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Oral

Radio occultation (RO) measurements have little direct sensitivity to clouds, but recent studies have shown that they may have an indirect sensitivity to thin, high clouds that are difficult to detect using conventional passive space-based cloud sensors. We implement two RO-based cloud detection (ROCD) algorithms for atmospheric layers in the middle and upper troposphere. The first algorithm is based on the methodology of a previous study which explored signatures caused by upper tropospheric clouds in RO profiles according to retrieved relative humidity, temperature lapse rate, and gradients in log-refractivity (ROCD-P; Peng et al. 2006), and the second is based on inferred relative humidity alone (ROCD-M; Kursinski and Berghardt 2012). In both, atmospheric layers are independently predicted as cloudy or clear based on observational data, including high performance RO retrievals. In a demonstration, we use data from 10 days spanning seven months in 2020 of FORMOSAT-7/COSMIC-2. We use the forecasts of NOAA GFS to aid in the retrieval of relative humidity. The prediction is validated with a cloud truth dataset created from the imagery of the GOES-16 Advanced Baseline Imager (ABI) satellite and the GFS three-dimensional analysis of cloud state conditions. Given these two algorithms for the presence or absence of clouds, confusion matrices and receiver operating characteristic (ROC) curves are used to analyze how well these algorithms perform, considering both their rates of generating false positives and false negatives. Both algorithms detect the presence and absence of clouds correctly with an accuracy greater than 75% at altitudes between 6 and 9 km. The accuracy of ROCD-M decreases with altitude. Though, the accuracy of ROCD-P sees accuracy increase above 8 km up to an accuracy of 86% near 12 km.

Presentation file

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