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Hydrology, hydrochemistry, dissolved and sediment yields in
the Bolivian Amazon drainage basin.

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The Rio Alto-Beni at Rurrenabaque (250 m), an andean white water river, and a tropical rain forest.

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The Climatological and Hydrological Program of the Bolivian Amazon drainage basin (PHICAB).

The environment

- a 744.000 km² basin, drained by 4 large rivers, 3 of Andean origin (Beni, Madre de Dios and Mamore), and 1 from the Brazilian shield (Itenez).
- very contrasted biogeographical environments, which ranges from the glaciers of the Eastern Cordillera of the Andes (6.500 m) to the humid tropical forest of the Amazon plain (150 m).

The goals

- study of the climate and its space-time variations.
- study of the hydrological regimes and water budgets.
- study of the hydrochemical regimes, dissolved and sediment yields.
- estimation of erosion in the Andes and sedimentation in the Amazon plain.

The participants and collaborations

- The French Institute of Scientific Research for Development through Cooperation (ORSTOM).
- The National Meteorology and Hydrology Service of Bolivia (SENAMHI).
- The Institute of Hydraulics and Hydrology (IHH), the Institute of Research in Chemistry (IIQ) of the Universidad Mayor de San Andres at La Paz (UMSA).
- The Hydrographical Service of the Naval Forces (SHN)
- The Municipality of La Paz (HAM).
- The Administration of the Airports and the Service of Air Navigation (AASANA).
- The National Power Company of Bolivia (ENDE).

The Means

- the meteorological and climatic measurement stations of the SENAMHI and AASANA networks.
- the 15 gauge stations of the PHICAB network in the Amazonia, and the 150 stations of the SENAMHI network in the Andes.
- 1 field team (ORSTOM, SENAMHI, SHN) who insures the maintenance and exploitation of the gauge stations in the Amazon plain.
- 1 team of investigators (ORSTOM, SENAMHI, IHH, IIQ) who process the data from the networks and publish the results together.

Abstract

The Amazon drainage basin of Bolivia corresponds to the high River Madeira basin, that drains a 850.000 km^2 region, 24% of which is lying in the Andes. The whole basin receives 350 to 7.000 mm.yr^{-1} rainfall.

At the head of the basin, the River Madeira is one of the biggest rivers in the world, with an interannual mean volume of more than $570.10^9 \text{ m}^3.\text{yr}^{-1}$, i.e. a $18.000 \text{ m}^3.\text{s}^{-1}$ mean discharge, 51% of which comes from the River Beni and 49% from the River Mamore. The yield from the Andes accounts for 25% of this volume.

The River Madeira receives a $41.10^6 \text{ tons.yr}^{-1}$ dissolved yield, 54% of which comes from the River Beni and 46% from the River Mamore. On the same way, the River Madeira receives a $210.10^6 \text{ tons.yr}^{-1}$ sediment yield, of which 70% are due to the River Beni and 30% to the River Mamore. All the sediments and most of the mineralization come from the Andes.

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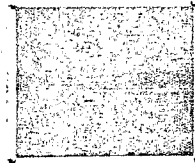
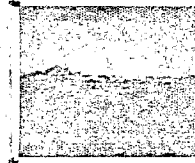
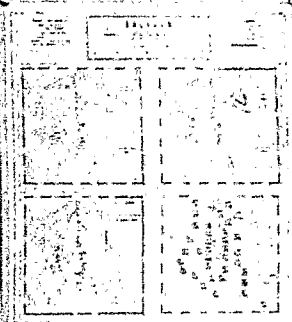
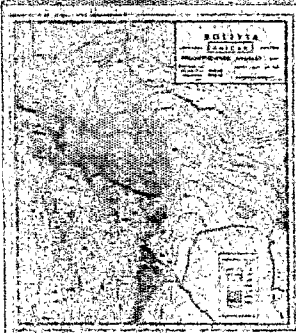
The results (1983-1987)

Station	River	Alt. (m)	Sup. (10 ³ km ²)	Rainfall ^x (mm)	Discharge (m ³ /s)(10 ⁹ m ³ /yr)		Mineralization (mg/l)(10 ⁶ t/yr)		Sediments (mg/l)(10 ⁶ t/yr)	
Angosto del Bala	Alto-Beni	280	67	1.720	2.200	69	100	6,9	1.140	150
Portachuelo	Beni	140	119	1.750	3.000	95	92	8,4	890	120
Miraflores	Madre de Dios	140	124	2.380	5.250	166	72	11	310	61
Caracoles	Orthon	130	32	2.000	480	15	66	0,9	130	1,8
Cachuela Esperanza	Beni	125	282	2.060	9.300	293	76	22	360	150
Abapo	Grande	450	59	750	330	10	400	2,5	7.500	110
Puerto Villarroel	Ichilo	170	7,6	3.000	560	18	54	1,0	220	5,1
Puerto Almacen	Ibare	150	5,3	1.850	(140)	(4)	84	(0,4)	78	(0,3)
Puerto Ganadero	Mamore	150	159	1.480	3.540	112	100	10	460	61
Puerto Siles	Mamore	130	216	1.700	5.660	178	110	16	260	53
Campamento More	Itenez	130	340	1.370	2.240	71	47	2,7	30	1,3
Guayaramerin	Mamore	125	590	1.520	8.950	282	79	19	220	63
Confluence	Madeira	120	872	1.700	18.250	575	--	41	--	213

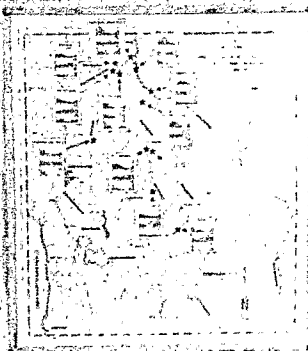
x Pluviometric data corresponds to the 1968-1982 period.

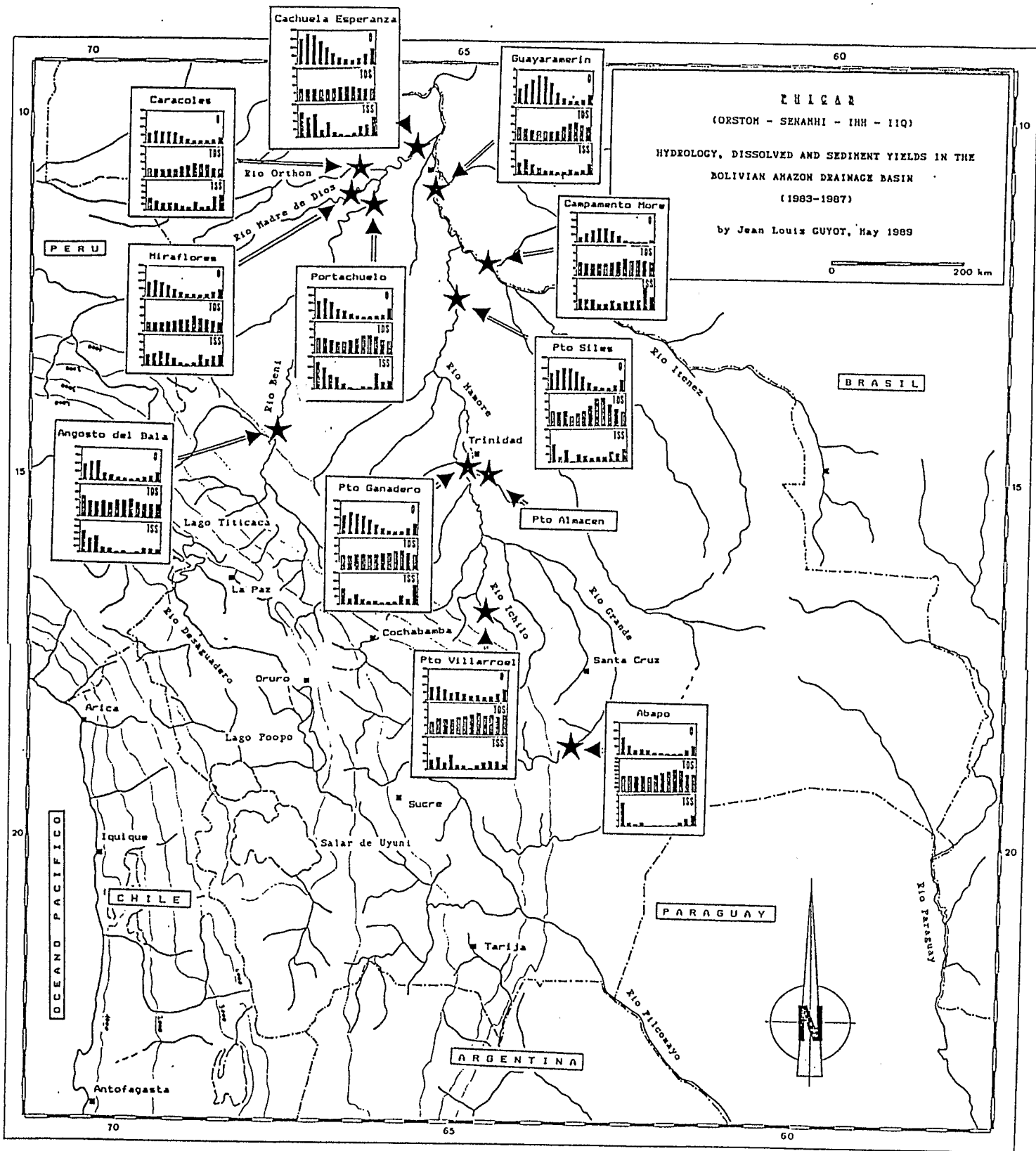
HYDROLOGY, HYDROCHEMISTRY, AND WATER QUALITY MONITORING IN THE LA PAZ AREA

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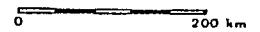
Abstract
Introduction
1.1. Study Area
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2. Materials and Methods
2.1. Sampling Points
2.2. Sampling Frequency
2.3. Analytical Methods
3. Results
3.1. Hydrology
3.2. Hydrochemistry
3.3. Water Quality
4. Discussion
5. Conclusions
References





ZHIGAR
 (ORSTOM - SENANHI - IHH - IIQ)
**HYDROLOGY, DISSOLVED AND SEDIMENT YIELDS IN THE
 BOLIVIAN AMAZON DRAINAGE BASIN
 (1983-1987)**

by Jean Louis CUYOT, May 1989



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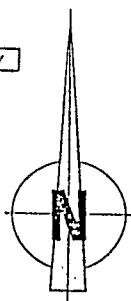
BRASIL

CHILE

PARAGUAY

ARGENTINA

OCEANO PACIFICO



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Muestreo de aguas realizado por:
 Michel-Alain ROCHE
 Nestor ABASTO
 En abril - mayo de 1982
 Análisis realizados por el
 Laboratorio de Hidrobiología Regional
 de Poitou - Charentes (L. R.)

BOLIVIA
 SENAMHI **PHICAB** ORSTOM
SALINIDADES IONICAS
DE LOS RIOS DE LA CUENCA AMAZONICA

Mapa realizado por: Michel-Alain ROCHE
 Nestor ABASTO
 Marcel TOLEDE
 MAYO DE 1986
 Jean-Paul CORDIER
 Christian POINTILLART

escala
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