Gas and dust in the diffuse interstellar medium: new surveys of diffuse interstellar bands and dust polarisation

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The composition and nature of interstellar dust grains and the molecular composition of interstellar gas are important factors in understanding the chemistry and physics of the diffuse interstellar medium and its role in star formation and galaxy evolution. In this contribution we present the first results from two VLT surveys studying in detail the nature and properties of interstellar gas and dust in diffuse clouds.

The ESO diffuse interstellar band large exploration survey (EDIBLES[1]) focusses on the atomic and molecular content of the diffuse ISM by probing the lines-of-sight towards ∼120 bright OB stars. This survey provides a deep census of interstellar atomic and molecular abundances and diffuse interstellar band (DIB) absorptions in the diffuse/translucent ISM. The goal of EDIBLES is to `reverse-engineer' the physical properties of the carriers of the enigmatic unidentified diffuse interstellar bands as a contribution towards their identification. I will present the first results related to DIB profiles, interstellar hydrides, and the C60 fullerene.

The large interstellar polarisation survey (LIPS[2]) is a medium-resolution spectropolarimetry study with FORS2 to measure the wavelength-dependent polarisation of starlight by aligned interstellar dust grains in ∼100 lines-of-sight (a large fraction overlapping with EDIBLES). We investigate the variations (evolution) of dust grains through a parametrised Serkowski-law fitting of these curves. The polarisation spectra are combined with UV extinction curves and modelled simultaneously with a physical dust grain model. We present the first observational results in terms of the Serkowski-parameters as well as the dust modelling of a sub-set of the targets, in particular our study of “single-cloud” sightlines.

Together, EDIBLES and LIPS provide a comprehensive examination of the molecules and dust properties in a statistically large sample of nearby Galactic sightlines.

References

[1] Cox et al. A&A, 606, A76 (2017)

[2] Bagnulo et al. A&A, 608, A146 (2017)