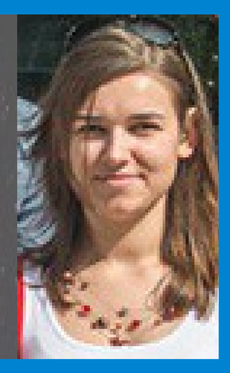
Water abundances in a massive star forming region IRAS 12326-6245 revealed by *Herschel*



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Main goals

- What are the water abundances and mass accretion rates in the envelopes of high-mass protostars?
- What is the origin of the water emission? Does the water primarily originate from high-temperature reactions or from sputtering in the shocks?
- What are the spatial scales of heating and cooling in protostars?

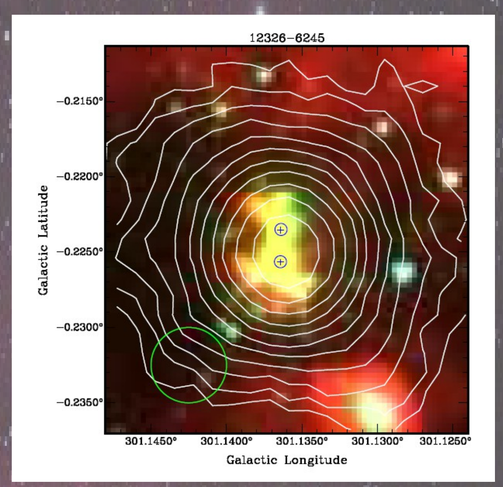
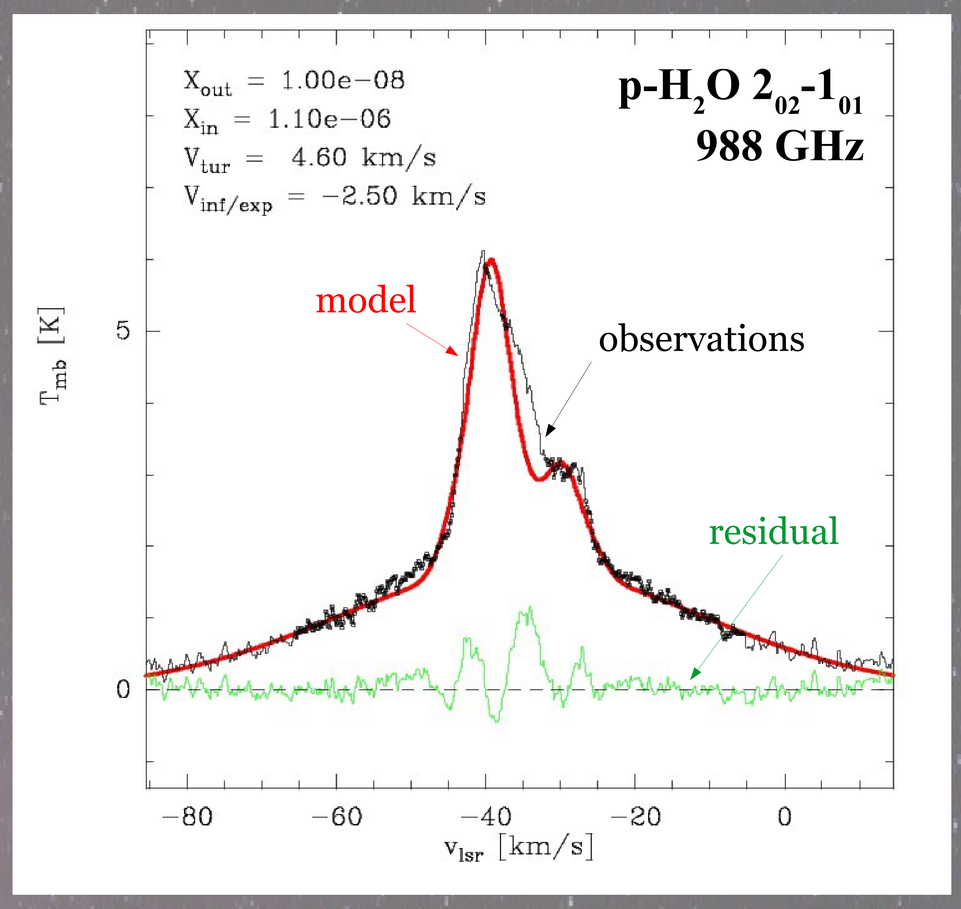


Figure from C. Dedes

Spitzer image of IRAS 12326-6245 with overlayed LABOCA 870 μm emision (contours)

H_2O Line modeling

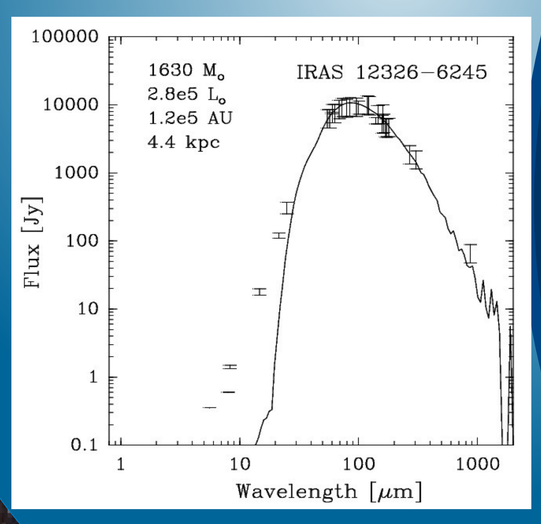


Best-fit RATRAN model allows to detemine χ_{H_2O}, v_{tur} and v_{infall} for all water lines

Conclusions

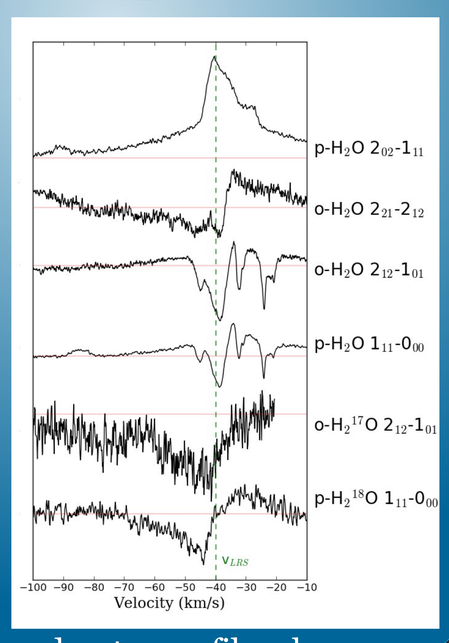
- Calculated water outer abundances of 10^{-8} typical for high-mass protostars
- Low inner water abundances with respect to low-mass protostars ($\sim 10^{-6}$)
- M_{acc} between 5×10^{-6} and 5.7×10^{-5} $M_\odot$/yr, typical for HM sources
- For all water lines $v_{turbulence} >> v_{sound}$
- Methanol traces gas at lower temperatures and velocities with respect to the bulk of water

Spectral Energy Distribution



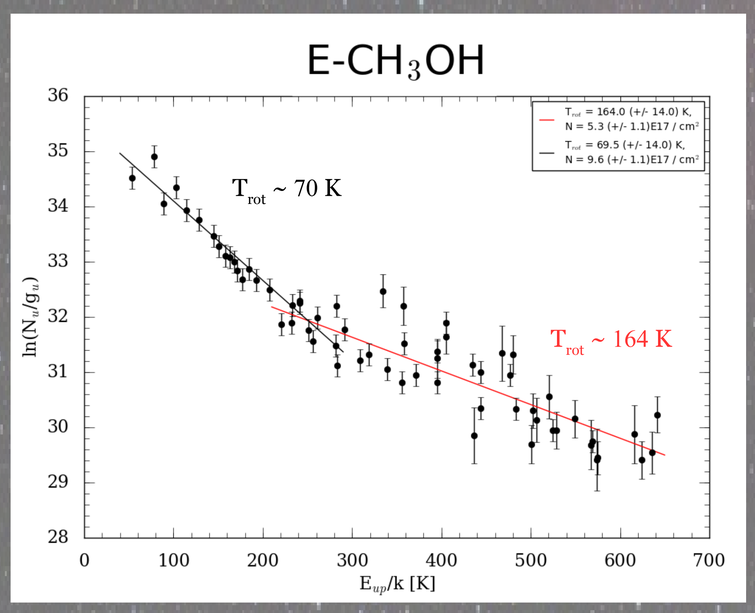
Envelope parameters constrained from the simultaneous fitting of the SED and continuum maps from SCUBA

H_2O line profiles



Observed water profiles show different velocity components

Methanol emission



Rotational diagram for CH_3OH shows two components: $T_{ex1} \sim 160$ K, $T_{ex2} \sim 70$ K

Shock or photon heating?

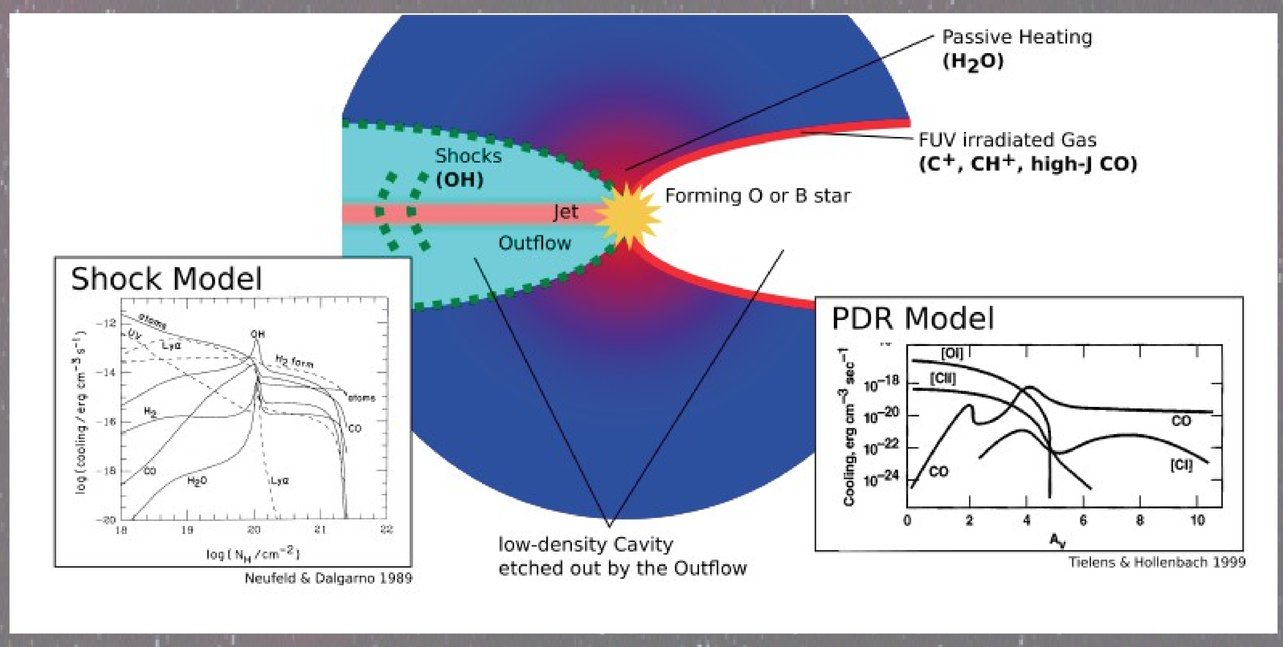


Figure from C. Dedes

Forthcoming comparisons to PDR and shock models will constrain the (F)UV fields, densities and shock characteristics

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