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Atmospheric Conservation Properties in ECMWF Reanalyses

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Variables that measure the gross properties of the atmosphere and are governed by simple physical constraints are useful in assessing the quality of atmospheric datasets such as reanalyses. Even though such global diagnostics do not give a detailed view of every point on the globe they do give an overview of the whole globe and are useful in providing an initial assessment of a dataset. Here, the atmospheric budgets of mass, energy and angular momentum and the hydrological cycle are investigated using monthly mean data from the ECMWF Interim Reanalysis (ERA-Interim) and compared with those from ERA-40. On the whole it is found that the physical constraints are more closely adhered to in ERA-Interim than in ERA-40. Furthermore, the adherences, as measured by the constancy of quasi-conserved variables or budget closure, vary in time. Where possible an attempt is made to relate these temporal variations to changes in the observing system.