Developments in climate reanalysis at ECMWF

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Reanalysis is a method for producing a comprehensive description of the climate as it has evolved during the recent past, based on observations from a mix of conventional and satellite-borne instruments, and constrained by the laws of physics as expressed in numerical models. Atmospheric reanalysis data are used for many different purposes, including studies of climate variability and change. While the quality of successive generations of reanalyses has improved in many respects, accurate representation of low-frequency variability remains a challenge. The fundamental difficulty is that the atmosphere has always been incompletely and inaccurately observed; a reanalysis uses a model to complete the picture, but models are not perfect. As a result, changes in the observing system can easily result in systematic errors in the climate signal. This presentation will focus on progress achieved in obtaining 'climate-quality' reanalyses, and prospects for future developments in this area. These include improvements in data assimilation (e.g., the use of variational methods to adjust biases in observations and models); model improvements (e.g., to better represent energy fluxes at the interfaces between atmosphere and surface); and improvements in the observations themselves (e.g., recovery and quality control of historic weather data, and re-processing and intercalibration of satellite measurements). Over the years, ECMWF has produced several multidecadal global reanalyses to support its own research and development in numerical weather prediction, and to serve the needs of scientific users world-wide. ERA-Interim, the latest ECMWF atmospheric reanalysis, covers the period from 1979 onward and continues to be extended forward in time. ERA-Interim provides gridded estimates of a large number of atmospheric parameters at 6hourly intervals (3-hourly for surface parameters), at approximately 79km global resolution and for 60 atmospheric layers extending from the surface up to 0.1hPa. ERA-Interim data are freely available for research and education, and can be retrieved from ECMWF data servers directly from a browser or by means of python scripts, with options for regional selection and gridding.