

**Poroelastic response to terrestrial water loading of the Bengal Aquifer System provides high-resolution, in-situ measurements for comparison with GRACE
Abstract n°1912**

Burgess William, London, United Kingdom

william.burgess@ucl.ac.uk

Zahid Anwar, Bangladesh Water Development Board, Dhaka, Bangladesh

Shamsudduha Mohammad, University College London, London, United Kingdom

Taylor Richard, University College London, London, United Kingdom

Ahmed Kazi Matin, University of Dhaka, Dhaka, Bangladesh

KEYWORDS: terrestrial water storage, poroelasticity, geological weighing lysimetry

In the Bengal Aquifer System (BAS), low topographic relief and low vertical hydraulic conductivity constrain gravitational groundwater flow. In contrast, substantial poroelastic responses of the compressible BAS sediments to surface water loading by monsoon rainfall and flooding have been demonstrated[1] in coastal regions of the Ganges-Brahmaputra-Meghna (GBM) floodplains. The integrated change in terrestrial water mass, TWS, evident from head measurements in nested piezometers, is the same as measured by the GRACE satellite mission, albeit at dramatically different spatial and temporal scales. Therefore the BAS poroelastic response could be employed in a spatially-extensive application of 'geological weighing lysimetry'[2] to provide direct, in-situ measurements of TWS, complementary to satellite gravity data, to explore spatial variability within a single GRACE footprint. In a preliminary analysis of weekly groundwater level measurements at thirty four deep nested piezometer sites, each with a 'sensing area' of approximately 20 km², we have investigated TWS across southern Bangladesh for the 2013 monsoon season. We applied a value of loading efficiency, the proportional change in hydraulic head relative to change in surface load, indirectly derived[1] from barometric efficiency. Values of TWS over the 2013 monsoon season are spatially variable over a range 0.53 to 3.44 m, locally consistent with the very large seasonal rise in river stage. The mean 2013 monsoon season TWS by piezometric lysimetry is 2.0 m, substantially higher than previous GRACE assessments across the full extent of the GBM floodplains[3,4] which span the lower limit of this range, 0.49 to 0.75 m per monsoon season over the period 2003-2007. 1. Burgess, W.G. et al. In review Nat Geosci. 2. van der Kamp, G. & Schmidt, R. 1997 GRL 24, 719-722. 3. Steckler, M. S. et al. 2010 JGR B08407. 4. Shamsudduha, M. et al. 2012 WRR W02508.

