



How to combine hydrology and geodesy to investigate water storage changes? The GHYRAF (Gravity and Hydrology in Africa) experiment

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We present a new experience in Africa which will combine hydrological data to geodetic and gravimetric data to investigate water storage changes. We concentrate geographically on three regions in West Africa: the Sahara (Tamanrasset, South of Algeria) with almost no rainfall, the Sahelian zone (Niamey and Diffa in Niger) and the equatorial monsoon band (Djougou, Benin Republic) with heavy rainfall. Our experience combines two kinds of ground gravity measurements: the repetition with an absolute gravimeter (AG) every two months of a North-South profile during the 3 year project (2008-2010) and the continuous monitoring of the time-variable gravity with a superconducting gravimeter (SG) at a fixed station with large soil moisture changes. All the gravity points will be collocated with permanent GPS stations in order to independently estimate the gravity contribution due to vertical motions of hydrological origin. Since gravity is sensitive to various length scales involved in hydrology, we will rely on dense in-situ measurements (rain gauges, piezometers, soil moisture) to model local gravity effects. The first goal is to better characterize the annual cycle of water storage in West Africa and to assess the predictions of global hydrology models (GLDAS, LadWorld) for this region. Our project will also allow to validate satellite gravity observations (mainly GRACE but also upcoming GOCE) with ground gravity and geodetic observations.