Triangulum galaxy viewed by Planck

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1. Introduction

A temperature asymmetry has been detected in *Planck* data toward the M31, Cen A, and M82 galaxies, always aligned with respect to the expected galaxy spin. The aim of this paper is to investigate whether the same phenomenon also occurs for M33 (also known as the Triangulum galaxy), which is an appropriate object on which to test our method, and on which we can trace the dynamics of the baryonic galactic halo (which at large scales also has to reflect the dark matter contribution) in a model-independent way because it is sufficiently extended and useful multi-wavelength observations are available.

M33 (or NGC 598) is the nearest late-type spiral galaxy that lies at a distance of only about 840 kpc. It is the third largest member (after M31 and the Milky Way) of the Local Group, and the coordinates of its center are RA $01^h33^m50.9^s$ and Dec $30^0 39' 37''$. It is classified as an SAcd galaxy, that is, a late-type spiral with a weak bar, no clear evidence of any bulge component, and relatively loosely wound arms. At the M33 distance $1'$ corresponds to 244 pc ($1^0 \simeq 14.67$ kpc), which allows us to study this galaxy with a great degree of accuracy. The relatively small inclination angle $i \simeq 56^0$ allows us to obtain a comprehensive view of the M33 galaxy, which is a key advantage, for example, for studying the correlation of the velocity field with the galaxy geometry. The M33 disk is rotating with a maximum circular velocity of about $120 - 130$ km s^{-1} and has a rising profile, indicating that the outer regions of the galaxy possess substantial mass. The observations at wavelength of 21 cm show the detailed spatial and kinematic structure of the neutral hydrogen in M33, which extends farther out than the stellar component. Interestingly, at least 18% of the HI gas is found beyond the star-forming disk. There is some evidence of a faint halo component that was previously undetected.

We used *Planck* data to study the M33 galaxy and find a substantial temperature asymmetry with respect to its minor axis projected onto the sky plane. This temperature asymmetry correlates well with the HI velocity field at 21 cm, at least within a galactocentric distance of 0.5^0, and it is found to extend up to about 3^0 from the galaxy center. We conclude that the revealed effect, that is, the temperature asymmetry and its extension, implies that we detected the differential rotation of the M33 galaxy and of its extended baryonic halo. For more details see De paolis et al. (2016).

Riferimenti bibliografici

[1] F. De Paolis et al., 2016, A&A 593, A57