Protoplanetary disks in the Orion Nebula Cluster: FUV radiation effects

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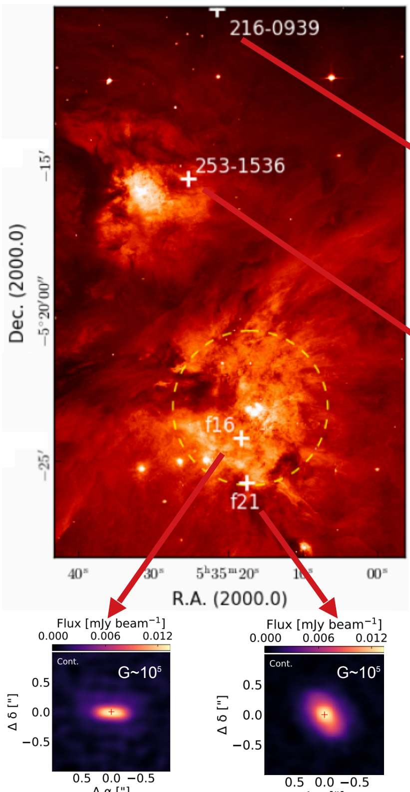
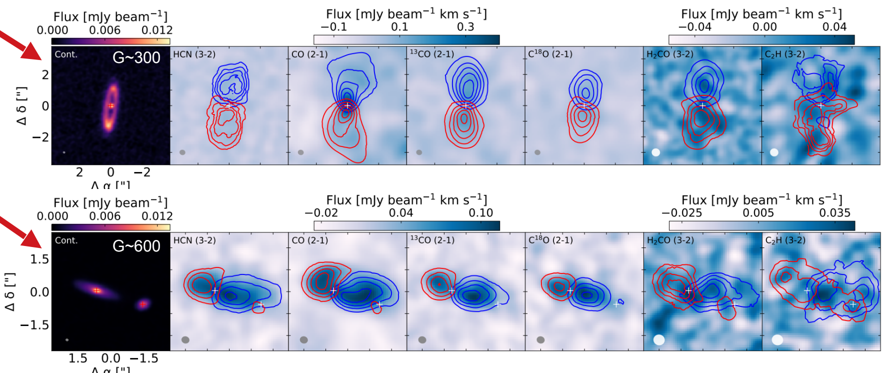
Until now the studies of the chemistry in disks are focused on low-mass star forming regions. This is because they contain isolated disks, which are separated from their parent molecular cloud, which eases the well detection of molecular lines. However, protoplanetary disks are commonly born in stellar clusters (Adams 2010), then they are constantly irradiated by strong radiation fields of neighbor stars while they are evolving to planetary system and their chemistry is changing. In order to investigate the effects of FUV radiation on the chemistry of protoplanetary disks which are located near to massive stars, and to test current chemical models which investigated these scenarios (Walsh et al. 2013), we present ALMA Band 6 observations of a line survey of four disks in the surroundings of the Orion Nebula Cluster.

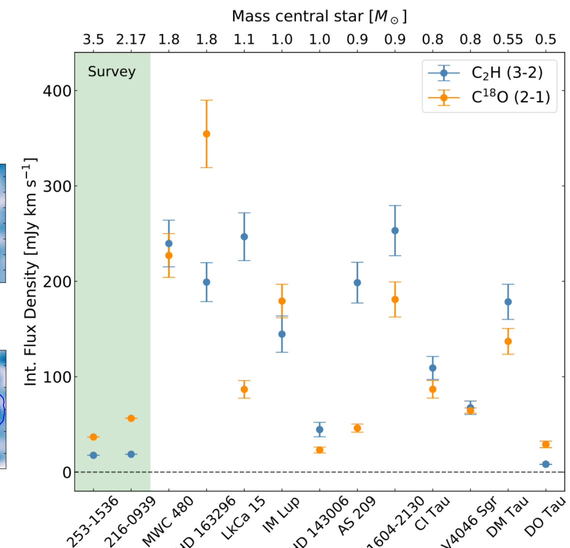


The ONC is the nearest young rich cluster which contains a massive star-forming region, where the radiation is dominated by the massive and young O-type star, θ^1 Ori. For that reason, this region allow us to investigate correlations between disk properties and their chemistry with environment properties.



These four disks are still embedded in their parental molecular cloud. Therefore we observe contamination from the cloud at the central velocity channels.

We detect CO, ^{13}CO, C^{18}O, HCN, H_2CO and C_2H towards two disks. Molecular lines such as DCN and C_3H_2 were observed but not detected with emission greater than 3σ. In cases of more irradiated disks such as f21 and f16, even CO isotopologues are difficult to detect, because of the presence of the molecular cloud.



The two disks in Orion show lower integrated flux densities compared to isolated disks (from Bergner et al. 2019). The fluxes have been normalized to bring all sources to a distance of 400 pc.

Our preliminary results show that there is not an evident difference between isolated and FUV irradiated disks. The non-detection of the lines in the two smallest and most strongly irradiated disks, could be due to a scale-down chemistry compared to the larger disks in the outskirts of the ONC. Future work will include the comparison of the observed flux ratios with chemical models adapted to these sources.

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