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The 3rd generation ECMWF reanalysis ERA-Interim

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Instead of being viewed as a series of largely independent "one-off" exercises, reanalysis has come to be seen more as an iterative process. In this process, developments in modelling, data-analysis techniques and computing power are allied with new data rescue efforts and data and experience from reanalyses carried out elsewhere, to produce a succession of reanalyses of increasing quality, accounting increasingly well for changes in the observing system. Users often express a requirement for reanalyses to be extended in close to real time, in what is known as Climate Data Assimilation System (CDAS) mode. This has been adopted by the National Centers for Environmental Prediction (NCEP) for its two global reanalyses and more recently by the Japan Meteorological Agency in extending its JRA-25 (1979–2004) reanalysis. Whilst this approach provides users with up-to-date data in a conveniently familiar form, if continued too long it results in products of significantly lower quality than would be produced by a replacement reanalysis. In particular a fixed, older analysis system is unlikely to exploit well, if at all, new types of data from the evolving observing system.

The previous ECMWF reanalysis project ERA-40 was funded and designed so that its production could be supported until 2003 by the European Union's Fifth Framework Programme. With limited human resources available from then onwards, effort was devoted to development of a new reanalysis system (T255L60, 12 hour 4D-Var, new humidity analysis, upgraded model physics, variational bias correction of radiance data) derived from the latest version of the operational ECMWF system. This new reanalysis system has now started, from January 1989, to produce an interim reanalysis (ERA-Interim) for the data-rich 1990s and 2000s, and continued as an ECMWF Climate Data Assimilation System (ECDAS) until superseded by a new extended reanalysis. The analysis has now reached 1996 and is expected to catch near real-time

in the latter part of 2008.

Several of the problems experienced in ERA-40 have been eliminated or significantly reduced in ERA-Interim: most notably a too-strong tropical oceanic precipitation that was marked from the early 1990s onwards and a too-strong Brewer-Dobson circulation in the stratosphere. Precipitation, which is higher in both ERA-Interim and ERA-40 than in the Global Precipitation Climatology Project (GPCP) over the tropical oceans, is closer to GPCP in ERA-Interim. ERA-40 and ERA-Interim are nevertheless in closer agreement with each other than either is to the GPCP estimate. Total column water vapour from ERA-Interim is significantly lower than from ERA-40, and closer to the SSM/I product by Remote Sensing Systems. A further indication of improvement of the hydrological cycle in ERA-Interim comes from diagnosis of the global balance of precipitation and evaporation. The excess of precipitation over evaporation seen in ERA-40 is much reduced in ERA-Interim. Precipitation remains higher than evaporation, however, consistent with the indications that rainfall over the tropical oceans is still somewhat too high, notwithstanding uncertainties in the accuracy of the observation-based estimates. Comparison of the accuracy of 10-day forecasts from ERA-Interim and ERA-40 with those from operations provides further evidence of the improvement of forecasting systems over the years.