

P216a **Water deuteration as a probe of the origin of H₂O in protoplanetary disks**

古家健次 (筑波大), Maria N. Drozdovskaya (Leiden Observatory), Ruud Visser (ESO), Ewine F. van Dishoeck, Catherine Walsh (Leiden Observatory), Daniel Harsono (Heidelberg University), Ugo Hincelin (University of Virginia), Vianney Taquet (Leiden Observatory)

The level of deuterium fractionation in molecules (measured via the HDO/H₂O abundance ratio for water) depends on their formation environments. Comets are thought to be the most pristine objects of the cold ice-bearing regions in the solar nebula. Based on the measurements of the HDO/H₂O ratio in cometary comae, there are long-standing arguments on the origin of cometary water (i.e., disk water). The suggested possibilities range from prestellar inheritance to in-situ formation in protoplanetary disks as two extremes. The main difficulty in distinguishing between these two cases comes from the fact that deuterium fractionation of molecules can occur efficiently both in the prestellar stages and in the cold midplane of protoplanetary disks.

Based on astrochemical modeling from molecular clouds to protoplanetary disks, we find that the ratio of D₂O/HDO to HDO/H₂O is a better probe to distinguish the two cases than solely the HDO/H₂O ratio. Future D₂O observations with H₂O and HDO toward cometary comae would provide the strongest constraints on the origin of cometary water.