

Comparison of Sunyaev-Zel'dovich measurements from Planck and from the Arcminute Microkelvin Imager for 99 galaxy clusters

Perrott Y., Olamaie M., Rumsey C., Brown M., Feroz F., Grainge K., Hobson M., Lasenby A., MacTavish C., Pooley G., Saunders R., Schammel M., Scott P., Shimwell T., Titterington D., Waldram E., Aghanim N., Arnaud M., Ashdown M., Aussel H., Barrena R., Bikmaev I., Böhringer H., Burenin R., Carvalho P., Chon G., Comis B., Dahle H., Democles J., Douspis M., Harrison D., Hempel A., Hurier G., Khamitov I., Kneissl R., Macías-Pérez J., Melin J., Pointecouteau E., Pratt G., Rubiño-Martín J., Stolyarov V., Sutton D.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 ESO. We present observations and analysis of a sample of 123 galaxy clusters from the 2013 Planck catalogue of Sunyaev-Zel'dovich sources with the Arcminute Microkelvin Imager (AMI), a ground-based radio interferometer. AMI provides an independent measurement with higher angular resolution, 3 arcmin compared to the Planck beams of 5-10 arcmin. The AMI observations thus provide validation of the cluster detections, improved positional estimates, and a consistency check on the fitted size (θ_s) and flux (Y_{tot}) parameters in the generalised Navarro, Frenk and White (GNFW) model. We detect 99 of the clusters. We use the AMI positional estimates to check the positional estimates and error-bars produced by the Planck algorithms PowellSnakes and MMF3. We find that Y_{tot} values as measured by AMI are biased downwards with respect to the Planck constraints, especially for high Planck-S/N clusters. We perform simulations to show that this can be explained by deviation from the universal pressure profile shape used to model the clusters. We show that AMI data can constrain the α and β parameters describing the shape of the profile in the GNFW model for individual clusters provided careful attention is paid to the degeneracies between parameters, but one requires information on a wider range of angular scales than are present in AMI data alone to correctly constrain all parameters simultaneously.

<http://dx.doi.org/10.1051/0004-6361/201424188>

Keywords

Cosmic background radiation, Cosmology: observations, Galaxies: clusters: general, Galaxies: clusters: intracluster medium, X-rays: galaxies: clusters