IRFEL irradiation of carbon dioxide ice

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Interstellar ice grains are believed to play a key role in the formation of many of the simple and complex organic species detected in space. However, many fundamental questions on the physicochemical processes linked to the formation and survival of species in ice grains remain unanswered. Field work at large-scale facilities such as free-electron lasers (FELs) can aid the investigation of the composition and morphology of ice grains by providing novel tools to the laboratory astrophysics community. During the talk, I will show how we used the intense monochromatic radiation of an infrared FEL source at FELIX (The Netherlands) to inject vibrational energy at selected frequencies into amorphous and crystalline CO_2 ice grown on the gold flat substrate of the ultrahigh vacuum LISA end station to study ice restructuring effects *in situ* by Fourier Transform Reflection-Absorption Infrared (FT-RAIR) spectroscopy. This work improves our understanding of how vibrational energy introduced by external triggers such as photons, electrons, cosmic rays, and thermal heating coming from a nascent protostar or field stars is dissipated in an interstellar icy dust grain in space. Moreover, it adds to the current literature debate concerning the amorphous vs polycrystalline structure of CO_2 ice observed upon deposition at low temperatures in different laboratories across the world.