José Cernicharo
Instituto de Física Fundamental-CSIC, Spain

"QUIJOTE line survey of NANOCOSMOS and the chemical complexity of a prestellar core TMC-1"

I will present the recent results obtained with the QUIJOTE line survey of the cold dark core TMC-1. The observations have been carried out with the YEBES 40m radio telescope (see Figure 1) in the Q-band. A new set of receivers have been installed in the telescope within the frame of the ERC synergy Nanocosmos project that allows to cover the whole 31-50 GHz band in dual polarization. The spectral resolution is 38.15 kHz. The sensitivity achieved so far varies between 0.12 and 0.25 mK, and allows to search for new molecules in a line by line (no stacking) detection procedure. These new data have permitted to detect many protonated species of abundant molecules and eight sulfur-bearing species.

Among the QUIJOTE's results I will focus on the detection of hydrocarbon chains and cycles with low permanent dipole moment, such as CH2CHCCH, CH2CCHCCH, the propargyl radical (C3H3), cyclopentadiene, indene (the first PAH detected in space), ortho-benzyne, two ethynyl derivatives of cyclopentadiene (c-C5H5CCH) and fulvenallene (c-C5H4CCH2). All these hydrocarbon and cycles exhibit a very large abundance.

I will discuss the present chemical models we are performing to explain the chemistry of these species and in particular the possible reactions leading to the formation of the cycles. We have found that a bottom-up approach starting with reactions of simple radicals, such as propargyl and the vinyl radical, with cations, vinyl and allyl acetylene, and other hydrocarbons reproduce satisfactorily well the observed abundances.

Finally, I will show the SANCHO project which is devoted to the study of the spatial distribution of these molecules around TMC-1 with a sensitivity never achieved so far (4 mK).