The Surprising Complexity of the Radio Emission from Star Forming Galaxies

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In the absence of a radio-loud active galactic nuclei, radio emission from galaxies is a superb tracer of the current star formation rate (SFR). This is due to the fact that radio photons are unimpeded by dust unlike common tracers of SFR in the optical and UV. In the radio regime both free-free emission from star forming regions and the large-scale galactic synchrotron emission are directly related to the on-going SFR. I will present the broad radio-band (~100 MHz to ~100 GHz) studies of 19 low redshift (z~0.1) powerful star forming galaxies (L_{IR}~10^{12} $L_{\odot}$). From 70-230 MHz we have photometric measurements from the Galactic and Extra-galactic MWA survey complemented by higher frequency photometry (1-100GHz) from the Australian Telescope Compact Array. In addition to distinguishing the free-free and synchrotron components, we can observe low frequency turn-overs mostly likely due to free-free absorption. Furthermore, we find multiple synchrotron components with different free-free turn-overs. These turn-overs are likely related to regions within the galaxy with different Emission Measures. I will discuss how this complexity in the radio spectral energy distributions is related to the geometry of the galaxy, i.e. the distribution of star forming regions and the nature of the inter-galactic medium.