Liang J., K. Terasaki, T. Miyoshi, 2023: A Machine Learning Approach to the Observation Operator for Satellite Radiance Data Assimilation. *J. Meteor. Soc. Japan*, **101**, 79-95. https://doi.org/10.2151/jmsj.2023-005

**Plain Language Summary:** Numerical weather prediction becomes less accurate if we forecast longer, but it can be improved by the effective use of observations such as satellite radiance observations. To use observations in numerical weather prediction, we need to simulate observations. For satellite radiances, we usually compute complex radiative transfer processes. This study explored a potential simplification using machine learning models. The proposed method simulates satellite radiance data using machine learning and obtained promising results. The method would be useful to accelerate the system development to use new satellite observations as quickly as possible after the satellite launch.

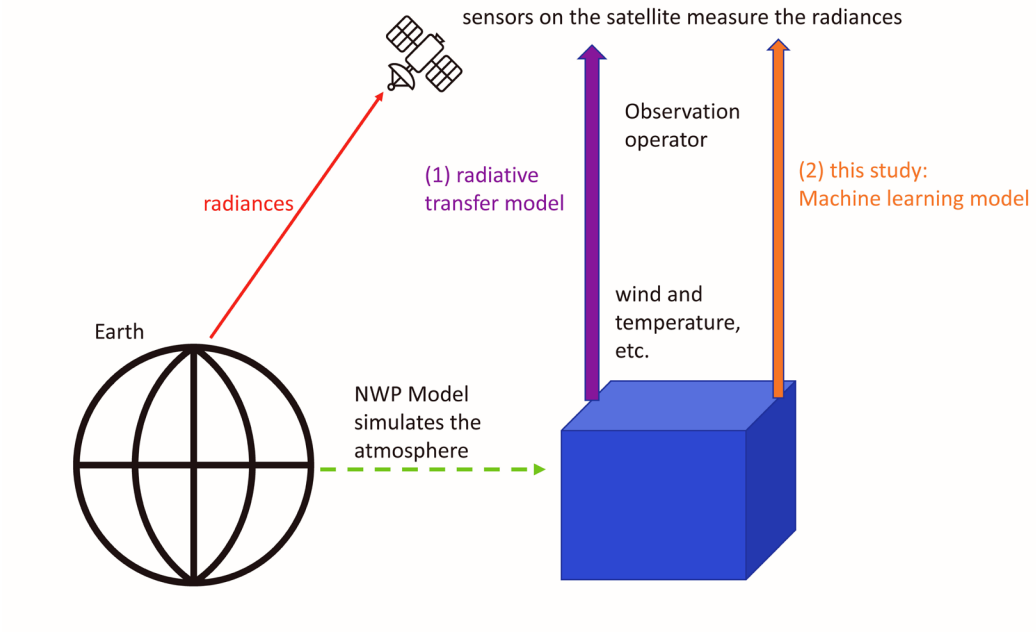


Figure 1. Sensors on the satellite measure the radiances emitted from the earth (thin red arrow). The earth's atmosphere is simulated by the numerical weather prediction (NWP) model (blue cube). To use the satellite radiance observations for NWP, an observation operator is required to simulate observations from the model variables such as temperature and wind. Usually, a physically based radiative transfer model is used (purple arrow). In this study, machine learning models are used instead (orange arrow).

**Highlights:**

- Model forecast and satellite microwave radiance observations are used to train machine learning models to obtain the observation operator for satellite data assimilation
- Data assimilation experiments using the machine learning-based observation operator show promising results without a separate bias correction procedure
- The machine learning-based observation operator can potentially accelerate the development of using new satellite observations in numerical weather prediction