

# HDCO in Class II disks : probing chemical inheritance and disk's substructures

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This work is part of the  
**DiskStrat ALMA Large Program** (PI. : R. Le Gal)



## Context

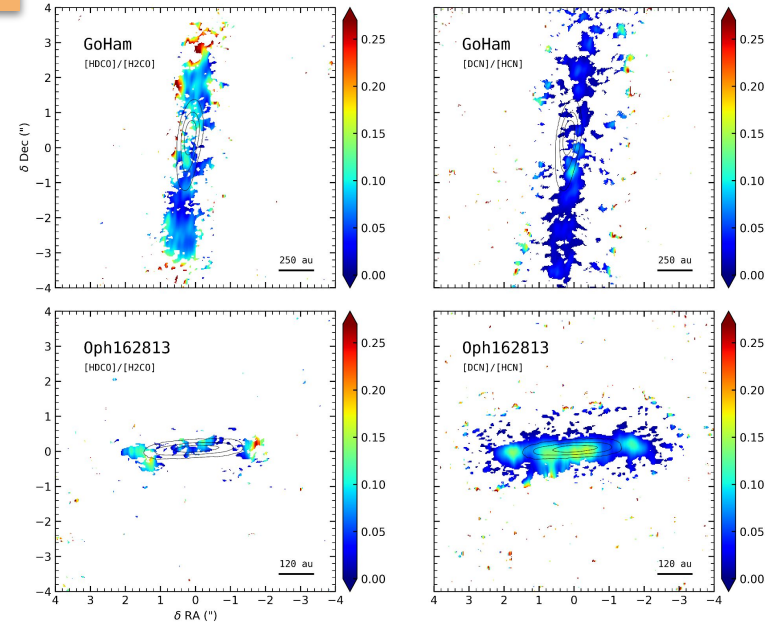
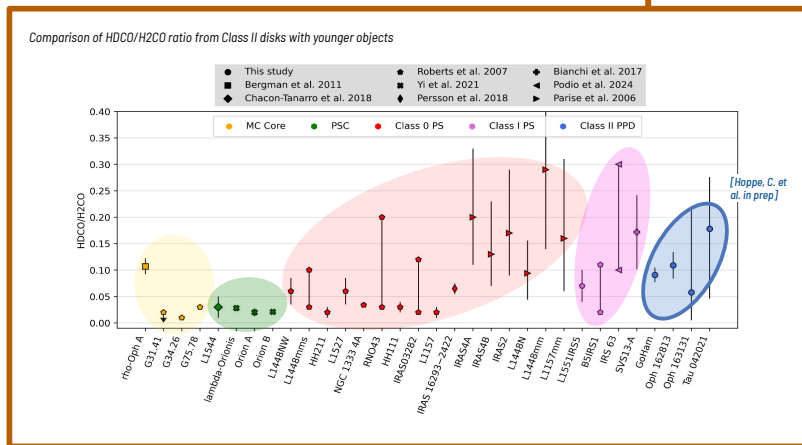
Deuterium fractionation can be used to quantify how material is conserved throughout the evolution from prestellar cores to protoplanetary disks.

This project focuses on the detection of HDCO and DCN in Class II edge-on disks, and **the derivation of the D/H ratio to constrain deuterium fractionation and chemical inheritance.**

Among the four Class II disks presenting deuterated material and studied during this project, we here present two where HDCO stands out as particularly bright and shows promising results : *GoHam* and *Oph 162813*.

## HDCO as a probe of inheritance

Column density calculation using rotational diagram method, two H<sub>2</sub>CO lines ( $3_{0,3}-2_{0,2}$ ,  $3_{2,2}-2_{2,1}$ ), and one HDCO line ( $4_{1,4}-3_{1,3}$ ). Excitation temperature of 20-30K was imposed for HDCO column density derivation.



HDCO/H<sub>2</sub>CO and DCN/HCN column density ratio

Value range between 0.05 and 0.25  
**High molecular deuteration levels**

Enhanced HDCO/H<sub>2</sub>CO ratio in localized regions  
HDCO primarily formed on grains earlier in the formation process, and desorbed in the gas phase via local processes

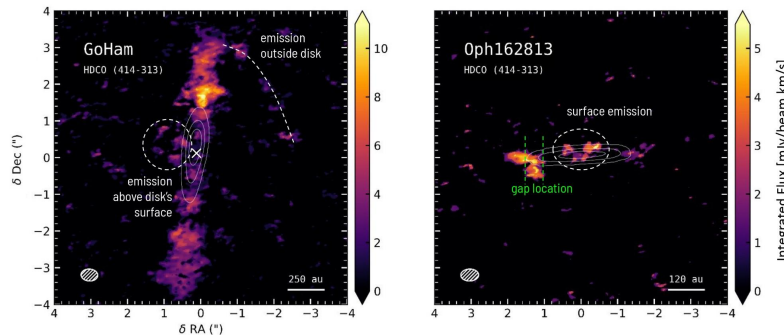
DCN/HCN ratio tracing the midplane of *Oph 162813*, not present in *GoHam*  
DCN primarily formed in the disk in cold region such as the midplane

HDCO/H<sub>2</sub>CO ratio values comparable to younger objects  
**Strong deuterium enrichment can persist into the the Class II phase**

## HDCO emission revealing disk substructures

HDCO traces disk substructures such as heated, UV-exposed or shocks regions, where conditions are ideal to desorb the molecule from grain surface.

Schematic structures of interest traced by HDCO in *GoHam* and *Oph 162813*  
Moment 0 maps of HDCO ( $4_{1,4}-3_{1,3}$ ) line



## Conclusions

- HDCO is a powerful tracer of prestellar chemical inheritance and can also reveal disk substructures and dynamical processes
- High molecular deuteration levels was derived across the sample, indicating that strong deuterium enrichment can persist into the protoplanetary disk phase.