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TITLE: The puzzle of the TW Hya disk mass and its carbon abundance

ABSTRACT BODY:

Abstract Body: TW Hya is one of the most studied protoplanetary disks, being the closest T Tauri system from the Earth. Also, it is the only case in which the fundamental rotational transition of Hydrogen Deuterium (HD) has been detected with the Herschel Space Observatory. Observations of HD emission lines provide an independent disk mass determination, since the HD distribution follows that of molecular Hydrogen (H₂) more directly than any other molecule and does not suffer from freeze-out. Comparing the inferred disk mass from HD (Bergin et al., 2013) with that from spatial integrated C¹⁸O observations of TW Hya with the SMA (Favre et al., 2013) a discrepancy of a factor up to 100 is found, leading to the suggestion that carbon is very depleted from the gas. We show that if CO isotope-selective photodissociation is implemented in a full physical-chemical code (Miotello et al., 2014), the mass discrepancy can be solved for an atomic carbon (C) depletion by a factor of 10 (Miotello et al., in prep.). This result shows the importance of properly modeling isotope-selective effects and highlights that C depletion needs to be considered in the determination of disk masses, albeit not as extreme as found by Favre et al. (2013).

CONTACT (NAME ONLY): Anna Miotello

CONTACT (E-MAIL ONLY): miotello@strw.leidenuniv.nl

AUTHORS/INSTITUTIONS: A. Miotello, M. Kama, E. van Dishoeck, Leiden Observatory, Leiden, NETHERLANDS|

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