The QUIJOTE CMB Experiment

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on behalf of the QUIJOTE Collaboration

The QUIJOTE Experiment

- **Site**: Teide Observatory (altitude 2400 m, 28.3º N, 16.5 W)
- **Frequencies**: 11, 13, 17, 19, 30 and 40 GHz.
- **Angular resolution**: 0.92º to 0.26º
- **Sky coverage**: -32º < Dec. < 88º (fsky=0.65).

- **2 telescopes and 3 instruments:**
  - Two telescopes installed (2012 and 2014)
  - Multi-Frequency Instrument (MFI) with 4 polarimeters at 10-20 GHz. In operation since Nov 2012
  - Second Instrument (TGI) with 31 polarimeters @ 30 GHz. First light in May 2016
  - Third instrument (FGI) at 42 GHz (31 polarimeters).
  - TGI and FGI in joint comissioning phase

- **Observing strategy**: Deep observations in selected areas plus wide survey

- **Point source follow-up observations** with VLA to correct for polarised sources selected from PLANCK maps. Observations in different epochs are being performed to study variability

Scientific goals

- To provide polarization maps at 6 frequencies in the range 10 - 40 GHz with sufficient sensitivity to correct radio foreground emission (synchrotron and AME) and to constrain the imprint of B-modes down to r=0.05
- To characterise radio foregrounds in a unique frequency range [10-20 GHz] which is not covered by other experiments so far
- Observational strategy
  - Wide survery

    Covering 20,000 deg^2

    ≈ 15 μK/(beam 1 deg) with the MFI @ 11, 13, 17 and 19 GHz

  - Deep cosmological survey

    It will cover around 3,000 deg^2 in three separated fields. The scientific goal is to reach r=0.05 after 3 years of operations of the TGI+FGI

    10 μK/(beam 1^o) after 1 year with the MFI @ 11, 13, 17 and 19 GHz

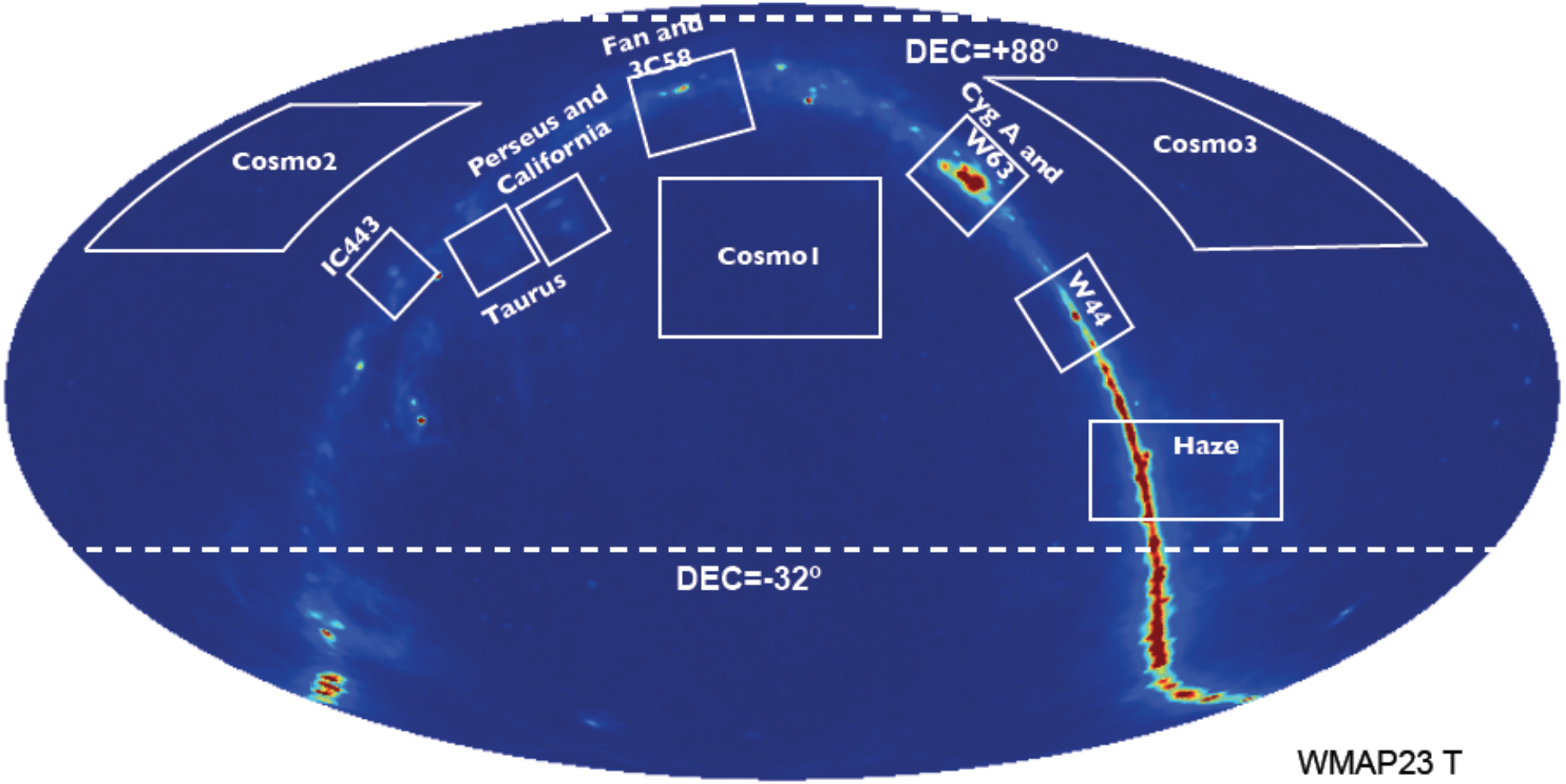
    ≈ 1 μK/(beam 1^o) after 1 year with the TGI and FGI @ 30 and 40 GHz

  - Other Galactic regions

    Covering few hundred deg^2 . To understand radio foregrounds

    ≈ 30-40 μK/(beam 1^o) with the MFI @ 11, 13, 17 and 19 GHz

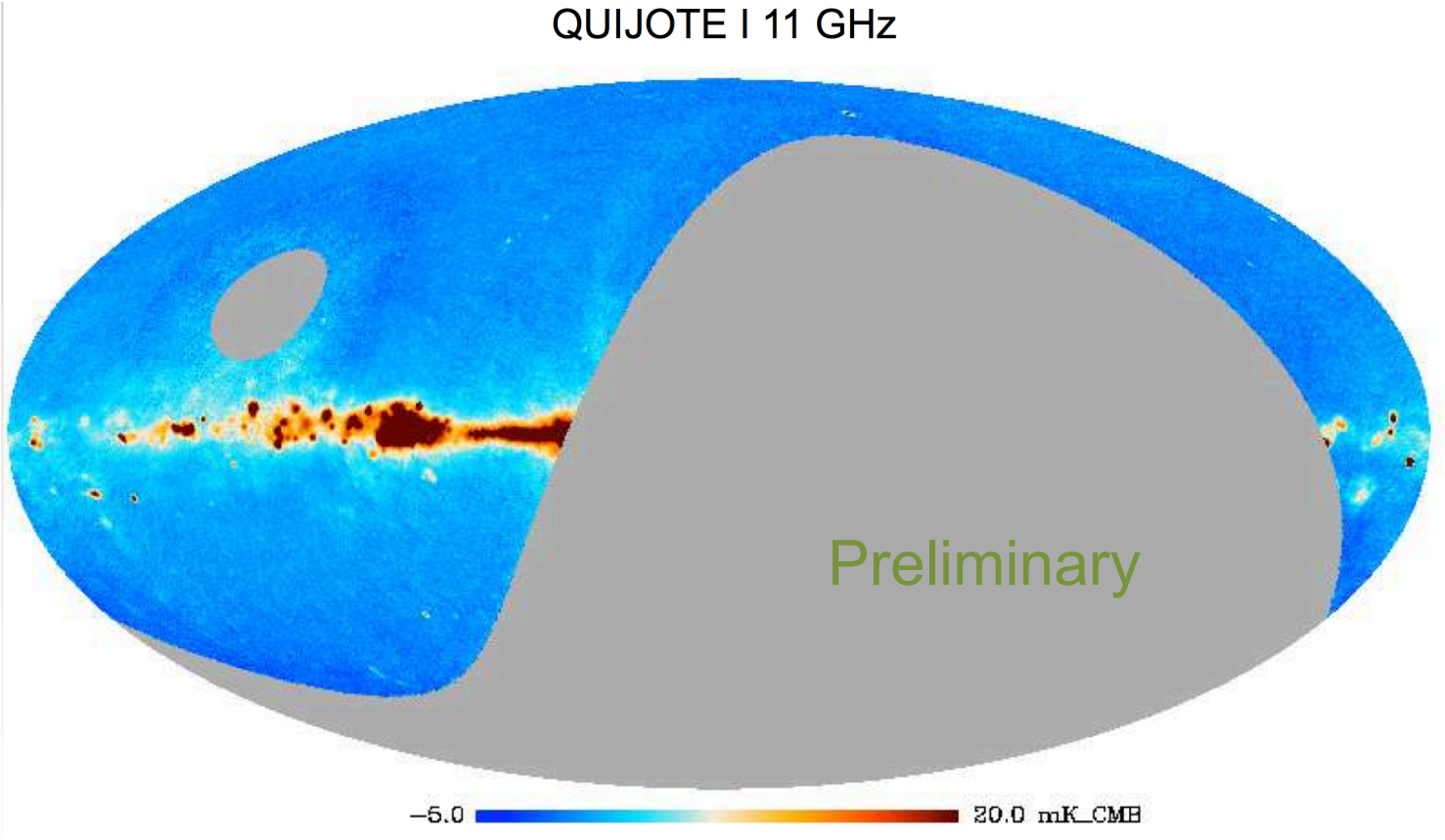
QUIJOTE cosmological and Galactic fields



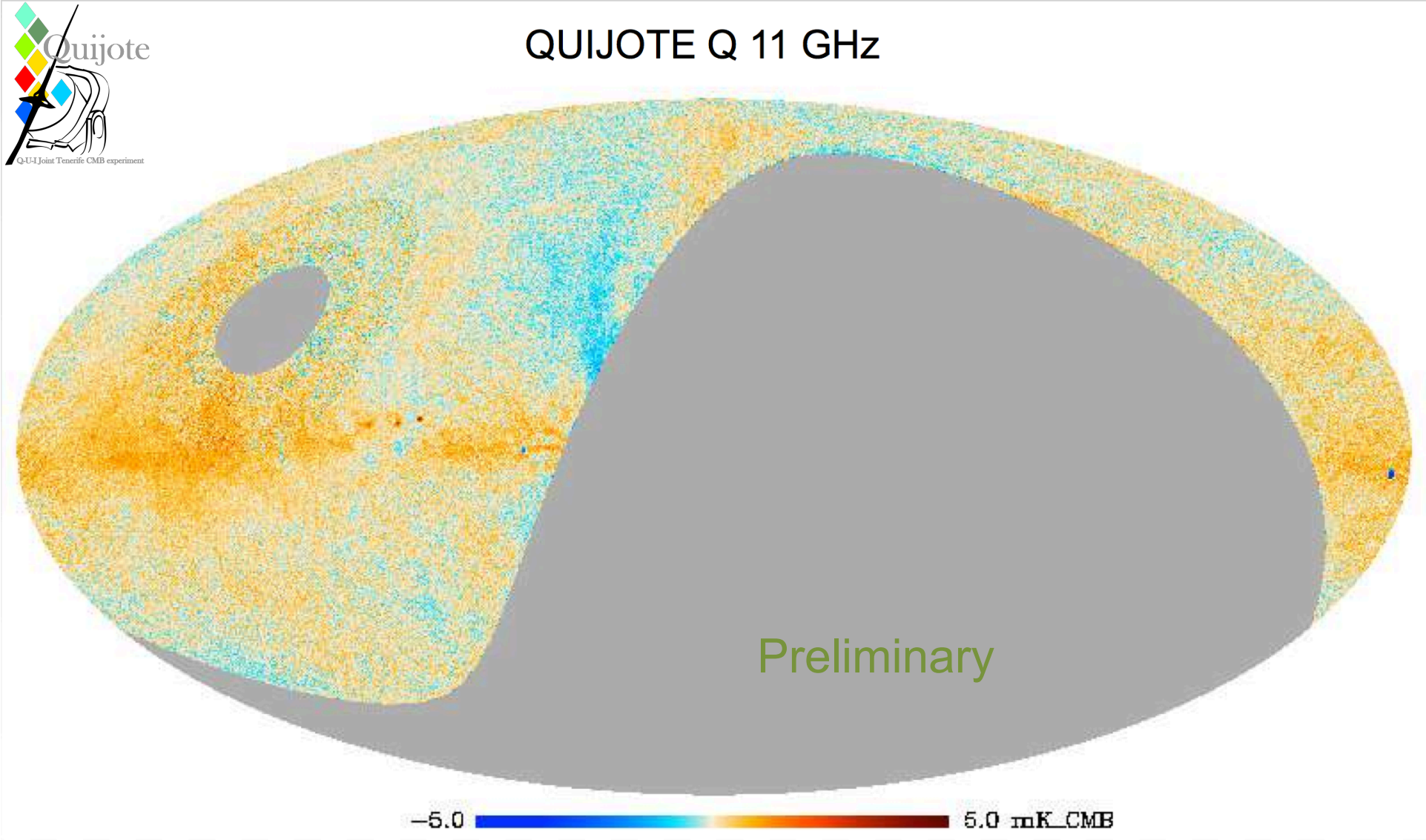
Observation time: 21.000 hours (2.4 years)

Wide survey

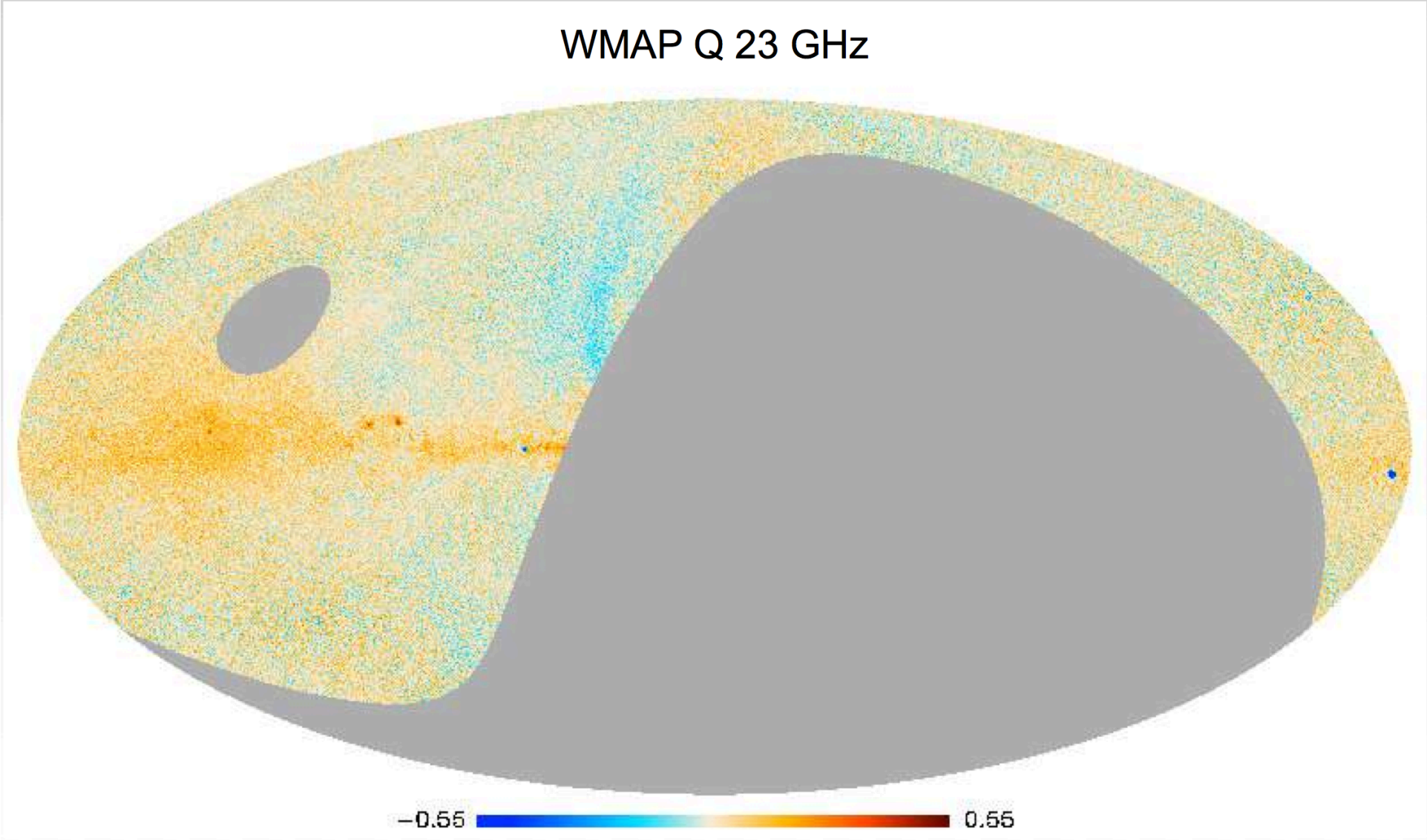
- 8,500 hrs on a region of 20,000 deg^2 in the northern sky.
- Still on-going (will reach ~10000 hrs).
- Goal: ~15 μK/beam in polarization



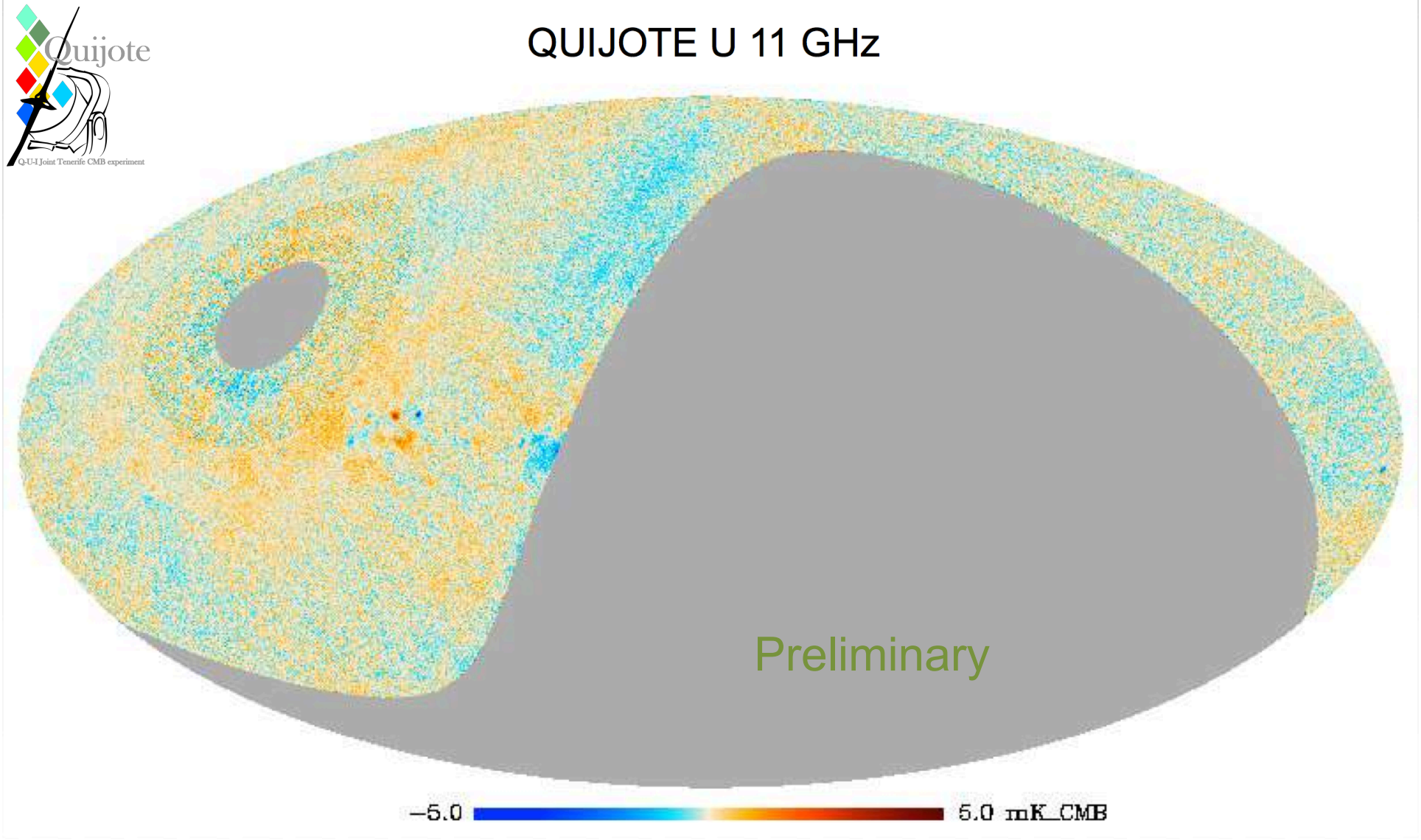
Wide survey: Q 11 GHz



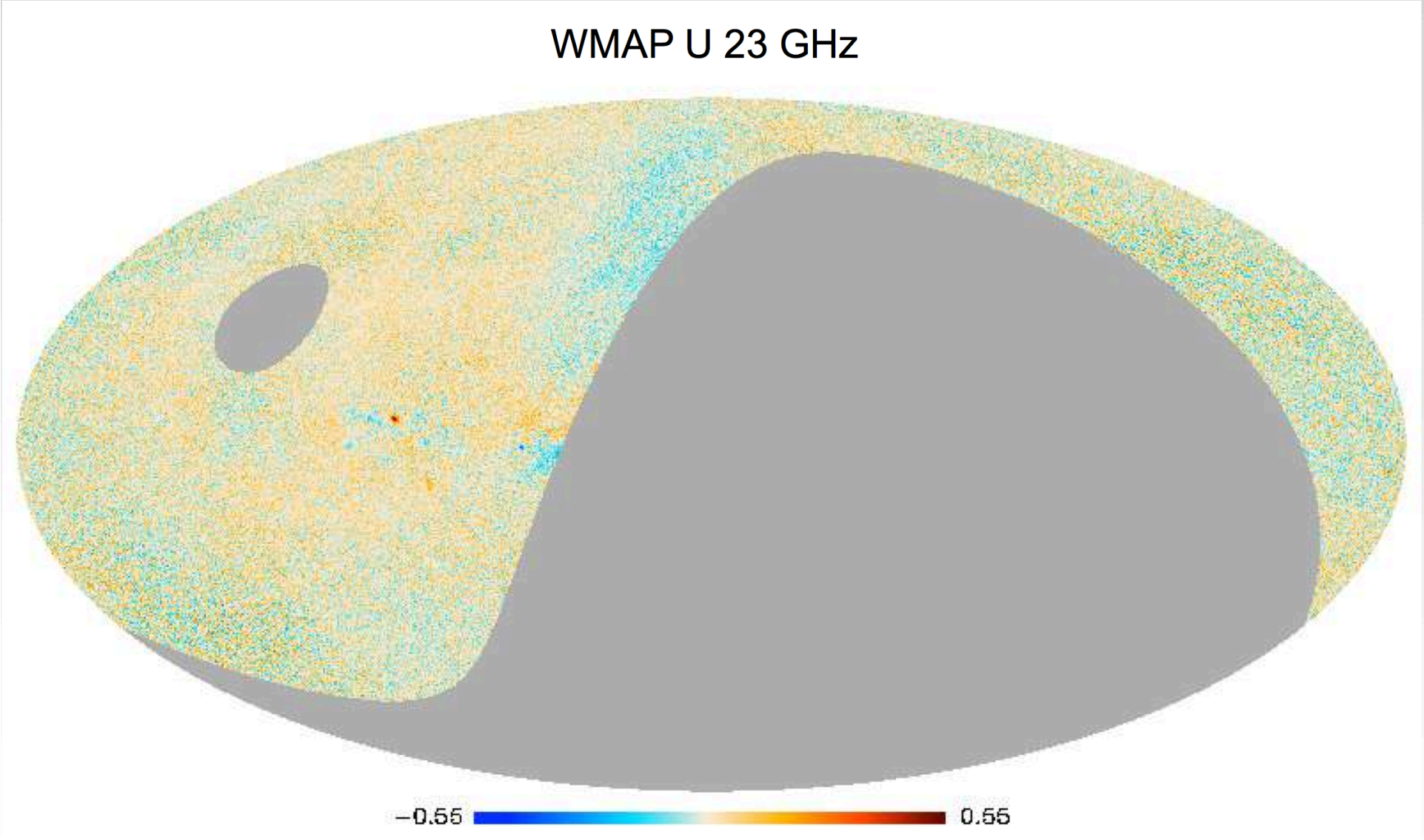
WMAP: Q 23 GHz



Wide survey: U 11 GHz



WMAP: U 23 GHz



QUIJOTE: plans

- Upgrade of MFI
  - Increasing sensitivity by a factor ~ 1.7
  - Ready in 2 years (already funded)
- Extension of QUIJOTE to the South Hemisphere
  - In collaboration with Wits University (South Africa)
  - A prototype of an MFI pixel to be constructed (already funded)
  - To be installed and tested at the 7.6m telescope at HartRAO ~ in 1.5 years
  - Plan to install a complete replica of QUIJOTE if the observations with the prototype are successful (not funded yet)