



Satellite radar altimetry measurements of river water levels : quantifying the accuracy and sampling efficiency.

Pascal Kosuth (1), Nicolas Bercher (1), Jérôme Bruniquel (2), Frédérique Seyler (3)

(1) Unité Mixte de Recherche « Structures et Systèmes Spatiaux », Cemagref-ENGREF, Montpellier, France (2) Alcatel Space Industries, Toulouse, France (3) LMTG « Laboratoire des Mécanismes et Transferts en Géologie », CNRS-IRD-Université, Toulouse, France (pascal.kosuth@teledetection.fr / Fax 33 4 67 54 87 00)

Although initially designed for oceanographic application, Satellite radar altimetry has recently been applied over continental waters, mainly lakes and large rivers, with promising results. A growing number of studies have proved that the technique was able to provide valuable information about continental water levels variations, rivers slopes, absolute heights with reference to the geoïd, etc. in an homogeneous way over continents. Furthermore various research directions, both technological (interferometry, lidar) and algorithmical (waveform retracking algorithms), have been identified that could lead to drastic improvements in the quality of river water level measurement from space.

Anyhow, such developments will only be possible once a method will be available to quantify the quality of satellite radar altimetry measurements over continental waters. Only then will it be possible to assess the gain in quality through new algorithms, or to compare the performances of various sensors or technologies. Additionally hydrologists need a reliable information about the accuracy of water level time series issued by satellite radar altimetry before using them in their processing modules or mathematical models.

Overall quality of satellite radar altimetry measurements over continental waters depend both on the accuracy of individual measurements and on the relevancy of the satellite sampling period (10 days for Topex Poseidon and Jason satellites, 30 days for ERS) in relation to the natural dynamics of the water level signal. A global approach

to quantify both accuracy and sampling period relevancy will be presented.

The quantification of accuracy relies on the analysis of the difference between satellite measurements and in situ measurement time series reconstructed from the closest hydrometric stations. The quantification of sampling period relevancy relies on a combination of hydrological analysis and signal processing analysis : the effective sampling frequency is compared to the frequency spectrum of the natural signal (characterized on the closest hydrometric station data using Fourier analysis) in order to characterize the fraction of the signal that can be reconstructed from satellite data. These results are translated to hydrological units.

The quality of satellite radar altimetry measurements (Topex Poseidon) over 40 sections of the Amazon river hydrographic network will be presented and will be related to the morphology and hydrology of the rivers. Results will be discussed.