Hydrology in a Changing World: Environmental and Human Dimensions
Proceedings of FRIEND-Water 2014, Montpellier, France, October 2014 (IAHS Publ. 363, 407-412, 2014).

Water budget in the Amazon basin and impacts on flood modelling

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Abstract Although recent modelling and observational efforts have been performed to better understand the hydrological processes at the global scale, estimates of the water budget over the continents are still inaccurate. Several modelling attempts have been conducted trying to improve the simulation of water and energy cycles at different temporal and spatial scales worldwide. These attempts are based on numerous modelling approaches and meteorological forcings, resulting in contrasting water balance estimates. Considering the restricted availability of observed data to fully evaluate simulated water balances at large scales, remote sensing is revealed as an important source of information for model evaluation. The objective of this study is to assess the water budget in the Amazon basin simulated by land surface models (LSMs) and impacts on flood modelling. For that purpose, outputs of three LSMs currently implemented in the Land Information System (LIS) were considered. They are: Noah3.2, Mosaic and CLM2. LSMs were run for the 1980–2008 period using Princeton's meteorological forcings on a 3-hourly time step and at a 1° resolution. The precipitation was rescaled to match the monthly global GPCP dataset. Flood modelling is evaluated in this study by means of daily streamflows and monthly floodplain extent simulated by the Hydrological Modelling and Analysis Platform (HyMAP) river routing scheme using simulated surface and sub-surface runoffs as forcings. Results demonstrate that mean evapotranspiration rates vary from 2.5 to 3.3 mm/day, depending on the model. Noah3.2 had the best overall performance coefficients for streamflows, followed by Mosaic. CLM2 showed a considerable overestimation of mean streamflows and floodplain extent all over the basin.

Key words water budget; Amazon basin; floodplains; HyMAP; LIS