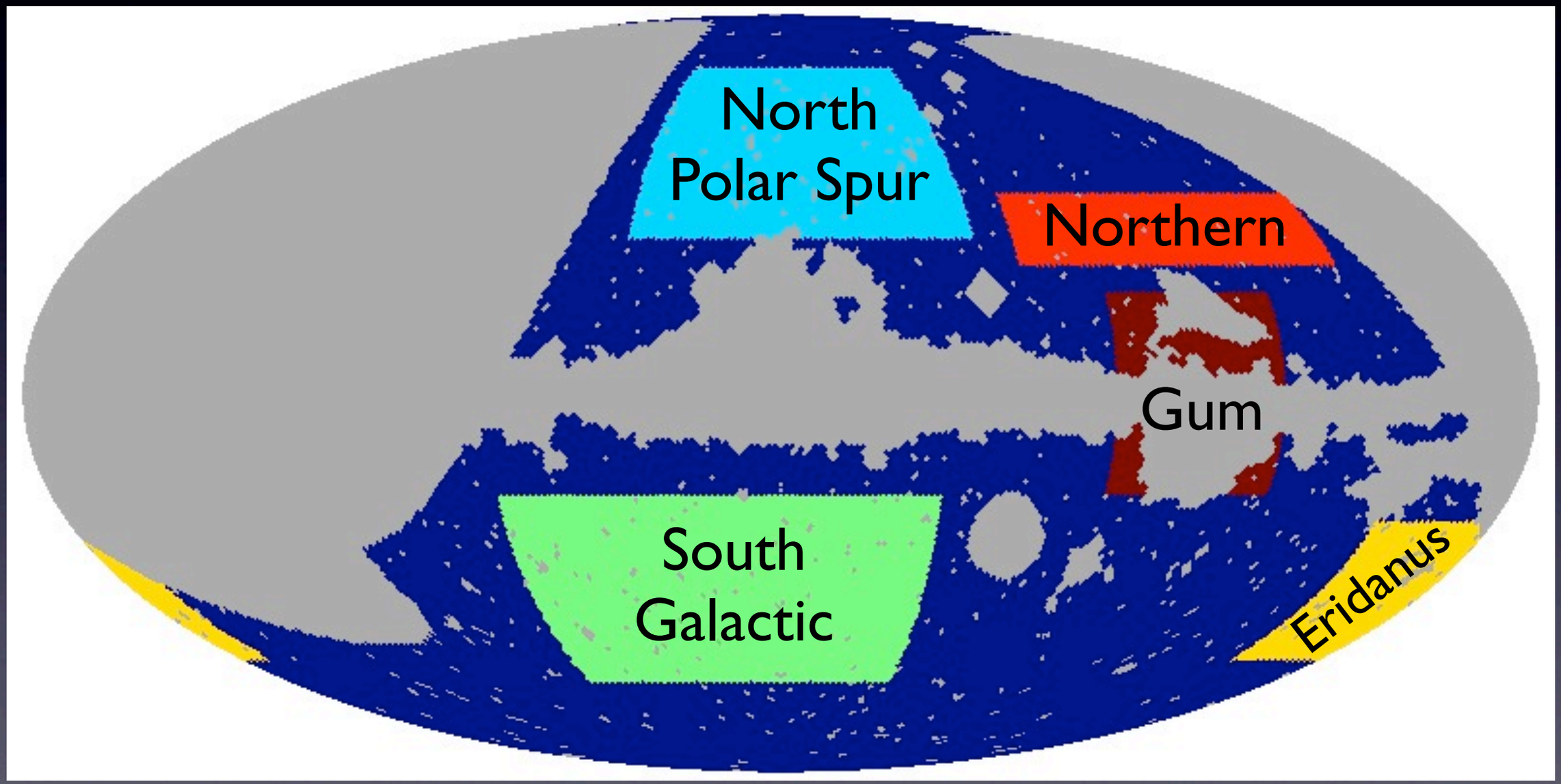
Regions



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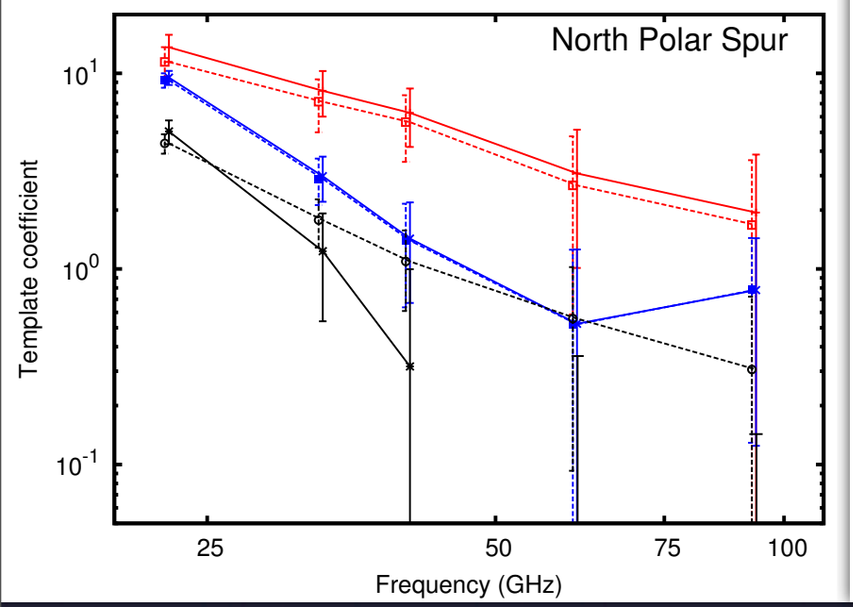
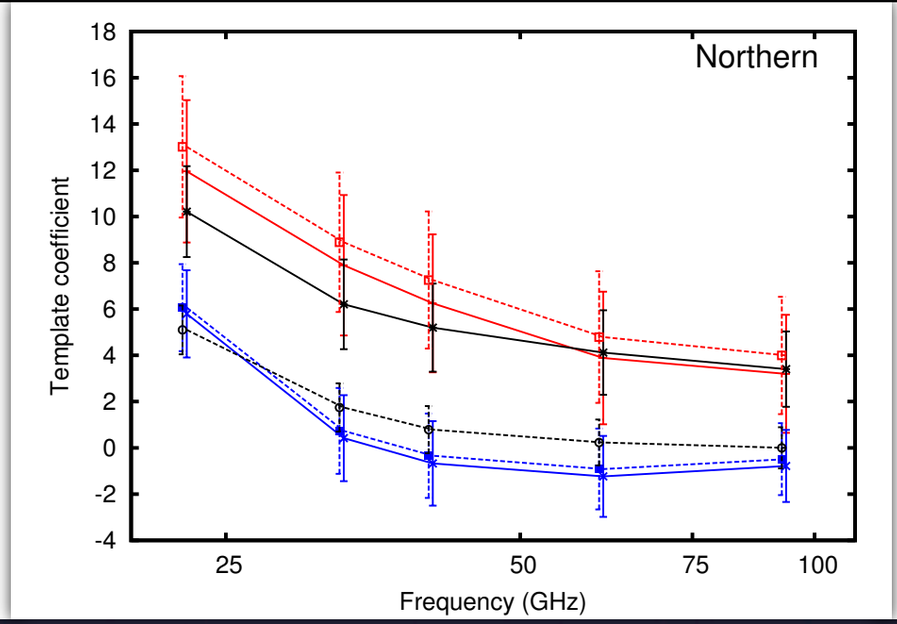
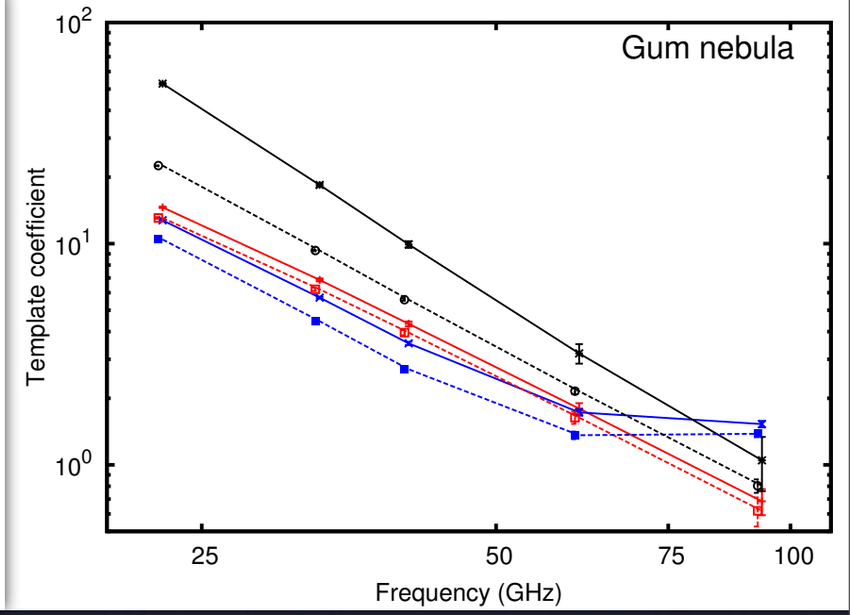
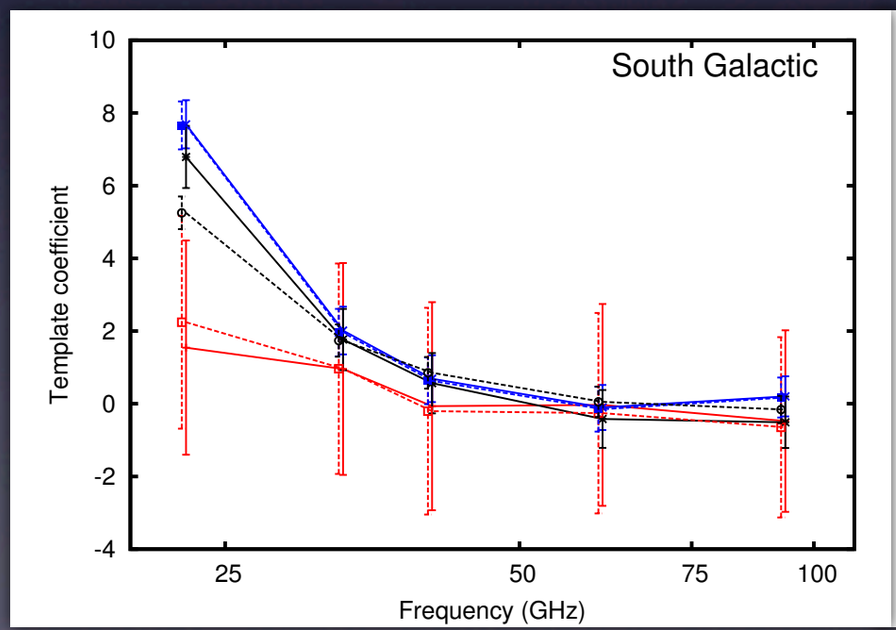
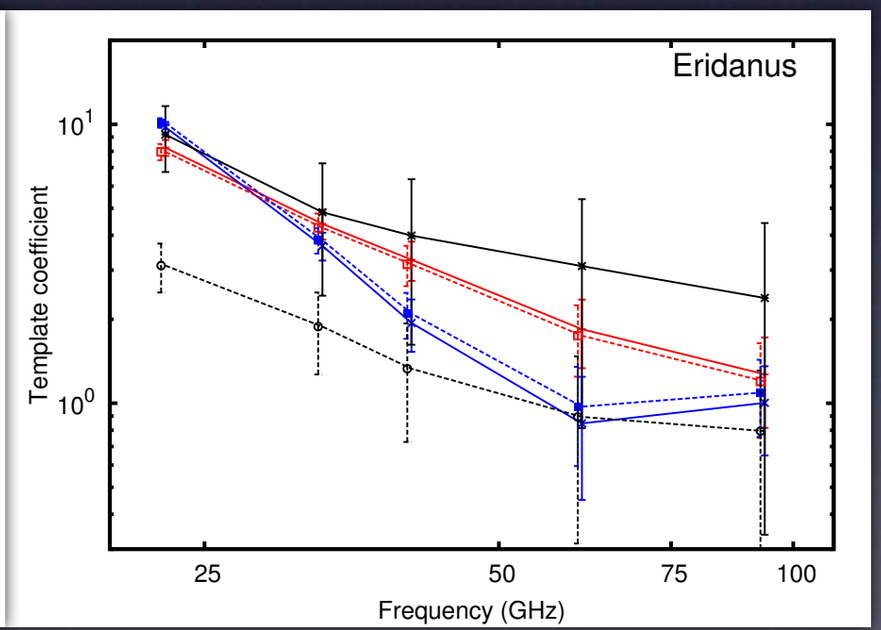










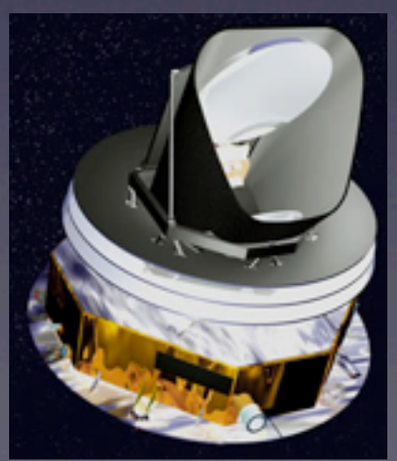
(black sync, red free-free, blue dust)

Conclusions

- Only a small amount of flattening synchrotron emission, particularly at high latitudes
- Dust correlated component only decreases by ~7% when using 2.3GHz rather than 408MHz (would have expected ~50% for flat sync)
- Agrees with expectations if most emission is from spinning dust grains

Future work

- Need more data!
- C-BASS 5GHz will better trace flat-spectrum synchrotron emission
- Planck LFI will provide additional measurements to constrain the spectra



Thanks for listening!

Questions?

For more info, see:
MNRAS (in press)
arXiv:1112.0432