Observations and modeling of Jupiter's atmospheric composition and dynamics in preparation of the JUICE mission.

Thibault Cavalié (Laboratoire d'Astrophysique de Bordeaux)
Bilal Benmahi, Raphael Moreno, Ladislav Rezac, Emmanuel Lellouch, Thierry Fouchet, Michel Dobrijevic, Paul Hartogh, Vincent Hue, Benjamin Benne

The JUICE mission is set for launch in April 2023 and will explore the jovian system for almost 4 years. One of its goals is to study Jupiter as an archetype of gas giants to better understand the formation and evolution of this type of planets. The observable composition of Jupiter's atmosphere is the result of its formation and evolution. The primordial composition has been modified and complexified by various processes ever since the planet formed, like photochemistry initiated by the solar UV flux and magnetospheric electrons on the one hand, and external input of material coming from the rings, satellites, comets and asteroids on the other hand. Because atmospheric dynamics then mix these different components together, it is important to measure composition and dynamics in 3D and as a function of time to disentangle the different contributions. The Submillimetre Wave Instrument of JUICE will be key in characterizing Jupiter's stratosphere to better understand its composition and dynamics. It will probe Jupiter's spectrum in two wavelengths simultaneously to measure the stratospheric composition, temperature and winds simultaneously. It will not only study the equatorial latitudes in which the quasi-quadrennial oscillation occurs, but also the higher latitudes in which the energy deposited from the powerful magnetosphere influence both the composition and the dynamics. In the past decade, we have obtained several observations of Jupiter from the ground (ALMA) and from earth-orbiting observatories (Odin and Herschel). In this paper, we will present these observations and the related modeling work we have achieved in preparation of the Jupiter observations that JUICE/SWI will perform.