Assessing Human Disturbance on the Amazon/Solimões River Floodplain Forest and its Impacts on the Várzea Aquatic Systems

Evlyn Novo
Cláudio Barbosa

Who?

Evlyn Marcia Leão de Moraes Novo

Researcher: Pos-Doc Univ.Sheffield, 1987

Ph.D Physical Geography - USP, 1984

Hydrosphere and RS Spectral Analysis

Claudio Clemente Faria Barbosa

Researcher: Ph.D Remote Sensing – INPE, 2005

Hydrosphere

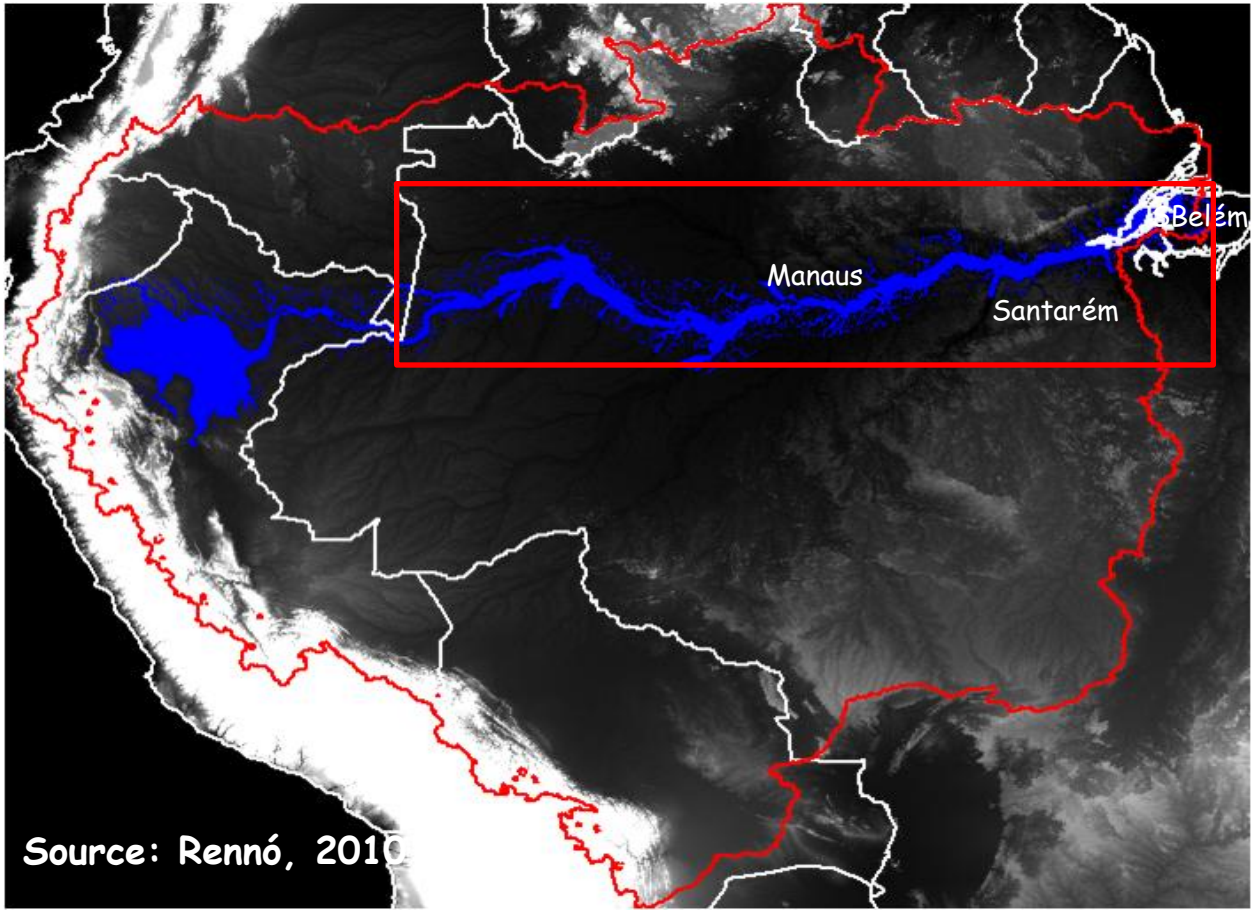
Research Questions

1) Which degrees of anthropic disturbances are imposed to the forest covered area between the high/medium Solimões and the medium/low Amazonas?
2) What are the effects of these disturbances on the várzea aquatic ecosystems?

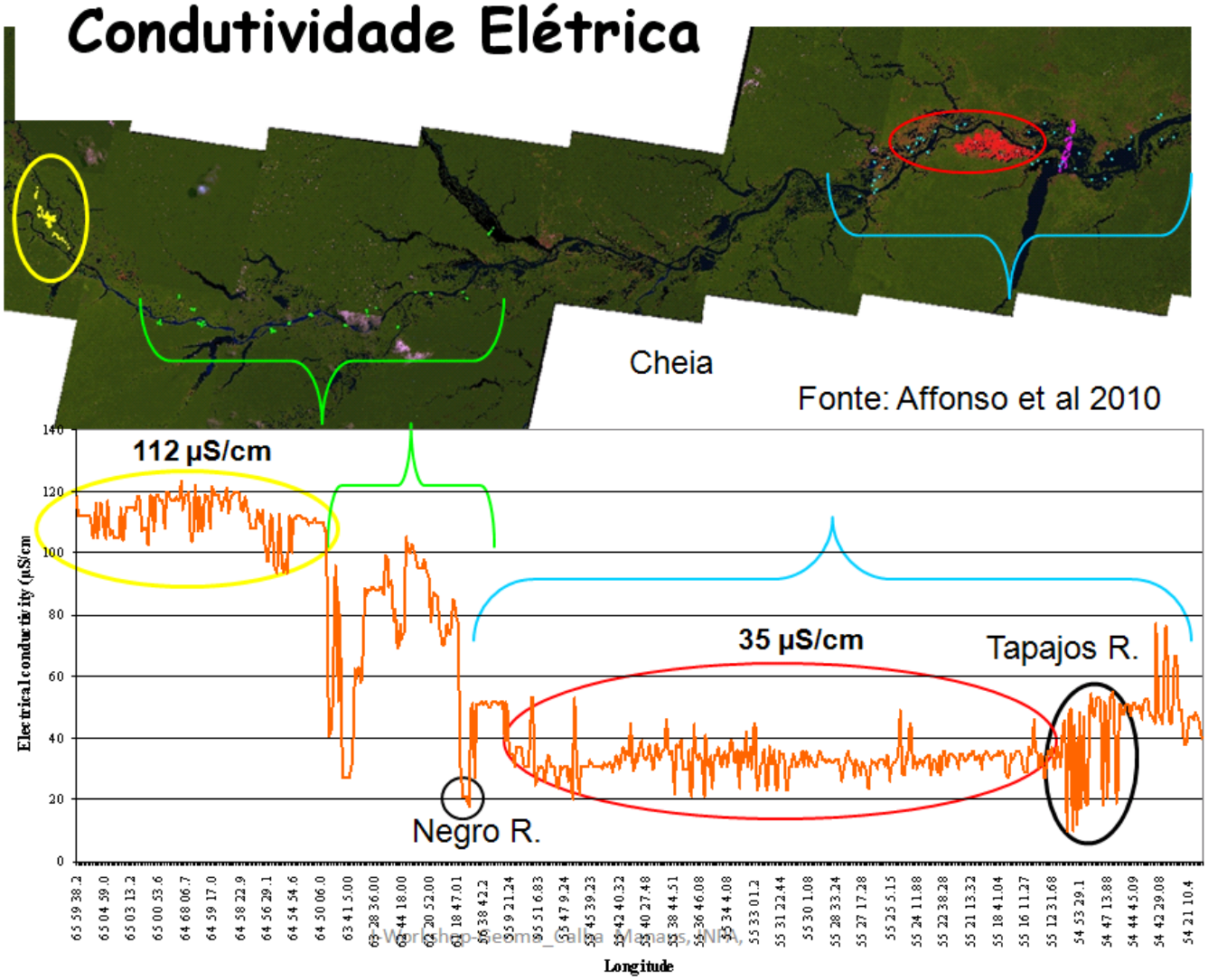
Scientific Questions

1) How the structural and floristic integrity of the Várzea Forest (measured by levels of landscape disturbance, vegetation cover, and proportional distribution of habitat succession) affects aquatic system processes
2) How the human activities in the Várzea (settlement density, settlement age, settlement proximity to large urban areas, etc) affects aquatic system components such as macrophyte density and diversity, phytoplankton diversity, fish production and diversity?

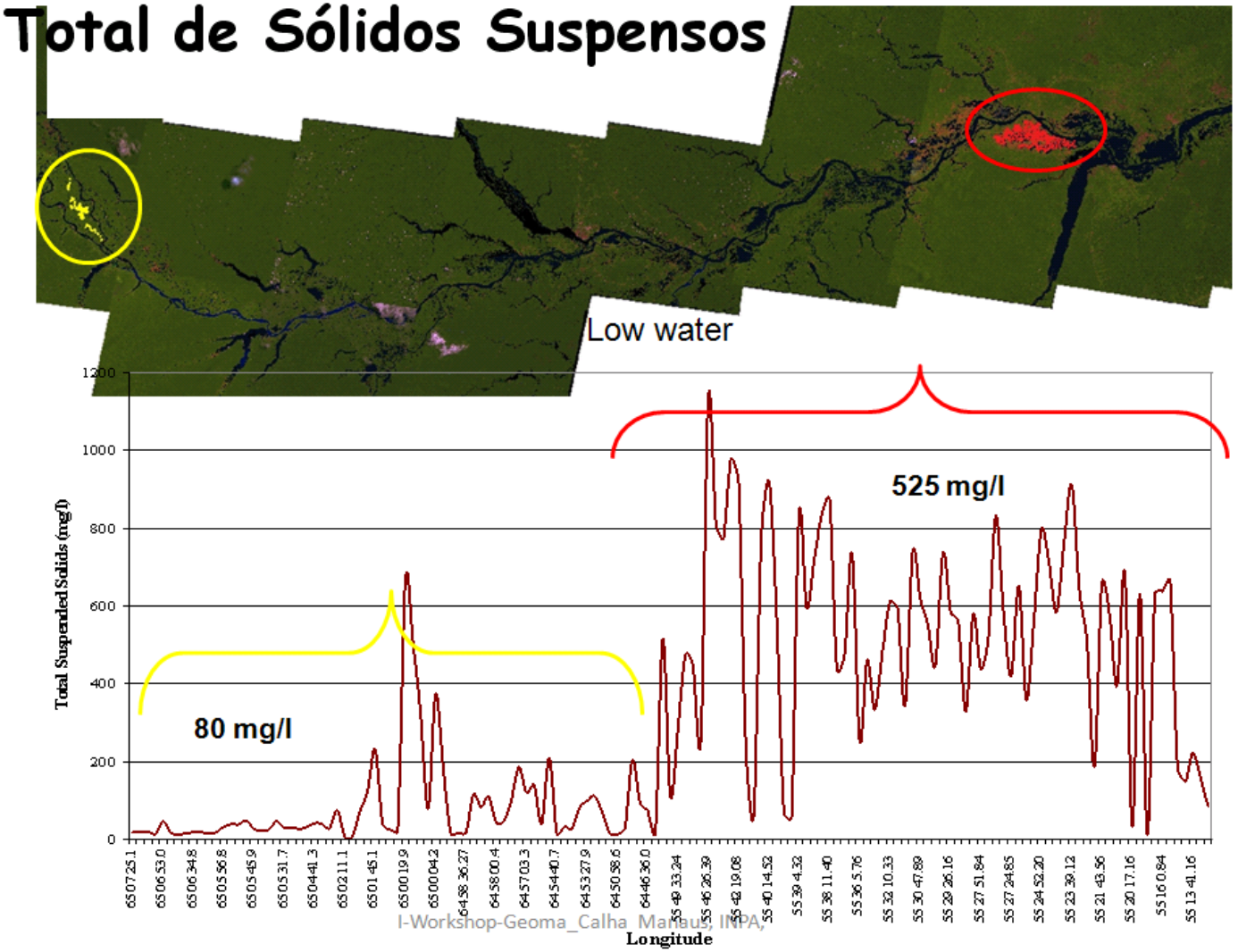
Study Area: Solimões/Amazonas Floodplain



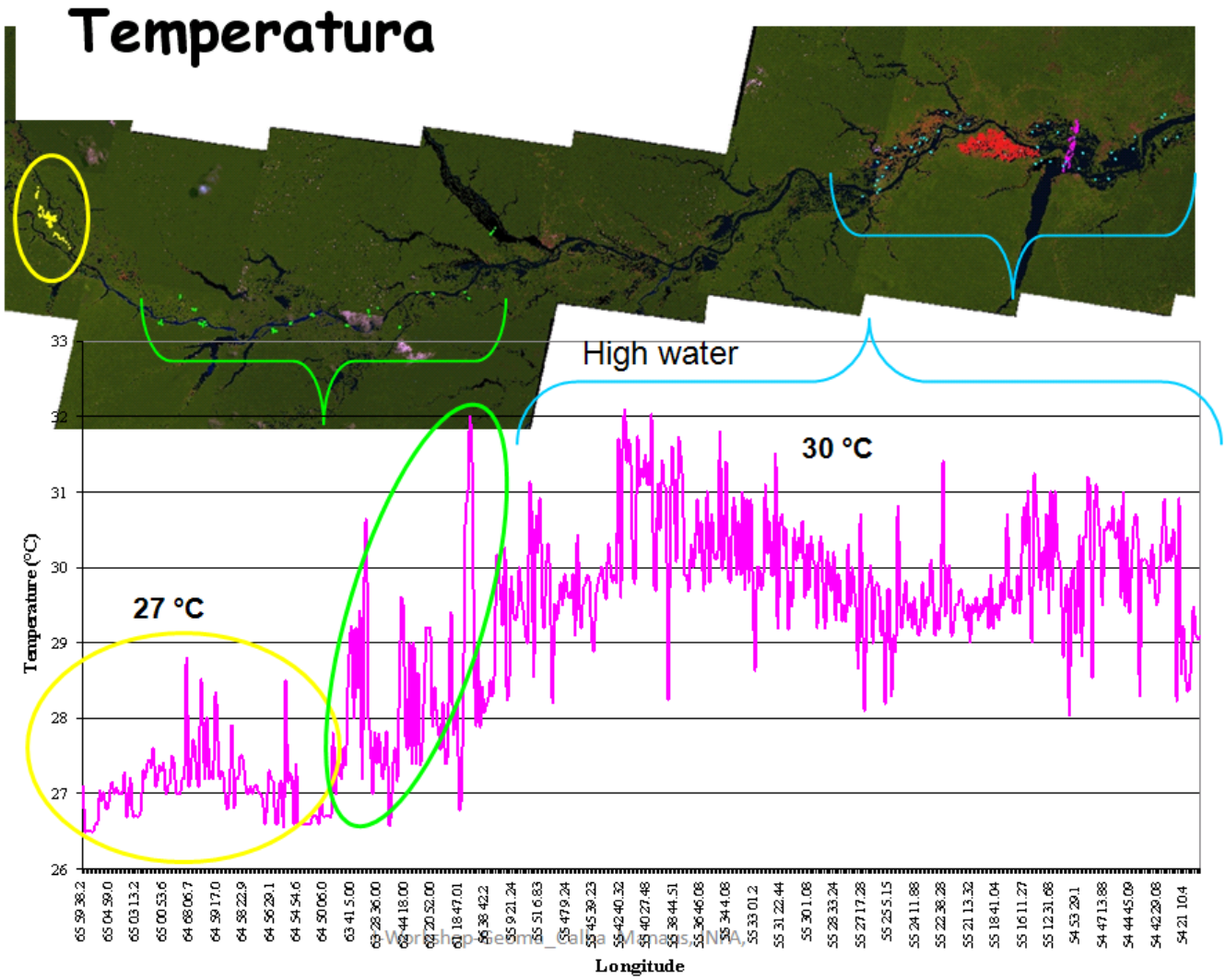
Facts
Electrical Conductivity Gradient



Solids Suspended Gradient



Water Temperature Gradient



Which amount of these differences in water properties is natural?

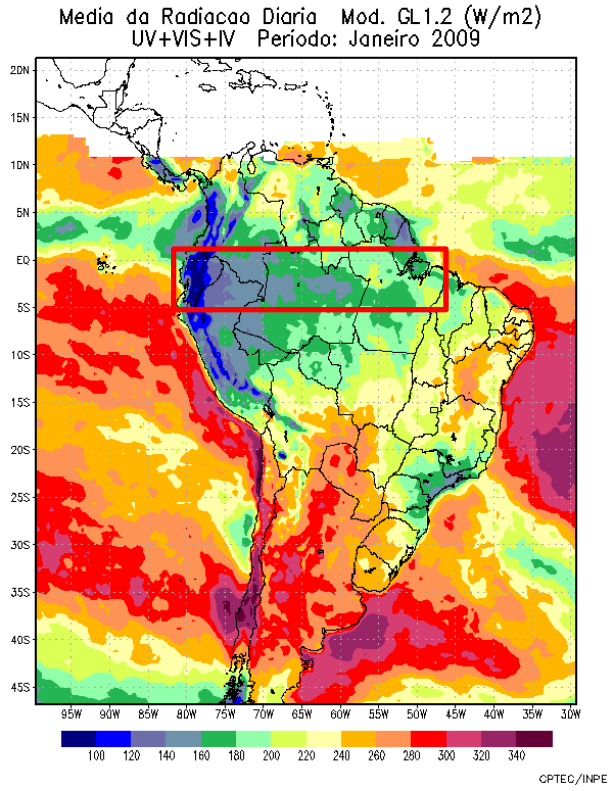
Which amount is induced by vegetation change in the várzea?

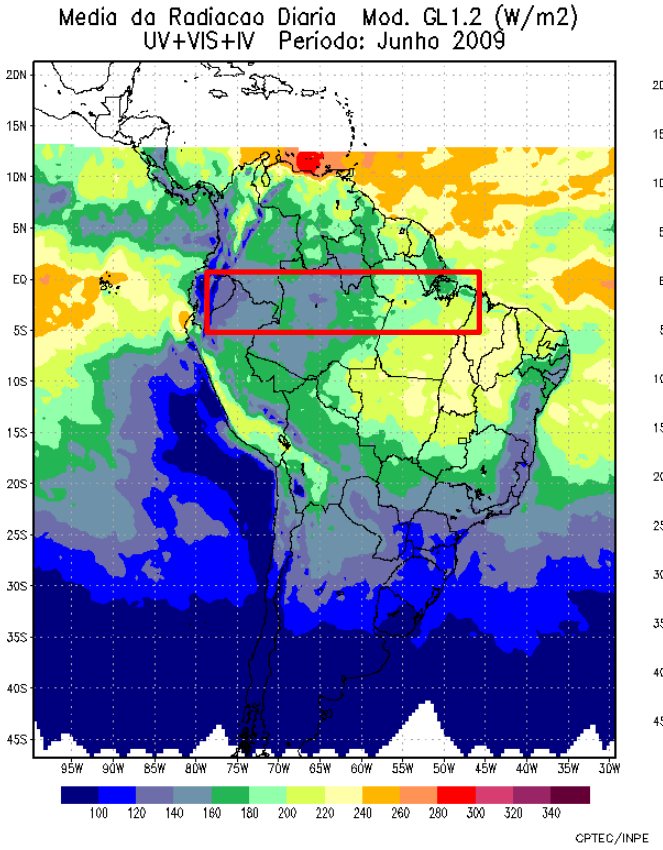
Problems

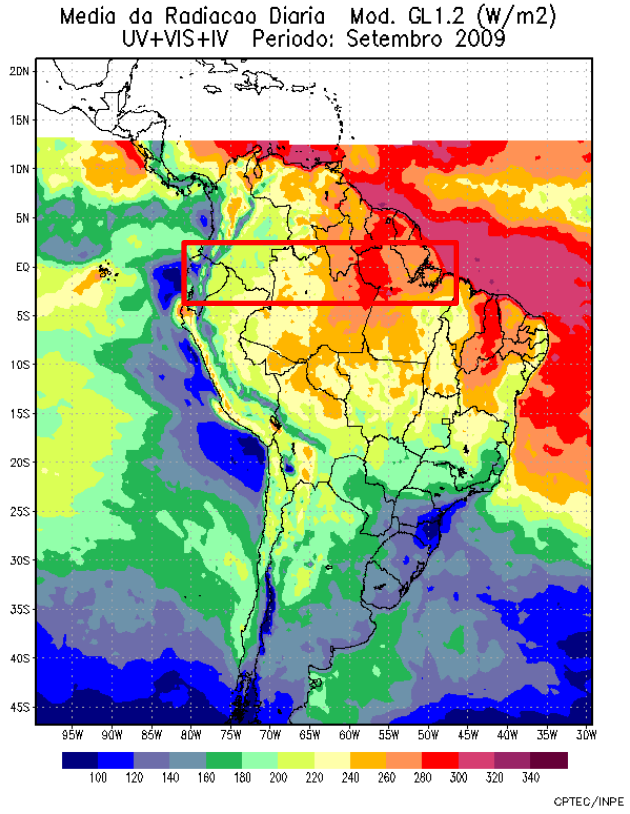
Natural Gradient

- Irradiance
- Temperature
- Pluviosity
- Liquid and Solid Flows
- Flood Pulse Amplitude

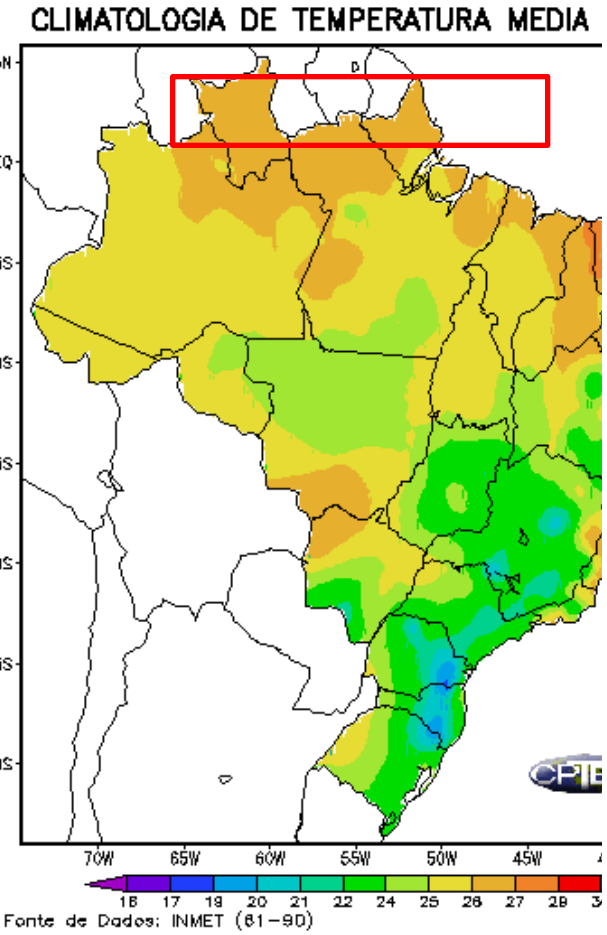
Solar Radiation Gradient

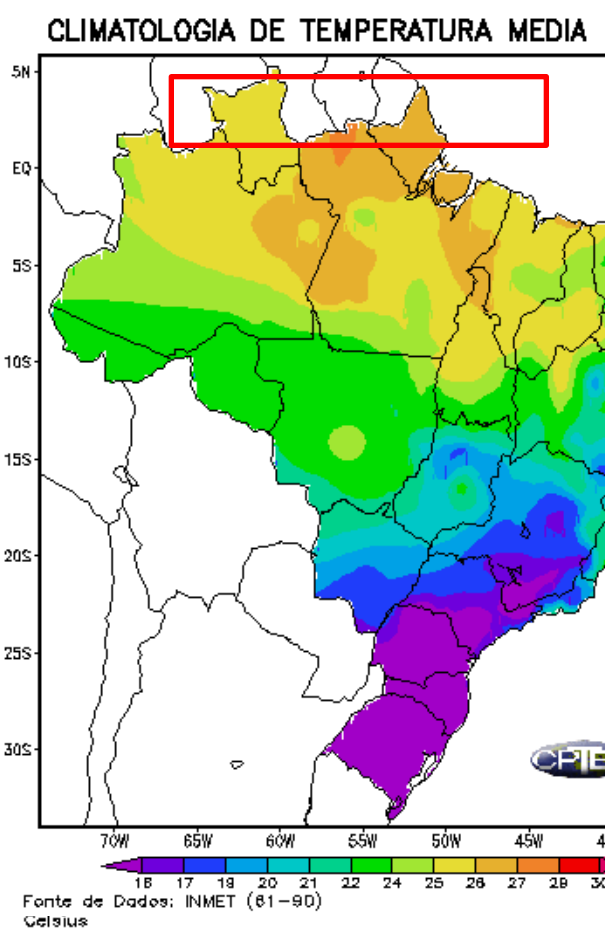


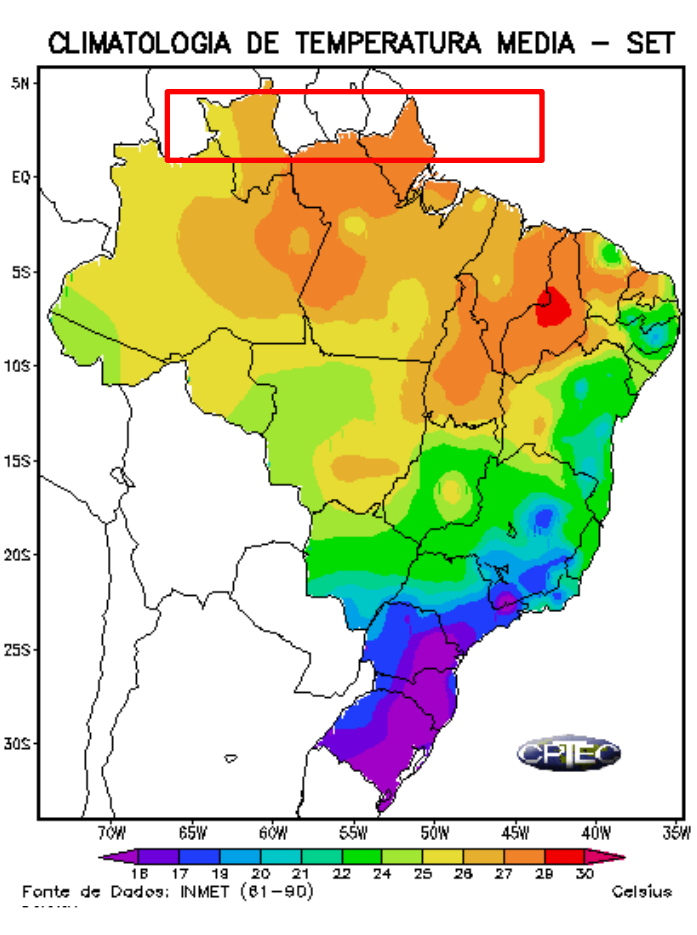




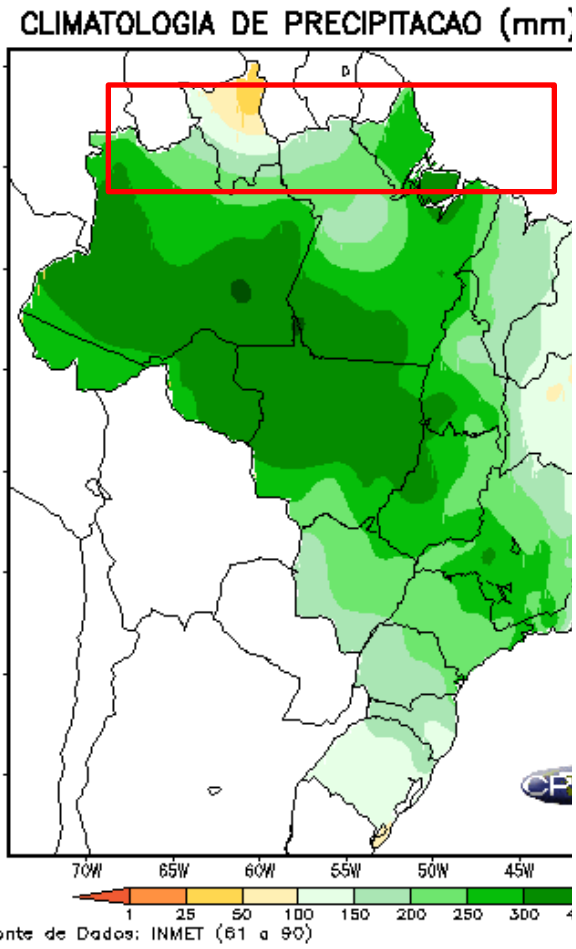
Temperature Gradient

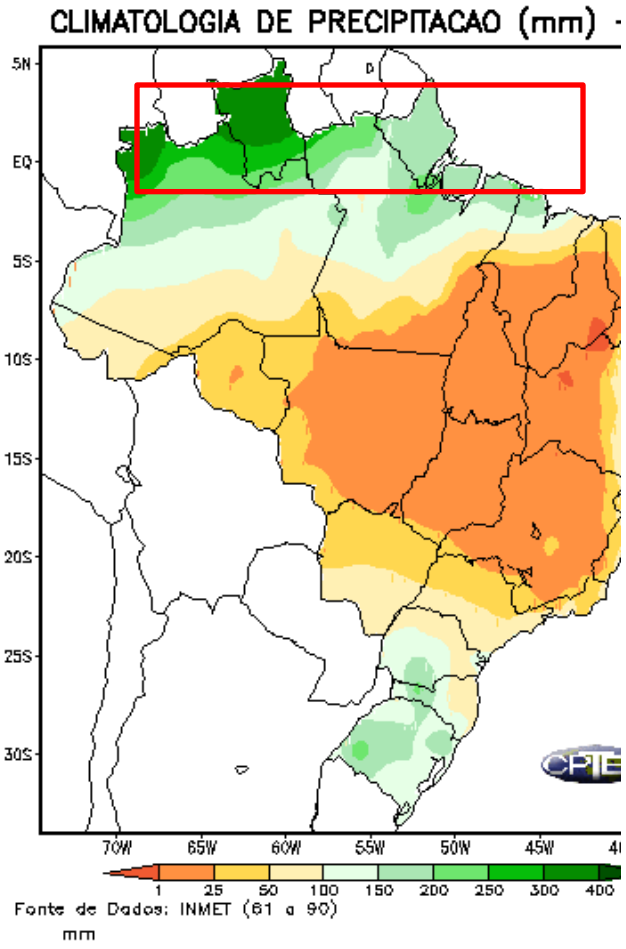


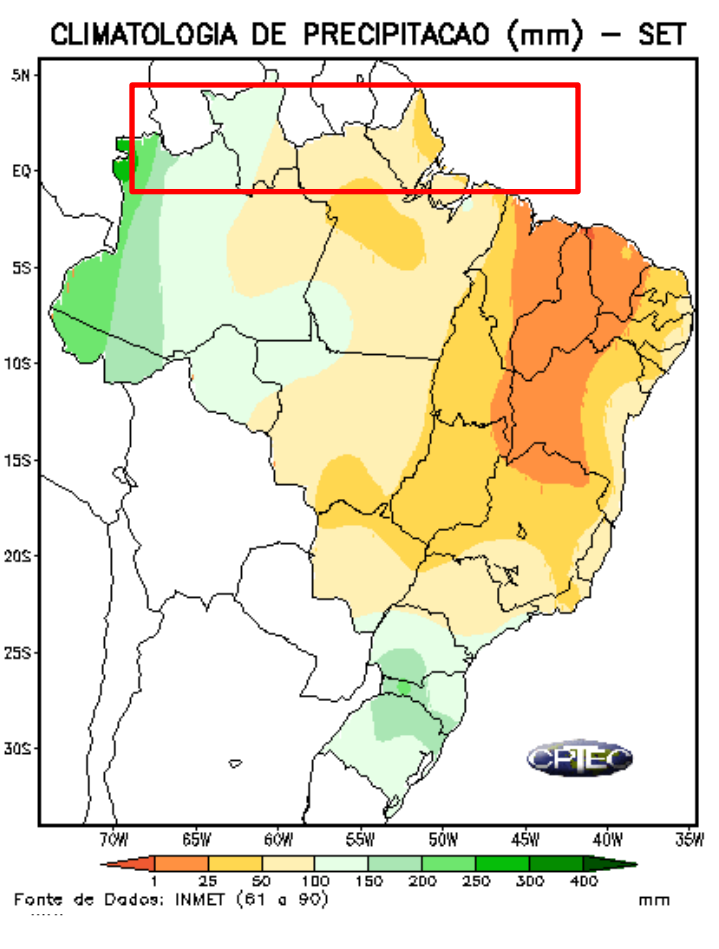




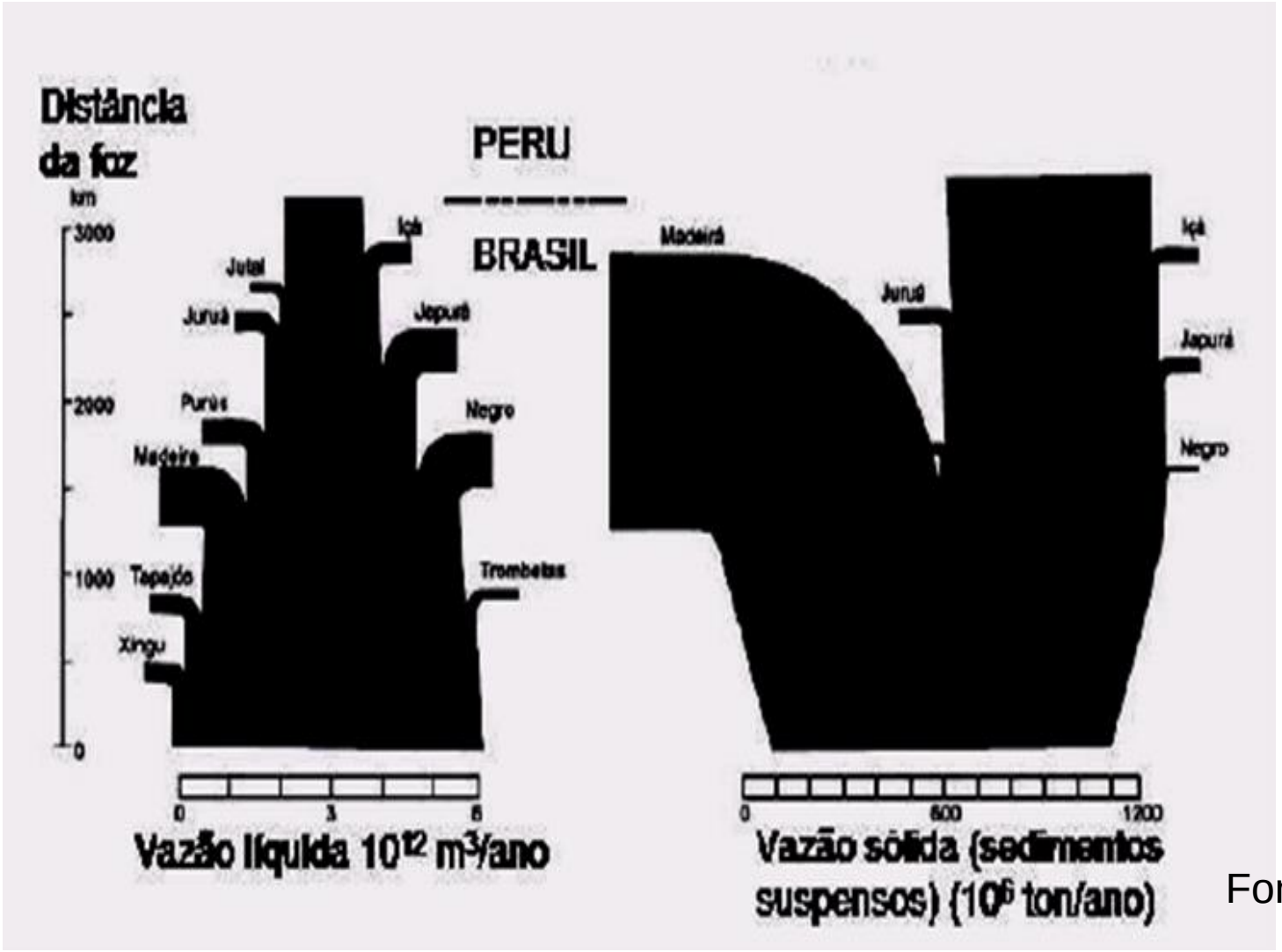
Precipitation Gradient





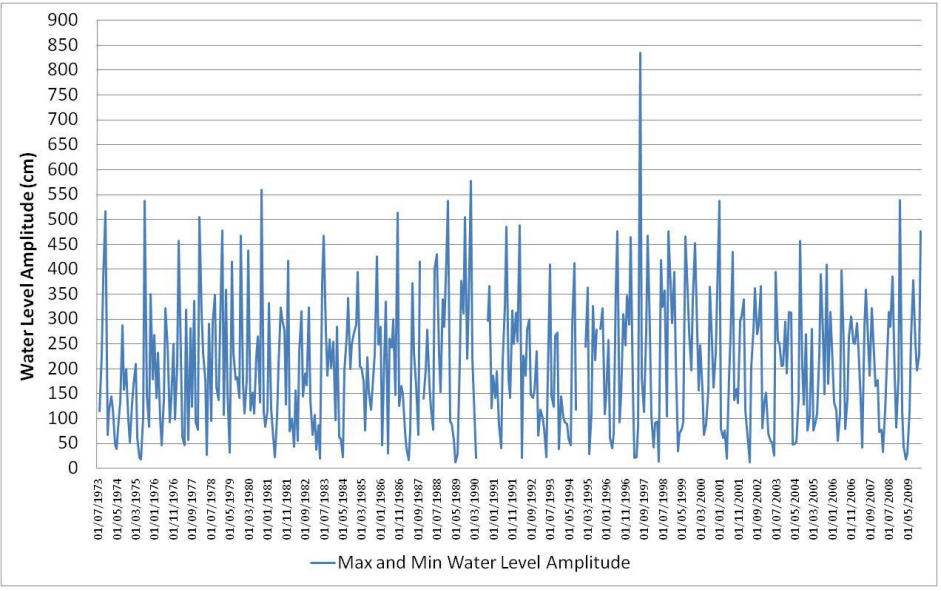


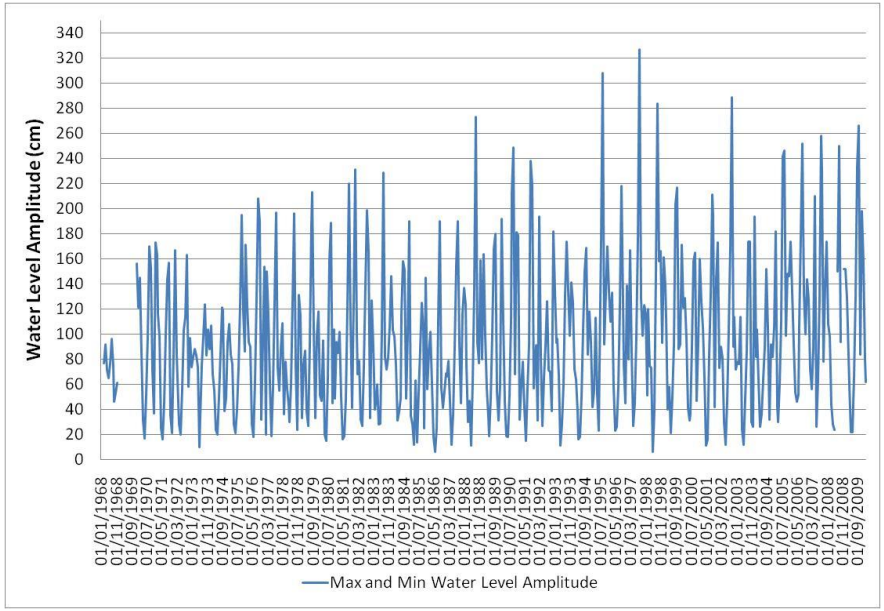
Liquid and Solid Flows Gradients



Fonte:Warne et al. 2002

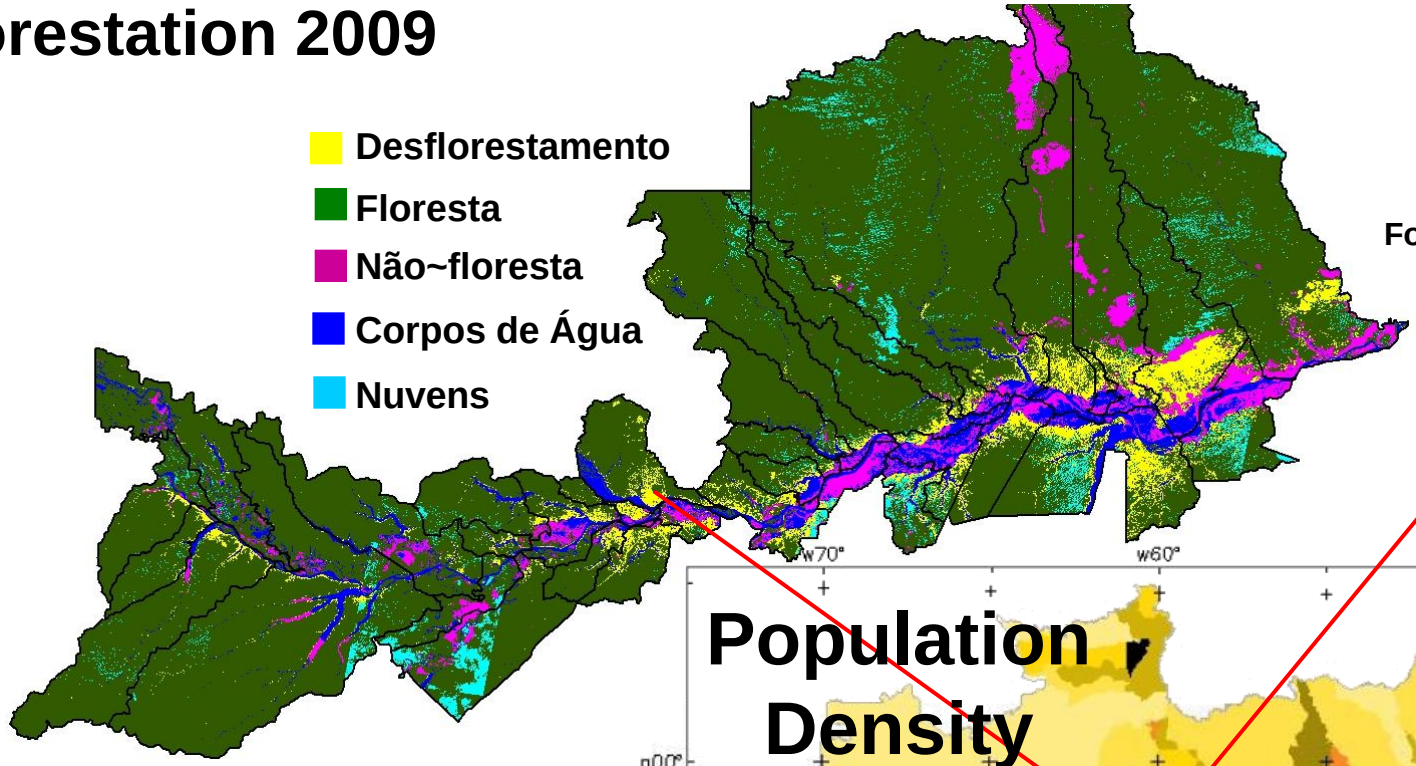
Water Level Amplitude Gradient





São Paulo Olivença *Óbidos*

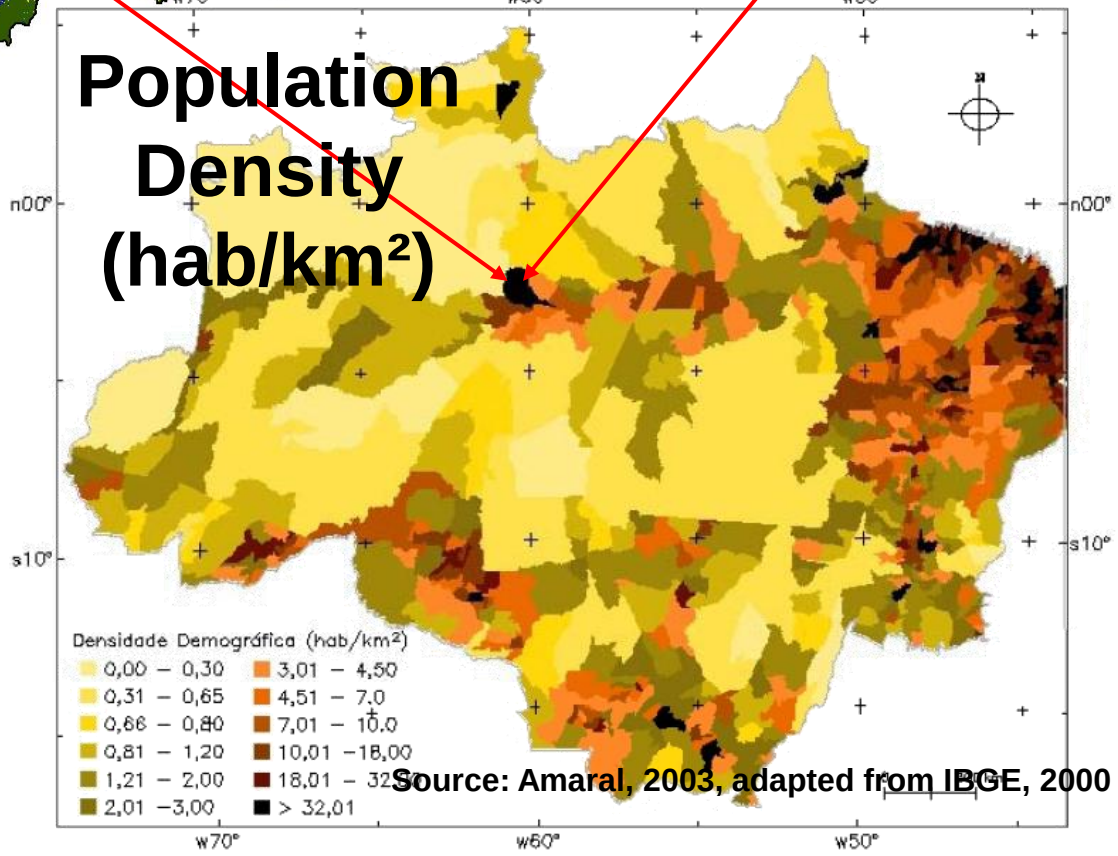
Deforestation 2009



Fonte: INPE, 2009

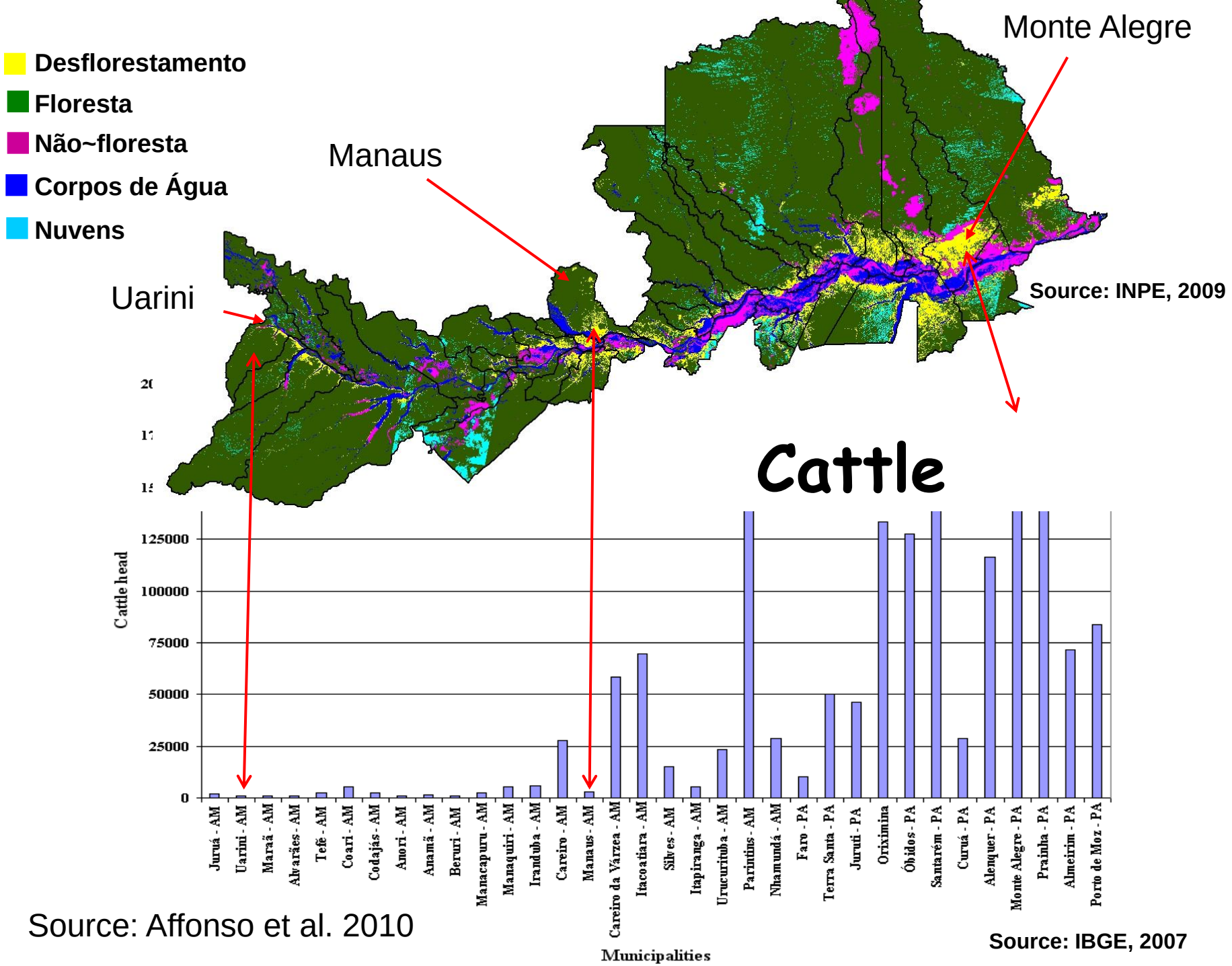
Fonte: Affonso et al.2010

Manaus



Source: Amaral, 2003, adapted from IBGE, 2000

Floodplain Human Occupation Gradient



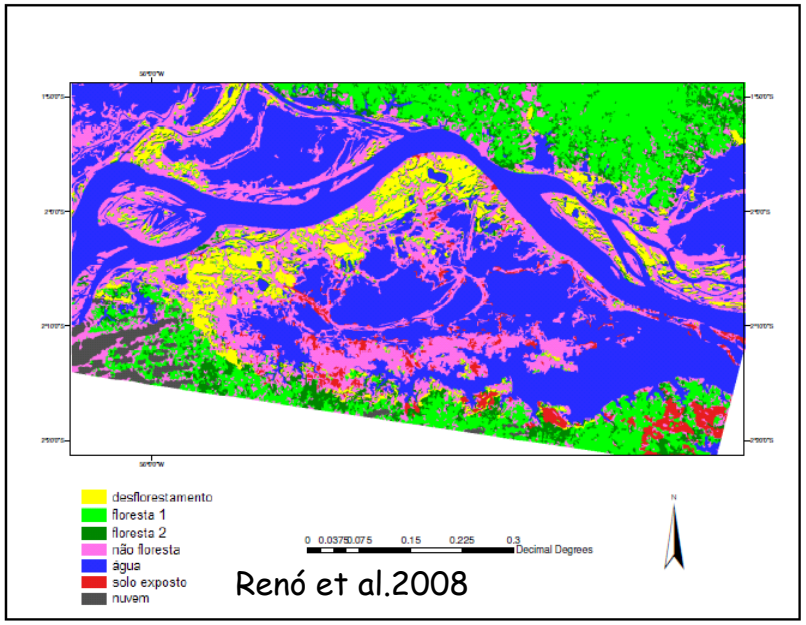
Source: Affonso et al. 2010

Forest Removal Results

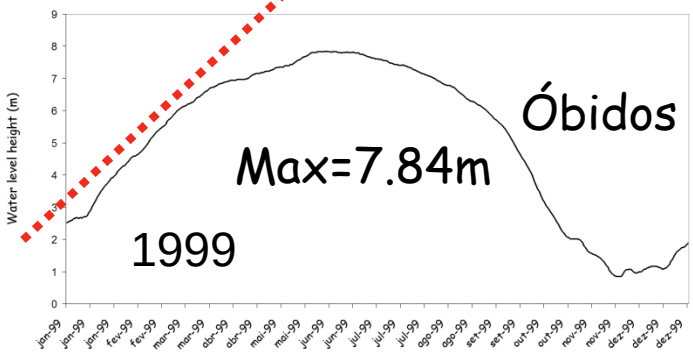
Change in the water flow resistance coefficient

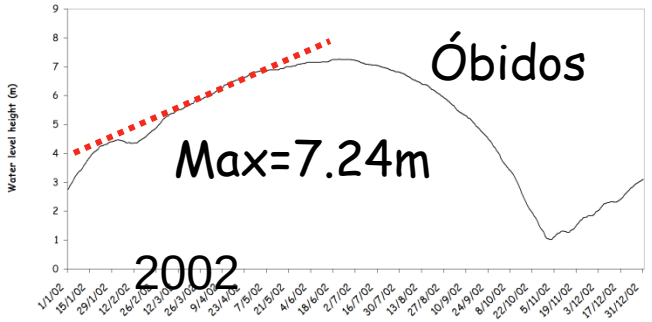
Change in the distribution of hydraulic roughness coefficient (measure of the resistance imposed by vegetation to the free flow of water) (Dawson & Charlton, 1988; Mason et al., 2003; Straatsma & Baptist, 2008)

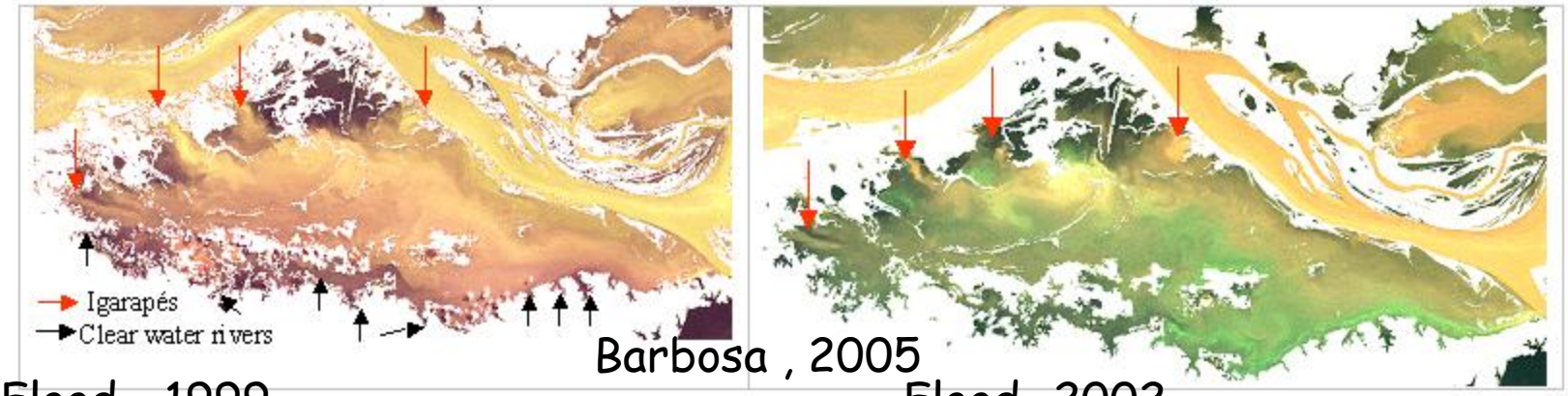
Change in the water flow velocity and level (Mason et al., 2003).



Renó et al.2008







Barbosa , 2005

Flood - 1999

Flood- 2002

Project Activities to Answer These Questions

Model and build a GIS with Solimões-Amazonas floodplain To allow decision makers to identify anthropic disturbances in the flooded forest and their critical levels for aquatic ecosystems stability.

Survey secondary data available in the literature about composition, phytostructure and phyto-phisionomy in representative floodplain forest samples from other researchers.

Identify possible gaps in this samples along the Solimões-Amazonas main channel in "Alto Solimões", "Medium Solimões", "Low Solimões and High Amazonas", "Medium Amazonas" and "Low Amazonas and Estuary

Project Activities to Answer These Questions

- Create primary data in these gaps through a sampling protocol to obtain a greater representation from a 1 hectare minimum sample size in each research unity.
- Execute the Flora inventory in várzeas
- Model and implement database with flora species catalog and description integrated to satellite images, topographic and thematic maps

Project Activities to Answer These Questions

Build a list of várzea species with photographic documentation and geographic location

Collect, herborize and catalog at least 200 species native and specific to várzea for the Herbário de Santarém collection

Model the effects of habitat quality and the flooded days on the reproductive biologys of cayman population in the study area

Project Activities to Answer These Questions

Correlate primary and secondary productivity in várzea lakes;

Correlate covered area by aquatic macrophyte with secondary in várzea lakes;

Model the probability of occurrence of tree species in várzea forests, specially the 10 species with lumber potential

Strategy

- Map the deforestation evolution in the várzea of the central Solimões/Amazonas floodplain from 1970 to 2010, from MSS, TM and ETM / Landsat images.
- Map the hydro epoch from Palsar temporal series according to Hess et al. 2010
- Stratify structural and flora sampling accordingly to flooding and anthropization gradients
- Integrate flora and limnologic sampling