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Kinematical evidence for secular evolution in *Spitzer Survey of Stellar Structure in Galaxies* (S^4G) spirals

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Abstract. We present a study of the kinematics of a sample of isolated spiral galaxies in the *Spitzer* Survey of Stellar Structure in Galaxies (S^4G). We use Hα Fabry-Perot data from the GHαFaS instrument at the William Herschel Telescope (WHT) in La Palma, complemented with images at 3.6 microns, in the R band and in the Hα filter. The resulting data cubes and velocity field maps allow a complete study of the kinematics of a galaxy, including in-depth investigations of the rotation curve, velocity moment maps, velocity residual maps, gradient maps and position-velocity (PV) diagrams. We find clear evidence of the secular evolution processes going on in these galaxies, such as asymmetries in the velocity field in the bar zone, and non-circular motions, probably in response to the potential of the structural components of the galaxies, or to past or present interactions.

Keywords. galaxies: kinematics and dynamics - galaxies: spiral - galaxies : individuals : NGC 864

Results

In Erroz-Ferrer *et al.* (2012) (arXiv:1208.1409) we have presented the first results of this survey, a kinematical analysis of NGC 864. In the paper we have mainly analysed the kinematic data cubes. Also, we have used other ancillary data, like *R*-band and Hα images taken with the instrument ACAM in the WHT, IFU data with the SAURON instrument, also in the WHT, and we used the 3.6 micron S^4G image.

The data cubes and velocity maps allow the study of the kinematics of every galaxy, including in-depth investigations of the rotation curve, velocity moment maps, velocity residual maps and position-velocity diagrams.

In the residual maps, we have found that there are deviations from the circular rotation velocity, confirming the presence of non-circular motions along the bar. These are probably caused by the non-axisymmetrical potential created by the bar. We can also observe the non-circular motions by creating a position-velocity diagram along the kinematic minor axis. In an ideal case without non-circular motions, the velocity profile along the kinematic minor axis would have been completely flat. This confirms that the bar has a significant influence on the kinematics of the galaxy, causing the velocities to deviate from the circular, rotational, motion. The presence of the non-axisymmetric gravitational potential of the bar can be recognised in the deviations from circular motion across the galaxy.

Reference

Erroz-Ferrer, S., Knapen, J. H., *et al.* 2012, *MNRAS*, 427, 2938