Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

PPS01-07 Room:201B Time:May 21 15:45-16:00

Dynamics and material transport of Jupiter's stratosphere as scientific targets of JUICE-SWI

Takeshi Kuroda[1*], Hideo Sagawa[2], Takao M. Sato[3], YASUKO KASAI[2], JUICE-SWI Team[3]

[1]Tohoku University, [2]National Institute of Information and Communications Technology, [3]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency

We will show the overview of atmospheric sciences in Jupiter's stratosphere in connection with the expected contributions of a sub-millimeter instrument proposed for the JUICE mission (JUICE-SWI).

It is very important to investigate the atmosphere of giant planets, for the universal understandings of formation and evolution of planetary atmospheric circulations with different viewpoints from the investigations of terrestrial planets, as well as the clarifications of physical parameters specific to each planet. Moreover, the field of planetary science is broadening beyond our solar system, and gas giants are especially important existences in extra-solar stellar systems as far as our current understandings. Then we need to understand Jupiter, the closest gas giant to us, thoroughly as the first step.

Jupiter's stratosphere extends for more than 350 km above the visible cloud top, with the pressure range of roughly between 10^3 and 10^{-3} hPa. The rotational speed of Jupiter is faster than Earth, dynamical processes are thought to be affected by radiative processes by molecules in stratosphere and eddies enhanced from the troposphere. Belts of fast westerly wind (up to 140 m s^{-1}) have been found at 23 N and 5 N, and the oscillations of equatorial zonal wind with periods of about 4 years (quasi-quadrennial oscillation, QQO) are also indicated. As for the minor components, CS, CO and HCN are inserted by collisions of comets (e.g. Shoemaker-Levy 9 in 1994). Water has also been observed, but the origin of it is not determined quantitatively.

JUICE-SWI is a very sensitive instrument to observe some minor species such as CH_4, H_2O, HCN, CO and CS in Jupiter's stratosphere. We can detect vertical temperature profiles and wind velocities from CH_4 molecular lines. CO and CS can be used as tracers for the investigations of atmospheric flows (general circulation and dynamical processes), because they are chemically stable. From these observations, it is expected to help us to understand the dynamical and chemical processes of Jupiter's stratosphere.

Keywords: Jupiter, atmospheric dynamics, atmospheric chemistry, sub-millimeter sounder, JUICE