

The Third National Workshop on the SKA Project - The Italian Route to the SKAO Revolution



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Galaxy dynamics in the era of large HI surveys

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The HI emission line at 21 cm is arguably the best tool to trace the internal dynamics of galaxies and was indeed pivotal to establish the dark matter problem. The HI emission typically traces rotating gas disks that extend further out than the stellar component of galaxies, so one can measure extended rotation curves out to large radii, where the dark matter effect becomes predominant. Current HI samples of galaxies, however, are limited to a few hundreds of objects at low redshift and are rather heterogeneous in nature (e.g., the SPARC database; Lelli et al. 2016, AJ), limiting our ability of testing galaxy formation models in a Λ CDM context as well as alternative theories. The SKA observatory and its pathfinders will revolutionize the study of galaxy dynamics, providing spatially resolved HI data for several thousands of galaxies, possibly up to high redshifts. Given the unprecedented amount of data, it will be crucial to have fast, automated, and reliable tools to model galaxy dynamics in an efficient way. In preparation to wide-field next-generation HI surveys, we started a major data-modeling project called BHINGO (Barolo HI Nearby Galaxy Overview). We collected about 1000 HI datacubes from several public archives and analyzed them in a homogeneous fashion using the 3D-Barolo software (Di Teodoro & Fraternali 2015). For all these galaxies, BHINGO provides HI moment maps as well as ready-to-use advanced data products, such as gas surface density profiles and rotation curves. BHINGO will increase the size of existing HI samples by a factor of about five: this is a necessary intermediate step to get ready to the order-of-magnitude increase in sample sizes expected from SKA precursors. I will also discuss how the same data-modeling techniques are currently being applied to pilot HI data from the ASKAP telescope as part of the kinematic pipeline of the WALLABY survey.

Research area

HI galaxy science

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