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

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A large variety of water vapour data records is available to date. Without proper background information and understanding of the limitations of available data records, these data may be incorrectly utilised or misinterpreted. The overall goal of assessments of CDRs is to conduct objective and independent evaluations and inter-comparisons in order to point out strengths, differences and limitations and, if possible, to provide reasons for them. The need for such assessments is part of the GCOS guidelines for the generation of data products. The GEWEX Data and Assessments Panel (GDAP) has initiated the GEWEX water vapor assessment (G-VAP) which has the major purpose to quantify the current state of the art in water vapour products (upper tropospheric humidity, specific humidity and temperature profiles as well as total column water vapour) being constructed for climate applications. In order to support GDAP and the general climate analysis community G-VAP intends to answer, among others, the following questions:
a) How large are the differences in observed temporal changes in long-term satellite data records of water vapour on global and regional scales?
b) Are the differences in observed temporal changes within uncertainty limits?
c) What is the degree of homogeneity (break points) of each long-term satellite data record?
A general overview of G-VAP will be given. The focus of the presentation will be on observed inconsistencies among the long-term satellite data records as observed by inter-comparisons and comparison to in-situ observations and the stability analysis. On basis of consistently applied tools major differences in state-of-art CDRs have been identified, documented and to a large extend explained. The results and the answers for TCWV are summarized as follows: On global ice free ocean scale the trend estimates among long-term data records were generally found to be significantly different. Maxima in standard deviation among the data records are found over, e.g., tropical rain forests. These and other noticeable regions coincide with maxima in mean absolute differences among trend estimates. These distinct features can be explained with break points which manifest on regional scale only and which typically do not appear in stability analysis relative to ground-based observations. Results from profile inter-comparisons will also been shown and exhibit, among others, that the observed break points are not only a function of regions but also of parameter.