



Rating curves and estimation of average water depth at the upper Negro River based on satellite altimeter data and modeled discharges

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The objective of this study is to derive the stage-discharge relationship for 21 “virtual gauge stations” located at the upper Negro River (Amazon Basin, Brazil). A virtual station can be defined as any crossing of water body surface (i.e. large rivers) by radar altimeter satellite tracks. Rating curve parameters are estimated by fitting with a power law the temporal series of water surface altitude derived from satellite measurements and the discharge. Discharges are calculated using ProGUM, a flow routing model based on the Muskingum-Cunge (M-C) approach considering a diffusion-cum-dynamic wave propagation (Leon et al., submitted). Among these parameters is the height of effective zero flow. Measured from the WGS84 ellipsoid used as reference, it is shown that the height of effective zero flow is a good proxy of the mean water depth from which bottom slope of the reaches can be computed and Manning roughness coefficients can be evaluated. Mean absolute difference lower than 1.1 m between estimated equivalent water depth and measured water depth indicates the good reliability of the method employed. We computed the free surface water slope from ENVISAT altimetry data for dry and rainy seasons. These profiles are in good agreement with the bottom profile derived from the aforementioned water depths. Also, the corresponding Manning coefficients are consistent with the admitted ranges for natural channels with important flows and irregular section.