Composition and dynamics of the giant planets with Herschel, ALMA and chemistry models

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Résumé

The giant planets play a crucial role in shaping planetary systems because they form quicker than telluric planets, and because of their gravity and migration. In addition, giant planet, and especially ice giants, are the majority of known exoplanets to date. It is thus crucial to understand how they form. Constraining giant planet formation requires several kinds of measurements, among which deep composition. However, deep composition is difficult to measure because our instruments rarely probe deep enough. The composition we have access to, in the upper troposphere, can be altered by external sources of material, (subsequent) chemistry and dynamics. It is thus important to measure composition and dynamics to disentangle the various contributions.

In these past four years, we have studied the composition and dynamics of the Solar System giant planets by means of submillimeter observations, with Herschel and ALMA, and chemical models to constrain external sources of material to their atmospheres and their deep composition. We have also achieved the first direct measurements of the winds in their stratospheres, a layer where the internal and external processes mix.

In this paper, we will present our observations and model results.

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