

## Planck intermediate results: VIII. Filaments between interacting clusters

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### Abstract

**Context.** About half of the baryons of the Universe are expected to be in the form of filaments of hot and low-density intergalactic medium. Most of these baryons remain undetected even by the most advanced X-ray observatories, which are limited in sensitivity to the diffuse low-density medium. **Aims.** The Planck satellite has provided hundreds of detections of the hot gas in clusters of galaxies via the thermal Sunyaev-Zel'dovich (tSZ) effect and is an ideal instrument for studying extended low-density media through the tSZ effect. In this paper we use the Planck data to search for signatures of a fraction of these missing baryons between pairs of galaxy clusters. **Methods.** Cluster pairs are good candidates for searching for the hotter and denser phase of the intergalactic medium (which is more easily observed through the SZ effect). Using an X-ray catalogue of clusters and the Planck data, we selected physical pairs of clusters as candidates. Using the Planck data, we constructed a local map of the tSZ effect centred on each pair of galaxy clusters. ROSAT data were used to construct X-ray maps of these pairs. After modelling and subtracting the tSZ effect and X-ray emission for each cluster in the pair, we studied the residuals on both the SZ and X-ray maps. **Results.** For the merging cluster pair A399-A401 we observe a significant tSZ effect signal in the intercluster region beyond the virial radii of the clusters. A joint X-ray SZ analysis allows us to constrain the temperature and density of this intercluster medium. We obtain a temperature of  $kT = 7.1 \pm 0.9$  keV (consistent with previous estimates) and a baryon density of  $(3.7 \pm 0.2) \times 10^{-4} \text{ cm}^{-3}$ . **Conclusions.** The Planck satellite mission has provided the first SZ detection of the hot and diffuse intercluster gas. © 2013 ESO.

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### Keywords

Galaxies: clusters: general, Large-scale structure of Universe