Contribution ID: **92** Type: **Poster**

A Closer Look at Some Gas-Phase Depletions in the ISM: Trends for O, Ge and Kr vs. F*, f(H_2) and Starlight Intensity

Tuesday 12 June 2018 14:13 (1 minute)

An analysis of interstellar absorption features in UV stellar spectra in the HST and FUSE archives reveals column densities of O I, Ge II, Kr I, Mn II, Mg II, H I and H_2 in many different directions. Expanding on an earlier study by Jenkins (2009), this effort probes the partial correlations of the element abundances of O, Ge, and Kr relative to hydrogen for three fundamental parameters: (1) a generalized parameter F*for the strength of depletions of elements by dust, (2) the fraction of hydrogen in molecular form f(H_2), and (3) a measure of the local intensity of starlight. Abundances of Mg II and Mn II relative to atomic and molecular hydrogen establish values of F.* Previous claims that the chemically inert element Kr is sometimes depleted are substantiated in this study, but correlations with any of the three parameters are very weak, especially after one accounts for error covariances arising from uncertainties in the total hydrogen column densities. The ratio of gas-phase O to H in the ISM exhibits positive correlations with both f(H_2) and starlight intensity, and as expected, a negative correlation with F. *Photodesorption of oxygen atoms from solid constituents probably accounts for the relationship between concentrations of gas-phase O and starlight intensity, but the reason for the correspondence with f(H2) is more difficult to explain and may arise from some indirect effect. Ge/H has a negative correlation with F* and no significant dependence on the other two parameters.

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Session Classification: Poster Presentations

Track Classification: What is dust?