Geophysical Research Abstracts
Vol. 18, EGU2016-7929, 2016
EGU General Assembly 2016

Total land water storage change over 2003–2013 estimated from a global mass budget approach

Habib B. Dieng (1), Nicolas Champollion (2), Anny Cazenave (1,2), Yoshihide Wada (3,4,5), Ernst Schrama (6), and Benoit Meyssignac (1)

(1) LEGOS, UMR5566, Observatoire Midi-Pyrénées, Toulouse, France (habib.dieng@legos.obs-mip.fr), (2) ISSI, Bern, Switzerland (anny.cazenave@legos.obs-mip.fr), (3) Department of Physical Geography, Utrecht University, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands (Y.Wada@uu.nl), (4) NASA Goddard Institute for Space Studies, 2880 Broadway, New York, NY10025, USA (Y.Wada@uu.nl), (5) Center for Climate Systems Research, Columbia University, 2880 Broadway, New York,NY10025, USA (Y.Wada@uu.nl), (6) Faculty of Aerospace Engineering, Kluyverweg 1, 2629HS Delft, The Netherlands (e.j.o.schrama@tudelft.nl)

Abstract

We estimate the total land water storage (LWS) change between 2003 and 2013 using a global water mass budget approach. Hereby we compare the ocean mass change (estimated from GRACE space gravimetry on the one hand, and from the satellite altimetry-based global mean sea level corrected for steric effects on the other hand) to the sum of the main water mass components of the climate system: glaciers, Greenland and Antarctica ice sheets, atmospheric water and LWS(the latter being the unknown quantity to be estimated). For glaciers and ice sheets, we use published estimates of ice mass trends based on various types of observations covering different time spans between 2003 and 2013. From the mass budget equation, we derive a net LWS trend over the study period. The mean trend amounts to$+0.30 \pm 0.18 \mathrm{mmyr}^{-1}$ in sea level equivalent. This corresponds to a net decrease of $^{-1}08 \pm 64$ km3 yr^{-1} in LWS over the 2003–2013 decade. We also estimate the rate of change in LWS and find no significant acceleration over the study period. The computed mean global LWS trend over the study period is shown to be explained mainly by direct anthropogenic effects on land hydrology, i.e. the net effect of groundwater depletion and impoundment of water in man-made reservoirs, and to a lesser extent the effect of naturally-forced land hydrology variability. Our results compare well with independent estimates of human-induced changes in global land hydrology.