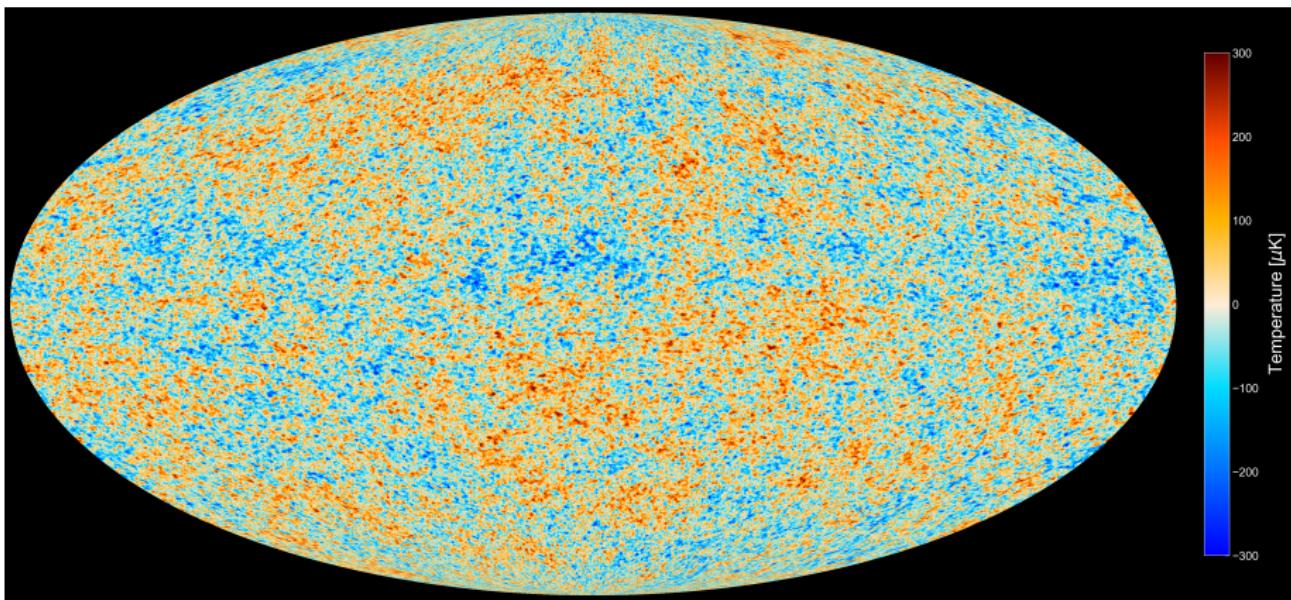


# Power spectrum of the Cosmic Microwave Background radiation

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Data Science Laboratory, October 2020



# Theoretical considerations

- Black-body radiation with average colour temperature of 2.725 K and excessive redshift ( $z = 1100$ )
  - Recombination period ( $\approx 370\,000$  years after the Big Bang)
  - Mean free path of photons increases by an imponderable extent (decoupling of photons)

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  - Spin-orbit coupling
  - Darwin effect
  - ⋮

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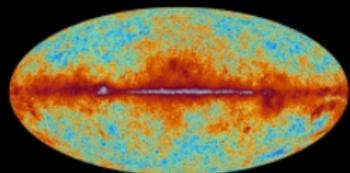
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  - ⋮
- A lot of superimposed effects on each other in the CMB also
  - Effects due to the movement of Sun and Earth
  - Point sources, Sunyev-Zeldovich effect
  - Lensing effects
  - ⋮

# Theoretical considerations

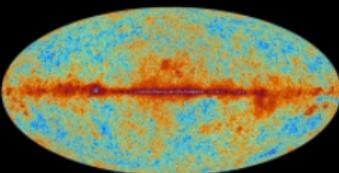


planck

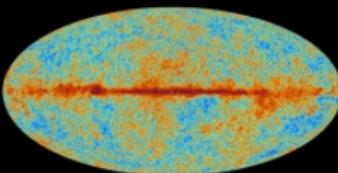
*The sky as seen by Planck*



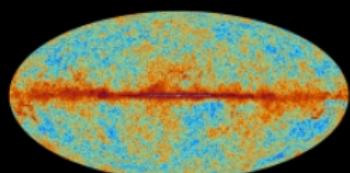
30 GHz



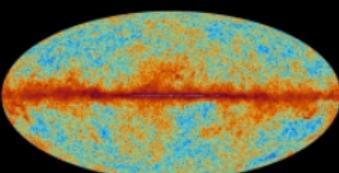
44 GHz



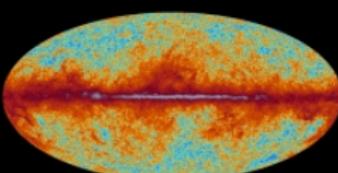
70 GHz



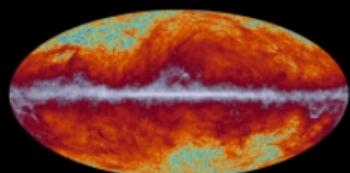
100 GHz



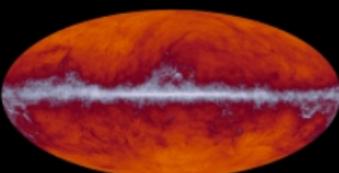
143 GHz



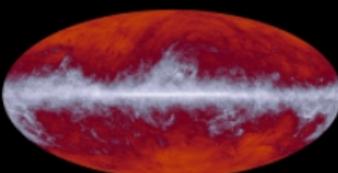
217 GHz



353 GHz



545 GHz



857 GHz

# Project goals

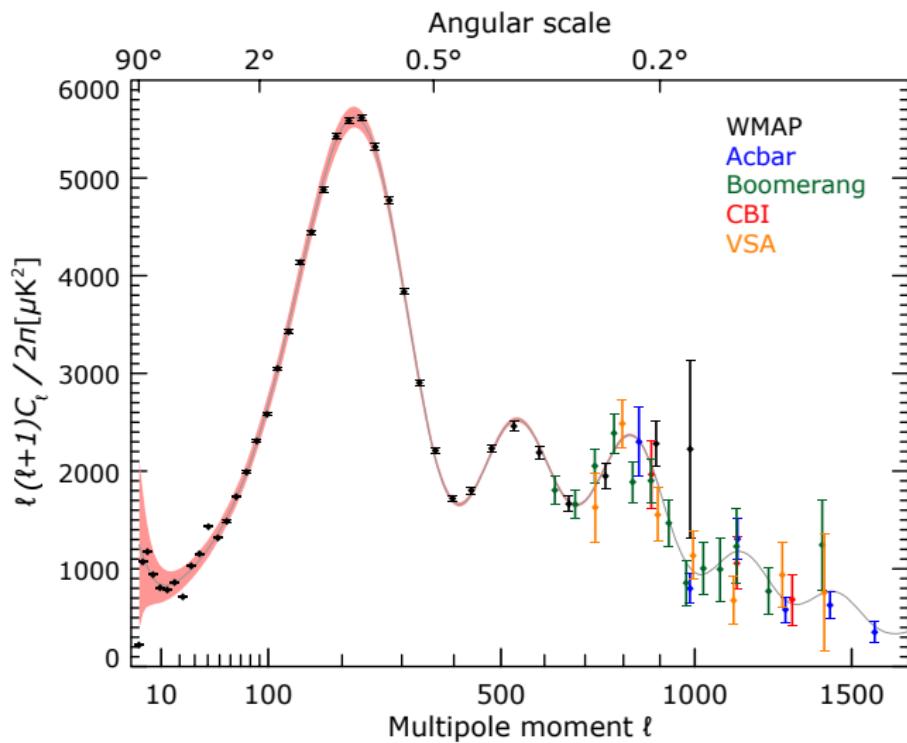
## Simulation

- Simulate map of the CMB
- Explore spectra of generated map
- Simulate noise from different effects

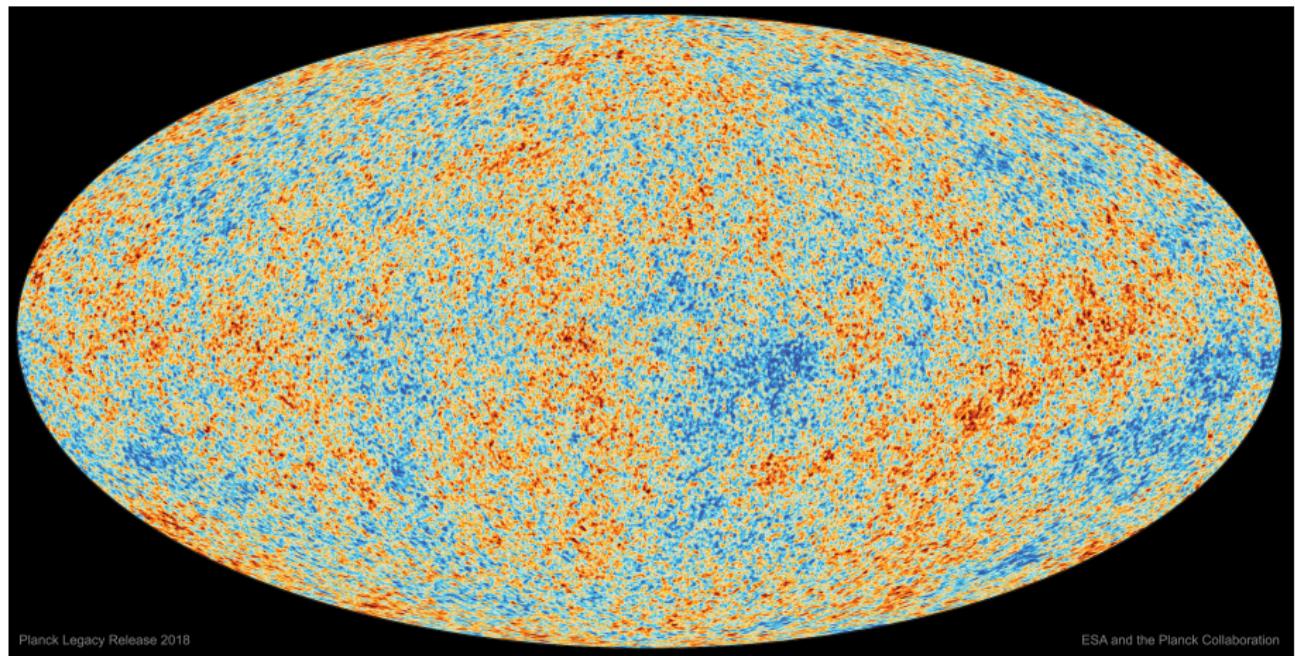
## Analysis of measurements

- Reverse engineer power spectrum
- Filter noise as much as possible
- Estimate cosmological parameters

# Power spectrum of CMB



# Real Planck CMB map



Planck Legacy Release 2018

ESA and the Planck Collaboration