A panchromatic view of the Virgo intra-cluster component. First detection of the Virgo intra-cluster dust

A. Longobardi, A. Boselli et al.

Context

"How did structures form and evolve?". Understanding the formation and evolution of galaxies remains a primary goal of modern astrophysics. Both observations and simulations point to a scenario in which structure formation follows hierarchical laws where galaxies and clusters grow by mergers and accretion of smaller subsystems. No model for structure evolution, however, can be complete without a detailed understanding of the physical mechanisms that take place. Hence, it is only through the detailed study of the local volume that we can hope to understand the role of the interactions in the hierarchical assembly of baryonic substructures. The proposed project is providing unique constraints to the current formation and evolution scenarios giving the first multi-wavelength mapping of the diffuse intra-cluster (IC) component, a direct product of the interactions within a cluster. The focus of work is on the Virgo cluster.

Based on the work submitted as letter to the editor *The GALEX Ultraviolet Virgo Cluster Survey (GUViCS) VIII. Diffuse dust emission in the Virgo intra-cluster space*

Virgo an ideal laboratory for Astrophysics

At a distance of 16.5 Mpc, the Virgo cluster is the dominant mass concentration in the local Universe (Fig.1). Virgo is a young system still in formation, a local analogue of the over-dense regions in the high-redshift Universe, and an ideal laboratory for studying the perturbing mechanisms that shaped galaxy evolution. This has made Virgo a key target in studies of how galaxies form and evolve in dense environments, resulting in the most extended collection of multi-frequency data that survey this system at good/optimal resolution and sensitivity.
GALEX and Hershel are two CNES initiatives that mapped this system in the Ultra-Violet and Far Infra-red

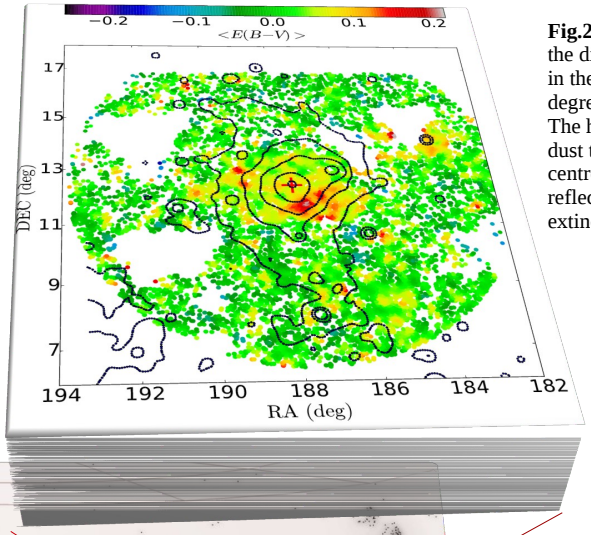

Fig.2 Spatial distribution of the diffuse dust component in the inner 36 square degree of the Virgo cluster. The higher concentration of dust towards the cluster's centre (red cross) is reflected in higher value of extinction, E(B-V).

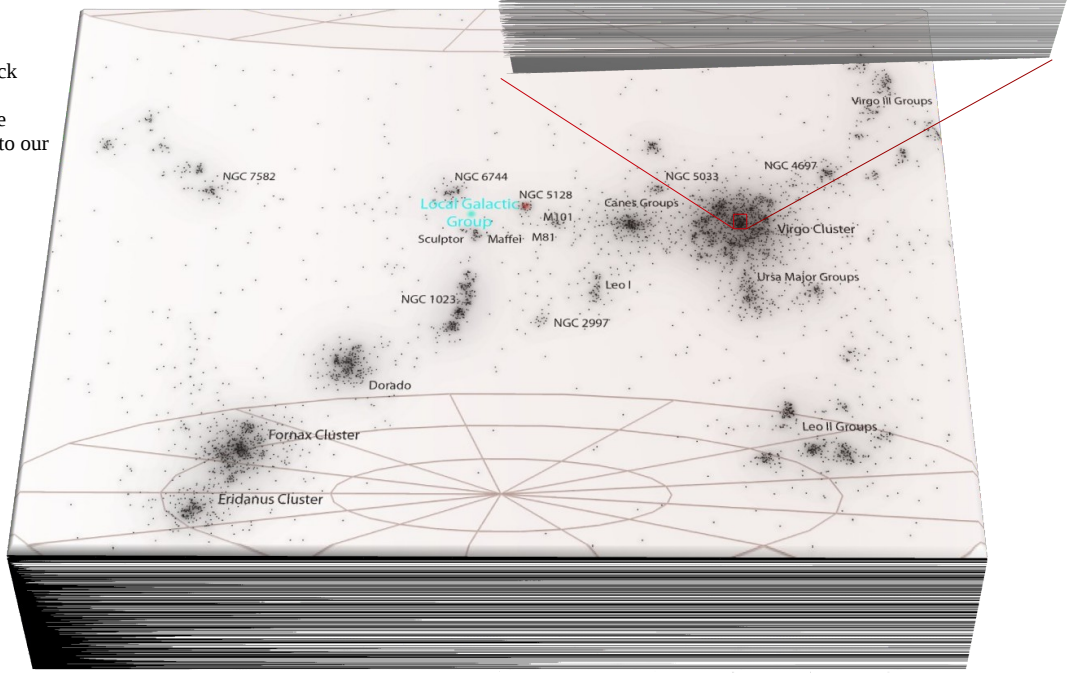

Fig.1 Illustration of the distribution of galaxies (black dots) in the Local Universe within 30 Mpc distance. The Virgo cluster appears north to our local group as the largest concentration of mass.

Research outcome

A synergy between GALEX and Herschel data have made it possible to detect, for the first time diffuse dust in the intra-cluster medium of the Virgo cluster (Fig.2). We now know that there is a cold dust component in Virgo that is transported into the cluster space trough similar phenomena (stripping) that are building up the optical IC light, in agreement with what is predicted by hierarchical scenarios of structure evolution.

Spin-off Science for future CNES missions

Understanding the relative fraction of the different components that constitute the IC content, hence their relative mass and energy supply, will lead to more accurate predictions on the detection of IC features in future missions like EUCLID and ATHENA. The results we are obtaining can validate/classify Virgo as an ideal target for these extraordinary missions, and, more broadly, will put constraints on the selection of the targets to survey within the topic of IC studies.