

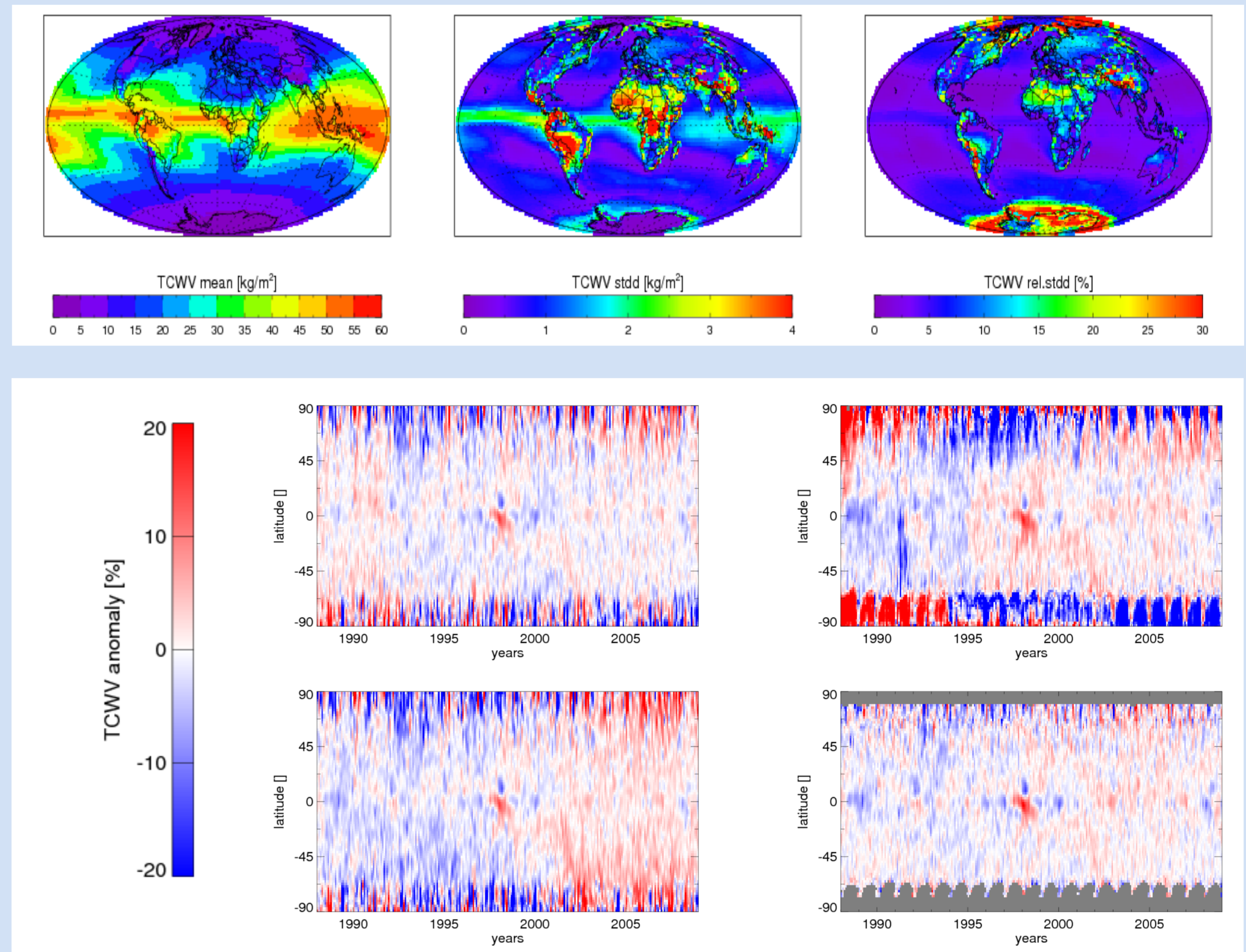
The GEWEX water vapor assessment (G-VAP) – results from inter-comparisons and stability analysis

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The GEWEX water vapor assessment (G-VAP) was initiated by the GEWEX Radiation Panel (GRP), meanwhile renamed into GEWEX Data and Assessment Panel (GDAP). The major purpose of G-VAP is to quantify the state of the art in water vapor products being constructed for climate applications, and by this support the selection process of suitable water vapor products by GDAP for its production of globally consistent water and energy cycle products (more information is available on www.gewex-vap.org).

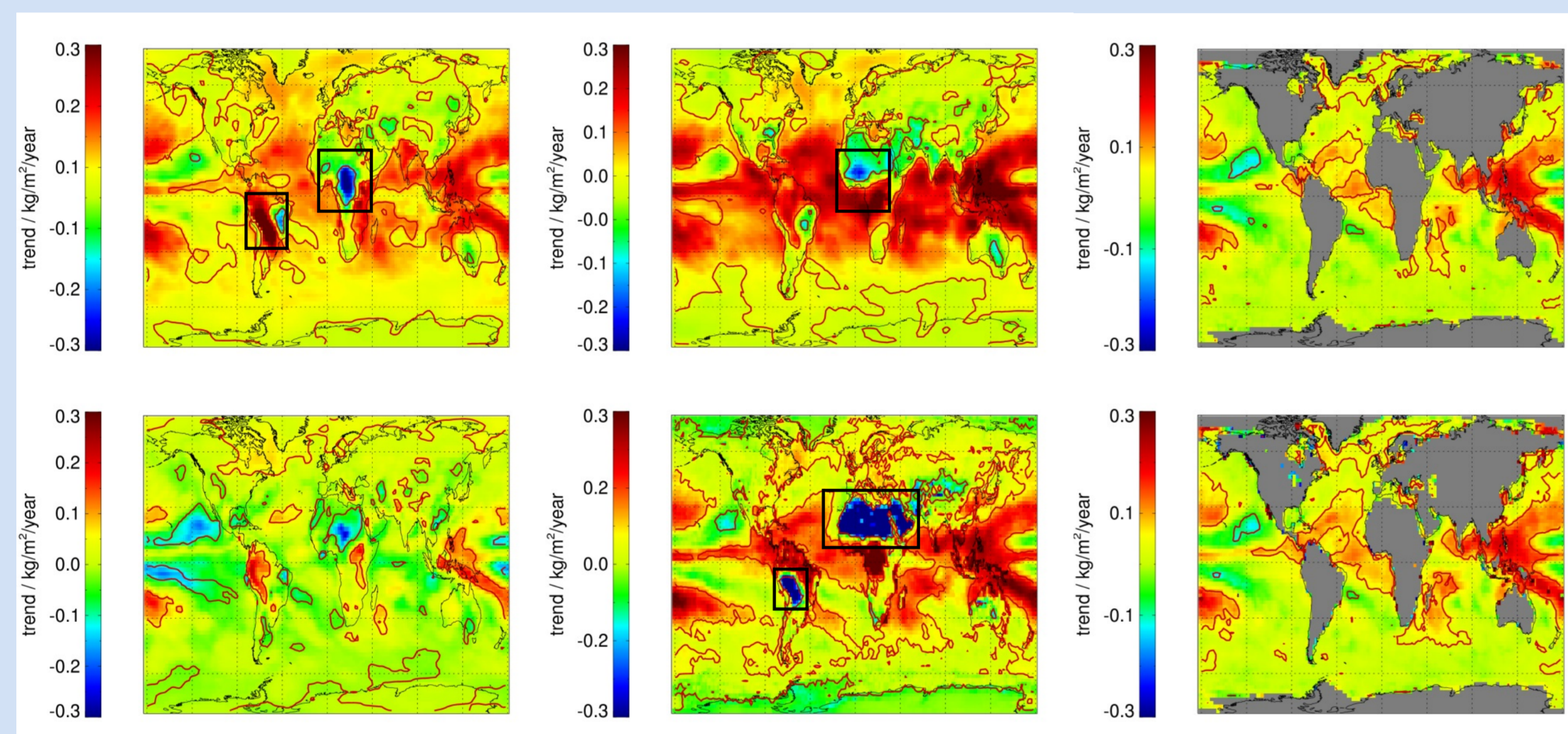
The assessment will provide an overview on available data records together with detailed meta data as well as comparable evaluation results based on product inter-comparisons and comparisons to ground-based and in-situ observations. The intercomparison results presented here consider six of the longest (> 25 years) TCWV (total column water vapor) data records, namely ERAinterim, MERRA, NCEP/CFR, NVAP-M, HOAPS, SSMI-RSS, and are based on monthly means on a common grid (2°x2°) for the time period 1988-2008.

Intercomparison



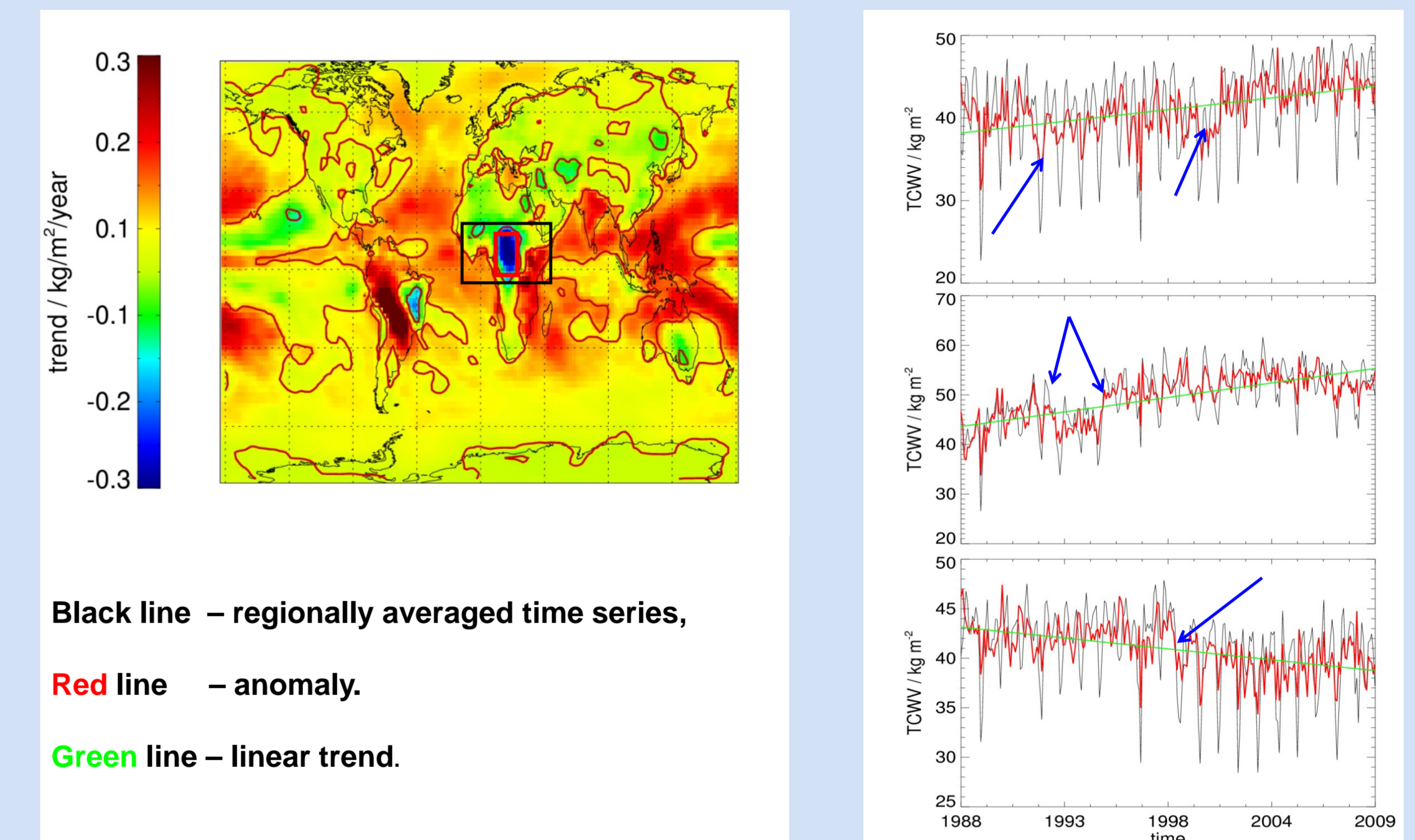
Top: Ensemble mean (left panel), standard deviation (middle panel) and relative standard deviation (right panel) based on the six long-term total column water vapor data records (only four data sets provide TCWV over land).
Bottom: Hovmöller plots of TCWV anomalies for four of the six data records considered.

Trend analysis



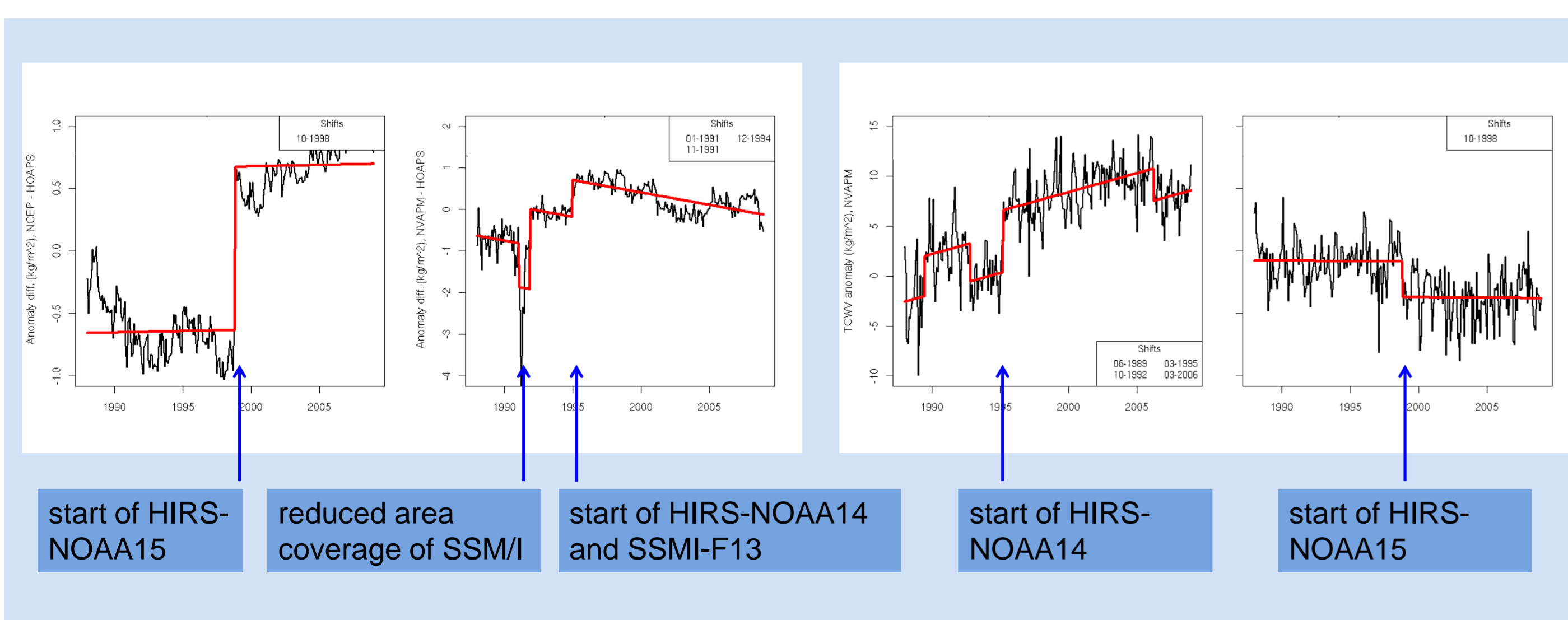
Trends in TCWV in absolute units per year for the six different data records considered. Red contours indicate the 95% confidence probability. Some obvious inconsistencies are highlighted by black boxes.

Regional Anomalies



Regionally averaged time series (black), anomalies (red) and linear trend (green) for the region of Central Africa (see red box in left plot) as depicted by three different TCWV data records.

Homogeneity tests



Change points detected using the penalized maximal F (PMF) test (Wang 2008a and 2008b). Left: two different ocean-only TCWV data series (using HOAPS as a reference series). Right: two different TCWV anomaly series over Central Africa.

Conclusions

G-VAP results on the intercomparison of six long-term gridded TCWV data records showed that largest regional discrepancies between the data sets are visible over land, especially over the Andes, dry areas, Arctic and Antarctic. The trend analysis revealed significant differences among the data records in terms of absolute values and in specific regions like central South America, central Africa, Sahara and Arabian Peninsula and the Arctic and Antarctic. An analysis of regional anomalies showed that regions of distinct trends usually coincide with breakpoints in the time series. These breakpoints are not evident on global scale. It was further shown that most of the temporal inhomogeneities (break points) and other artefacts can be attributed to changes in the observing system (changes of satellites, observation frequency, etc.). **CM SAF shall host the built-up collocation and validation data base and can offer to reassess updates of data records.**

The next workshop will tentatively be held at the Institute for Space Sciences, Free University Berlin, Berlin, Germany in the week 06-10 October 2014

References

- Wang, 2008a, J. Appl. Meteor. Climatol., 47, 2423-2444.
- Wang, 2008b, J. Atmos. Oceanic Tech., 25 (No. 3), 368-384.

