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Presentation Requested: poster

Category: Other

Question: Other

The Star Formation in Radio Survey: 33GHz Continuum Imaging and Initial Spectral Index Mapping

The Star Formation in Radio Survey: 33GHz Continuum Imaging and Initial Spectral Index Mapping

We present a gallery of Jansky Very Large Array (VLA) 33GHz images at 2" resolution taken as part of the Star Formation in Radio Survey (SFRS). The SFRS sample covers 118 galaxy nuclei and extranuclear star-forming regions in 56 nearby ($d < 30$ Mpc) galaxies included in the Spitzer/SINGS and Herschel/KINGFISH legacy programs. VLA observations of the entire sample have recently been completed at 3GHz (S band) and 33GHz (Ka band); 15GHz (Ku band) observations are currently queued. For an initial subset of 9 targets, we have also obtained 90GHz ALMA continuum and line imaging during cycle 1 observations.

The 33GHz data probe free-free emission, providing a sensitive, dust-unbiased measurement of the star formation activity in each source. Consequently, these data can be used to accurately calibrate other empirically-derived star formation rate diagnostics that are more easily measured for high redshift studies, as well as help interpret rest-frame 33GHz observations from a new generation of deep high frequency (>10 GHz) radio surveys. The frequency spacing of our complete radio data set will allow us to accurately measure the spectral index and curvature of these targets, in order to model the physical processes that produce the radio emission.

Our sample includes NGC1266, a low level AGN that has a molecular outflow rate of $> 13 M_{\odot} yr^{-1}$. Along with the observed SFRS data, we have used an archival 1.4GHz and a new 5GHz VLA image to make resolved spectral index and curvature maps of this galaxy. These maps are currently being used to model the age and diffusion history of synchrotron electrons which were presumably accelerated by the AGN.