



planck



HFi PLANCK  
a look back to the birth of Universe



# The Planck Sky Model (PSM)

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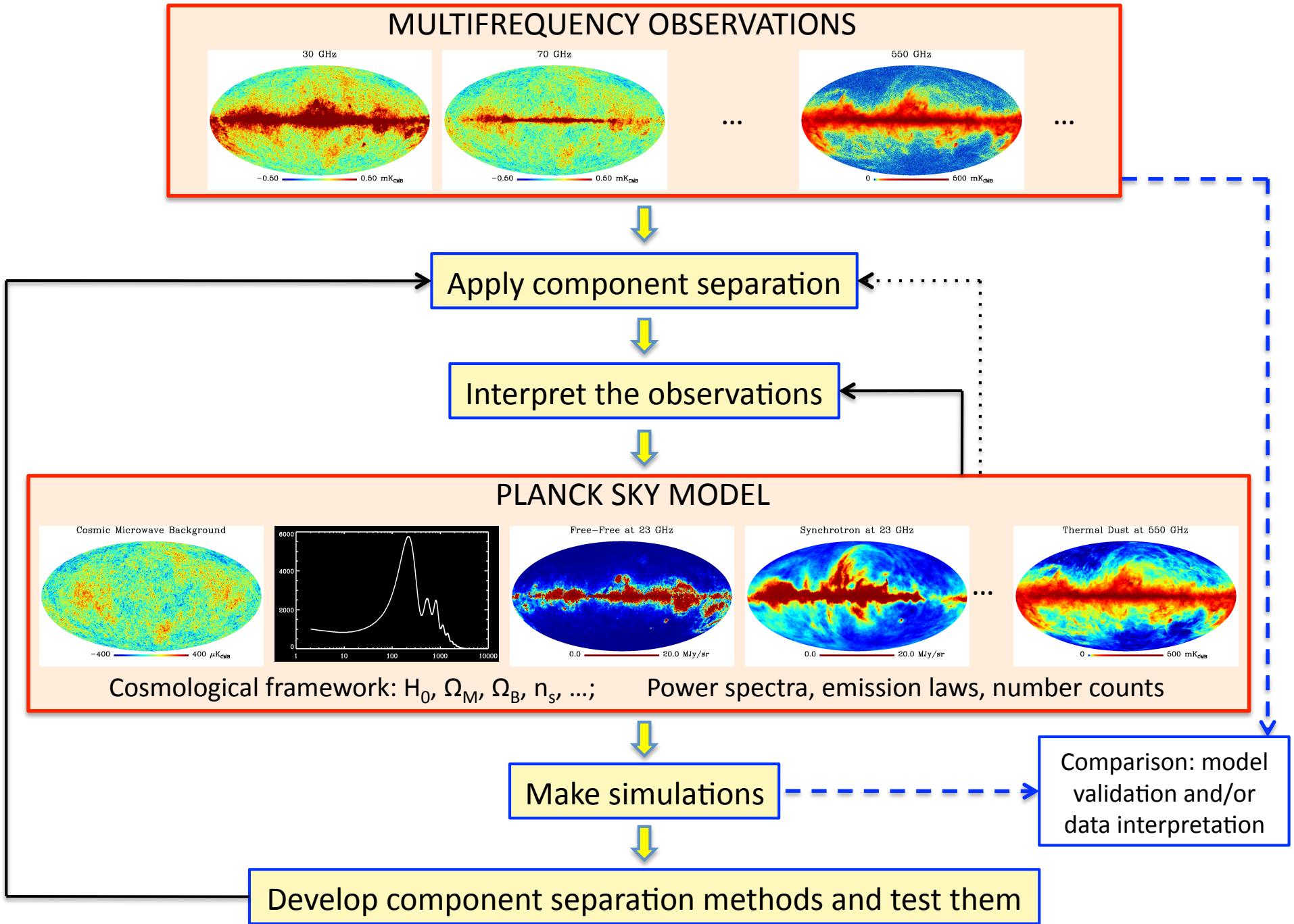
On behalf of the Planck Collaboration

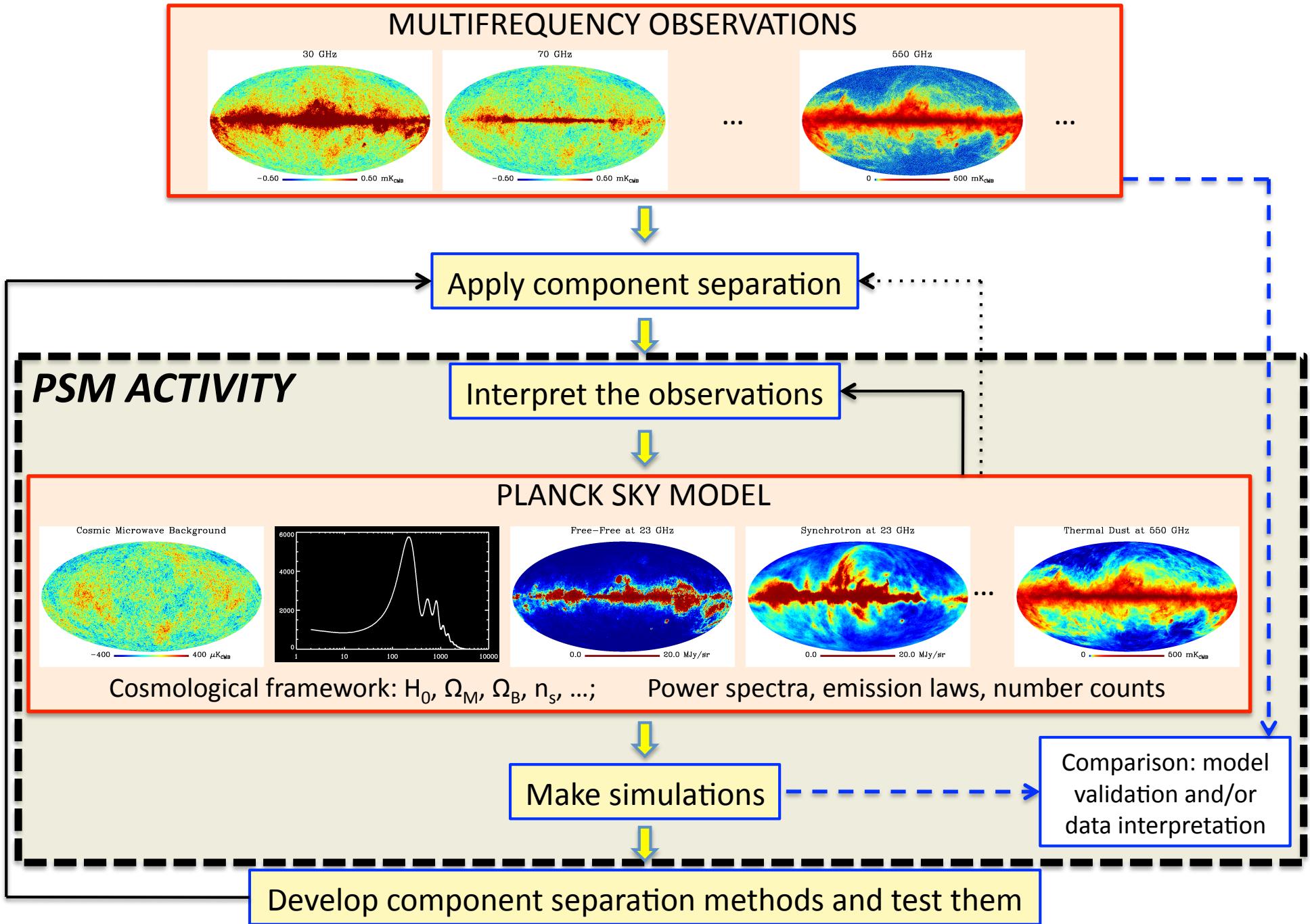


- General philosophy and objectives
- Implementation and status
- Summary

# A PSM wish list

- A multi-component model
- Perfect representation of the real sky ?
  - For each component, provide IQU( $\nu$ ,  $p$ ) at any frequency  $\nu$  and for any point  $p$  on the sky
  - Provide values parameters of interest (e.g. cosmological parameters, statistical properties, etc.)
  - Be compatible with all observations
- A tool for simulating sky emission and its observations
  - Statistically representative
  - Parametric





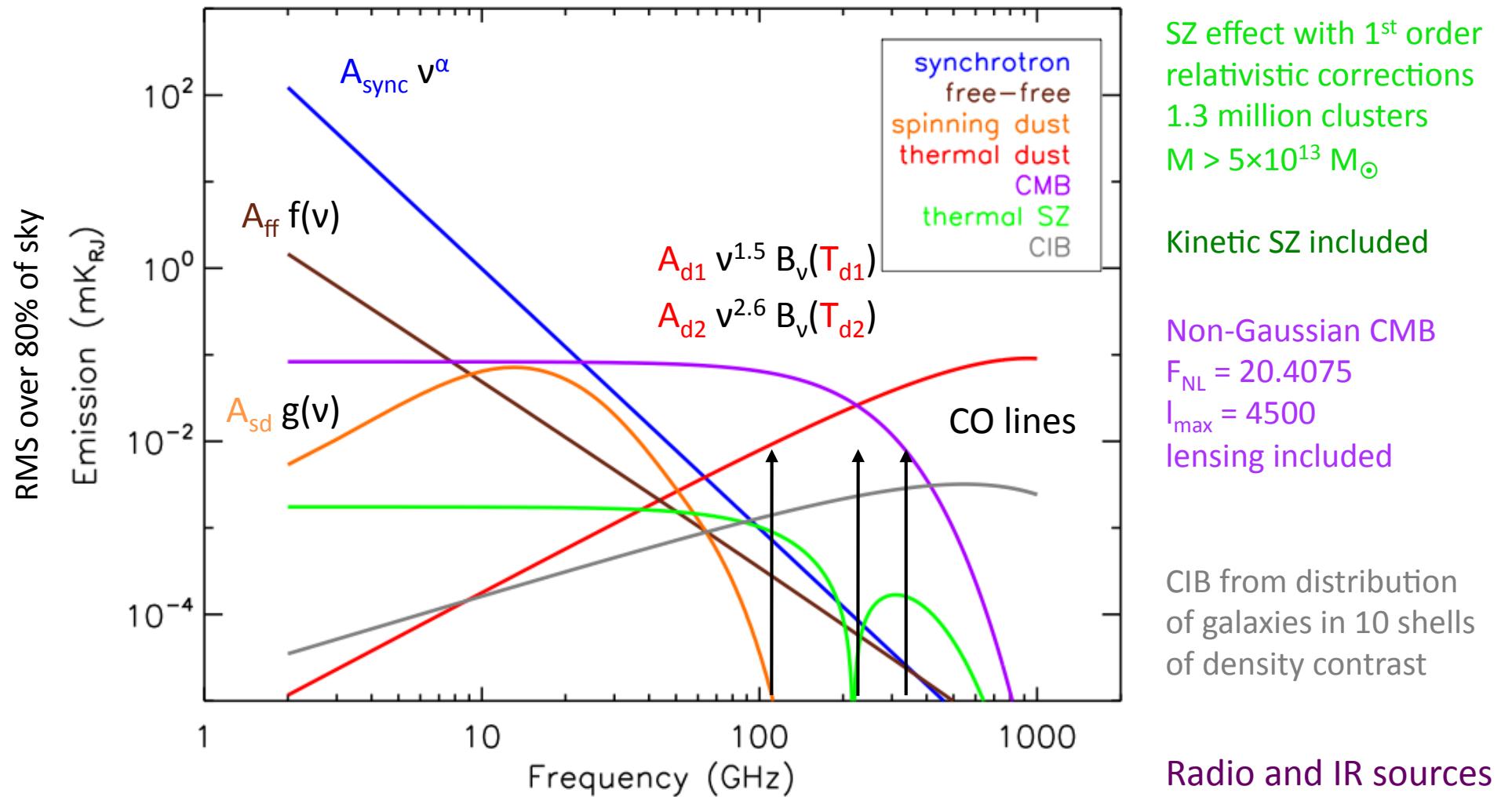
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# Components

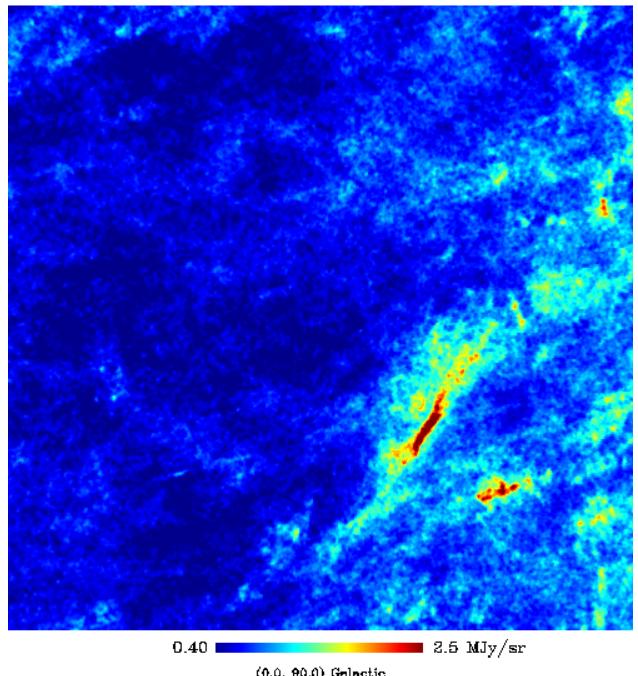
- Check PSM paper for details
  - *Delabrouille et al., A&A, in press, arXiv:1207.3675*
- Specific changes for FFP6:
  - Template emission for galactic dust at 100 microns obtained by scaling a de-sourced, filtered version of the Planck 857 GHz channel (from a previous internal release)
  - CIB emission

# Components in FFP6 simulations

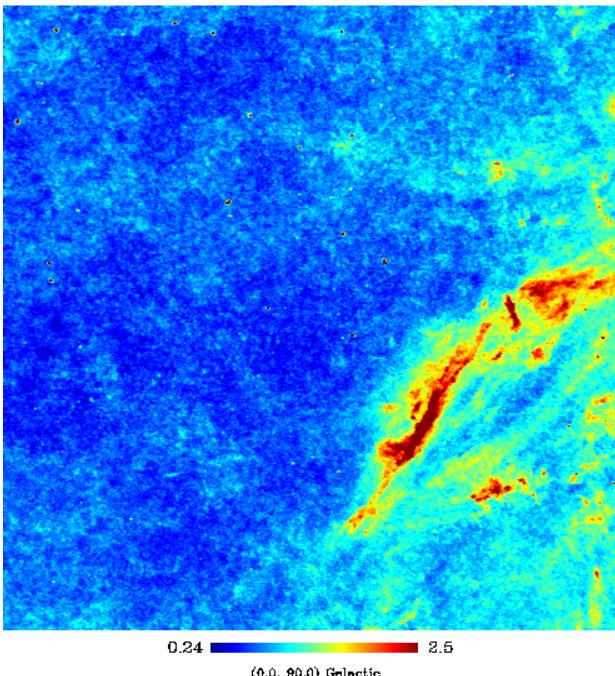


# Thermal dust at 857 GHz

FROM SFD model

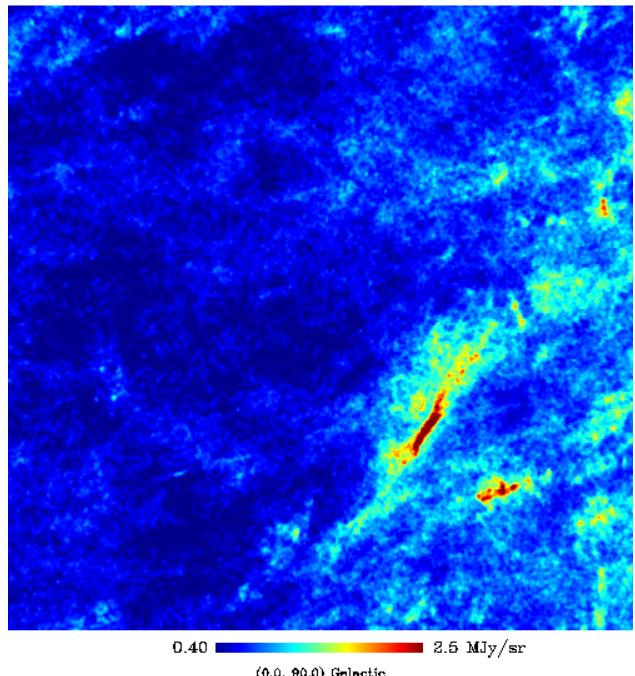


Planck map

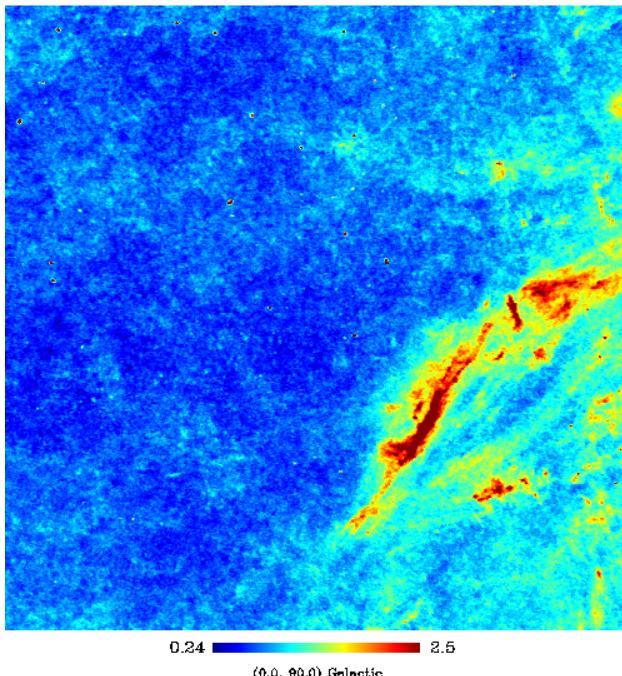


# Thermal dust at 857 GHz

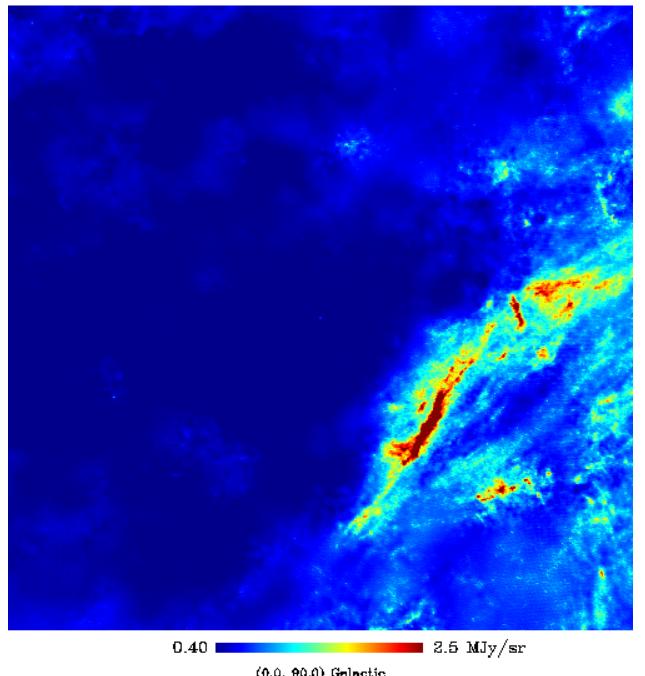
FROM SFD model



Planck map

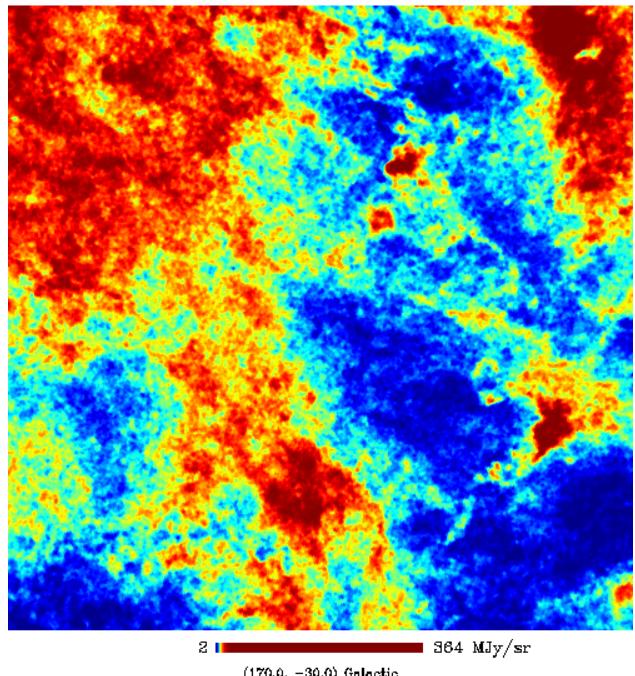


FFP6

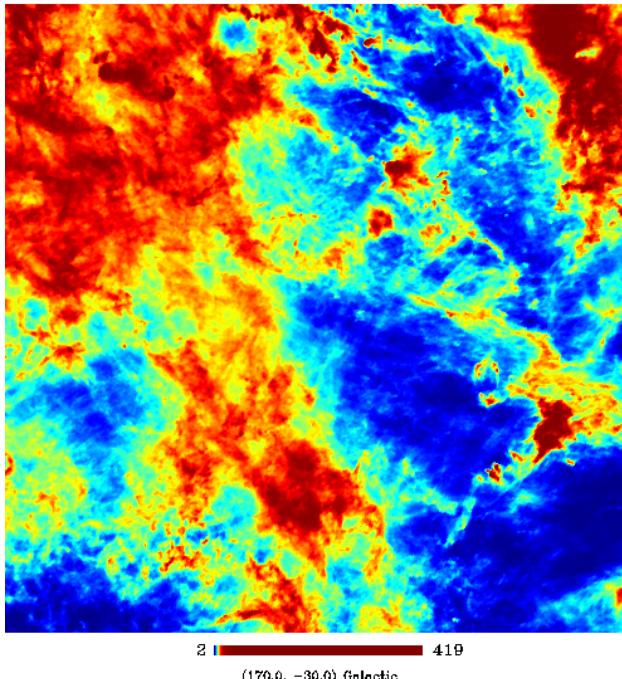


# Thermal dust at 857 GHz

FROM SFD model



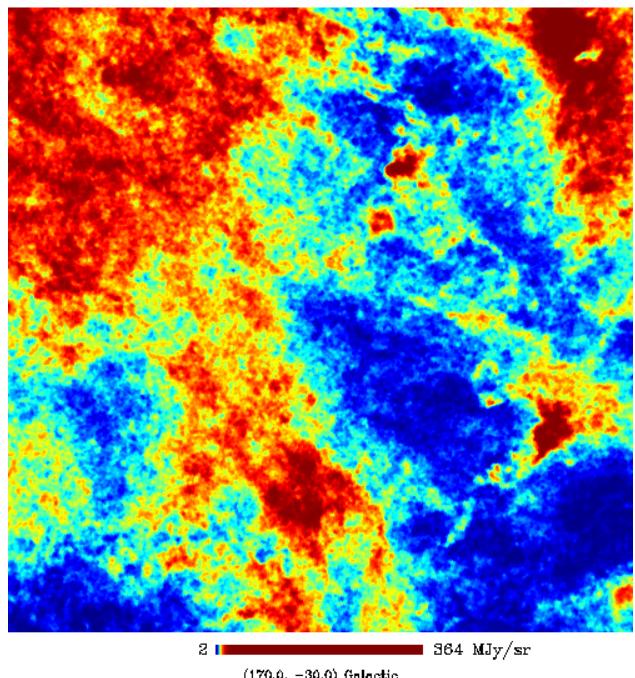
Planck map



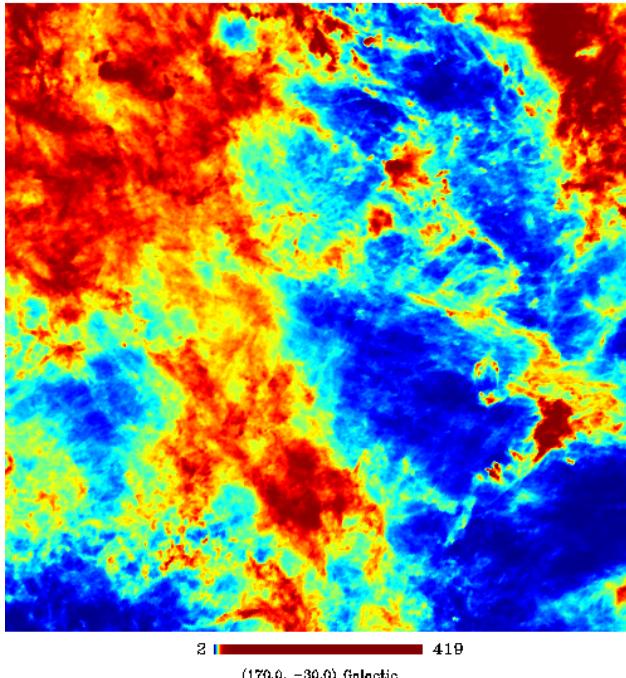
Gaussian small scale fluctuations added  
to 9' SFD map...

# Thermal dust at 857 GHz

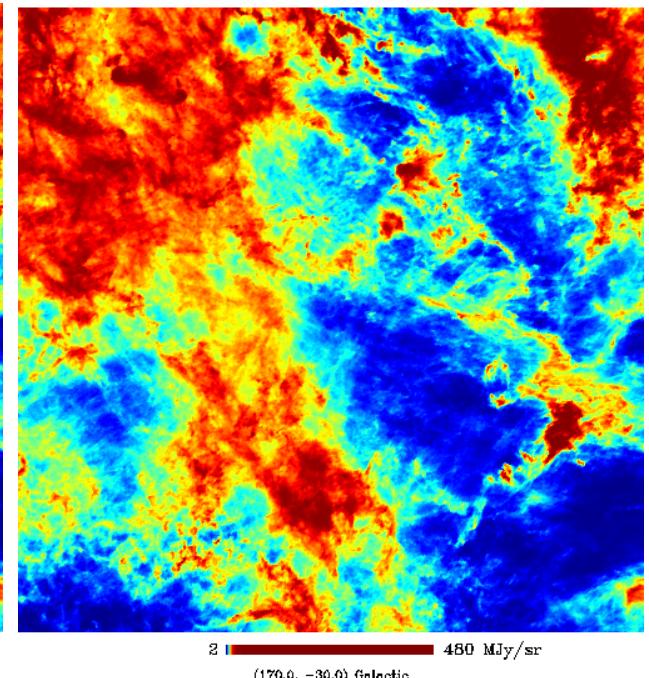
FROM SFD model



Planck map



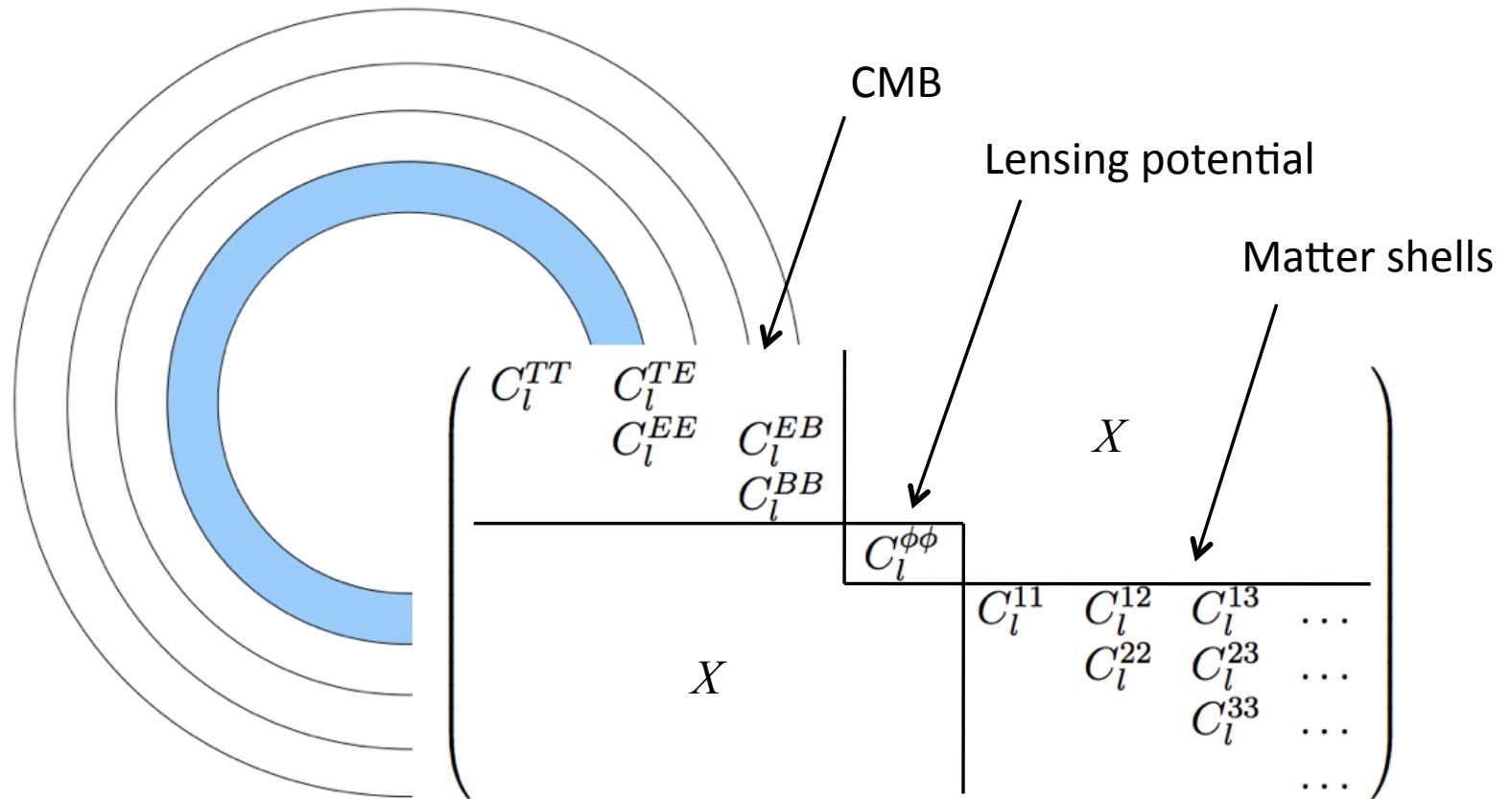
FFP6



# CIB: Cosmological framework

- Standard cosmology ( $h, \Omega_m, \Omega_b, \Lambda, A_s, n_s, \tau, r, \dots$ )
- CAMB and CLASS interfaced to compute CMB  $C_l$  and matter  $P_k(z)$
- The cosmological model is used consistently for modeling CMB, cluster counts, velocity flows, shells of density contrast used for the CIB)

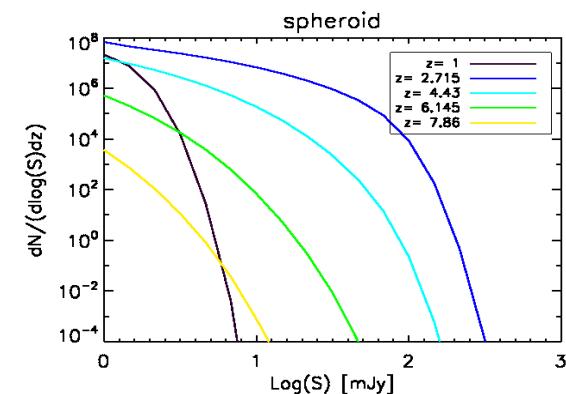
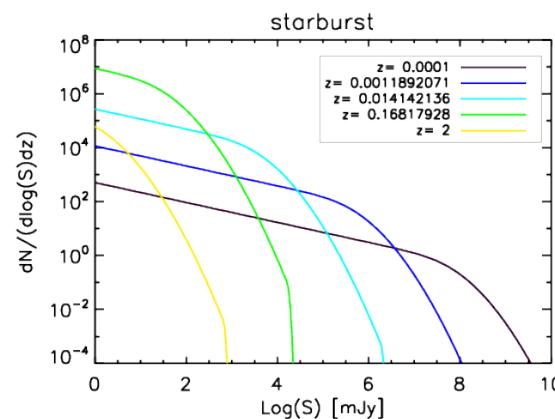
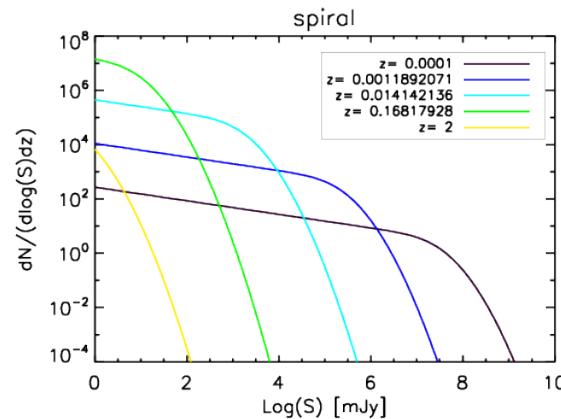
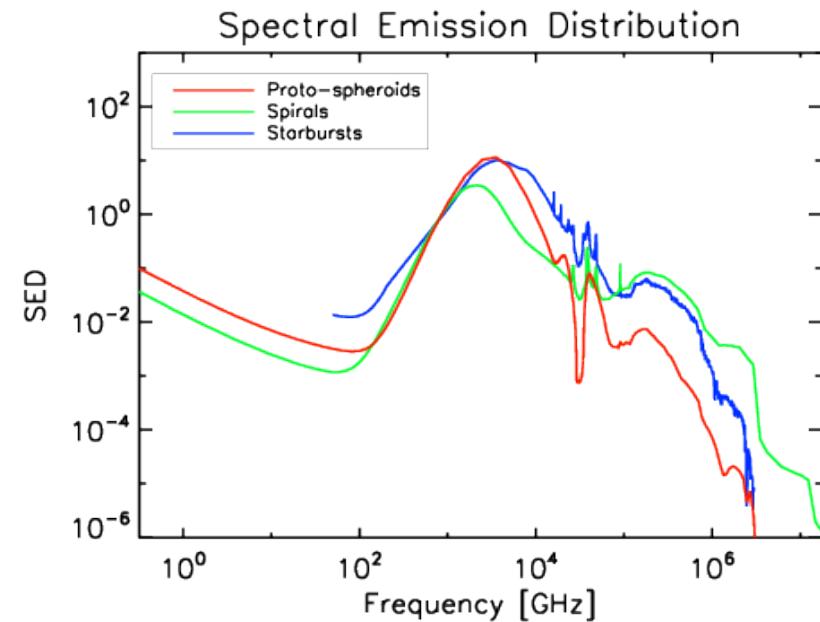
# Shells of density contrast



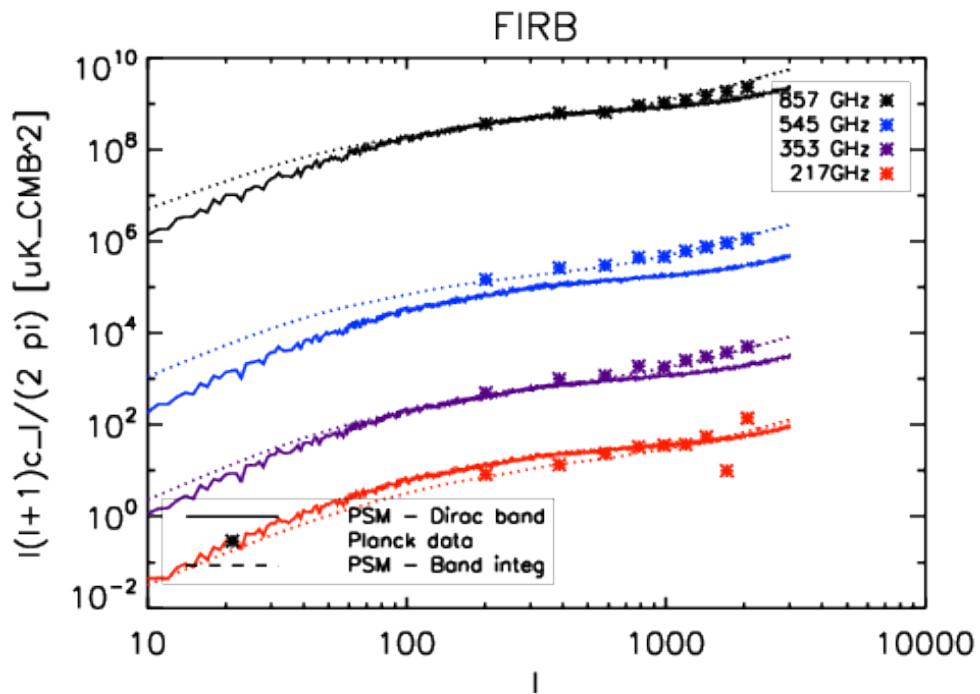
# CIB galaxies

Shells are populated with galaxies on the basis of number counts.

Probability distribution according to local  $\delta\rho/\rho$  (with a prescription for bias)



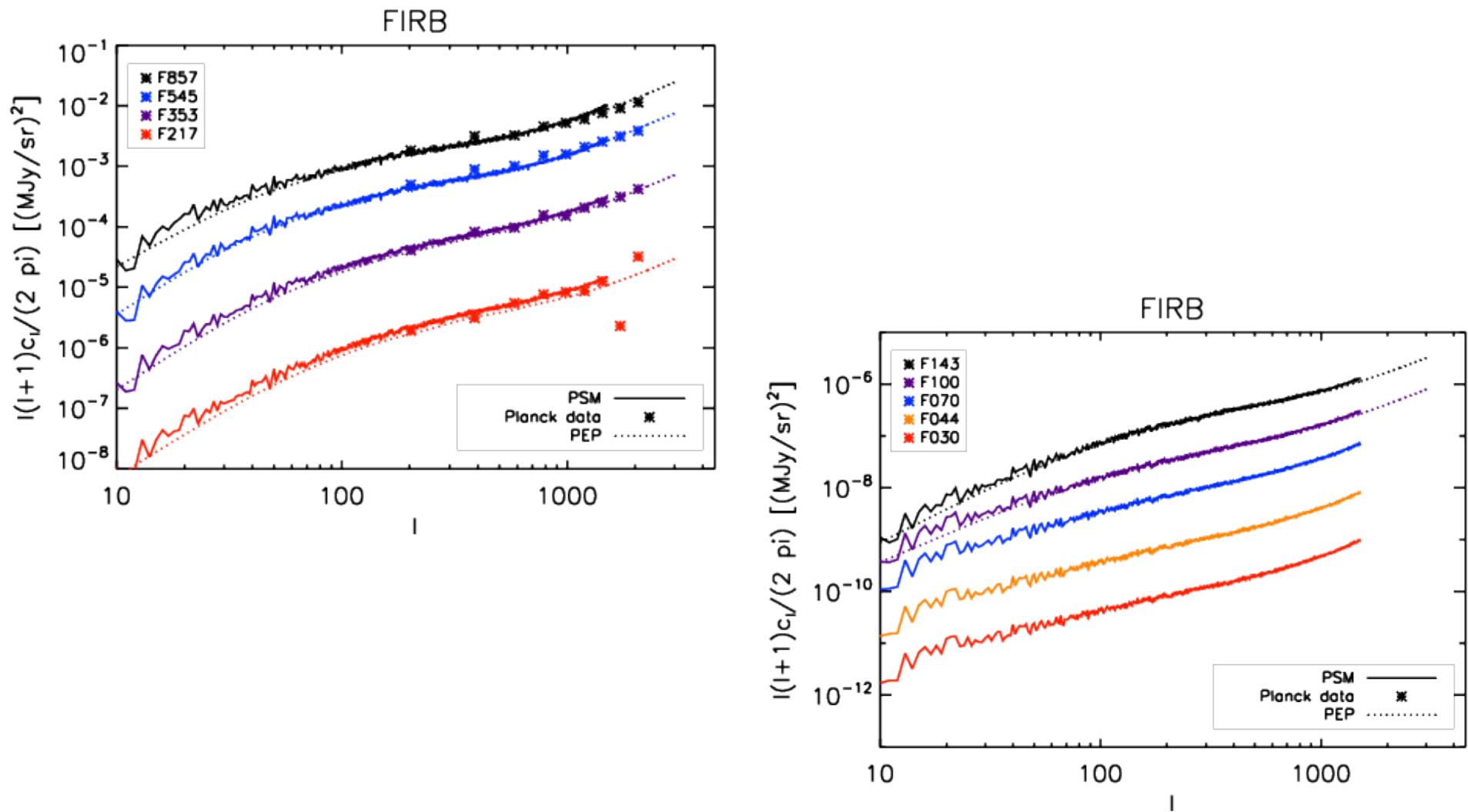
# CIB maps



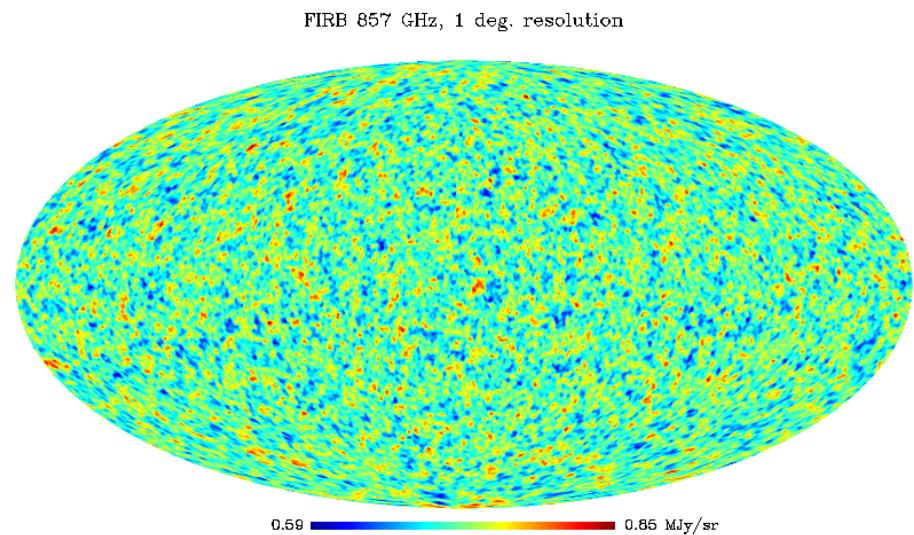
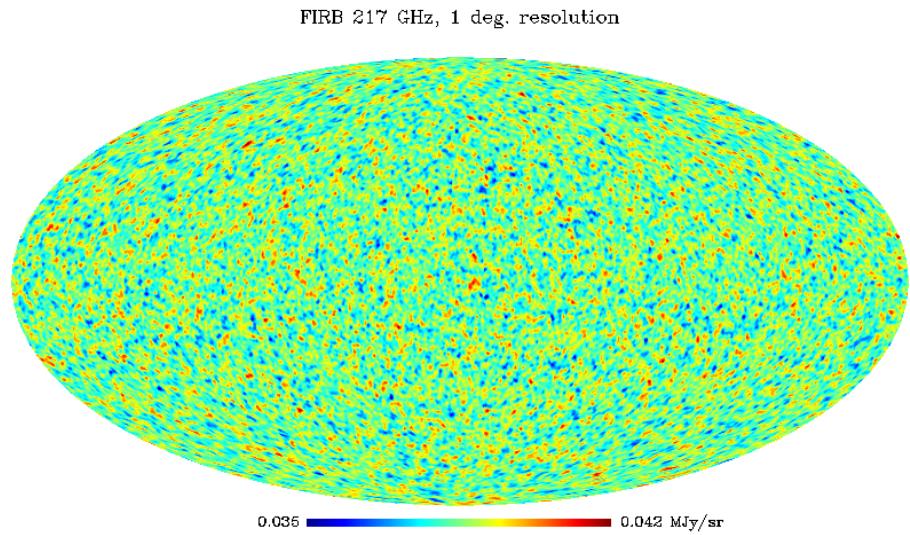
Power spectra from this CIB model are close to measured Planck CIB spectra, but not exactly consistent...

Spectra re-adjusted to match Planck PEP  $C_\ell$  measurements  
+  
decorrelation added artificially between lowest and highest frequencies

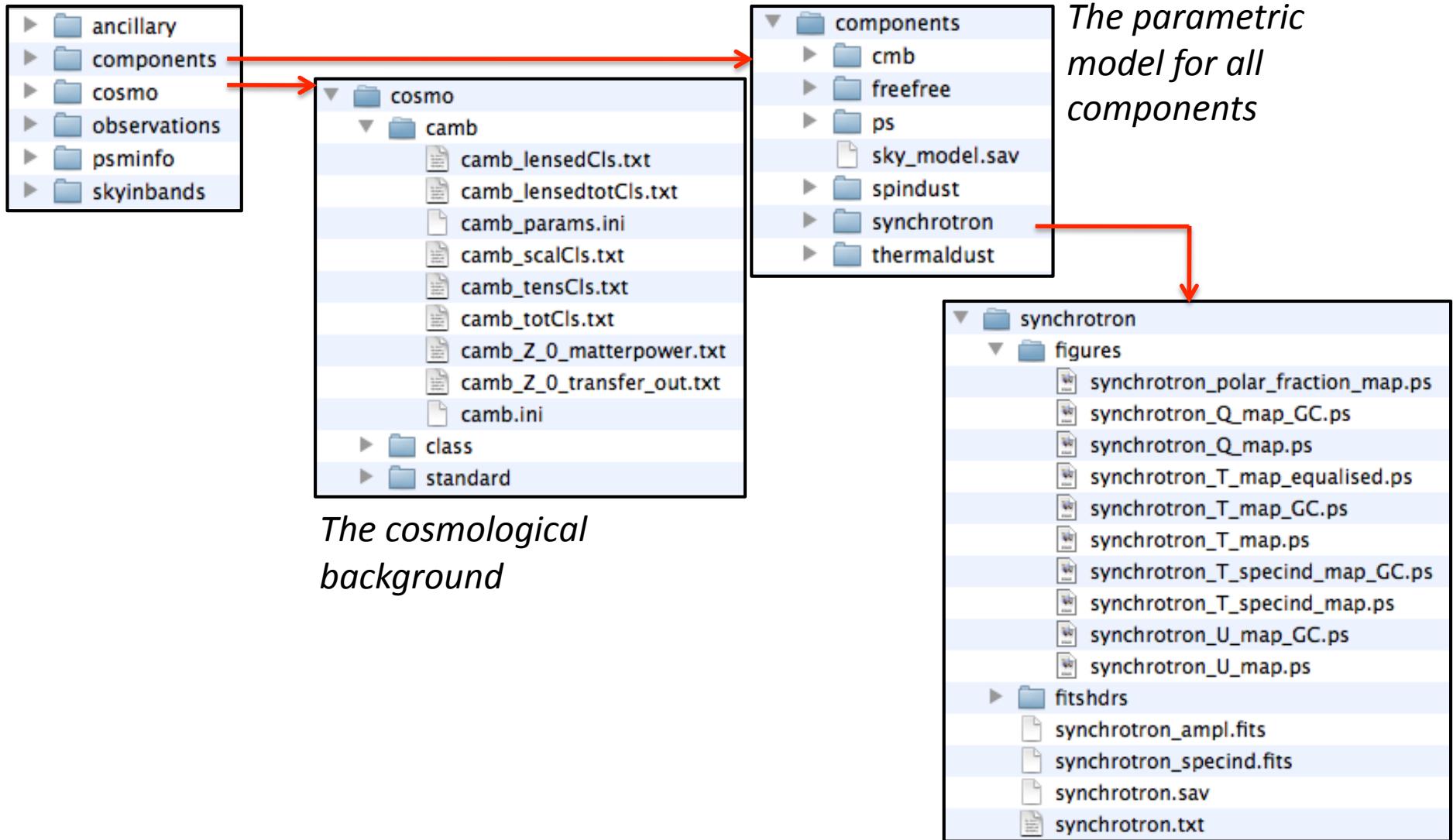
# CIB spectra



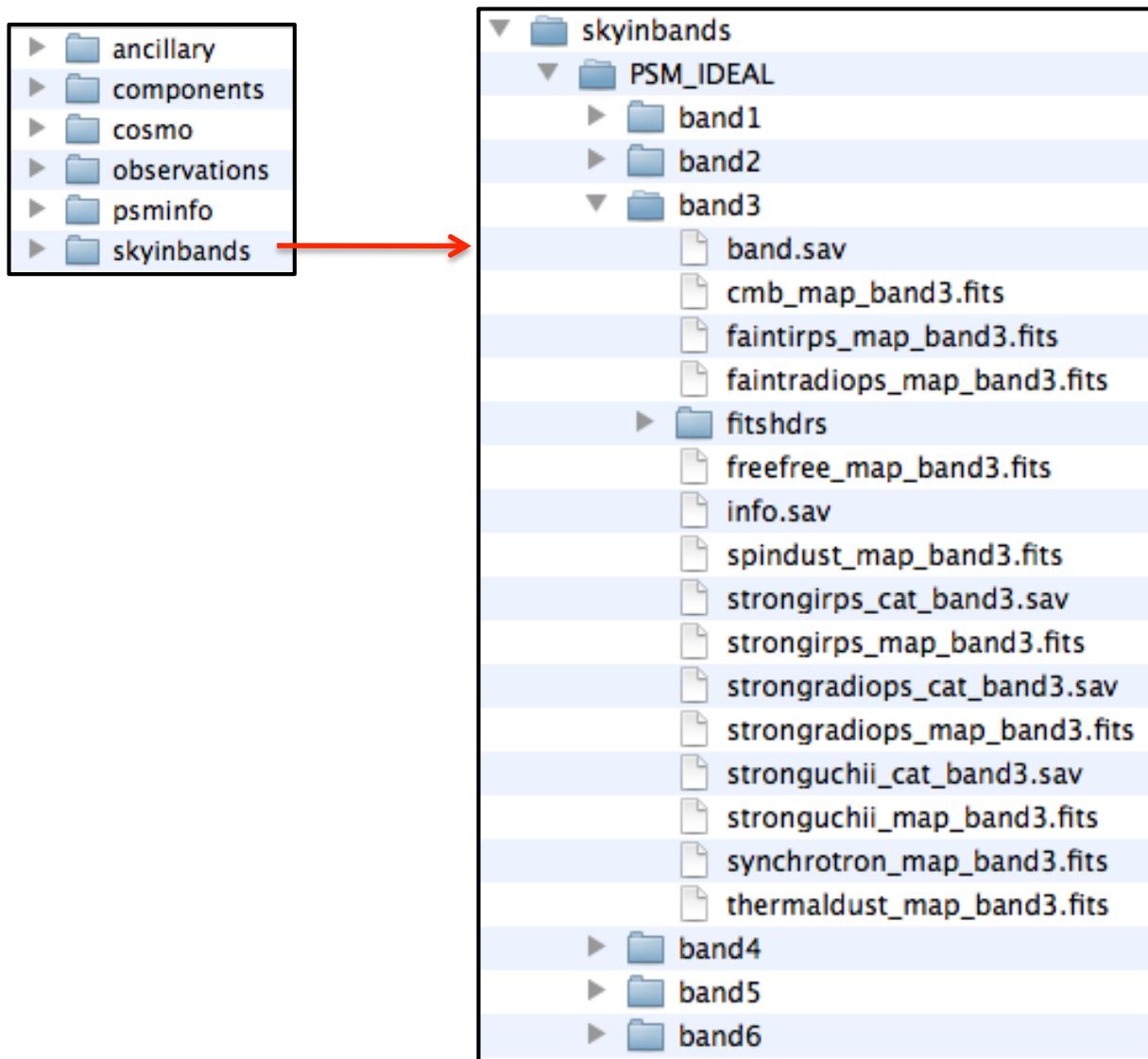
# CIB maps



# PSM outputs

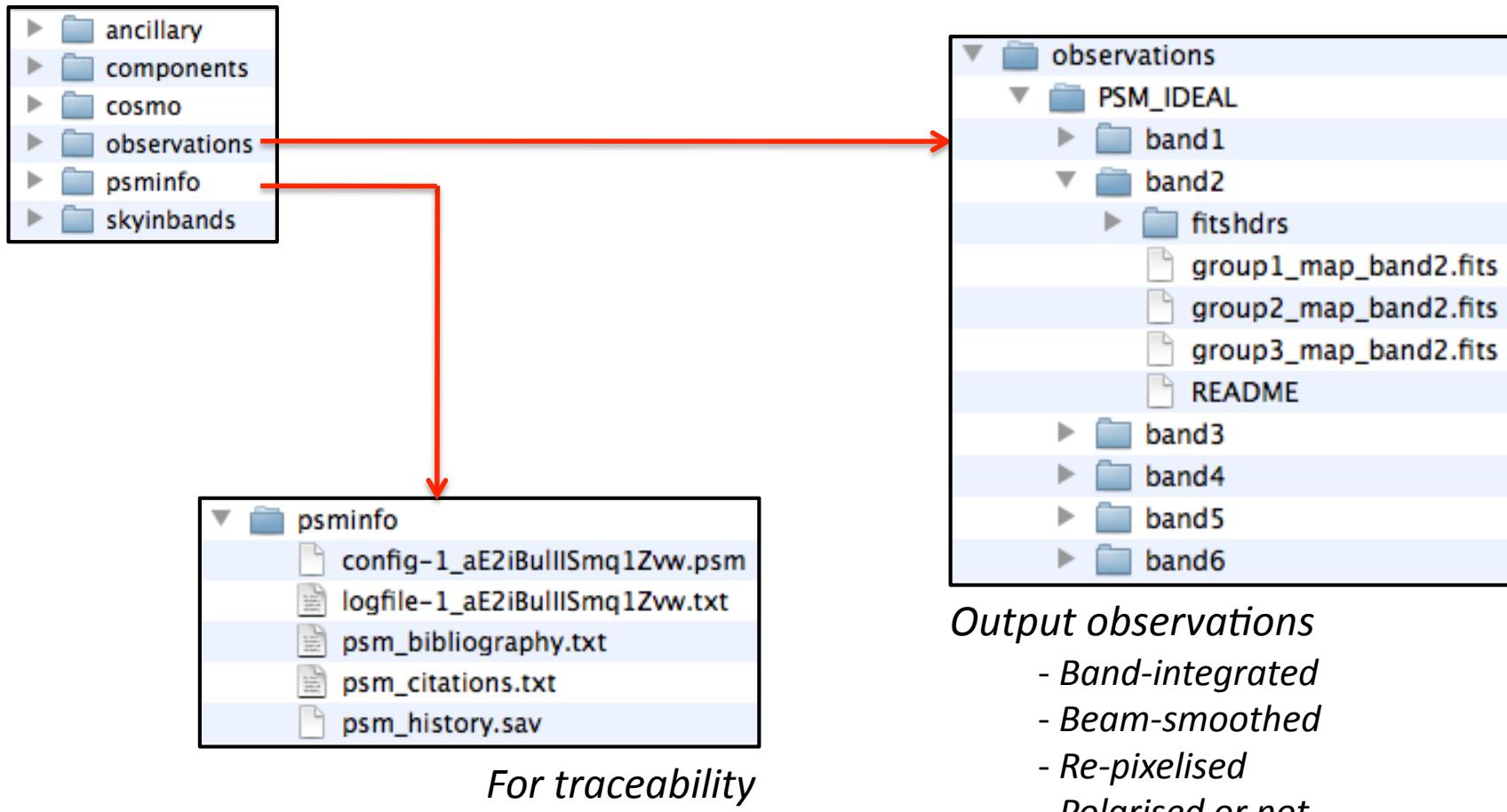


# PSM outputs



*Maps and/or catalogues  
of band-integrated  
emission for all components*

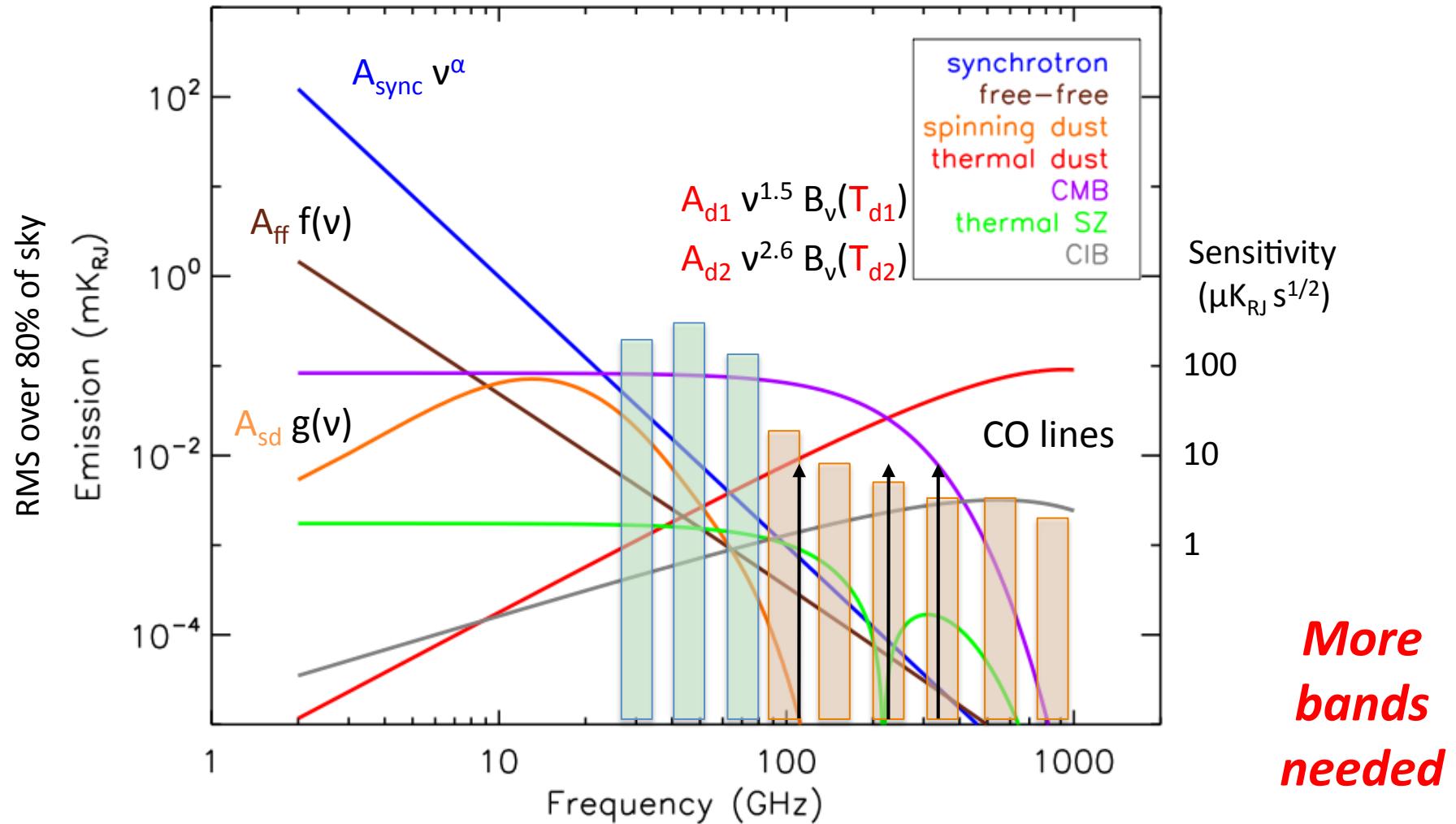
# PSM outputs



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# Constraining the model...



# What the PSM is and is not

- The PSM is ***NOT***
  - a set of sky emission maps at different frequencies
    - It implements a **model** (i.e. an interpretation of existing observations)
    - It is **very flexible** (turn on and off components, effects, noise, options...)
  - the real sky
    - Always check simulations and understand their limits

# What the PSM is and is not

- The PSM is
  - A parametric model (keyword: flexibility)
    - Parameters for the cosmological framework and for all components
    - Components are represented using maps of parameters (e.g. map of average dust temperature, map of CMB anisotropies, ...), catalogues (e.g. point sources, galaxy clusters), statistical properties (power spectra, number counts, uncertainties, ...).
  - Data + code
    - A set of data (observations), together with characterisation and uncertainties
    - Prescriptions to assign values to all the parameters of the model on the basis of these observations, and software tools that implement them
  - A simulation tool
    - code to produce a complete set of component maps and their observation with a set of instruments (not specific to Planck)
    - a library of many useful software tools
  - A **very useful** investigation tool
    - For developing “optimal” data analysis pipelines
    - For investigating the impact of varying assumptions and model parameters

The scientific results that we present today are a product of the Planck Collaboration, including individuals from more than 100 scientific institutes in Europe, the USA and Canada



Planck is a project of the European Space Agency, with instruments provided by two scientific Consortia funded by ESA member states (in particular the lead countries: France and Italy) with contributions from NASA (USA), and telescope reflectors provided in a collaboration between ESA and a scientific Consortium led and funded by Denmark.