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Applications of GNSS data for hydrological studies in the Amazon basin.

D. Moreira (1,2), F. Perosanz (3), S. Calmant (4), A. Santos (1), J. Silva (5), G Ramillien (3), O. Rotunno (2), F. Seyler (4), A. Monteiro (1), and C.K Shum (6)

(1) CPRM- Geological Survey of Brazil, Rio de Janeiro,Brazil, (2) COPPE/UFRJ,Federal University of Rio de Janeiro, Brazil, (3) CNES/GRGS,Toulouse,France, (4) IRD,Institut de recherche pour le développement, Toulouse,France, (5) UEA, University of the State of Amazonas,Manaus,Brazil, (6) OSU,The Ohio State University, Colombus, Ohio, USA

Applications of GNSS data is constantly being used in hydrology. The key applications are the levelling of hydrological gauge stations and characterization of river's longitudinal profiles, these information are required to develop hydrological and hydrodynamic studies and to evaluate the quality of data obtained through space altimetry techniques.

Some factors illustrate the challenge of establishing quality altimetry data from a GNSS receivers to obtain rivers profiles in Amazon Basin. GNSS reference network is sparse, the distance between survey points and reference stations is large, rivers have an extension of several thousands of kilometers. All these factors contribute in limiting the efficiency of classical techniques of GNSS data processing like double difference. In addition the Amazon Basin are strongly affected by charge effects, mainly caused by the hydrological cycle of this basin. These effects can produce a variation of about 10 cm in amplitude of vertical coordinates

In the present work we use the Gins-PC software developed at CNES / GRGS. We discuss the capability of kinematic processing strategy implemented in GINS-PC in use GNSS data to calculate river's longitudinal profiles in the Amazon Basin. The profiles will be processed using data obtained from GPS receivers on boarding boats along the rivers of Amazon Basin such as Negro river, Madeira river and Amazon/Solimões river. For this purpose, field campaigns were conducted between 2005 and 2011 by ANA (Brazilian National Water Agency), CPRM (Brazilian Geologic Survey), IRD (French Institute of Research by Development), Hybam (Hydrology of Amazon Basin), PROSUL (Research project by CNPQ/UFRJ) and FOAM (From Ocean to inland waters Altimetry Monitoring) river section project.

The profiles are also used to levelling some gauge stations in Amazon Basin and gauge data are used to obtain a temporal variation of these profiles. GPS data are processed using a Double-Difference and a PPP strategy. The comparison of the series derived from the two approaches demonstrate the strength of PPP wherever reference stations can not be easily installed. The seasonal hydrological loading signal of these profiles will be removed by data derived from the series of permanent GNSS stations installed in the Amazon. GRACE data also be used to convert the hydrologic load into crustal displacements to remove hydrological loading effects.

The results of the Amazon rivers profiles will be then compared with profiles obtained by water level variation data using altimetry data from tracks of the Jason-2 and ENVISAT missions.