

Using TRMM rainfall estimates in hydrological and hydrodynamic modelling of the Amazon Basin

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Abstract Hydrological modelling of the Amazon is an enormous challenge because of its size, limited data, regional climatic diversity and particular hydraulic features, which include low gradients, backwater effects and extensive inundated areas. However, uncertainties in rainfall arising from limited ground-level measurements and low raingauge density impose severe difficulties, particularly in parts of the drainage basin lying outside Brazil. Rainfall estimation by remote sensing using satellite-derived data from the Tropical Rainfall Measuring Mission (TRMM) is a possible means of supplementing raingauge data, having better spatial cover of rainfall fields. This study reports on the use of the MGB-IPH large-scale hydrological model with rain fields obtained from TRMM. The MGB-IPH is a distributed, physically-based model using the Muskingum-Cunge formulation and a full hydrodynamic model for river routing, including backwater effects and seasonal flooding. Applying the model to the whole Amazon basin required development of several pre-processing tools to generate information about river cross-sections, flood plain extent, flood volume, and water slope from the SRTM DEM. Although TRMM under-estimates rainfall in regions with more marked relief, such as the transition region between the Amazon and the Andean regions of Peru, Ecuador and Colombia, results from the model in terms of its ability to reproduce observed hydrographs at several locations throughout the basin are encouraging.

Key words TRMM; hydrological modelling; hydrodynamic modelling; Amazon basin