

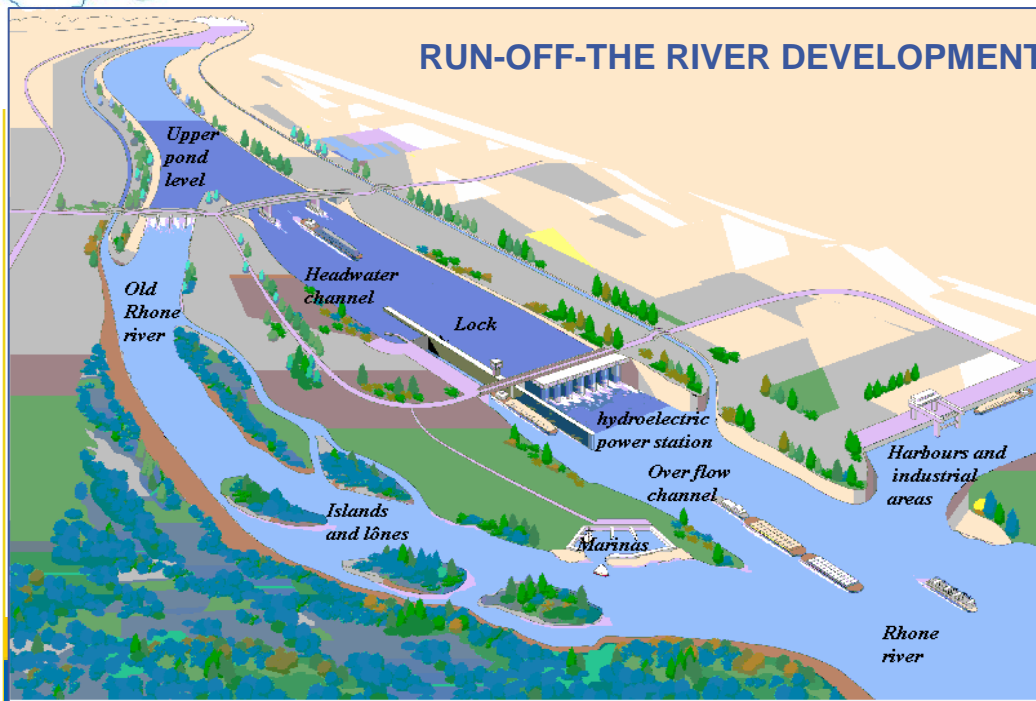
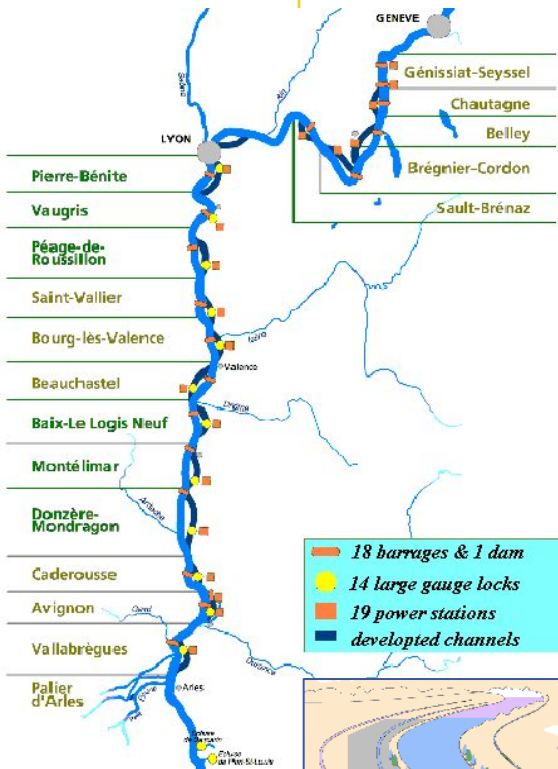
# Best Practices for Flood Forecasting and Warning Systems : The Compagnie Nationale du Rhone's Experience in Flood Forecasting and the Advantages it can provide for the **LMB**

*Pierre BOULESTREAU, Daniel JOUVE, Vincent PIRON*  
*Compagnie Nationale du Rhône*  
*Lyon, France*

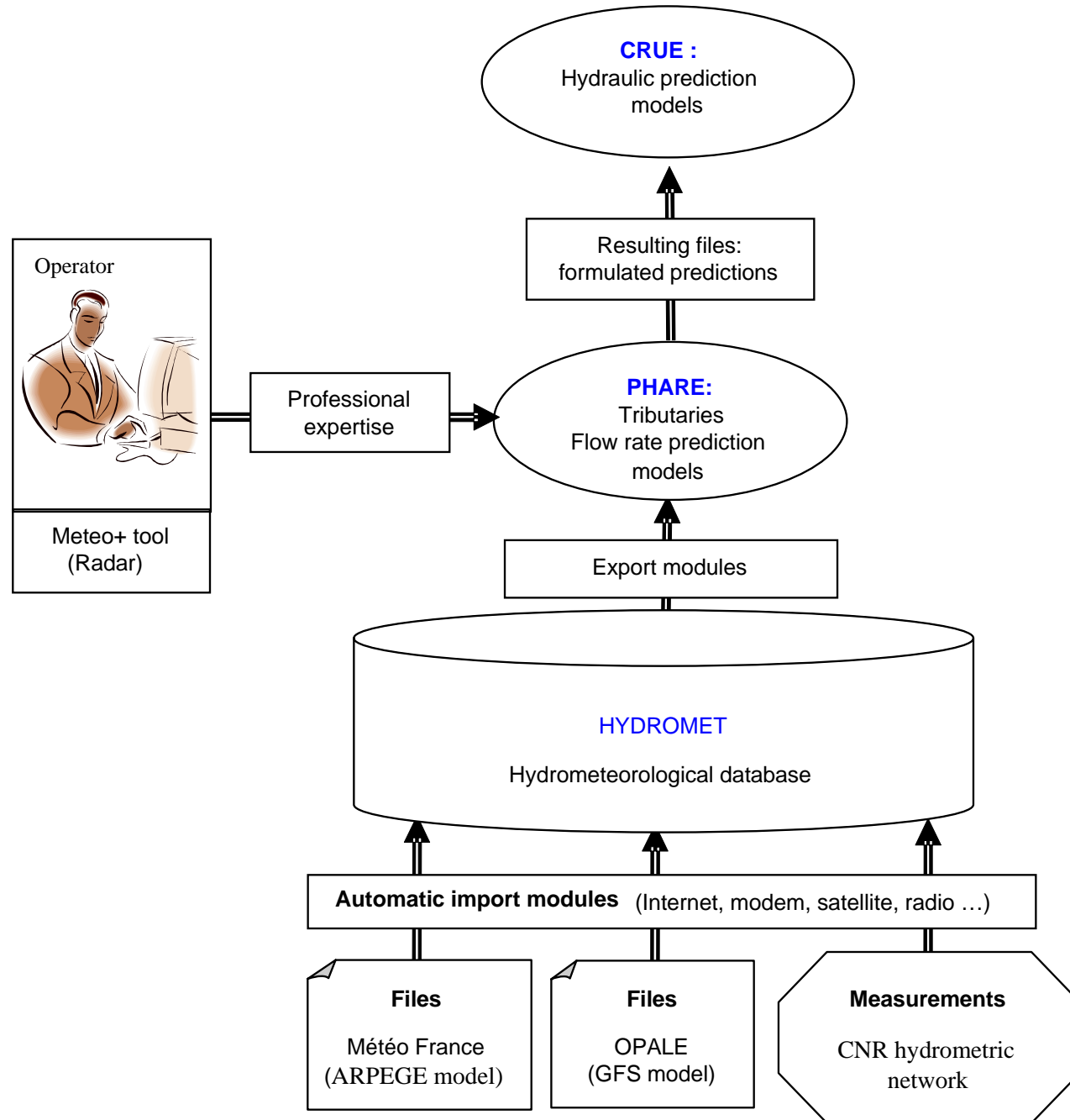
# RHONE RIVER DEVELOPMENTS

## Multipurpose development :

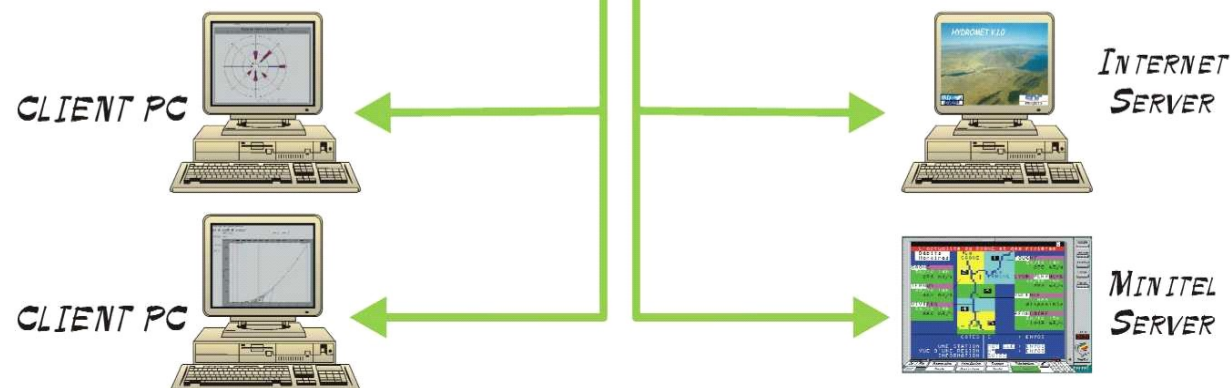
- ☀ Hydroelectricity: 19 HPP, 3.000 MW, 16 TWh/y
- ☀ Navigation: 330 km large gauge waterway, 14 locks
- ☀ Harbors and industrial areas: 28, 120 million tons x km, multimodal platforms (inland and maritime, railway, roads, pipeline)
- ☀ Irrigation: 120.000 ha
- ☀ Flood control: 40.000 ha protected, 400 km of embankments, maintenance and control of flood runoff capacities
- ☀ Environment: restoration of river works



- ☀ Catchment area: 100 000 km<sup>2</sup>
- ☀ Length: 517 km in France
- ☀ Average discharge : 400 m<sup>3</sup>/s to 1.700 m<sup>3</sup>/s
- ☀ 1000-year Flood: 2.500 m<sup>3</sup>/s to 14.000 m<sup>3</sup>/s
- ☀ Largest flood recorded: 12.500 m<sup>3</sup>/s (2003)

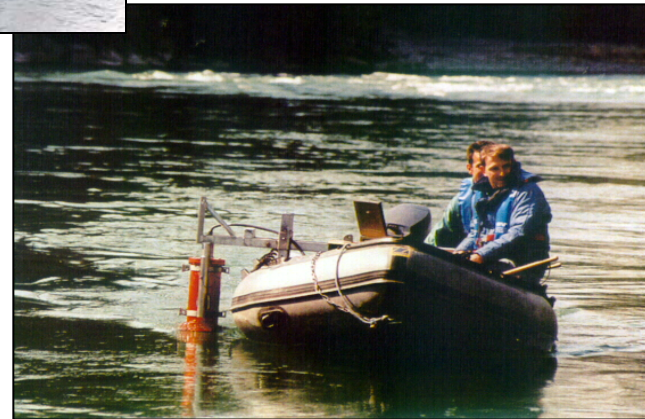
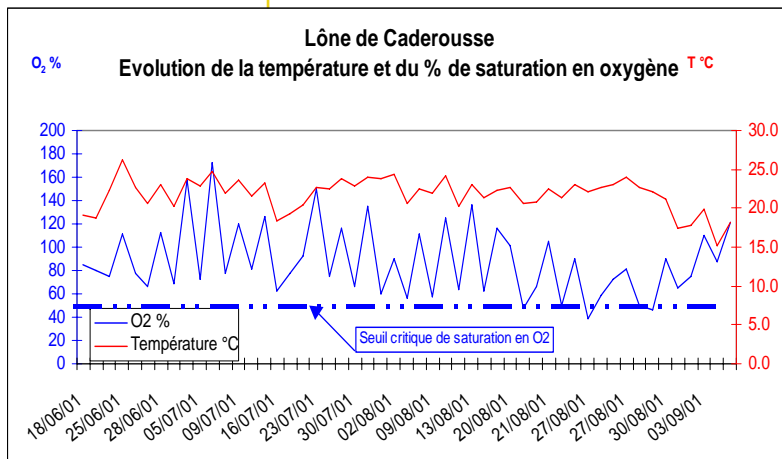
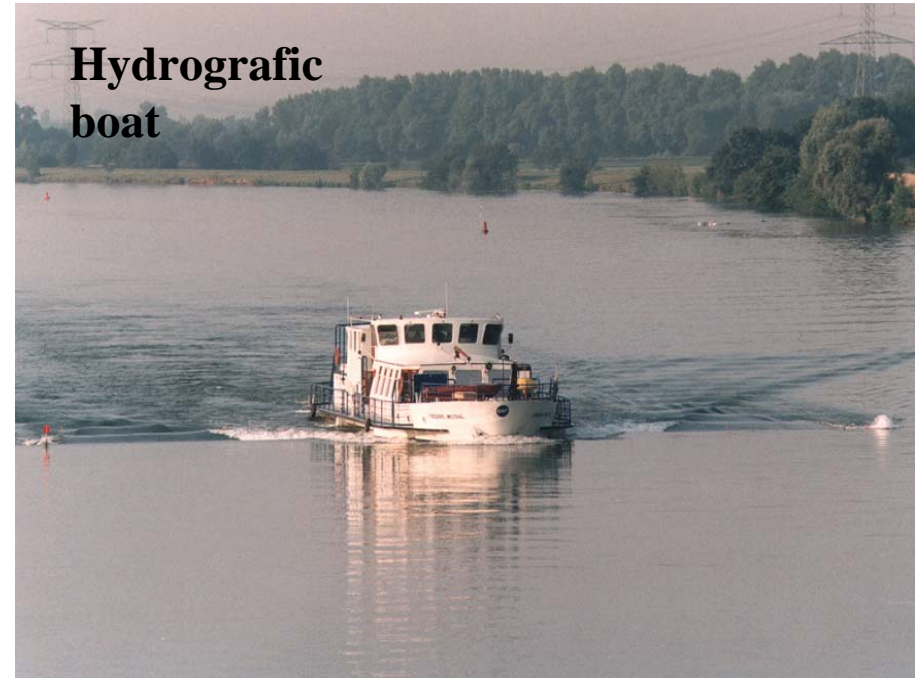
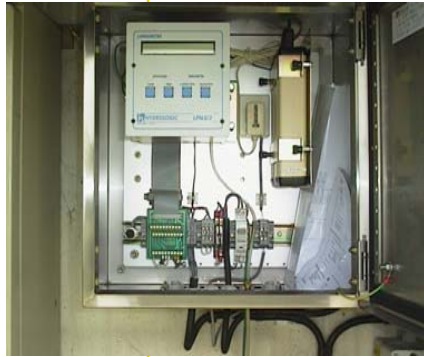


# An hydrometeorological tool : HYDROMET

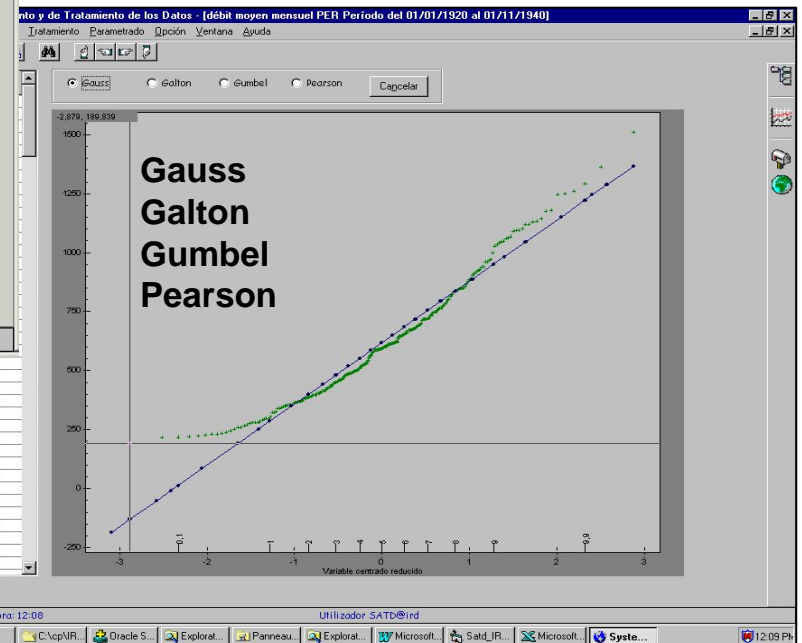
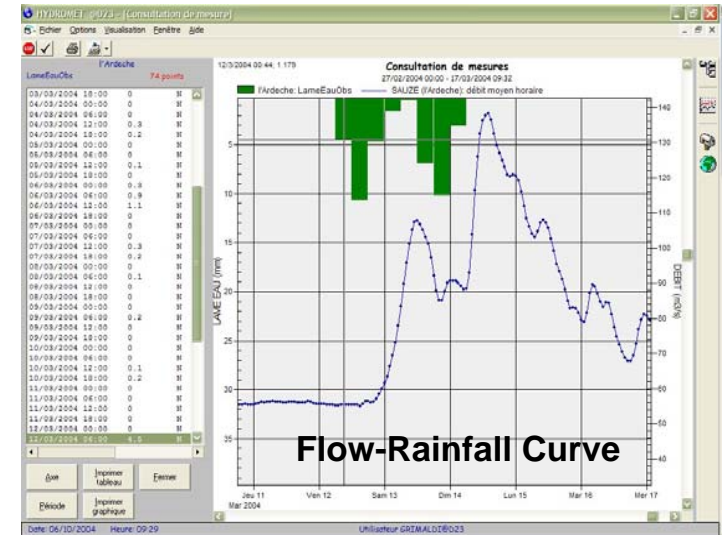
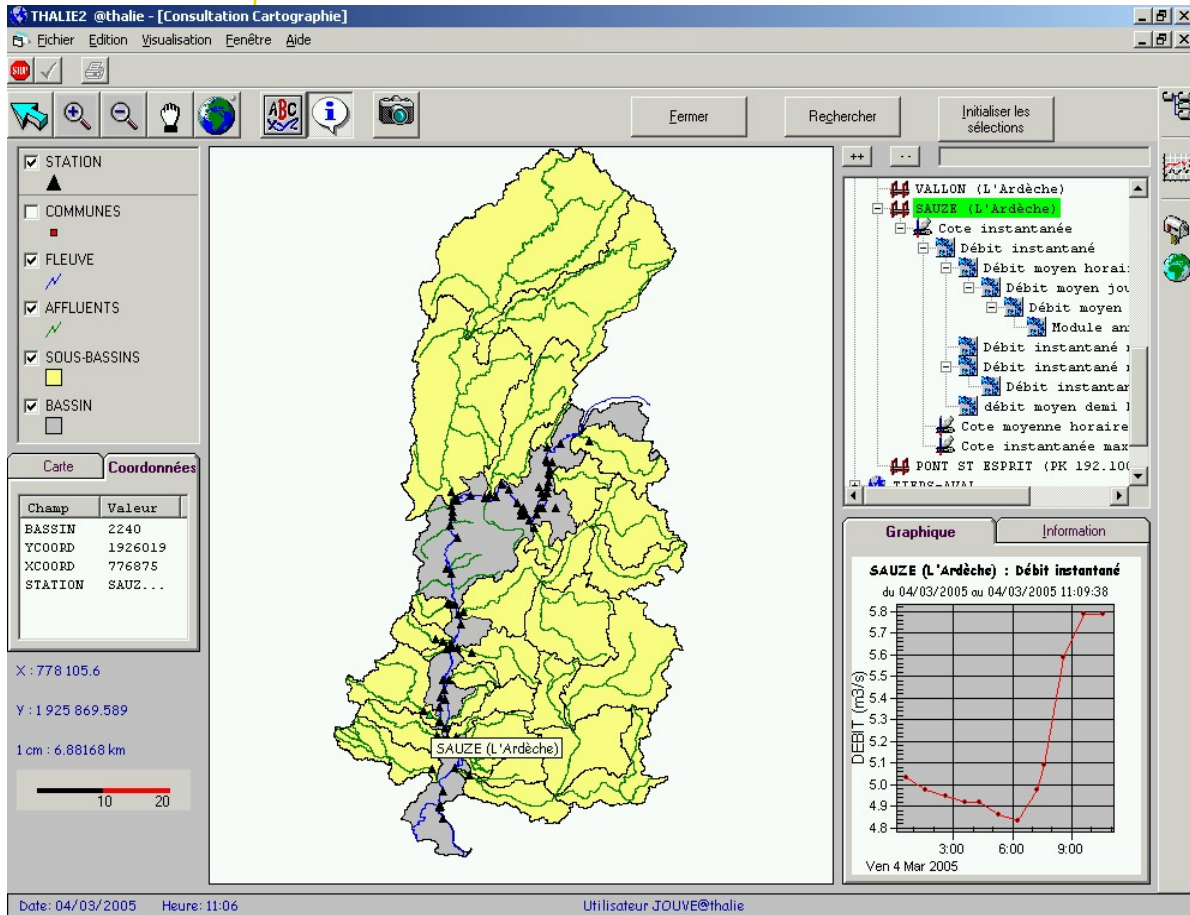




# Hydrological management of Rhône river



# HYDROMET - data treatment



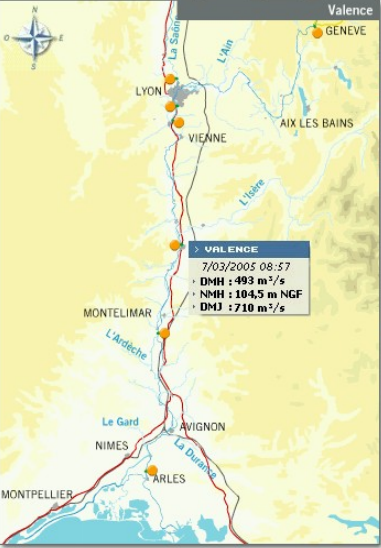


# HYDROMET – Dissemination of data

CNR - InfoRhône - Microsoft Internet Explorer provided by Compagnie Nationale du Rhône

Compagnie Nationale du Rhône >>> **INFORHÔNE**

Navigation | Hydrologie | Découvrir le Rhône



**LE RHÔNE**

- HYDROLOGIE
- RAPPORT DU JOUR
- HISTORIQUE
- ACTUALITES
- METEO
- FRQ
- LIENS

DMH : DEBIT MOYEN HORAIRE  
NMH : NIVEAU MOYEN HORAIRE  
DMJ : DEBIT MOYEN JOURNALIER (DE LA VEILLE)

LEGENDES

ZOOM

Mentions légales | © 20

**Rapport du jour publié le 07 mars 2005 à 08:57**

Stations de mesure	Débit de la veille		Débit		Niveau
	06/03/2005	à 19h	à 7h	à 7h	
Pougny	84 m³/s	80 m³/s	86 m³/s		333,0 m NGF*
Lyon-Perrache	270 m³/s	239 m³/s	298 m³/s		162,1 m NGF*
Couzon (Saône)	263 m³/s	258 m³/s	252 m³/s		162,4 m NGF*
Ternay	520 m³/s	488 m³/s	526 m³/s		150,5 m NGF*
Valence	710 m³/s	668 m³/s	493 m³/s		104,4 m NGF*
Viviers	784 m³/s	695 m³/s	470 m³/s		58,7 m NGF*
Beaucaire	830 m³/s	828 m³/s	481 m³/s		0,5 m NGF*

\* Système de nivellement en mètre NGF orthométrique

⚠ La Compagnie Nationale du Rhône communique les info délaistrés bruts. Ces informations qui proviennent d'entres contrôlées ni validées, elles sont à vérifier et à interpréter, utilisateurs.

Hydrological and navigation Information system : [www.inforhone.fr](http://www.inforhone.fr)

hydrometeorological information system : intranet tool - <http://sih>

**Système d'Information Hydro-Météorologique**

Mesures Bulletin du jour Bulletin Météo Scenarii Cartographie Aide Liens

**Vues**

- Stations principales
- Vue générale
- Du Léman au Fier
- De Bognes à Pont de Lagnieu
- De Pont de Lagnieu à Ternay
- De Ternay à Viviers
- l'Isère
- Affluents RD aval de Viviers
- Affluents RG aval de Valence
- Stations Météo-France

**Bulletins**

- Historique 3 jours
- Rapport temps réel


**Couches**

- Rhône
- Affluents
- Lacs
- Bassins
- Villes
- Fond de carte

**Types stations**

- Station Hydro
- Station Pluvio
- Station Mixte


**⚠ Avertissement**



**Rhône: le Rhône**

**Infos Station**

Station : BEUCAIRE (PK 263 600)  
Mesure : Débit moyen demi horaire  
Valeur : 2547,4 m³/s à 11:00

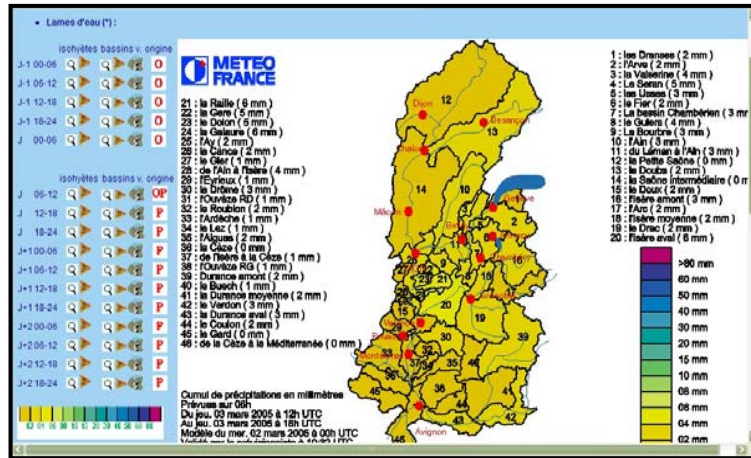


BEUCAIRE  
Débit (m³/s) - 105500 0550 - 110500 11 01

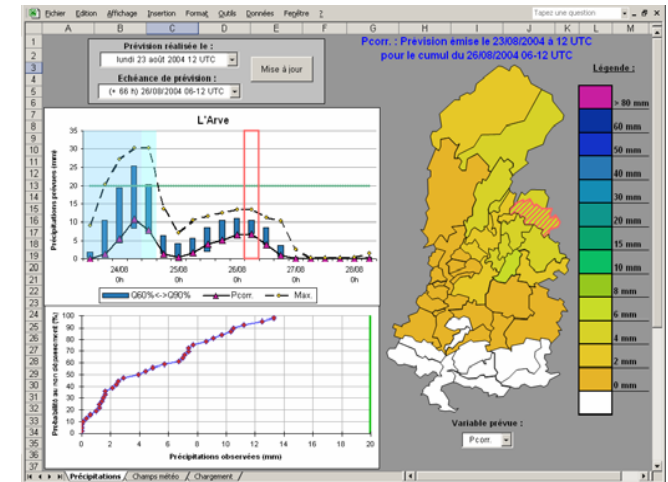
00 06 12 18 00 06

Débit = 1105000 110127

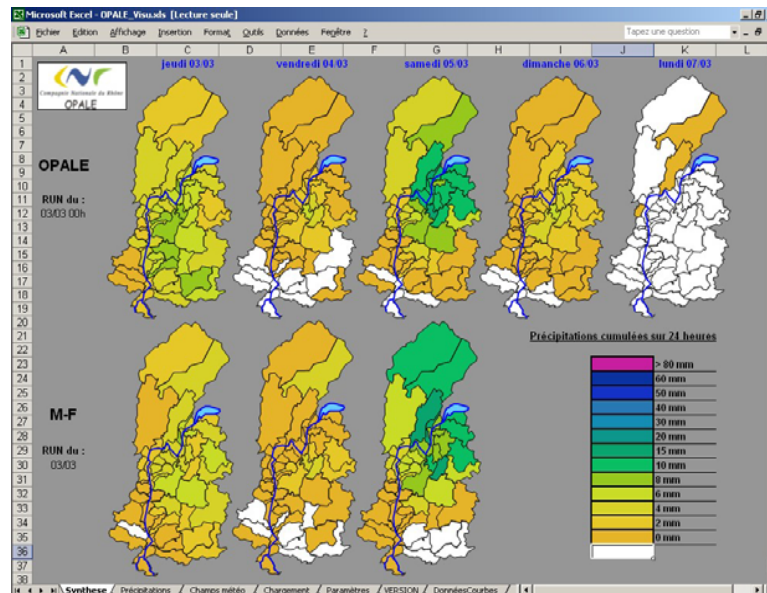
# Rainfall forecasting



Meteo France web site developed with CNR using meteorological ARPEGE model



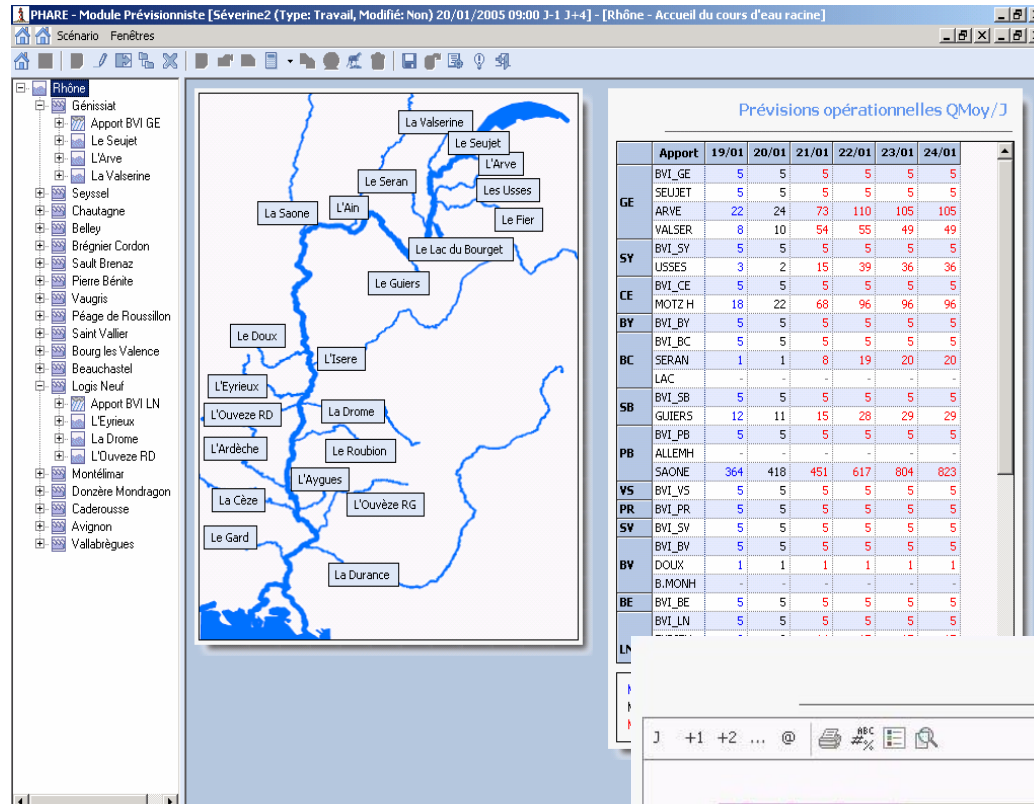
OPALE : analog method developed by CNR using meteorological GFS model



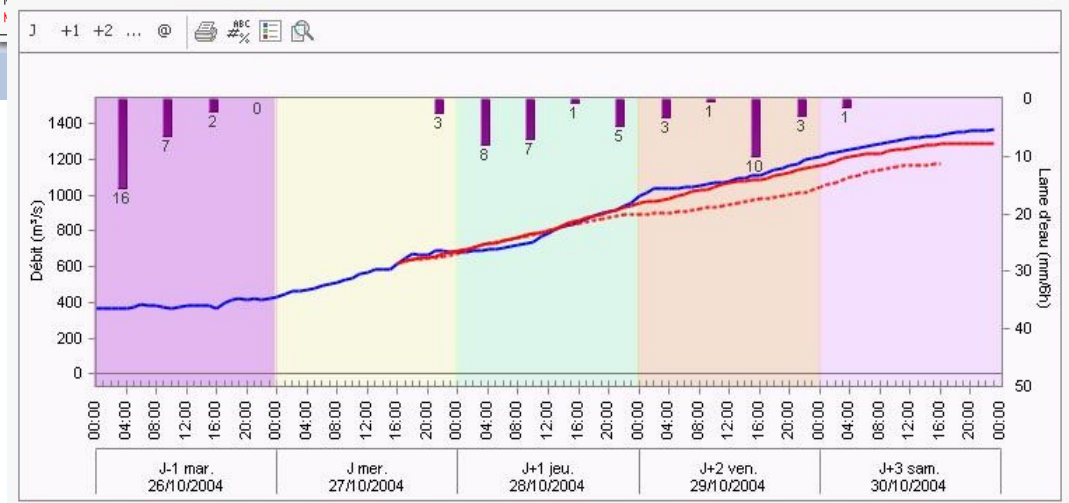
Comparative screen of both method



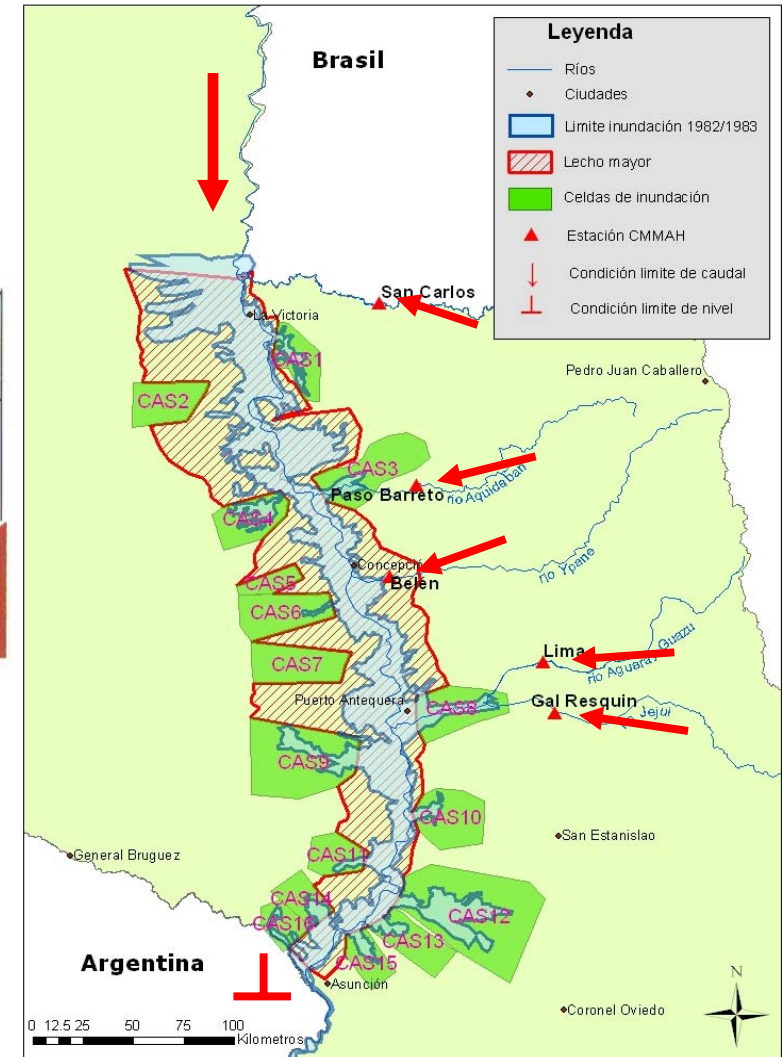
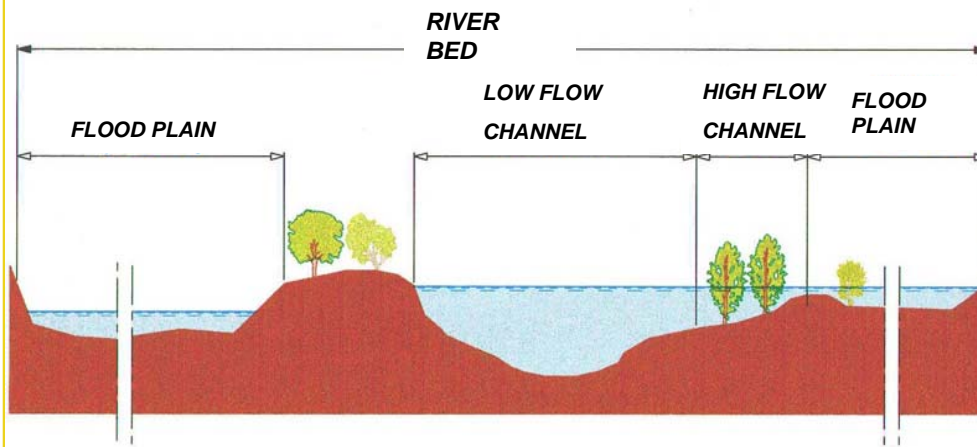
# Hydrological forecasting



La Saone (27/10/2004 16:00:00)

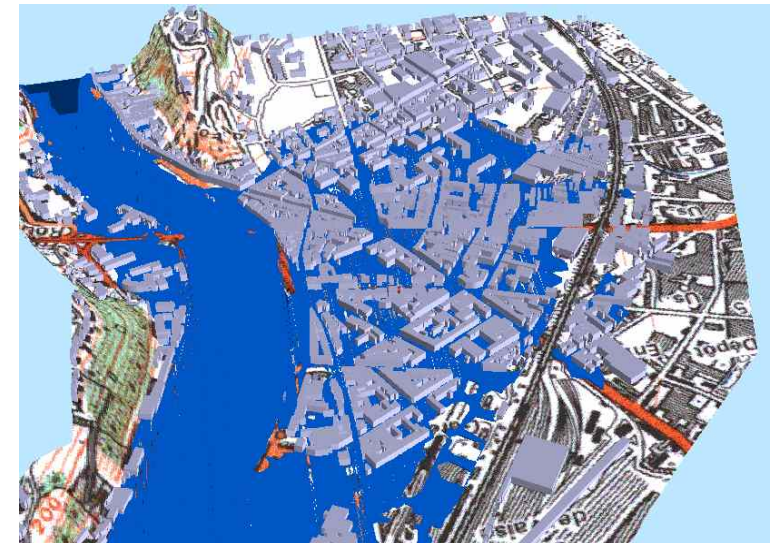
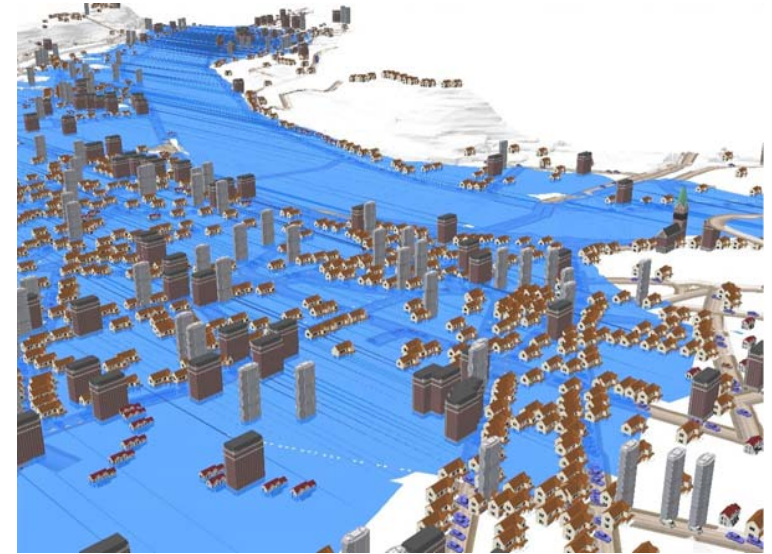
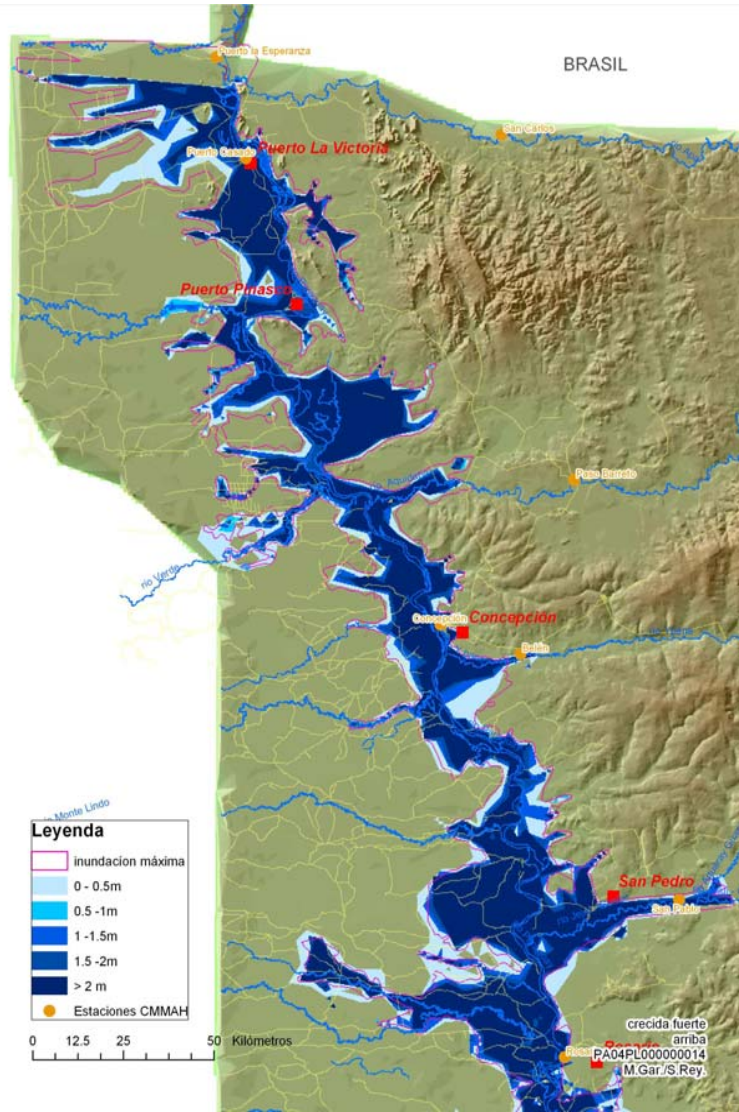


# Hydraulic model





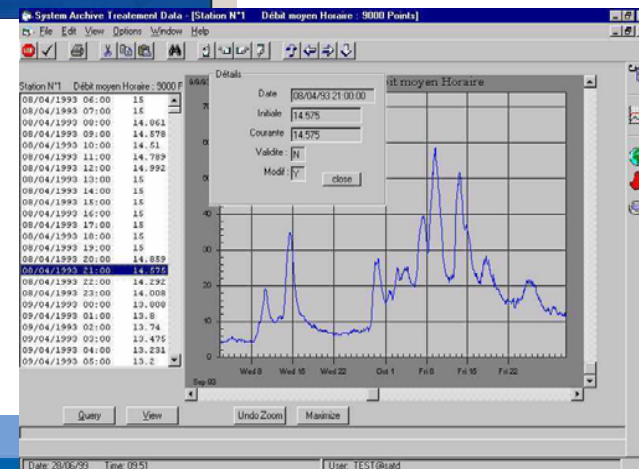
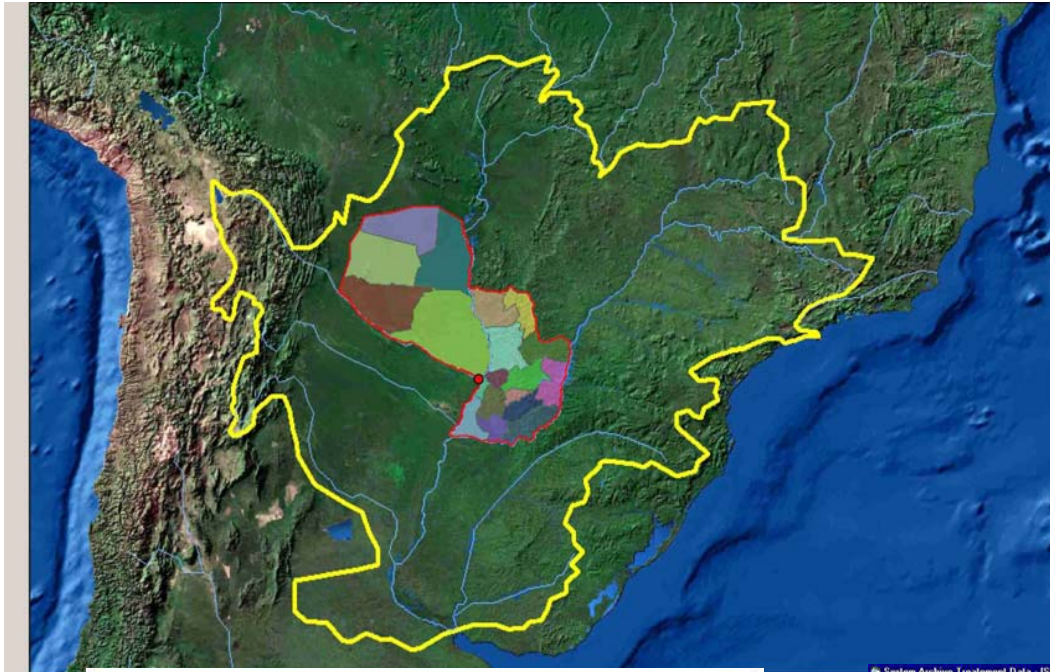
# Geographic Information System using





# CNR'S EXPERIENCE IN PARAGUAY

35 remote stations with satellite transmission and Hydromet software in the Paraguay river basin, part of rio de la Plata river basin



# CNR'S EXPERIENCE IN PARAGUAY

## Hydrological models of the Paraguay river's main tributaries



Fecha de la previsión 15/11/2001

Carpeta de los datos exportados : C:\Export

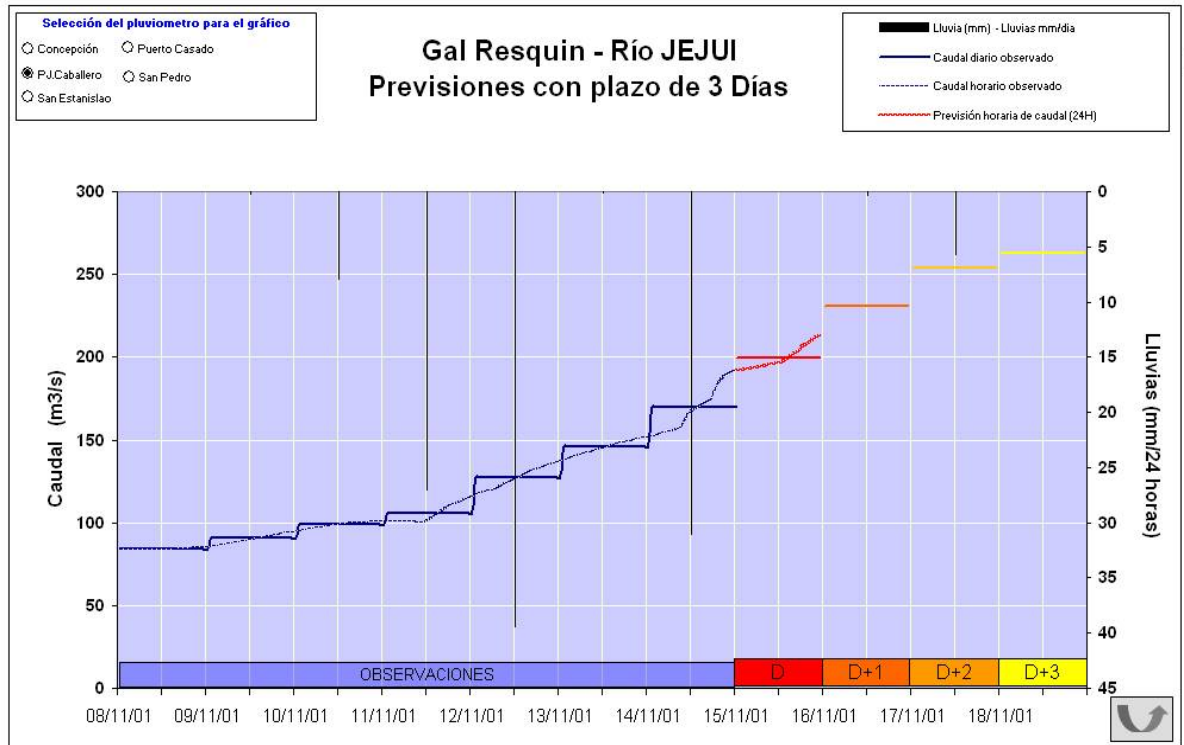
Previsiones

Poner al día

Con lluvia prevista

Lluvia prevista nula

Exportar



Up to 4-day flow rates forecasts



# CNR'S EXPERIENCE IN PARAGUAY

## Hydraulic model of the Paraguay river

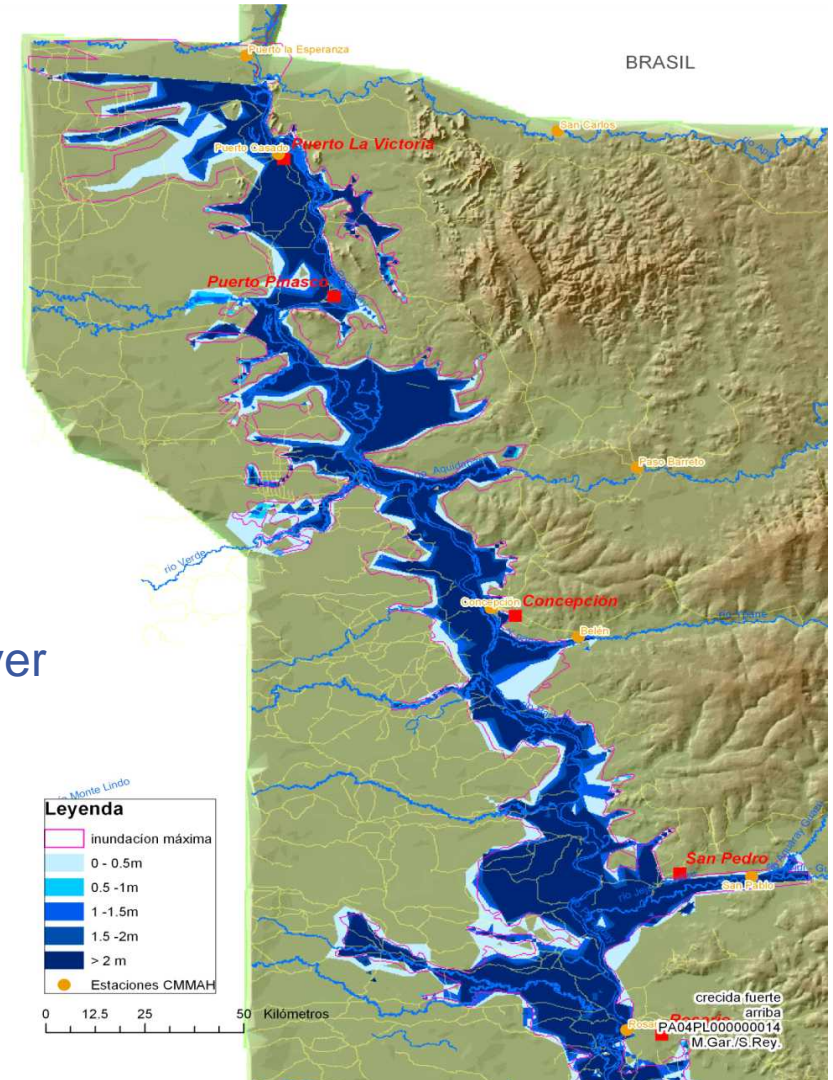


Water level forecast in the Paraguay river

Forecast accuracy:

5 days during fast flooding conditions

15 to 20 days during slow flooding cond.



Cartographic representation of the water level forecasts in 3D<sub>14</sub>

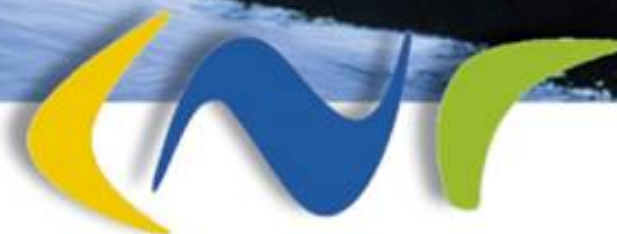


*1934-2004, 70 ans de développement durable*

Depuis 70 ans, les femmes et les hommes de la Compagnie Nationale du Rhône produisent une énergie propre, inépuisable, grâce à la force du Rhône : l'énergie du développement durable. Deuxième producteur d'électricité français et seule entreprise dont l'énergie soit certifiée 100% renouvelable, la CNR assure 25% de l'hydroélectricité nationale. Pulser l'énergie sans épuiser la planète, respecter et préserver l'environnement pour les générations futures, développer le transport fluvial, c'est notre culture et notre engagement au quotidien.

*Compagnie Nationale du Rhône, groupe Electrabel-Suez.*

[www.cnr.tm.fr](http://www.cnr.tm.fr)



*Compagnie Nationale du Rhône*  
L'ÉNERGIE À L'ÉTAT PUR