

Visit to Kyoto University

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Thanks to the invitation from Prof. Yokoyama and Dr. Huang, and the support of the PBASE program, I had the opportunity to visit Kyoto University and share my research with researchers in Japan. This visit provided an excellent opportunity to exchange ideas on lower-upper atmospheric coupling, ionospheric variability and ionospheric modeling.

The major focus of the scientific discussions was the global modeling of EPBs. It was a particular privilege to discuss my research with Prof. Yokoyama. His modeling studies on MSTIDs and EPBs taught me a lot when I was a PhD student. During my visit, I discussed my recent work using the advanced coupled SAMI3/SE-WACCM-X model with Prof. Yokoyama and Prof. Saito. SE-WACCM-X is a high-resolution whole-atmosphere model with a horizontal resolution of approximately 25 km that can self-consistently resolve gravity waves. This high resolution allows the model to capture small- and medium-scale gravity waves, which are considered important for EPB seeding. With atmospheric inputs from SE-WACCM-X, the SAMI3 model can self-consistently generate EPBs. This coupled modeling framework is important for investigating the physical mechanisms responsible for the day-to-day variability of EPB occurrence and may ultimately contribute to EPB forecasting.

We also discussed the possibility of coupling the GAIA model with SAMI3 at CCMC, which could provide a useful capability for the broader research community. The discussions with Prof. Yokoyama and Prof. Saito provided valuable feedback on the interpretation of the model results and their comparison with satellite and ground-based observations. I also had the opportunity to learn interesting insights about the IMAP/VISI mission from Prof. Saito. In addition to the EPB work, Prof. Charles Lin from NCKU also visited Kyoto University during my stay, we had a great discussion with Prof. Yamamoto about the Artemis II event.

On my last day at Kyoto University, I presented my work on modeling post-midnight EPBs using SAMI3/SD-WACCM-X under quiet and disturbed conditions. Interesting, I had previously learned about post-midnight EPBs from Prof. Yokoyama's studies based on C/NOFS observations conducted during his time at NASA GSFC with Dr. Robert Pfaff almost 16 years ago. The continued advancement of coupled whole atmosphere-ionosphere models provides a more comprehensive picture of the physical processes controlling post-midnight EPBs.

This visit has provided an opportunity to strengthen scientific connections with researchers in Japan and explore potential future collaboration. The exchange of research ideas and experiences provided new perspectives that will be valuable for my ongoing research. In particular, the discussions can lead to future collaborative studies involving high-resolution ionosphere-thermosphere simulations, satellite observations, and model-data comparisons. Overall, this visit was a productive and rewarding component of the PBASE program. It facilitated scientific exchange and established potential avenues for future international collaboration in ionospheric and upper-atmosphere science. Finally, I would like to sincerely thank Ms. Shikata, Dr. Ajith, and Dr. Sori for all of their help and support during my visit.