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# A 50-year simulation of Amazon discharge by ORCHIDEE

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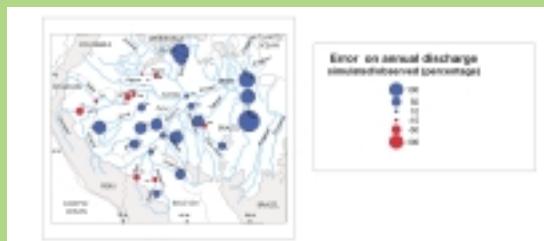


## Objective:

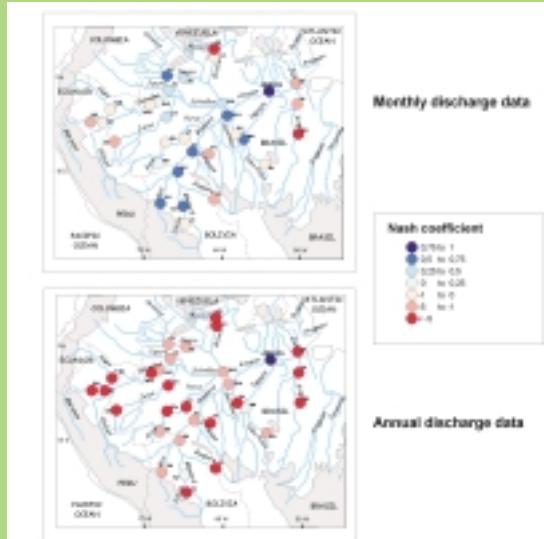
Validation of discharge values simulated by the IPSL (Institut Pierre Simon Laplace) land surface model ORCHIDEE (Organising Carbon and Hydrology in Dynamics EcosystEms), using observed discharge values in various Amazon tributaries and in the Amazon in Óbidos, the last gauged station before the ocean.

### Error on annual discharge:

- Strong overestimation in eastern Amazon (Xingu-Jari), in northern Amazon (Branco), In southern tributaries: Jurua, Puru
- Weak overestimation in the Madeira (+ 30 %).
- Weak under estimation in big western tributaries (median Solimões, Negro) (-20%).



### Good simulation in the southwestern Madeira basin

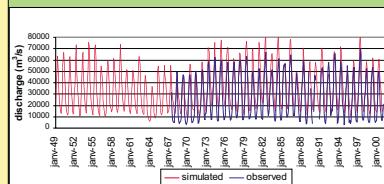


### Nash Sutcliffe coefficient:

Using monthly data:

- Good simulation along the Beni-Mamoré-Madeira
- Rather good simulation in the downstream Solimões and Negro

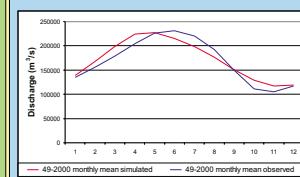
Using annual data, the simulations are not good.



Simulated and observed monthly discharge in Fazenda Vista Alegre (Madeira).  $R^2$  is 0,73 between monthly data, 0,61 between annual data. The change at the beginning of the 70' is reproduced.

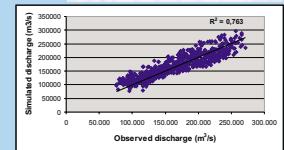
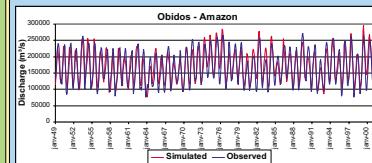
### Good simulation in Óbidos

- 800 km from the Atlantic ( $1^{\circ}56' S$   $55^{\circ} 30' W$ )
- $4\ 677\ 000\ km^2$  (3/4 of the Amazon basin)
- Mean annual discharge:  $170\ 000\ m^3/s$  (1903-2003)



### Simulation of the annual cycle:

- The simulated high flow occurs sooner (April-May) than the observed high flow (June) and it is slightly not high enough (-7 to -10%)
- As a consequence, the decrease of the flood is too slow.
- The timing of the low-flow water is good.
- Low flow and rising flow are slightly too high.



- On monthly data: 0,80
- On annual data: 0,81
- Mean annual error: + 2%
- RMSE on monthly data = 13%

Reproduction of the long-term Amazon variability (Callède et al. 2004), with a rupture at the beginning of the 1970'.

### CONCLUSION and perspectives:

- Good simulation of the water fluxes in Obidos and along the Madeira, but overestimation in the southern tributaries and underestimation in the western basins.
- Good simulation of the interannual and multi-decadal variability, especially along the Madeira.
- Some discrepancies between the observed and simulated annual cycles.
- The accuracy of CRU rainfall in the Amazon basin needs further analysis. The introduction of HYBAM rainfall in ORCHIDEE is ongoing.
- The behaviour of the routing scheme within ORCHIDEE, and especially the parameterisation of floodplains, needs further analysis.

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