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Oral

The most dominant interannual atmospheric variability modes in the tropics are the Quasi-Biennial Oscillation (QBO) and the El Niño-Southern Oscillation (ENSO). They are commonly described by using variability proxies (indices), e.g., stratospheric winds at different pressure levels for the QBO, and sea surface temperature anomalies for the ENSO. However, in the transition region between the troposphere and the stratosphere, these proxies are not sufficient for describing the variability. Also, for atmospheric temperature the response time lag needs to be accounted for, when using the indices as proxies for temperature variability.

Here we derive atmospheric variability indices based on Global Navigation Satellite System (GNSS) Radio Occultation (RO) observations using the Wegener Center OPSv5.6 record. We present two different approaches for characterizing the atmospheric temperature variability in the tropical troposphere and stratosphere, both based on an empirical orthogonal function (EOF) analysis.

The first method utilizes the whole vertical and horizontal information of the RO temperature field from 30°S to 30°N and from 2 km to 35 km altitude. The resulting indices resemble the well-known patterns of QBO and ENSO in the tropics. However, they do not provide vertically resolved information on the atmospheric variability.

The second method takes advantage of the vertical resolution and the uniform distribution of the RO temperature soundings and applies the EOF analysis at each altitude level separately. The resulting indices present a mixture of all variability modes found at the respective altitude level including the QBO and ENSO and capturing more variability than method one.

These new indices also cover the vertical details of the atmospheric variability compared to the commonly used variability indices. When using them as proxies for temperature variability, we do not need to account for QBO and ENSO time lags. Atmospheric variability indices as novel products from RO will be of high value for studies on atmospheric dynamics and climate variability, for climate trend analysis as well as for the evaluation of climate models.

OSTS session

Regional and Global CAL/VAL for Assembling a Climate Data Record

Meeting name

Joint COSMIC Tenth Data Users' Workshop and IROWG-6 Meeting

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