Satellite-Derived Upper Tropospheric Humidity Datasets and Comparison with Total Column Water Vapor

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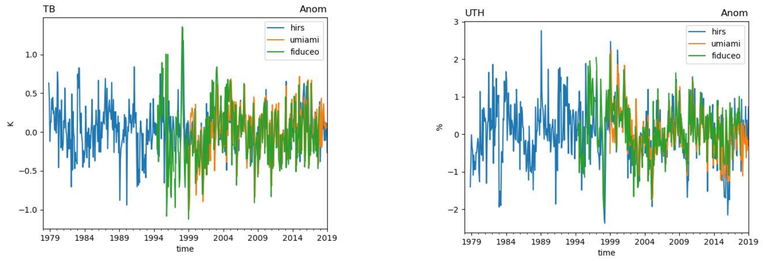
Introduction

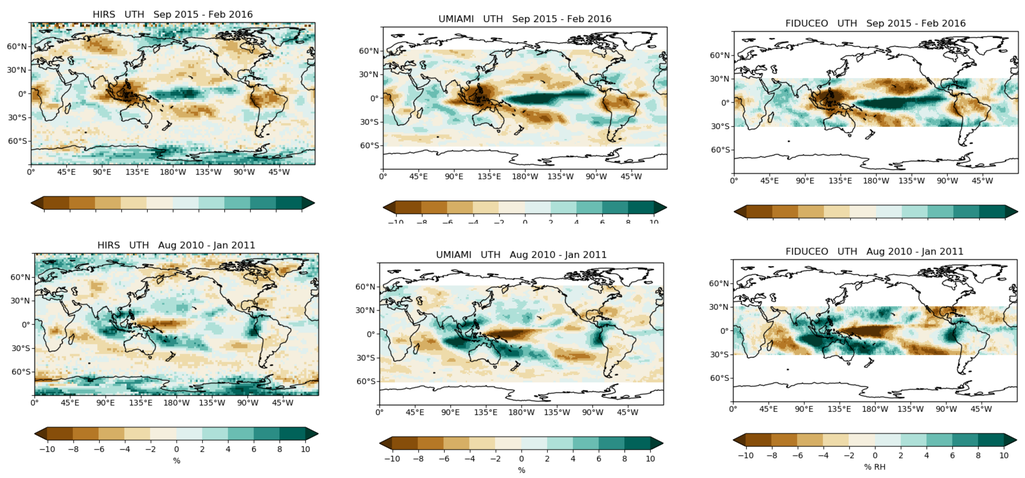
As part of the activities for the Global Energy and Water Exchanges (GEWEX) water vapor assessment (G-VAP, http://gewex-vap.org), the upper tropospheric humidity (UTH) datasets are being inter-compared. New datasets are being added to the assessment. The UTH datasets include both infrared and microwave satellite sounder measurements. The HIRS UTH dataset has also been compared to the total column water vapor (TCWV) time series focusing on their respective patterns during major El Niño and La Niña events.

Time Series of UTH Anomalies



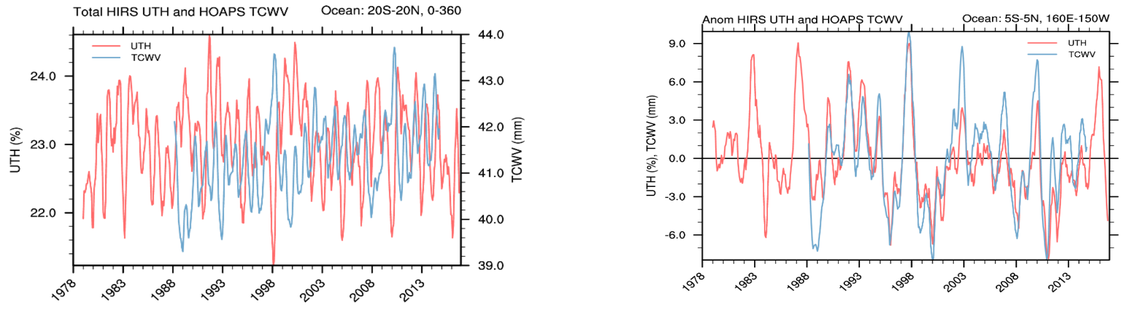
Anomaly time series of brightness temperature (left panel) and UTH (right panel) for infrared and microwave sounder measurements. Labels: hirs: HIRS data from NCEI; umiami: AMSU-B and MHS (MW) data from University of Miami; fiduceo: MW data from Fidelity and uncertainty in climate data records from Earth Observations.

El Niño and La Niña Events

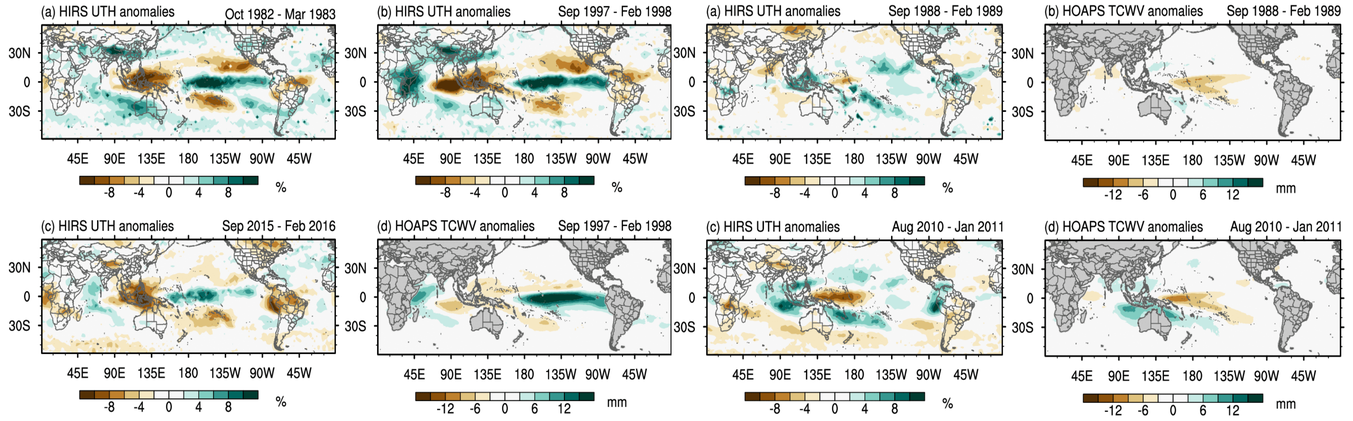


UTH anomalies during the 2015–2016 El Niño (upper panels) and 2010-2011 La Niña events (lower panels).

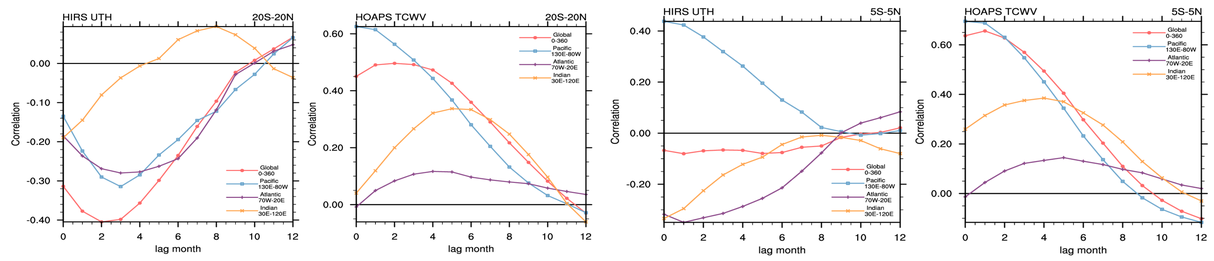
UTH Comparisons to Total Column Water Vapor



Time series of HIRS UTH and Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data (HOAPS) TCWV for 20°S–20°N (left), and anomalies of the two datasets over the Niño 4 domain (right). The phase of tropical-wide average time series of UTH is mostly opposite to that of TCWV, while on a small-regional scale, such as over the Niño 4 domain, the phases of the two time series are highly consistent.



Anomalies during peak six months of several very strong El Niño events (left two columns) and La Niña events (right two columns).



Lag correlations of the Niño 3.4 index leading UTH and TCWV for 20°S–20°N (left two panels) and for 5°S–5°N (right two panels). UTH and TCWV have significantly different lag correlations with the Niño 3.4 index in both the sign and lag time over tropical oceans.

Acknowledgments

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