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In this study we investigate the random error characteristics of the newly launched COSMIC-2 mission using the Three-Cornered Hat (3CH) method, which we have successfully applied to co-located atmospheric data sets in recent years.

The 3CH method requires three data sets and provides estimates of the random errors while removing the impact of biases. The error estimates include all sources of random errors, e.g., co-location and interpolation errors, instrument errors, and representativeness errors.
The largest source of errors of 3CH results are due to error correlations among the data sets. Error correlations lead to a non-zero, unknown error covariance term, which biases the results towards estimates that are too low for the data sets that are error correlated and too high for the third data set.

We applied the 3CH method to COSMIC-2 in combination with model reanalyses and radiosonde data. We computed error variance estimates for RO-specific constraints, such as low versus high signal-to-noise ratio and rising versus setting occultations, as well as different geographic locations and atmospheric conditions such as latitude bands, land versus oceans, local times, and dry versus moist conditions. All of these factors are shown to cause variations in the diagnosed C2 error statistics.

These different experiments give a deeper insight into the accuracy of COSMIC-2 data for a variety of scenarios.

Presentation file
rieckh-presentation.pdf
Meeting name
8th International Radio Occultation Working Group Meeting - IROWG-8
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