Ghasp: a kinematical sample of nearby isolated spiral galaxies

Benoît Epinat (LAM, LATT) &
P. Amram, M. Marcelin, C. Balkowski, H. Plana, L. Chemin, S. Torres-Flores

2009-10-05

The GHASP survey (Gassendi HAlpha survey of SPirals) consists of 3D Hα data cubes for 203 spiral and irregular galaxies, covering a large range in morphological types and absolute magnitudes, for kinematics analysis. It is the largest sample of Fabry-Perot data published up to now (Epinat et al. 2008a,b). A Fabry-Perot database is beeing built (`http://fabryperot.oamp.fr`). This new database under construction already contains the GHASP data. It will soon contain more than 500 galaxies from various samples : VIRGO (Virgo cluster galaxies), compact group galaxies, blue compact galaxies, BHaBar (barred galaxies), low surface brightness galaxies, the SINS sample, ... Some results from the VIRGO sample have been discussed (effect of the environment and interactions in the center of the cluster).

The GHASP sample has been used to study the effects of the beam smearing on high redshift ($z > 1$) galaxy kinematics observations (Epinat et al. 2009). A substantial part of the sample (150 galaxies out of 203) have been projected at $z \sim 1.7$ with a 0.5" seeing and with a 0.125" pixel, in order to mimic typical SINFONI observations. The main effect on the kinematics is a decrease of the velocity gradient and an increase of the velocity dispersion in the center and along the minor axis. However, depending on the shape of the rotation curve and flux distribution, the peak in velocity dispersion may be not observable. In addition, when local velocity dispersion is large, this effect is more difficult to observe. It is possible to recover the maximum velocity, the local velocity dispersion and the position angle of the major axis using simple velocity field modeling of rotating disks (with 2 parameters rotation curves) that take into account the spatial resolution. The comparison of high redshift observations (SINFONI/VLT and OSIRIS/KECK) with the projected GHASP sample show strong evidence for change in the dynamical support. In particular a rise of the local velocity dispersion of the gas from ~ 25 km/s at $z \sim 0$ to ~ 70 km/s at $z \sim 2$ in disks is observed. These disks, probably thick may be transient and progenitor of bulge or thick star disks. However, spectral resolution effects still cannot be excluded to explain the larger velocity dispersions observed at high redshift.

Mass modelling of GHASP, low surface brightness and compact group galaxies has been performed (Spano et al. 2008, Chemin et al. in preparation, Plana et al. in preparation). The pseudo isothermal sphere profile fits better the Fabry-Perot data than ΛCDM NFW model (Navarro, Frenk & White) and the surface density of dark matter halo is constant with the magnitude for isolated, cluster and comact group galaxies. The ΛCDM Einasto model has also been used to fit low surface density galaxies that are dark matter dominated galaxies. This profiles fits better than the isothermal sphere model. The Universal Rotation Curve is beeing studied (Persic & Sallucci 1991, Persic & Sallucci & Stel 1996, Catinella et al. 2006) from GHASP galaxies. We recover the fact that (i) inner velocity gradients increase with the luminosity (I,K-bands) of the galaxies, (ii) outer velocity gradients decrease (up to zero) with the galaxy luminosity. However, within each bin of magnitude ($-18 < I < -23$), a wide variety of rotation curves is observed, both in shape and V_{max}. Moreover, except in a few cases, we find no convincing evidence for declining rotation curves within the optical scales. These declining rotation curves were suggested by Persic & Sallucci & Stel (1996) for high luminosity galaxies. The links between star formation rates and kinematics has been studied on the GHASP sample. In particular, we find that the gaseous local velocity dispersion is correlated to both SFR and surfacic SFR. This is the opposite for stellar velocity dispersion since we expect that stars form in cold disks. We also find that the local gaseous velocity dispersion increases with magnitude and that it is higher for early type spirals.