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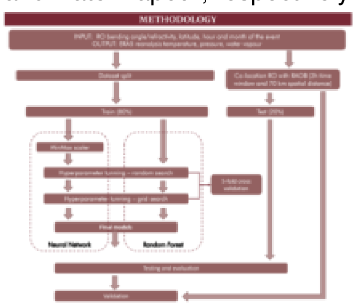
Poster
Precise and reliable information on the tropospheric temperature and water vapour profiles play a key role in weather and climate studies. Among the sensors supporting the atmosphere's observation, one can distinguish the Global Navigation Satellite System Radio Occultation (RO) technique, which provides accurate and high-quality meteorological profiles of temperature, pressure and water vapour. However, external knowledge about temperature is essential to estimate other physical atmospheric parameters. Hence, to overcome the constraint of the need of a priori temperature profile for each RO event, I trained and evaluated 4 different machine learning models comprising Artificial Neural Network (ANN) and Random Forest regression algorithms, where no auxiliary meteorological data is needed. To develop the models, I employed almost 7000 RO profiles between October 2019 and June 2020 over the part of the western North Pacific in Taiwan's vicinity (110-130E; 10-30N). Input vectors consisted of bending angle or refractivity profiles from the Formosa Satellite 7/Constellation Observing System for Meteorology, Ionosphere, and Climate-2 mission together with the month, hour, and latitude of the RO event. Whilst temperature, pressure and water vapour profiles derived from the modern ERA5 reanalysis and interpolated to the RO location served as the models' targets. Evaluation on the testing data set revealed a good agreement between all model outputs and ERA5 targets. Slightly better statistics were noted for ANN and refractivity inputs, however, these differences can be considered as negligible. Root mean square error (RMSE) did not exceed 2 K for the temperature, 1.5 hPa for pressure, and reached slightly more than 2.5 hPa for water vapour below 2 km altitude. Additional validation with 56 colocated radiosonde observations and operational one-dimensional variational product confirms these findings with vertically averaged RMSE of around 1.3 K, 1.0 hPa and 0.5 hPa for the temperature, pressure and water vapour, respectively.


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