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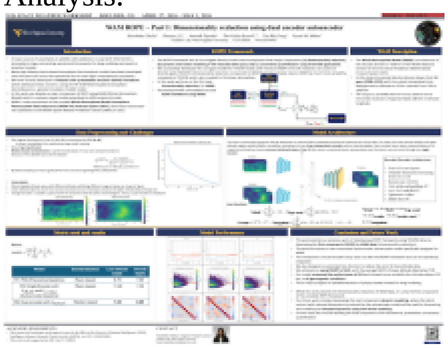
Physics based models that produce atmospheric density data for drag modelling face challenges in operationalization due to large size and computational complexity. Our recent work enabled operationalization of TIEGCM data by using a deep learning based Reduced Order Probabilistic Emulator (ROPE) framework which encompasses dimensionality reduction, dynamic modelling in reduced state space, and uncertainty quantification using ensemble approaches. In applying the framework's first step of dimensionality reduction for WAM data, the autoencoder used for TIEGCM could not directly be adapted due to WAM data's complex nature and variability as it is coupled to the lower atmosphere. This paper introduces a new convolutional dual encoder autoencoder with customized data processing and loss function specifically designed to perform dimensionality reduction on WAM data and to capture the different data patterns at different altitudes. The model's Mean Absolute Percentage Error (MAPE) for higher altitudes is below 6%, and with the introduction of dual encoder and other customizations, the MAPE for lower altitudes came down from 14% to less than 8% without affecting the model's structure. The overall MAPE on the test set is 6.74%, capturing both mean and variability of the dataset well for above 120 km, and the mean of the dataset well for below 120 km. Although this MAPE is higher than that of TIEGCM, this model captures the complex patterns and variability in the WAM data well and is designed to perform well at all levels of geomagnetic activity, better than Principal Component Analysis.

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