



Use of GNSS Data for Hydrological Surveys in the Amazon Basin

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GNSS data are constantly being used in hydrology. The key applications are the levelling of hydrological gauge stations, that of ADCP profiles for discharge and bathymetry of the cross-sections, and characterization of river's longitudinal slope of the free . These information are required to develop hydrological and hydrodynamic studies and to assess the quality of water level data obtained through space altimetry techniques.

Establishing quality altimetry data from GNSS receivers to obtain gauge levelling and rivers profiles in the Amazon Basin is challenging. The GNSS reference network is sparse, the distance between survey points and reference stations is large, the major part of the basin can be only accessed by boat and rivers can have an extension of several thousands of kilometres. All these factors limit the efficiency of classical techniques of GNSS data processing like those based on double differences (DD). In addition, the Amazon Basin is strongly affected by loading effects, mainly caused by the hydrological cycle. In this basin, vertical displacements of these effects can reach more than 10 cm of amplitude.

In the present work, we discuss the capability of calculating thousands of kilometres long altimetric profiles along the major rivers of the Amazon basin. GNSS data coming from receivers installed on-board boats are used together with GNSS stations fixed on gauges. First, differential techniques implemented in the GINS-PC software developed at the CNES-CLS IGS AC are used. These results are compared to those obtained with the Precise Point Position (PPP) technique. The impacts of fixing ambiguities to integer values in PPP technique are discussed as the use of Glonass data. We point on the specific corrections and cautions that are necessary during the data collection and the data processing.

The accuracy of the profiles is assessed by comparing the results with fix points at gauge stations. The base application of the method is to enable fast leveling of remote gages without any specific field work but initial installation of GNSS stations on boats cruising the river network. The main results presented in this paper will show that the processing data of isolated GNSS receivers in kinematic PPP technique on-board boats are able to obtain altimetric information of water level of Amazon rivers with 3 centimetres of accuracy and this technique can be used to avoid errors of classical differential GNSS processing techniques in base lines larger than 28 km. This presentation also deals with methodologies to be used to remove water loading effects and other cautions that are necessary to achieve cm level of vertical accuracy in the specific case of the Amazon Basin.