TERAHERTZ TIME DOMAIN SPECTROSCOPY OF SIMPLE ASTROPHYSICALLY RELEVANT ICES: THE STRUCTURE OF THE ICE

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International astronomical facilities, in particular the Herschel Space Telescope, SOFIA and ALMA, are currently characterizing the interstellar medium (ISM) by collecting a huge amount of new THz spectral data that must be compared to THz laboratory spectra to be interpreted. The latter, however, are largely lacking, and this severely restricts the scientific impact of the astronomical observations. We have recently constructed a new THz time-domain spectroscopy system to investigate the spectra of interstellar relevant ice analogs in the range between 0.3 - 7 THz. The system is coupled to a FT-IR spectrometer to monitor the ices in the mid-IR (4000 - 500 cm^{-1}). The THz region of the electromagnetic spectrum is dominated by large amplitude motions, such as phonon modes and intermolecular vibrations, along with high-frequency torsional motions of individual species. This talk will focus on the laboratory investigation of the composition and structure of the bulk phases of interstellar ice analogs (*i.e.*, H_2O, CO_2, CO, CH_3OH, NH_3, CH_4). Different temperatures, mixing ratios, and matrix isolation experiments will be shown. The ultimate goal of this research project is to provide the scientific community with an extensive THz ice-database, which will allow quantitative studies of the ISM, and guide future astronomical observations of species in the solid phase.