Atmospheres of icy giant planets in the solar system

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Telescopic observations from the space represent a unique opportunity to study objects in our own Solar System that - for their remoteness - will not likely be explored extensively by spacecrafts in the next few decades. Telescopic observations are also fundamental to fill the temporal gaps - between different missions – in data records of highly variable phenomena such as the meteorology of Jupiter and Saturn. Icy giants (Uranus and Neptune) represent a class apart of planets, explored in situ only by Voyager 2 flybys. Even today, most of the available information about these objects has been derived from telescopic observations. A far-infrared, high resolution telescope would allow us to address a number of fundamental questions: a) the overall energy budget, to be estimated on the basis of far IR continuum observations (thermal emission of these planets peaks in the 30-40 μm regtion) at the highest possible spatial resolution, to disentangle the possible role of local meteorology b) the thermal structure at the tropopause level, by observations of the H2 CIA bands (centered at 17 and 28 μm) c) the vertical mixing of the atmosphere above tropopause, by estimating the ortho/para for hydrogen, again from the H2 CIA bands d) estimate of stratospheric temperatures, from emission of H2 quadrupole line at 17 μm, e) estimate of exogenic influx to the stratosphere by observations of CO and H2O rotational emission lines. Minor bodies in the external Solar System are another class of objects that would benefit from IR high spatial resolution measurements. Of particular interest are the surface temperatures of major trans-neptunian objects (as well as outer satellites of giant planets) and rotational emission lines from comets at the earliest stages of their activity on their way to the Sun.