



The Global Water Cycle Reanalysis (GWCR): record extension and new developments

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Recently we developed a data assimilation method to derive 1° resolution monthly time series for 2003–2012 of water stored in snow, rivers, lakes, below the surface, and in oceans. The resulting Global Water Cycle Reanalysis (GWCR) record is available via <http://www.wenfo.org/wald/>. The record was derived by combining ground observations, satellite water level altimetry, GRACE gravity observations, ancillary mapping and an ensemble of hydrological models.

Here, we present recent developments of the GWCR record, which includes extension through to 2014, enhancement of the spatial resolution to 0.5° , separation of the soil and groundwater signals, and the use of additional ancillary data to better constrain the reanalysis. In addition to the stores, consistent estimates of the main water fluxes (precipitation, evapotranspiration and runoff) were also produced in the reanalysis process, allowing more detailed analysis of the terrestrial water budget.

Using the updated time series, trends and events in the global water cycle during 2003–2014 are re-examined. This includes groundwater pumping and regional changes in the balance between precipitation and ET, and their effect on sea level rise, as well as an analysis of the propagation of recent 'mega' droughts through the water cycle.