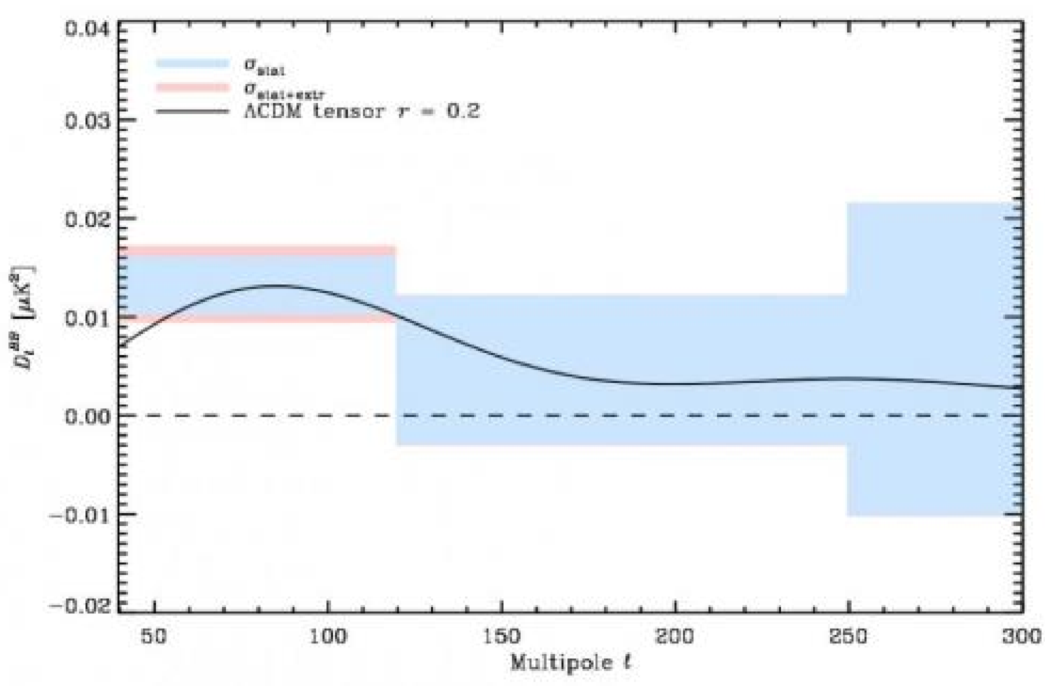
Gravitational waves according to Planck

September 22 2014



Scientists of the Planck collaboration, and in particular the Trieste team, have conducted a series of in-depth checks on the discovery recently publicized by the Antarctic Observatory, which announced last spring that it had detected some direct effects of gravitational waves on cosmic microwave background radiation, a potentially groundbreaking discovery in the field of cosmology. Analysis of the Planck satellite data demonstrates that the effect of contaminating sources, such as gases from our galaxy, cannot be ruled out.

No one has ever directly observed gravitational waves, phenomena predicted by Einstein's theory of General Relativity, and such a discovery would have profound implications for the study of the Universe. Last March, however, the team behind the BICEP2 project made a ground-breaking announcement: the Antarctic observatory had detected a signal referable to gravitational waves. The study claimed to have excluded possible contaminants (other sources that could have generated the same signal) and that the observation was therefore to be considered genuine. But not everyone agreed and many scientists expressed doubts. To test the observation, the team in charge of analysing the Planck satellite data (in which the International School for Advanced Studies SISSA of Trieste, INAF-Astronomical Observatory of Trieste and the University of Trieste participate at one of the two Data Processing Centres) carried out a series of checks in the same portion of sky observed by BICEP, both at the same and at a higher frequency ranges.

The study, now available in the archives (and due for publication in *Astronomy & Astrophysics* on Monday), in part damps down enthusiasm. "Unfortunately, according to our analysis, the effect of contaminants and in particular of gases present in our Galaxy cannot be ruled out", explains Carlo Baccigalupi, SISSA cosmologist and one of the authors of the study.

The strength of Planck – which provides a coarser-grained picture of the sky compared to BICEP2 – is that it observes the Universe at a very wide range of frequencies (nine bands from 30 to 857 GHz, as against the single frequency of 150 GHz used by BICEP2). And it is precisely this "multiple" image which enabled the Planck scientists to establish that the effect of a contaminant may indeed be at work.

The news is not all bad, however, and could instead prove "fruitful": "we have started a collaboration with BICEP2. We are directly comparing their data with the Planck data, in the same frequency, 150 GHz, and trying to exploit the image of the contaminants we reach with Planck at other frequencies", continues Baccigalupi. "This way, we hope to be able to give a definitive answer. In fact, we might find that it was indeed a contamination, but, given that we're optimists, we might even be able to exclude it with confidence. This way, Planck could give a crucial contribution to the discovery of evidence of gravitational waves from the Big Bang in cosmic background radiation. Such a discovery would open a completely new window onto unknown scenarios in the study of the primordial Universe and very-high-energy physics".

More information: Planck intermediate results. XXX. The angular power spectrum of polarized dust emission at intermediate and high Galactic latitudes, arxiv.org/abs/1409.5738

A joint analysis of Planck and BICEP2 B modes including dust polarization uncertainty, arxiv.org/abs/1405.5857

Provided by International School of Advanced Studies (SISSA)

Citation: Gravitational waves according to Planck (2014, September 22) retrieved 27 April 2024 from https://phys.org/news/2014-09-gravitational-planck.html