

Title: Global Measurements of the Essential Climate Variables

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Session I: Introduction and keynote presentations

Abstract: Even without the challenges imposed by global warming and climate change, a comprehensive and to the best possible extend complete knowledge of the state of the atmosphere and climate of at least the current and the 20th century is a prerequisite for a reliable assessment and classification of the current observational information comprising mean conditions, extreme events, their variability and trends. It is also needed to validate and actually properly understand the results of numerical weather prediction based re-analysis and of climate projections, and to reliably and objectively verify the success of implementation of GHG reduction policies and climate change mitigation in general. However, prior to the detection of global warming and its association to raising GHG concentrations, the demand on geo-temporal homogeneity and climate readiness of observations was basically limited to a subset of mostly surface based in-situ measuring systems addressing the observational needs to monitor climate in a narrow sense which is defined in the glossary of the Fifth Assessment Report (AR5) of IPCC simply as average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical averaging period applied is 30 years as defined by the World Meteorological Organization (WMO) with the view that this does – under stable conditions – reveal characteristic values. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Without a change in the radiative balance imposed by raising GHG concentrations and climate altering pollutants the demand on an in depth understanding of the climate system affected in all its five components, i.e. the atmosphere, the hydrosphere, the cryosphere, the lithosphere and the biosphere, including its mutual interaction would have remained a fairly academic question and the demand for an accordingly comprehensive observation extending the scope of the essential climate variables would probably have stayed too low to gather the momentum to establish a Global Climate Observing System (GCOS). In fact it still took its time until 1992 when the second world climate conference decided for this. To ultimately meet the requirements of the UN Framework Convention on Climate Change (UNFCCC) and other international conventions and agreements mostly related to Climate Change, GCOS addresses the total climate system including physical, chemical and biological properties, and atmospheric, oceanic, terrestrial, hydrologic, and cryosphere components. In doing so, GCOS addresses the need for global coverage and timeliness of data for example through the promotion of the Essential Climate Variables (ECVs, Bojinski et al., 2014) concept and the formulation of the 20 GCOS Climate Monitoring Principles (GCOS, 2013). The choice of over 60 ECV's cover the atmospheric, oceanic and terrestrial domains and have been identified based on their relevance, feasibility and cost effectiveness. With the adoption of the Global Framework for Climate Services at WCC-3 and its implementation thereafter, the importance and demand for an ECV based observational regime has even grown. One important aspect of the ECV designation lies in the principle of free and unrestricted exchange of ECV datasets, as requested by the state signatories of the UNFCCC. In pursuing its mission GCOS heavily dwells on the contributions of the WMO National Hydrological and Meteorological Services in the field of data rescue, raise, processing and publication organised – inter alia - through the World Weather Watch programme including its WMO Information System (WIS). For the ECV precipitation the Global Precipitation Climatology Centre (GPCC) operated by the Deutscher Wetterdienst since 1989 has taken the charges to world-wide collect, quality assure and process in-situ precipitation data and to generate best quality gridded observational data sets for this ECV. Therefore the presentation will on the one hand present the ECV concept of Bojinski et al. (2014) describing the ultimate goal of a complete Global Climate Observing System and the monitoring requirements that have to be met to reach there, but shall on the other hand also provide some insights into the actual challenges that data centres like the GPCC face in their day-to-day work on the stony path to this ideal situation. References: Bojinski, S., Verstraete, M., Peterson, T. C., Richter, C., Simmons, A., and Zemp, M., 2014: The concept of Essential Climate Variables in support of climate research, applications, and policy. doi: 10.1175/BAMS-D-13-00047.1;

http://www.wmo.int/pages/prog/gcos/documents/bams_ECV_article.pdf GCOS. 2013:

<http://www.wmo.int/pages/prog/gcos/index.php?name=ClimateMonitoringPrinciples>.

Last update 28 January 2013.