PRESS RELEASE

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A&A special issue: *Planck* 2015 results

Astronomy & Astrophysics, volume 594, October 2016

***Astronomy & Astrophysics* is publishing a special issue of 28 articles to describe the latest release of data gathered by the European Space Agency's *Planck* satellite, which took place between February and August 2015. This series of papers presents the data products released and the scientific results extracted from them by the Planck Collaboration.**

Planck is ESA's mission to observe the cosmic microwave background (CMB) - the first light in the Universe. *Planck* was designed to image the temperature and polarization anisotropies of the CMB over the whole sky, with unprecedented sensitivity and angular resolution. The *Planck* data is used to test theories of the early universe and the origin of cosmic structure and provides a major source of information relevant to many cosmological and astrophysical issues.

Planck was launched on 14 May 2009, and the minimum requirement for success was that the spacecraft should complete two whole surveys of the sky. In the end, *Planck* operated continuously for ~50 months. It completed five full-sky surveys with both Low and High Frequency instruments (LFI and HFI), and more than eight full-sky surveys with the LFI. *Planck* eventually stopped acquiring data in October 2013.

The early release of the *Planck* data in 2011 included cluster and point source catalogs. The first public release of *Planck* data took place in March 2013. It included maps of the temperature anisotropies of the CMB, built from data gathered by *Planck* over its initial 15 months of operations. This release was described in an A&A special issue published in November 2014 (volume 571).

The most recent 2015 data release is much more extensive than the previous one: it uses the complete *Planck* dataset to build maps of both temperature and polarization anisotropies of the CMB covering the entire sky. The all-sky polarization maps at high frequencies offer a completely new view of the sky, and the entire set constitutes a very important new scientific tool for both cosmology and astrophysics.

The polarization maps allow us to estimate cosmological parameters independently of temperature data - the degree of consistency of these two lines of analysis is very good, giving high confidence in the *Planck* data's reliability. The best-fit 2015 cosmological parameters confirm the ''cosmic recipe'' that was determined by *Planck* in 2013 (see 2014 press release). No compelling evidence is found for any extensions to the model, nor any need to require exotic physics.

Astrophysics also greatly benefits from the *Planck* data. The polarization maps at high frequencies trace the thermal emission of dust particles which have been aligned by the magnetic field permeating the Milky Way. This is a new tool for understanding the physics and energetics of the Galactic interstellar medium.

The papers included in this special issue describe in detail all the Planck Collaboration's major findings based on this dataset, both for cosmology and astrophysics. Since the release of the data in 2015, understanding of the data has increased even more, and the Collaboration plans a final release of higher-quality data in 2017. Two articles in a forthcoming volume of A&A provide a preview of its cosmological content. They use newly processed polarized information at large angular scales to constrain the optical depth to the epoch of reionization with the highest accuracy ever (see the recent ESA press release).

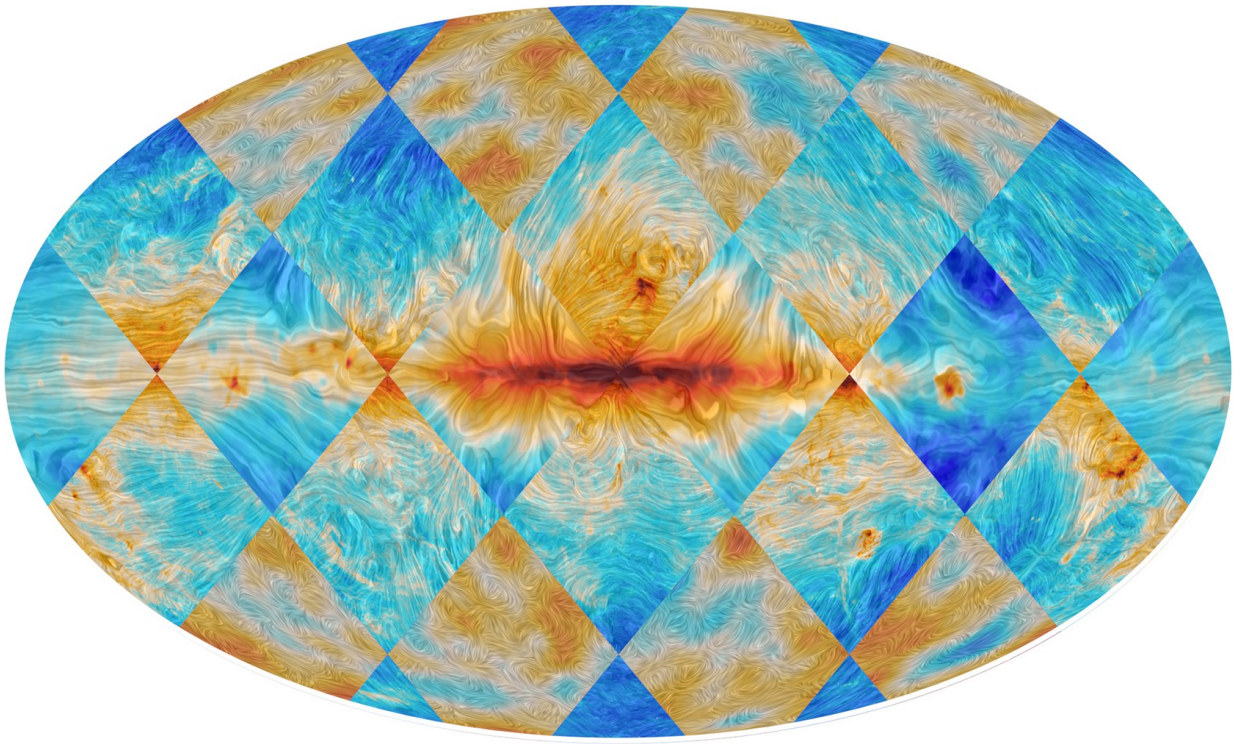

Fig. 1. This figure combines three maps newly released by *Planck* in 2015 and described in this special issue: polarized synchrotron emission at 30 GHz, polarized thermal dust emission at 353 GHz, and polarized CMB radiation. In each case, the color scheme represents total intensity, and the stripy texture represents the direction of polarization

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