Visit to Nagoya University
Name: Jean-François Ripoll
Affiliation: CEA, France

With the support of the Institute for Space-Earth Environmental Research (ISEE) of Nagoya University, I was able to visit, organize, chair and lead the "Multi-satellite Observations and Modeling of the Earth's Radiation Belts 2" (MOMERB 2) workshop from March 16 to March 20. My ISEE host was Prof. Y. Miyoshi, who greatly contributed to all scientific aspects. He and the ISEE staff also fully managed the technical aspects of the venue and workshop.

We were 20 scientists, with 10 from Nagoya and 1 from Kyoto University, and 9 from foreign universities and national laboratories from Europe and America. Our goal was to conduct observationally-oriented studies to investigate the dynamic processes that govern relativistic electrons and energetic ions in the near-Earth space environment.

A fundamental question that remains unanswered is how energetic particles are distributed along the magnetic field lines from one hemisphere to the other. This knowledge has great value for practical space weather applications, which seek to know and predict the radiation environment for the thousands of satellites operating in near-Earth space.

For this second edition of MOMERB, we included four main topics for discussion: 1- the major Gannon geomagnetic storm, 2- other major storms which occurred after Gannon, including the 3 storms of October 2024, January 2025, and November 10–11 2025, 3- electromagnetic waves and plasma density, 4- particles in the inner magnetosphere and radiation belts. The Gannon storm of May 10, 2024 is the strongest geomagnetic storm in near-Earth space in the past 20 years, with aurorae seen at latitudes of southern France. This major storm generated persistent radiation belts at ultra-relativistic energies (> 1 MeV) that are extremely well covered and documented by Arase measurements.

For these subject, we looked for a global description of the energetic particle and electromagnetic wave distributions by combining datasets from two main satellite missions observing the radiation belts: JAXA's Arase (ERG) mission (Japan) and NASA's Van Allen Probes (RBSP) mission (USA). Each mission provides a different and complementary latitudinal view of the electromagnetic wave environment and radiation belts, delivering a full description along the field line. In addition, we also compared these satellite data with those measured by Low Earth Orbit satellites, such as the CNES Demeter, ESA Swarm-E (ePOP), and the new NASA TRACERS mission, launched in July 2025, for which we saw some of the first results.

A group photo from MOMERB

During the week of the workshop, we had 23 presentations from workshop members related to the main topics above. Some of these presentations targeted the questions to be addressed by our group during the following months. Work sessions were organized in parallel in order to either collaboratively address specific questions or to plan future actions for longer-term studies to be performed by the workshop team members within the coming year. An example of a work session of particular importance was, for instance, the determination of conjunction times between Arase and TRACERS. One event was found for which both satellites measured the same wave emission, both acquired through high-resolution burst measurements. New

measurement times in burst mode during which both satellites will be in conjunction have also been planned for the coming months of 2026 and should lead to impactful results.

For the most advanced studies, for which most results were gathered between MOMERB-1 and MOMERB-2, we organized article writing sessions during which we advanced upcoming articles. I personaly contributed to advancing three science articles, all to be submitted to JGR Space Physics. Among these studies, a major achievement was the finalization of the comparison of electron radiation belt fluxes measured by both Arase and Van Allen Probes for 2018, the year during which both satellites were in operation. The comparison of these fluxes shows very good agreement between Arase and Van Allen Probes in most of the high-flux regions of the radiation belts, particularly in the dynamic outer radiation belt. This result has great implications for the JAXA Arase mission and its operation planned until 2032. A second notable article advanced was the statistical description of electromagnetic whistler-mode waves observed by Arase.

In conclusion, the MOMERB-2 workshop was a successful, efficient, productive, and engaging event, which all participants greatly enjoyed. We sincerely thank ISEE for having made its organization possible.