



Hydrology-induced signals at superconducting gravimeter site at Sutherland/South Africa

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The superconducting gravimeter (SG) operating at the South African Geodynamic Observatory Sutherland (SAGOS) is one of the few instruments installed in the southern hemisphere and presently still the only one of its kind on the African continent. SAGOS is located in the Karoo, a semi-arid region with an average annual precipitation in the range of 200 to 400 mm. The distance to the ocean is approx. 220 km.

A seasonal effect on gravity related to fluctuations in local hydrology is clearly seen in the SG record. Its general order of magnitude is estimated to be about 4 to 10 nm/s². A large-scale hydrological impact in a similar order of magnitude or even larger (up to 60 nm/s² peak-to-peak) is inferred from global hydrological models for the years 2003 to 2007. Significant contributions are found for the southern coast, the central Cape region, and the basin of the Orange river. Contributing basins with larger distance comprise the areas of Okavango/Sambesi, Congo, and eastern Africa. Between SG data, temporal GRACE gravity field solutions, and the gravity effect derived from global hydrological models clear differences are present. Among others, differences between the hydrological models can be traced to deviations in the gravity effect originating from the Okavango basin and the central Cape region.

The present findings indicate the suitability of the SG observations at Sutherland for studies on changes in continental water storage in the South African region.