

An HI-census of the hidden Vela Supercluster (VSCL)

Abstract

Recent optical spectroscopy revealed a first glimpse of the outer edges of a previously unknown, extended supercluster at low Galactic latitudes in Vela (VSCL: $cz \sim 18'000\text{km/s}$; $\sim 260\text{ h}70\text{ Mpc}$). Reconstructions suggest that this extended mass-overdensity may play an important role in resolving the two decade-long bulk flow discrepancies (cf. Said et al. 2020, Fig. 9). Because of Galactic dust and star obscuration, the walls and main core conforming the VSCL have remained uncharted. Only systematic HI-surveys can prevail here. MeerKAT with its superb L-band sensitivity, survey speed and spatial resolution ($\sim 8''$) is optimally suited to map the extent of this enigmatic supercluster. We plan to use MK64 L-band and 4k correlator for a systematic HI-survey, covering the VSCL across the opaque part of Milky Way, i.e. a strip of 20 degrees in longitude for the latitude range $|b| < \pm 7.5$ degrees (excluding the inner ± 2 degrees covered by the GPS Legacy Survey). With Nyquist sampling (requiring 666 pointings) and an integration time of 5 minutes per pointing, we will reach a 5-sigma detection limit of $\sim 4.4 \times 10^9\text{ Msun}$, about half an order of magnitude below the knee of the HI mass function (HIMF). This will allow the detection of the majority of the gas-rich spiral population populating the two merging VSCL walls - and the derivation of its mass-overdensity from the resulting HIMF. According to the proposal tools, this can be achieved in 66.5 hrs observing time, including overhead.