Molecular gas in the most massive spiral galaxies

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Abstract

Super spirals represent a very rare population of massive disk galaxies that have not quenched star formation (SF). These spiral galaxies are extreme by many measures, with r-band luminosities of L = 8–14 L, stellar masses of Mstar= 2–6×10ˆ11 M, and giant isophotal diameters of D25 = 55–134 kpc. Their specific star formation rate (sSFR) places them on the star-forming main sequence.
Super spirals are excellent objects to test galaxy evolution. Their extreme properties (size, stellar mass) provide a unique opportunity to extend studies of disk galaxy scaling laws to an entirely new regime, normally occupied by giant elliptical galaxies. Super spirals show a break in the BTFR at very high mass, with a lower baryonic mass compared to the dynamical mass. This implies that when disk galaxies build up to halo masses > 6 × 10ˆ11 M, they accrete inefficiently, causing the amount of cold accreted gas to stall out, restricting the amount of gas available for star formation, and leading to the observed break in the BTFR. An alternative possibility would be that SF is inefficient at these high masses so that less stellar mass is built up.
We recently observed a sample of 24 super spirals in CO(1-0) with the IRAM 30m telescope which allows for the first time to include the molecular gas content in the analysis. I will present and discuss the new results which suggest that the SF and molecular gas fraction are not considerably different from lower mass objects, and that the deviation from the BTFR holds when taking the total gas amount into account.

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