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A new analysis of low-frequency radio luminosity as a star-formation tracer in the Lockman Hole region using LOFAR deep observations

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In preparation for the deep and wide continuum extra-galactic surveys that will be carried out by the SKA, we have exploited LOFAR deep observations of the Lockman Hole field at 150MHz to investigate the relation between the radio luminosity of star-forming galaxies (SFGs) and their star formation rates (SFRs), as well as its dependence on stellar mass and redshift. The adopted source classification, star formation rate (SFR) and stellar mass estimates are consensus estimates based on a combination of four different SED fitting methods. We note a flattening of radio spectra of a substantial minority of such sources below ~1.4 GHz. Such sources have thus a lower "radio-loudness"level at 150MHz than expected from extrapolations from 1.4 GHz using the average spectral index. We found a weak trend towards a lower SFR/L_{150MHz} ratio for higher stellar mass. We argue that such a trend may account for most of the apparent redshift evolution of the L_{150MHz}/SFR ratio, in line with previous work. Our data indicate a weaker evolution than found by some previous analyses. We have derived luminosity functions at 150MHz of both SFGs and radio-quiet (RQ) AGN at various redshifts. Our results are in very good agreement with the T-RECS simulations and with literature estimates. We also present explicit estimates of SFR functions of SFGs and RQ AGN at several redshifts derived from radio survey data. In the talk, a comparison with the analysis by Bonato et al. (2021) of deep WSRT observations of a fraction of the field will be presented as well.

Reasearch area

Extragalactic Continuum (galaxies/AGN, galaxy clusters)

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