Dust depletion of metals from local to distant galaxies: the origin of dust

Christina Konstantopoulou

April 21, 2023

The cycle of metals between dust and gas plays a fundamental role in the chemical enrichment of the ISM. Metals are missing from the observable ISM gas phase because they are instead incorporated into dust grains, an effect we call dust depletion. This effect alters the observed chemical abundances, which can be inferred through absorption-line spectroscopy. Characterizing the dust depletion of metals both in the local and distant Universe is important to investigate the evolution and origin of metals and dust through cosmic time. The fraction of metals in dust can be described by the dust-to-metal ratio (DTM) and the dust content by the dust-to-gas ratio (DTG). These properties can give us clues about the production and destruction mechanisms of dust and how it evolves with metallicity and over cosmic time.

In my talk I will present my recent results on characterizing the dust depletion of 18 metals (C, P, O, Cl, Kr, S, Ge, Mg, Si, Cu, Co, Mn, Cr, Ni, Al, Ti, Zn and Fe) using relative abundances in different galactic environments, including the Milky Way, the Magellanic Clouds and damped Lyman-alpha absorbers (DLAs) towards quasars (QSOs) and towards gamma-ray bursts (GRBs). Our inferred dust depletion measurements are then used to estimate the dust-to-metal ratio (DTM), dust-to-gas ratio (DTG) and the dust composition in the ISM in these different galactic environments. These results have implications on the origin of cosmic dust and the dominant processes of dust production.