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The mass budget and hemispheric divergent wind in ECMWF Reanalyses

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It has long been known that one of the greatest sources of uncertainty in atmospheric analyses originates in the divergent wind. This leads to analyses containing spurious mass fluxes which are related to erroneous surface pressure tendencies. In this work, the mass budget and conservation of global dry mass are investigated using monthly mean diagnostics from the ECMWF Interim Reanalysis (ERA-Interim) and ERA-40. The results are used to infer the quality of the analysed mass field. Then we examine the simple case of the vertically integrated hemispheric mass divergence, which is equivalent to the cross equatorial mass flux. The improvements in the quality of this mass divergence in ERA-Interim over that in ERA-40 are discussed.