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Looking for very low tectonic deformation in GNSS time series impacted by strong hydrological signal in the Okavango Delta, Botswana

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Located in northern Botswana, the Okavango Delta is a vast wetland, fed from the Angolan highlands and constrained by a half-graben in the Kalahari depression. Since the 70's, the Okavango graben is usually considered as the terminus of the East African Rift System. But a recent geodetic study showed there has been no extension on the tectonic structure over the past 5 years, and recent geophysical studies began to call this hypothesis into question. The deformation in the area could instead be related to far-field deformation accommodation due to the motion of the Kalahari craton relative to the rest of the Nubian plate and to the opening of the Rift Valley.
Getting to the vertical deformation isn't trivial. The GNSS time series show a strong annual deformation of the ground surface (3 cm of amplitude). On the vertical component, this periodic signal is so strong that it hides the tectonic long-term deformation, while this information would give a crucial insight on the geodynamic process at play.
This periodic signal is related to the seasonal loading of water due to the rainy season. This hypothesis is corroborated by the modeling of the surface deformation based on the GRACE satellites data, interpreted as the variation of groundwater amount. In the Okavango Delta, the peak of water level isn't paced with the local precipitations, but is driven by a flood pulse coming from the Angolan Highlands. The migration of this massive water body isn't visible at first order in GRACE data. Yet, local precipitations are supposed to undergo too much evapotranspiration to be significant in the hydrological balance. Thus this later water body isn't supposed to produce a mass anomaly in GRACE time series. This paradox could highlight a relationship not yet defined between groundwater and local rainfall.
The wide spatial resolution of GRACE data (about 300 km) doesn't allow a modeling accurate enough to give access to the slow tectonic deformation, nor to determine the groundwater behavior within the basin. While GRACE data show a strong groundwater variation in the area, very few direct data are available on this hydrological reservoir. We thus decided to implement a new geodetic and piezometric network in the Okavango Delta.
The first results show an unpredicted influence of the local rainfall on the water table elevation, with disturbance or even stop of decrease of the water table. Signals differ between stations, in response to daily evapotranspiration as well as monthly behavior of the water table.