PLANCK MISSION

Polarized views unchanged

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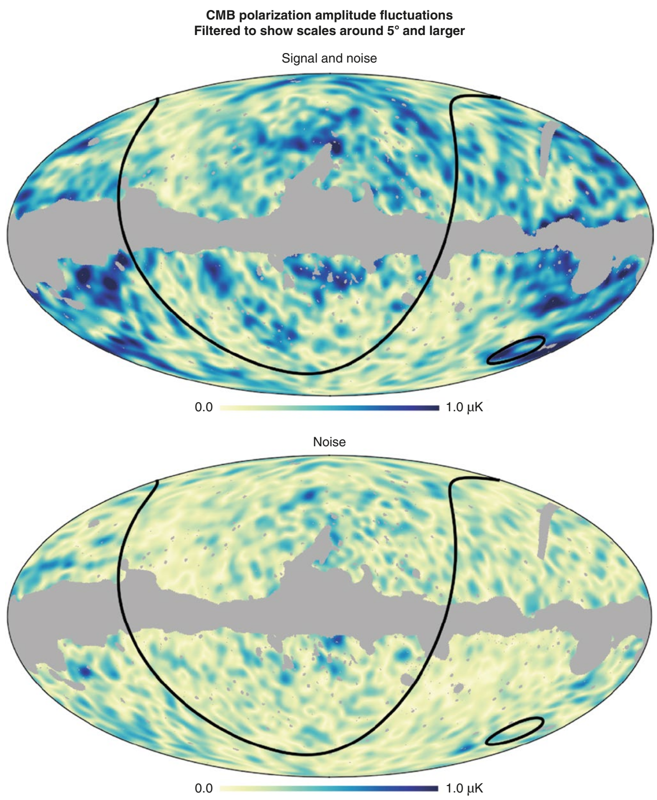

Credit: ESA/Planck Collaboration

On large scales, the Universe is supposed to look the same in all directions, assuming the Λ cold dark matter (ΛCDM, where Λ is the cosmological constant) model is correct. However, in the temperature map produced using the 2013 Planck satellite data, faint features appear on large scales (5°; or 10 times the size of the full Moon), including a cold spot (circled in the southern hemisphere — below the U shape — of the polarization maps). Moreover, the measurements are weaker than expected from the ΛCDM model, at the 10% level. They could be 'statistical flukes', according to the team. But if they are true anomalies, could they indicate new physics? Similar features in the polarization of the cosmic microwave background (CMB) radiation could then lend support for temperature fluctuations. A statistically robust analysis of Planck polarization data by the Planck Collaboration set out to settle the issue.

The CMB radiation was originally polarized by collisions with free electrons when the Universe was 380,000 years old, before protons and electrons combined to form hydrogen atoms. Then some 150 million to 1 billion years later, reionization meant that electrons were once again free to scatter photons, though not as many as before. The Planck Collaboration's analysis of the full-sky polarization data is the most complete to date, involving a better understanding of the systematic effects as well as new techniques in making maps and calibrations. Given the relatively poor signal to noise (pictured: signal and noise, top; noise only, bottom), the results are consistent with no features at current sensitivity levels, but nothing can be ruled out yet. It will now take a dedicated mission to advance the debate.

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