

Sea-tide effects on downstream Amazon River flows

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Physical influence of sea tide on downstream Amazon River can be assessed more than 1000 km upstream from the sea.

In order to analyze this phenomenon, over the year recording of water levels (every 30'') has been ensured at 5 stations along the downstream Amazon River and measurement campaigns have been organized, for different river discharge rates (low flow 100 000 m³/s and mean flow 150 000 m³/s) and sea tide amplitude (2 meters to 3.5 meters).

During these measurement campaigns, hourly variations of water levels and discharges (using ADCP technique) have been recorded at different stations along the downstream Amazon River. It led to such surprising observations as local changes in discharge from 130 000 m³/s to 40 000 m³/s in 4 hours, cyclic storage of 8 billion m³ in 6 hours, or even local inversion of flow from 60 000 m³/s to – 22 000 m³/s in 4 hours on some branches of the Amazon. Hourly fluctuations in suspended sediment concentrations have equally been monitored.

Damping and time-delay of the tidal signal, depending on water regime and distance to the sea has been analysed. Physical processes of wave propagation and cyclic water storage and release have been studied both through data analysis and confrontation with mathematical hydrodynamic models. The impact of this tidal pulses on sediment transport to the sea has been analyzed.

This study is intended to contribute to increased understanding of physical processes at the interface between large rivers and the ocean, improved methodology to measure and monitor these processes, and better understanding of large rivers hydrodynamics.

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