



Comparison of Spirit levelling, bi-frequency GPS positioning and satellite radar altimetry

P. Kosuth (1), D. Blitzkow (2), G. Cochonneau (3)

(1) Cemagref, UMR TETIS, “Remote Sensing and Geo-information for Environment and Land Management”, Cemagref-CIRAD-ENGREF Joint Research Unit, Montpellier, France

(2) Department of Civil Engineering, Escola Politecnica of the University of São Paulo (EPUSP), CP 61548 CEP 05424-970 São Paulo, Brazil (3) Laboratoire des Mécanismes et Transferts en Géologie (LMTG), Institut de Recherche pour le Développement (IRD), 31400 Toulouse, France

Three levelling techniques were compared for the levelling of hydrometric stations along Amazonian rivers : spirit levelling, bi-frequency GPS positioning and satellite radar altimetry (Topex/Poseidon T/P). Results show a good agreement between GPS positioning and satellite radar altimetry techniques, the two techniques having been compared on 23 hydrometric stations with an average root mean square error of 0.05 +/- 0.64m. Comparison with spirit levelling allowed the identification of discrepancies in direct geometric land levelling results from Brazilian and Peruvian networks over the Amazon Basin.

Levelling hydrometric stations through satellite radar altimetry required a specific methodology : maximum annual water levels (referred to the geoid, using EGM96 geopotential model) are quantified at intersections between the satellite ground tracks and the river network. Maximum annual water levels at hydrometric stations are then derived through longitudinal interpolation. Comparison with maximum annual readings at gauges allows the determination of local orthometric heights at these stations. Altimetric levelling from Topex/Poseidon measurements has been realized for 97 hydrometric stations along 27 740 km of the Amazon hydrographic network. Resulting river surface longitudinal profiles proved to be fully consistent in terms of hydrodynamics.