What is the major difference of reconstruction method between this paper and your previous study (Yang, Y., Han, W., Sun, H., Xie, H., and Gao, Z.: Reconstruction of 3D DPR Observations Using GMI Radiances, Geophysical Research Letters, 51, e2023GL106 846, https://doi.org/10.1029/2023GL106846, 2024.), Except for the data, it seems that the methods used in the two studies are similar.

Response：
Thank you for your question. While the models used in both studies are similar, the key difference lies in the architecture and the data incorporated. In our previous study, we employed a hybrid network architecture to incorporate temperature profiles, which included both a CNN module and an MLP module. The CNN module was used to extract spatial features from the multi-channel GMI brightness temperatures, while the MLP module was designed to extract temperature profile information from ERA5. Through evaluation, we found that incorporating temperature profiles significantly improved the model's reconstruction accuracy, particularly near the melting layer.
In contrast, in this study, we use additional channels from the MWRI-RM, including multiple oxygen absorption channels (50 GHz and 118 GHz). These channels are sensitive to both clouds and precipitation, and also provide atmospheric vertical temperature information. Therefore, the model architecture in this study is based solely on a CNN. A detailed explanation of this difference can be found in the revised manuscript, **lines 177-182**.

What is the spatial resolution of the reconstructed reflectivity profiles?

Response：
Thank you for your question. It is challenging to define an exact spatial resolution for the reconstructed reflectivity profiles, as this depends on the model's reconstruction accuracy. Our goal is to ensure that the resolution of the reconstructed reflectivity profiles aligns as closely as possible with the resolution of PMR.

What exactly are the channels used in each experiment? I think it would be better to show a list of channels used in each experiment.

Response：
Thank you for your valuable suggestion. In response, we have added a table in the manuscript detailing the specifications of the MWRI-RM channels, which will help readers better understand the channel information. Additionally, we have clearly indicated the number of oxygen absorption channels and polarization difference sets in the manuscript. To further clarify the input channels for the three experiments, we have provided the following detailed explanation:
Line 107-114:
“MWRI-RM: A significant payload of the FY-3G satellite, the MWRI-RM has 17 frequency points ranging from 10.65 GHz to 183 GHz, including nine dual-polarized channels in the 10-89 GHz spectrum and twelve oxygen absorption sounding channels around 50 GHz and 118 GHz, totaling 26 channels. These channels have spatial resolutions ranging from 5 to 25 kilometers. Detailed channel information for the MWRI-RM can be found in Table 1

Using a conical scanning regime with imaging channels and sounding channels having incidence angles of 53°±1° and 50°±1°, respectively, MWRI-RM has an effective observation swath of 800 kilometers, as shown in Fig. 1b. This instrument captures passive microwave radiation from the Earth's surface, providing valuable information on precipitation, atmospheric water vapor, cloud liquid content, path-integrated liquid water thickness, melting layer height and thickness, sea surface wind speed, and more (Zhang et al., 2023a)."

Line 186-195:

"To critically evaluate the influence of various channel configurations and feature inputs on the model's ability to reconstruct radar reflectivity, we orchestrated a series of controlled experiments, as shown in Fig. 2. The baseline experiment (Ex14) excludes the oxygen absorption channels, using 14 input channels (out of the total 26, excluding 12 oxygen absorption channels) to assess the model's basic capability without temperature information. The full channel experiment (Ex26) incorporates all 26 input channels, including the oxygen absorption bands, providing additional temperature profiles to improve precipitation detection and enhance the delineation of melting layers. Building on this, the polarization difference enhanced experiment (Ex35) adds Tb polarization difference data, bringing the total number of input channels to 35 (26 channels plus 9 polarization difference sets), which enhances the model's ability to distinguish precipitation types and capture finer structural details. With a consistent architecture across all experiments, this setup allows for a rigorous evaluation of how the extended MWRI-RM channel information influences the model's performance in precipitation reconstruction."

In "Full Channel Experiment", all 26 channels of MWRI-RM were used in the training model, and in "Polarization Difference Enhanced Experiment", 9 additional Tb polarization difference data were added in the training model, however, the channels used to calculate the polarization difference have already been used in the "Full Channel Experiment", there is no additional information was added in the "Polarization Difference Enhanced Experiment" compared to "Full Channel Experiment" from the perspective of amount of information. It is strange that the accuracy of the reconstructed reflectivity profiles in the "Polarization Difference Enhanced Experiment" is better than that in the "Full Channel Experiment".

Response：

Thank you for your insightful observation. While it is true that the channels used to calculate the polarization difference (PD) were already included in the "Full Channel Experiment," the addition of PD as a hand-engineered feature provided critical information that enhanced the model's performance.

Polarization difference is a well-established parameter for revealing the shape and size distribution of hydrometeors and distinguishing precipitation types, offering unique insights into precipitation processes. Previous studies, such as Das et al. (2022), have successfully incorporated PD as an input to machine learning models. In their work, GMI brightness temperatures from 13 channels, along with 5 PD values and other auxiliary variables, were used in a CNN model for land-based precipitation type classification. They conducted a careful evaluation of impact matrices confirming that the polarization difference plays a dominant role in the decision-making process. This finding aligns with the physical understanding of polarized microwave radiative transfer, which varies with surface types and microphysical properties of snow and liquid clouds. By explicitly adding PD as an input, the model could leverage this information more effectively, leading to improved accuracy in reconstructing reflectivity profiles compared to the "Full Channel Experiment."

Das, S., Wang, Y., Gong, J., Ding, L., Munchak, S. J., Wang, C., Wu, D. L., Liao, L., Olson, W. S., and Barahona, D. O.: A Comprehensive Machine Learning Study to Classify Precipitation Type over Land from Global Precipitation Measurement Microwave Imager (GPM-GMI) Measurements, Remote Sensing, 14, 3631, https://doi.org/10.3390/rs14153631, 2022.