



## Inundations in the Mamoré basin (south-western Amazon—Bolivia) and sea-surface temperature in the Pacific and Atlantic Oceans

Josyane Ronchail<sup>a,\*</sup>, Luc Bourrel<sup>b</sup>, Gérard Cochonneau<sup>c</sup>, Philippe Vauchel<sup>d</sup>,  
Luis Phillips<sup>e</sup>, Annibal Castro<sup>f</sup>, Jean-Loup Guyot<sup>b</sup>, Eurides de Oliveira<sup>g</sup>

<sup>a</sup>*Institut de Recherche pour le Développement (IRD), HydroGéodynamique du Bassin Amazonien (HYBAM)/LMTG, IPSL/LODYC, Boite 100, 4 Place Jussieu, 75252 Paris Cedex 05, France*

<sup>b</sup>*IRD-HYBAM/LMTG, 38, rue des 36 ponts, 31400 Toulouse, France*

<sup>c</sup>*IRD-HYBAM/Maison de la Télédétection, 500 rue J.F. Breton, 34093 Montpellier, Cedex 05, France*

<sup>d</sup>*IRD-HYBAM/LMTG, CP 9214, 00095 La Paz, Bolivia*

<sup>e</sup>*SEMENA, Servicio al Mejoramiento de la Navegación Amazonica, CP 156, Trinidad, Béni, Bolivia*

<sup>f</sup>*AASANA, Administración de Aeropuertos e Servicios Auxiliares a la Navegación Aérea CP 4382, La Paz, Bolivia*

<sup>g</sup>*ANA, Agencia Nacional de Águas, SPF, Área 5, qd 3, bl B, Brasilia (DF), Brasil*

Received 17 April 2003; revised 9 July 2004; accepted 30 July 2004

### Abstract

Extensive inundations have been observed in the Llanos de Mojos (Mamoré basin, south western Amazon) causing social and economic disasters. Since the beginning of the seventies precipitations have increased in the Bolivian lowlands (Llanos) and in the over-rainy eastern Cordillera and Andean foothills (Yungas) and inundations have become more frequent.

As a result inundations have been investigated in relation to rainfall over the Mamoré basin in Trinidad—Puerto Varador and, in order to determine whether they are predictable, in relation to Sea Surface Temperature (SST) in the Atlantic and the Equatorial Pacific Oceans. The methods are correlation and composite techniques.

As expected, during the 1945–1946/1998–1999 period, inundations have been associated with abundant rainfall in the Mamoré basin, mainly in the Llanos and Yungas. The role of rainfall in the inner dry Andes and downstream from Trinidad is more limited. When consecutive floods are observed, the ground water storage contributes to the occurrence of the second or third inundation event and rainfall anomaly is generally weaker.

Rainfall in the Mamoré basin is hardly associated with Sea Surface Temperature Anomalies (SSTA) in the Pacific and Atlantic Oceans during the 1952–1953/1998–1999 period. However, during the nineties the southern Atlantic SSTA account for 50 percent of rainfall variability. Inundations are also related to negative SSTA differences between the tropical and subtropical southern Atlantic. Two thirds of the 22 inundation events occurred in association with this oceanic anomaly that features a weak SSTA gradient in the southern Atlantic. During the 1988–1989/1998–1999 period, a particularly significant relation can be

\* Corresponding author. Tel.: +33 1 4427 8467; fax: +33 1 4427 3805.

E-mail address: [josyane.ronchail@lodyc.jussieu.fr](mailto:josyane.ronchail@lodyc.jussieu.fr) (J. Ronchail).

observed between SSTA and inundations events. Despite being associated with major El Niño events (1982–1983, 1991–1992), inundations are not significantly related to the equatorial Pacific SSTA.

© 2004 Elsevier B.V. All rights reserved.

**Keywords:** Amazon basin; Mamoré; Bolivia; Inundation; Rainfall; Atlantic SST; ENSO

## 1. Introduction

The Mamoré–Béni–Guaporé fluvial system whose watershed is situated in the Andes, the Amazonian plain and the Brazilian Shield, is part of the south western Amazon basin (Fig. 1). It defines a vast floodplain known as the ‘Llanos de Mojos’, between 12 and 17° South and 62.5 and 67° West in Bolivia; its mean altitude is about 150 m and its slope is less than 10 cm per km (Guyot, 1993). The central part of Llanos de Mojos, around Rio Mamoré in Trinidad, is

plagued by inundations capable of extending over 100,000 km<sup>2</sup>. They affect towns and Indian communities, cause considerable herd losses and impede the sustainable management of fish resources. Hence the need for flood forecasts which is the primary motivation behind this work.

Inundations in Trinidad result from local and remote processes, depending on the hydro meteorological conditions in the Andean and lowland sub watersheds of Rio Mamoré (Roche and Fernandez, 1988; Bourges et al., 1992; Bourges and Hoorelbecke, 1995;

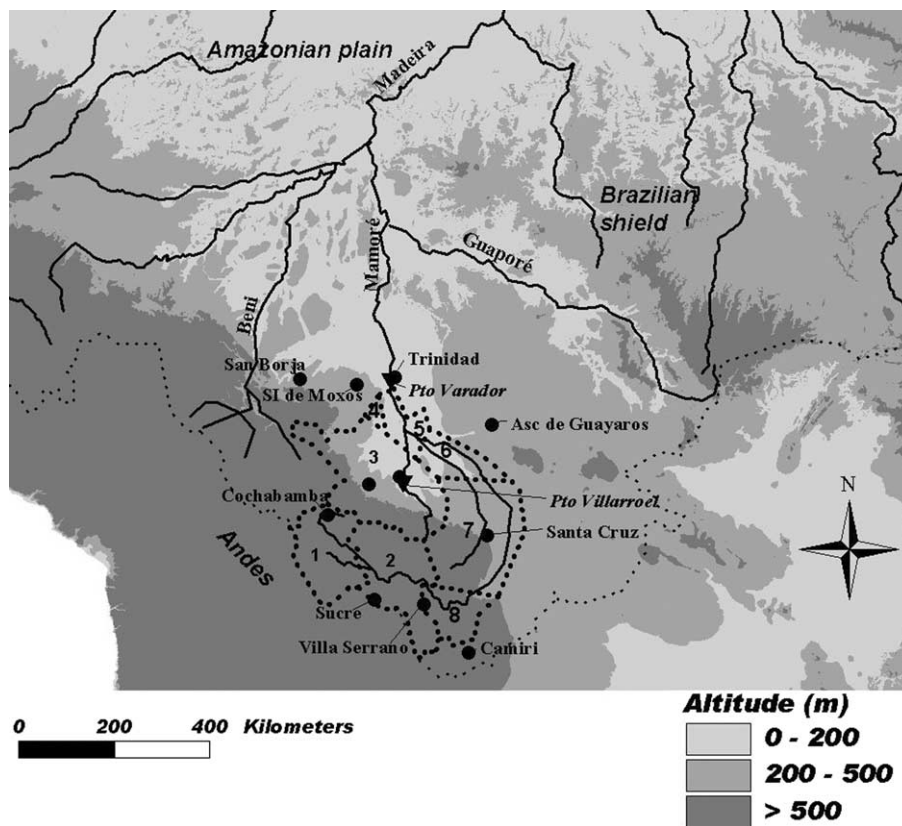


Fig. 1. Basin of Rio Mamoré (Bolivian Amazonia): relief, river network, fluviometric (triangles) and rain gauge (dots) stations. Thin dots indicate the south-western limit of the Amazon basin. Thick dots define the limits of the 8 hydrological regions of the Mamoré basin in Trinidad—Puerto Varador. In the Mamoré watershed, regions 1 and 2 are in the inner Andes, region 3 in the Yungas, regions 4, 5, 6, 7 and 8 in the Llanos. The Llanos de Mojos are located around Trinidad along the Mamoré River.

Download English Version:

<https://daneshyari.com/en/article/9491438>

Download Persian Version:

<https://daneshyari.com/article/9491438>

[Daneshyari.com](https://daneshyari.com)