**Non-LTE excitation of CO in the cometary comae**

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An accurate determination of the physical conditions in astrophysical environments relies on the modeling of molecular spectra. In such environments, densities can be so low (*n* << 1010 cm-3) that local thermodynamical equilibrium conditions cannot be maintained. Hence, radiative and collisional properties of molecules are needed to correctly model molecular spectra. CO is one of the most abundant molecules in the interstellar medium and is even found to be dominant in comae of comets at large heliocentric distances. It is then of high interest to study the excitation of CO induced by collisions with H2O and CO, the dominant collisional partners in cometary comae.

In this talk, I will present new scattering calculations for the collisional energy transfer in CO-H2O and CO-CO collisions. Using quantum and statistical approaches, cross sections and rate coefficients are provided for collisional energy transfer between the first 11 levels of CO. In comparison with data available in the literature, significant differences were found, especially for the dominant transitions. Using these new collisional data, non-LTE excitation models were performed and compared to recent CO observations in CO-rich cometary comae. These new data allow an accurate modelling of the physical conditions in these astrophysical environments that are keys for understanding stars and planets formation.

François Lique received his PhD from Sorbonne University in Paris (France) in 2006. He worked as a postdoctoral fellow at the University of Maryland in the USA and as associate/full professor at the University of Le Havre Normandy (France). He is now full professor at the University Rennes 1 (France). François Lique's research mainly focuses on the modeling of physico-chemical processes of astrophysical interest and its applications. The objective is to obtain precise data for the processes (radiative, collisional or reactive) in which the interstellar molecules are involved. His work has enabled important advances in the field of molecular astrophysics, such as the discovery of new interstellar physical molecules or the resolution of problems related to the abundance of interstellar species.