Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

O02-01 Room:IC Time:May 24 09:45-10:20

Precipitation Science with Spaceborne Precipitation Radar Observation–From TRMM to GPM–

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The Tropical Rainfall Measuring Mission satellite has been equipped with the first and only space-borne precipitation radar (TRMM PR) for sixteen years until the recent launch of the core observatory of the Global Precipitation Measuring Mission. TRMM PR has realized and accumulated three-dimensional observations of precipitation for 17 years, overlapped with the GPM core observatory for one year, and finishing its task around the end of coming March. In this talk, I will introduce some examples how TRMM has opened new horizons in precipitation science, by ″ measuring ″ the precipitation characteristics in a global scale, which could never been realized before the TRMM. We have obtained new perspectives in ″ precipitation climatology ″ , which means not only precipitation amount distribution, but also precipitation characteristics and extremes. These new knowledge of precipitation should benefit to the safety of our everyday life. Some early results from the new GPM mission, started with a launch of core observatory in February 2015, will also be presented.

Keywords: TRMM, GPM, Spaceborne precipitation radar, Precipitation Science

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Water in Earth and planetary interiors

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Earth is one of the terrestrial planets that are made mostly of rocks and metallic Fe. However, although a small fraction of the total mass, there is ocean on Earth, and it is generally considered that the presence of the surface ocean is a key to the origin and evolution of life. More than a half century ago, it was recognized that the ocean (and the atmosphere) on Earth has been formed by the volatile elements provided by the volcanic activities throughout the geological history. However, the common view at these days was that water and other volatile elements are present only in the shallow regions in Earth. This view has changed completely based on recent studies that show evidence that a substantial amount of water is present in the deep interior of Earth. This finding implies that the global circulation of water throughout the geological time might affect the present of ocean and hence the origin and evolution of life on Earth. Similarly, recent studies showed that the Moon's interior has about the amount of water as Earth's interior. In this lecture, I will show how scientists study water in Earth and other planets.

Keywords: water, ocean, Earth's interior, life

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O02-03 Room:IC Time:May 24 10:55-11:30

Science of an asteroid sample return mission Hayabusa2 and water in the solar system

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An asteroid explorer Hayabusa2 launched December 2014 and now flies on the way to an asteroid 1999 JU_3. The target asteroid is a near earth asteroid and has a C-type surface reflection spectrum, a dark (low reflectance) flat spectrum without notable mineral absorptions within optical to near-infrared wavelength bands. The payload science instruments are an optical multi-band camera, a near infrared spectrometer, a thermal infrared imager, a laser range detector, an impactor (making an artificial crater), a detached camera (recording snapshots of impact ejecta), and a small lander (developed by an European team). Hayabusa2 also brings small rovers for engineering purposes. Further, it has a sampler for collecting surface material of the asteroid, designed for storing samples from at most three different places (one of which is intended to get underground material excavated from the artificial crater made by the impactor) without mixing with each other. We plan to bring back the asteroid samples to the Earth in the end of 2020.

C-type asteroids are thought to be parent bodies of carbonaceous chondrites, primitive meteorites that contain a few percent of organic matters. They are thought to be survivors or fragments of planetesimals (building blocks of planets during the formation stage) in the outer solar system. Some carbonaceous chondrites contain hydrous minerals produced by reactions of rocks with hot water, so that at least a subset of C-type asteroids had internal hydrothermal activities (hot springs!) during the formation stage of the solar system. To clarify the mineral-water-organic material reactions in planetesimals is one of the most important objectives of the Haybusa2 project.

Near earth asteroids like 1999 JU_3 are collisional fragments of parent asteroids that had belonged with the main asteroid belt (between Mars and Jupiter orbits) and brought to Earth closing orbits by planets (such as Jupiter) gravitational perturbations. Such material transport from the main asteroid belt was vital during the early stage of the solar system history and many asteroids had fallen on the surface of the early Earth. The contribution of these asteroidal material to the early Earth, especially ocean formation and prebiotic environmental evolution should be important.

Under the session keyword of ”water”, this talk will highlight on ”planetary science *from* an asteroid”, the mantra of the Hayabusa2 mission.

Keywords: solar-system exploration, asteroid, comet, hydrothermal activity, prebiotic environmental evolution, planetary science