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River stage height measured by GPS and satellite altimetry in the Amazon Basin–A case study for GPS hydrology

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The major difficulties in the hydrological data collection such as river stage height in the Amazon Basin include: inadequate data collection, poor accessibility due to political problems, and a lack of an unified reference datum across countries to incorporate data. We present the use of satellite-based technologies such as GPS and satellite altimetry to support data collection of river stage height and datum unification. A campaign was conducted by the French Insitute de Recherche pour le Developpement (IRD) to collect river stage and its gradient with a GPS-equipped ship and a GPS buoy along the course of the Branco River, Brazil, a tributary of the Negro River, in the Amazon Basin. The main objective was to improve the knowledge of the flow velocity and discharge affected, in part, by the climate variability. Two cross sections along the Branco River were selected for height verification where valid satellite altimeter height measurements from ENVISAT were able to obtain. The combined river stage measurements from GPS and from ENVISAT were compared to the time series of the only river gauge in the vicinity. Four different trackers of ENVISAT were tested for the optimal result. The stage gradient, which is the primary information for quantify river flow velocity, is estimated from the GPS ship data. The standard deviation of using GPS in estimating river stage gradient is about +/-0.4 cm/km, which is consistent with other studies in this area. The current limitation of using satellite technologies in the flow velocity determination depends on the accuracy of local geoid models and it is anticipated to be improved by the geoid model determined from a combination of

Gravity Recovery And Climate Experiment (GRACE) large scale solutions together with the Gravity field and steady-state Ocean Circulation Explorer mission (GOCE).