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Ilaria Ruffa - Molecular gas kinematics in local early-type galaxies with ALMA

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The unprecedented resolution and sensitivity provided by ALMA have opened up a new era in the study of massive early-type galaxies (ETGs) at low redshifts ($z < 0.1$), enabling us to resolve the key scales over which the feeding and energetic output of their central super-massive black holes (SMBHs) operate, and thus uncovering a number of physical phenomena (e.g. nuclear bars, massive cold gas inflows/outflows). At the same time, dynamical studies of spatially-resolved molecular gas at the centre of ETGs are enabling very accurate determinations of a key intrinsic SMBH parameter, that is its mass, thus revolutionising the study of SMBH-host galaxy co-evolutionary processes.

In this talk, I will present the results obtained by analysing the kinematics of multiple CO transitions observed at high-resolution with ALMA in a number of nearby massive ETGs, hosting both active and inactive SMBHs. I will discuss how the results obtained for active ETGs provide important constraints on radio jet–cold gas interactions, and the overall SMBH fuelling and feedback processes. I will then present high-precision CO-dynamical SMBH mass measurements obtained in the context of the mm-Wave Interferometric Survey of Dark Object Masses (WISDOM) project on objects with very different types of nuclear activity, showing the enormous potential of this technique in underpinning our understanding of the SMBH-host galaxy scaling relations. Finally, I will also highlight the crucial synergy with high resolution radio continuum, neutral hydrogen, optical and X-ray observations to understand which mechanisms regulate the life-cycle of massive (active) ETGs, and the overall connection between the SMBH fuelling/feedback processes and their host galaxy evolution.

Session Classification: Local Universe