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Sunyaev Zel'dovich high resolution view of filamentary structures between galaxy clusters pairs

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It is well known that about half of the baryons in the Universe must be in the galaxy clusters outskirts and in the form of hot and low-density filaments connecting galaxy clusters. Due to the low density, most of this filamentary plasma can not be detected by X-ray observatories. In particular cases of low redshift cluster pairs in the pre-merging phase, the Sunyaev Zel'dovich (SZ) effect can be used to observe the inter-cluster regions and detect the imprint of missing baryons.

The Abell399-401 (A399-401) system is the perfect laboratory to test our ability to detect filamentary structures via the SZ effect with $< \sim 1'$ angular resolution. This pair has been well studied at several frequencies: it exhibits double radio-halos, an excess of X-ray emission in the inter-cluster region and a synchrotron radio 'ridge' connecting the two clusters. Moreover the Planck satellite provided the first SZ detection of the gas between A399-401 despite the poor angular resolution ($\sim 10'$) of its SZ map.

We have used an Atacama Cosmology Telescope (ACT) and Planck satellite Compton- y map (1.65' angular resolution) that combines ACT data from 2008 to 2019 with Planck maps and MUSTANG-2 at the Green Bank Telescope data (9'' angular resolution) to study the A399-401 system in detail. We present the data analysis and results.

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