A STUDY OF THE $c$-$C_3$HD/$c$-$C_3$H$_2$ RATIO IN LOW-MASS STAR FORMING REGIONS.

JOHANNA CHANTZOS, SILVIA SPEZZANO, PAOLA CASELLI, ANA CHACON-TANARRO, The Center for Astrochemical Studies, Max-Planck-Institut für extraterrestrische Physik, Garching, Germany.

Deuterium fractionation increases significantly in cold ($T < 25$ K), dense ($n_H > 10^4$ cm$^{-3}$) molecular clouds, in which molecules like CO freeze out onto dust grains leading to an enhanced abundance of H$_2$D$^+$, D$_2$H$^+$ and D$_3^+$. $c$-$C_3$H$_2$ is formed and deuterated exclusively by gas-phase chemistry. This makes it to a very good indicator of gas-phase deuteration and therefore to an excellent tool to study the early phases of star formation.

We observed the $c$-$C_3$HD/$c$-$C_3$H$_2$ ratio toward 13 prestellar and 4 protostellar cores in the Taurus and Perseus Complex, respectively. In particular, the $3_{0,3} - 2_{1,2}$ and $2_{1,2} - 1_{0,1}$ transitions of the isotopologues $c$-$C_3$HD and $c$-$^{13}$CC$_2$H$_2$ were observed in all prestellar and protostellar cores with a very high S/N. In both samples a high deuteration factor was found. In the prestellar cores the $c$-$C_3$HD/$c$-$C_3$H$_2$ ratio varies between 5% and 13% while in protostellar cores is found to be 9%-23%.

I will present our results on the correlation between the deuterium fractionation of $c$-$C_3$H$_2$ and evolutionary indicators such as central density and dust temperature and compare them with the deuteration of N$_2$H$^+$ observed in the same sources.