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The Baryonic Matter at Supercluster Scales: The Case of Corona Borealis Supercluster

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Abstract. Superclusters of galaxies are the largest gravitationally bound structures of the Universe. Numerical simulations indicate that a significant fraction of baryonic matter could be located in supercluster (SC) scales in the form of a warm/hot plasma. The sensitivity and resolution of the VSA interferometer at Teide observatory allow us to search for evidence of the Sunyaev-Zeldovich effect (SZE). We have published evidence for such a plasma towards the center of the Corona Borealis Supercluster (CrB-SC), Génova-Santos *et al.* (2005). Two large decrements in the intensity of the signal measured by VSA at 33 GHz (CrB-B and H) subtending an angle of about $25'$ could be indicative of a concentration of baryonic matter comparable to thousands of galaxies. This matter could be in the form of a plasma of temperature $\sim 10^5 - 10^7$ K where no clusters of galaxies have been identified. No other similar spots have been found in the VSA fields observed to measure the CMB primordial power spectrum of fluctuations, Rubiño-Martin *et al.* (2003), and suggests that this is indeed a very particular feature of the CrB-SC of galaxies. Additional data obtained with the MITO telescope of CrB-H also support this VSA finding Battistelli *et al.* (2006), and could be related to warm/hot plasma in the SC. We would expect a galaxy population to be associated with such a plasma, as it is well known to occur in clusters of galaxies where the SZE has been measured, Lancaster *et al.* (2005). However, the absence of X-ray emission in the ROSAT images in the CrB-SC SZ spots suggests that if there is a galaxy population linked to the plasma it may have a peculiar spatial distribution. We obtained photometry of CrB-SC region using the data base from *SDSS DR4*, covering a total of 15^{o^2} in the CrB-SC area. We built a catogue with 121251 galaxies down a selection criterion based on galaxies colours $0.2 \leqslant r - i \leqslant 0.6$ and $\delta(g, r, i) \leqslant |0.2|$ errors. In order to study the behaviour of differents regions in the CrB-SC, four regions were measured that belongs it, two regions not associated with overdensity, A2065, and CrB-H with 30' radius for each ones. The completeness magnitude is $R \leqslant 21$. A photometric study produced colour-magnitude diagrams where we can detect evidence that many of these galaxies belong to the same system. The excess in the number density of galaxies appears to be larger in CrB-H where the strongest CMB temperature decrement was found. The number of galaxies in it is a factor ~ 1.5 lower than A2065 and ~ 2.5 highest that the SC background field. This resembles the typical number of galaxies in clusters of galaxies. However, it appears these galaxies are more broadly distributed than in the well known clusters of this SC. It is possible that the hot plasma causing the SZ spot is indeed associated with a new large concentration of galaxies unidentified in the SC.

Keywords. (cosmology:) large-scale structure of universe, dark matter

References

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