CONTROL ID: 2254993
TITLE: Water in embedded low-mass protostars: cold envelopes and warm outflows
ABSTRACT BODY:
Abstract Body: As stars form, gas from the parental cloud is transported through the molecular envelope to the protostellar disk from which planets eventually form. Water plays a crucial role in such systems: it forms the backbone of the oxygen chemistry, it is a unique probe of warm and hot gas, and it provides a unique link between the grain surface and gas-phase chemistries. The distribution of water, both as ice and gas, is a fundamental question to our understanding of how planetary systems, such as the Solar System, form.

The Herschel Space Observatory observed many tens of embedded low-mass protostars in a suite of gas-phase water transitions in several programs (e.g. Water in Star-forming regions with Herschel, WISH, and the William Herschel Line Legacy Survey, WILL), and related species (e.g. CO in Protostars with HIFI, COPS-HIFI). I will summarize what Herschel has revealed about the water distribution in the cold outer molecular envelope of low-mass protostars, and the warm gas in outflows, the two components predominantly traced by Herschel observations. I will present our current understanding of where the water vapor is in protostellar systems and the underlying physical and chemical processes leading to this distribution. Through these dedicated observational surveys and complementary modeling efforts, we are now at a stage where we can quantify where the water is during the early stages of star formation.
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