DARK MATTER GAMMA-RAY EMISSION FROM THE LOCAL UNIVERSE

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We present gamma-ray all-sky maps of the Local Universe where we only consider the emission coming from dark matter (DM) decay and annihilation [1]. We are using high-resolution N-body constrained simulations, from the CLUES project [2], in which observational data are used to set the initial conditions, reproducing in this way the main prominent features visible on the sky such as the Virgo, Coma and Perseus clusters, and the Great Attractor.

In Figure 1 and 2, the DM decay $L_i=\Sigma m_p/4\pi d_i^2$ and annihilation $L_i=\Sigma m_p \rho_i/4\pi d_i^2$ luminosities, respectively, are shown (m_p is the particle mass, ρ_i and d_i are the *i*th particle density, measured over a 32 particle SPH kernel, and distance, respectively). The maps are obtained from a simulation box of 160 h^{-1} Mpc on a side with 1024^3 particles run using the ART code. The central density of the halos is typically underestimated due to the finite simulation resolution and therefore it has been corrected analytically assuming that DM halos follow a NFW density profile.

By running Fermi satellite simulations [5] of the DM decay and annihilation luminosity maps of Figure 1 and 2, we can forecast what Fermi will be able to detect. In Figure 3, the signal-to-noise (S/N) maps for gamma-rays between 100 MeV and 10 GeV, result of a 5-year observation simulation, are shown. Here, we adopted a b-b*bar* final state channel [6] with a DM particle mass of 100 GeV. Galaxy clusters and groups at high galactic latitude are the best candidates. Note also that the filamentary structure is clearly visible, particularly for decay. In individual pixels the filaments have S/N factors of a few lower than clusters, but stacking analysis on larger region along filaments will increase the signal.

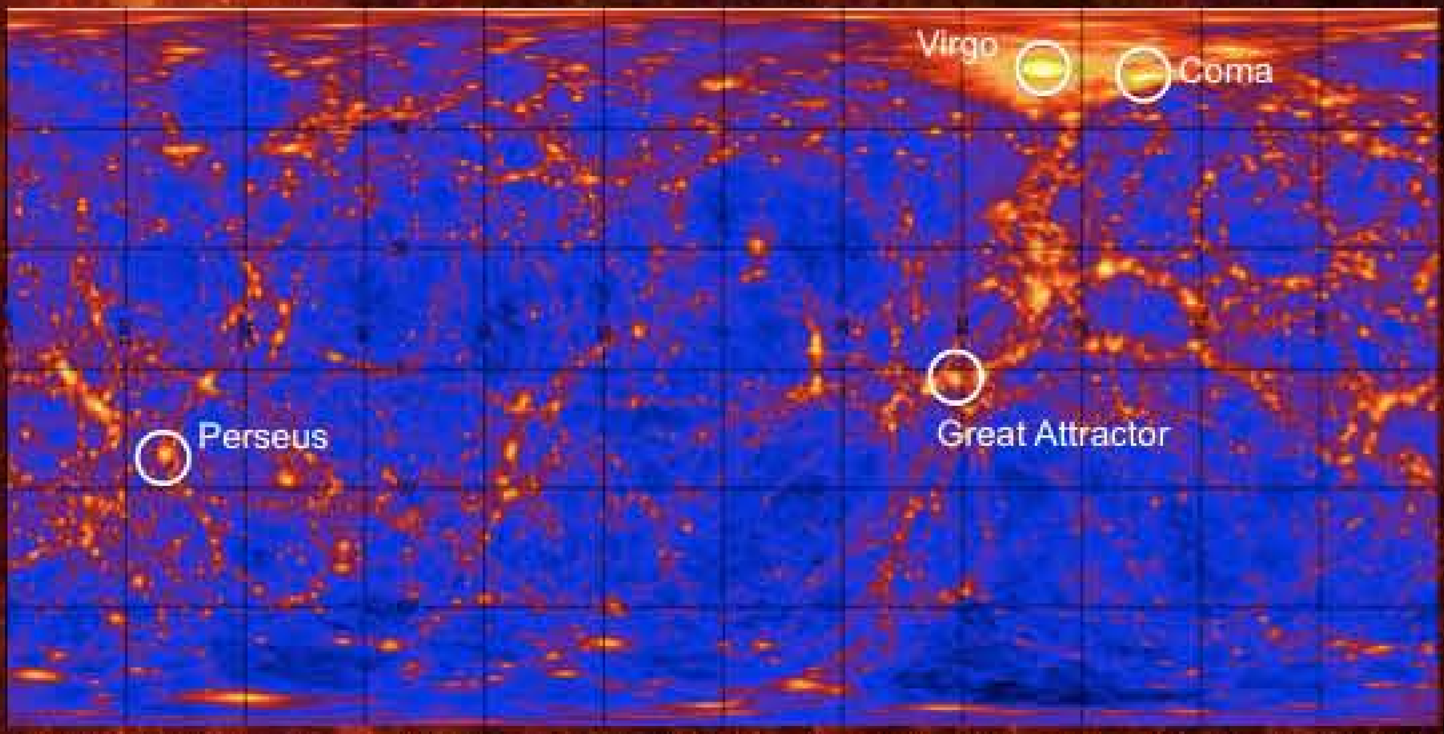

Figure 1: DM *decay* luminosity all-sky map in Cartesian projection and galactic coordinates. The color scale is logarithmic and it is saturated in order to make visible the structures. The map maximum is around 1, while the mean pixel value is around 0.2 (units are GeV cm^{-3} Kpc sr^{-1}). White circles indicate the principal objects identified in the constrained simulation. Figure obtained with HEALPix [4].

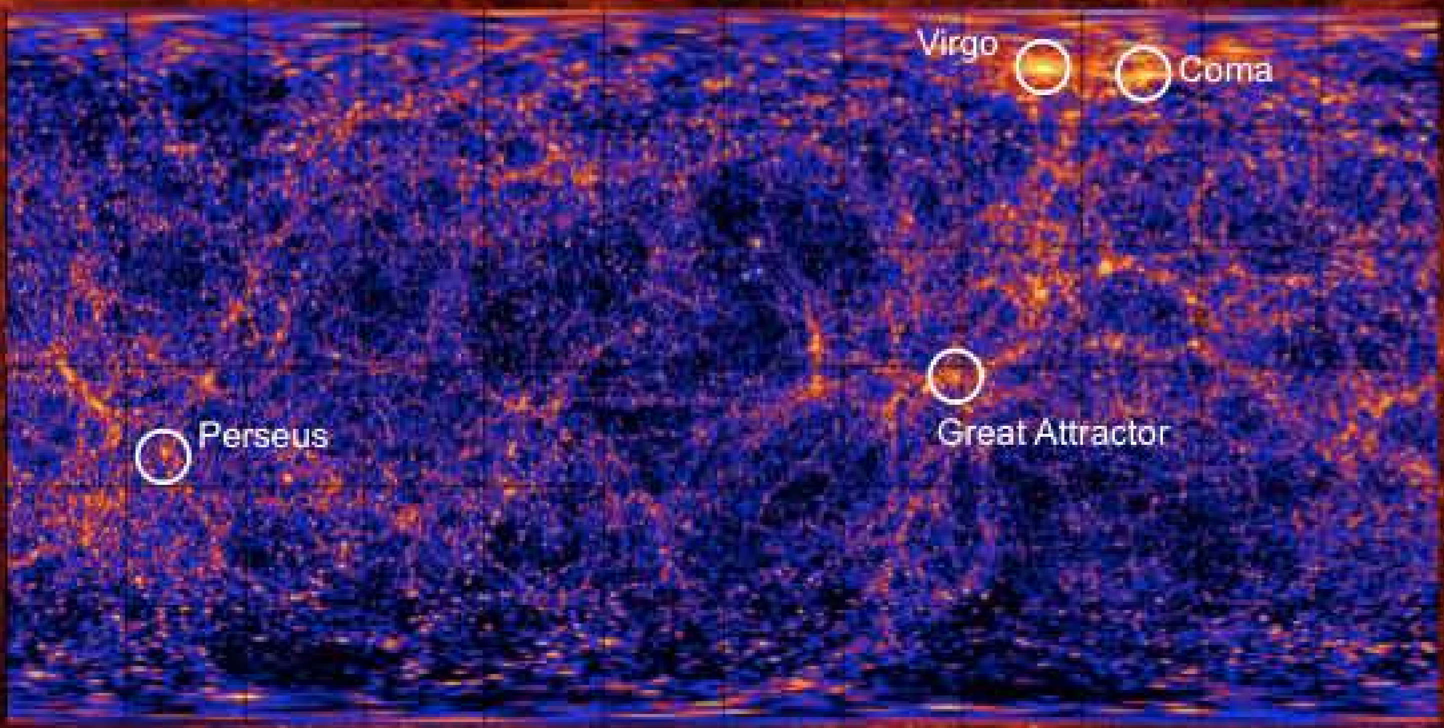

Figure 2: DM *annihilation* luminosity all-sky map in Cartesian projection and galactic coordinates. The color scale is logarithmic and it is saturated in order to make visible the structures. The map maximum is around 2, while the mean pixel value is around 0.3 (units are GeV^2 cm^{-6} Kpc sr^{-1}). White circles indicate the principal objects identified in the constrained simulation. Figure obtained with HEALPix [4].

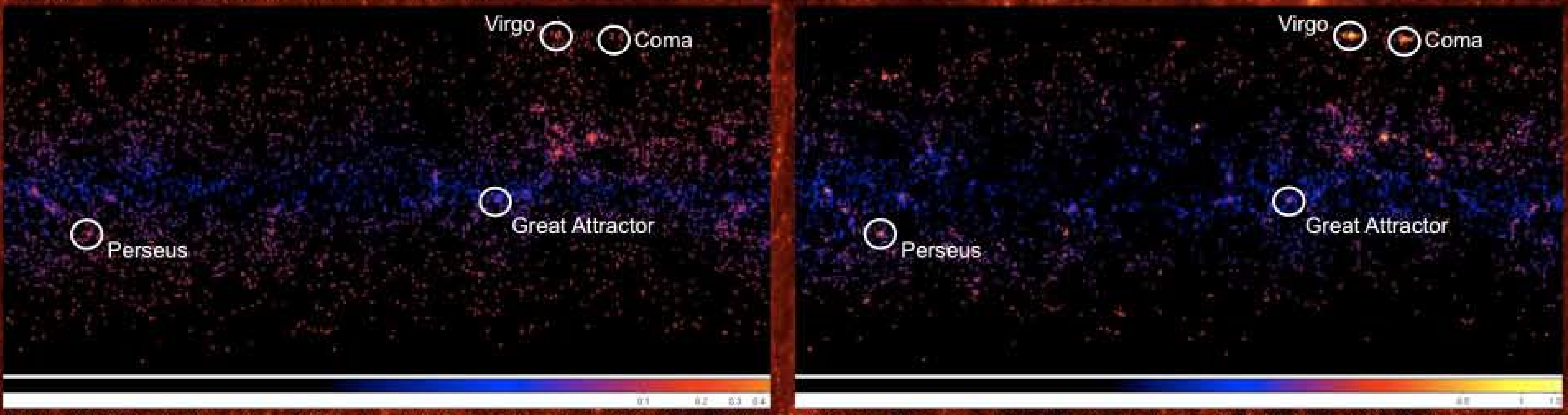

Figure 3: S/N all-sky maps of DM *decay* (left panel) and *annihilation* (right panel) induced gamma-ray emission between 100 MeV and 10 GeV. Maps were obtained by running Fermi satellite 5-year observation simulations [5] of the DM luminosity maps of Figure 1 and 2. The latest available background model from the Fermi collaboration has been used. We adopted a b-b*bar* final state channel [6] with a particle mass of 100 GeV. Maps are in Cartesian projection and galactic coordinates. White circles indicate the principal objects identified in the constrained simulation. Note that in individual pixels the filaments have S/N factors of a few lower than clusters and groups, however stacking analysis on larger region along filaments will increase the signal.

REFERENCES:

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