SPATIAL DISTRIBUTION OF TURBITY IN A STRETCH OF MADEIRA RIVER

MONITORING MADEIRA RIVER PROJECT

PORTO VELHO (RO)

4th scientific meeting of the ORE-HIBAM.

September 2011
4a Scientific Meeting ORE-HYBAM
(www.ore-hybam.org)

Hydrology and Geodynamics of the basins of South America

Lima (Peru) 6 – 9 September 2011

Author:

Henrique Bernini– SIPAM
Ana Cristina Strava – SIPAM
Astrea Jordão – SIPAM
Bárbara Karina B. Nascimento - SIPAM
Tatiane Checchia - UNIR
INTRODUCTION

The problem and inquiry:

- Economic development using natural resources of Amazonian region;
- Set of two hydroelectric power plants over an area of 100 km;
- Fluvial dynamics of deposition and suspension of sediments:
  a) Before... Monitoring to achieve mandatory knowledge about river dynamics;
  b) after ... Monitoring as part of alert systems

To answer the question:
The Objective

Better understanding of fluvial dynamics for deposition and suspension of sediments in the Madeira River. It aims to perform in situ inspection and use data from orbital sensors to assess spatial distribution of turbidity upstream and downstream of Santo Antônio and Jirau hydroelectric plants.

This work: *Shows only the characteristics of spatial distribution found in situ for the period of low water level*
GENERAL CONSIDERATIONS

Amorim et al. 2008
Origem e dinâmica da deposição dos sedimentos superficiais na Várzea do Lago Grande de Curuai, Pará, Brasil;

Filizola, N et al. 2009
Study of the variability in suspended sediment discharge At Manacapuru, Amazon river, Brazil;
GENERAL CONSIDERATIONS

Orbital Sensors

Initially: Landsat 5

Actual: MODIS 13 Product
Field work equipment

- Boat from Marinha do Brasil;
- Technical Cooperation Agreement nº 008/2008, of 18/07/2008 along with a PPGG - Department of Geography Master - UNIR;
- Sonde *YSI Incorporated 6820*, from ANA (National Water Agency);
- Secchi disk, from Biochemistry Laboratory/UNIR;
- ADCP from CPRM – Porto Velho.
Methodology

- Mesh samples with 7 (seven) sessions in a transverse spacing of 100x100 (one hundred per cent) plan totaling 49 samples at a stretch downstream of the city of Porto Velho - RO;
- The record of the variation in turbidity during the study period was measured to 1 (one) meter deep;
• Using Secchi disk of the same set of points for water transparency;
1. The analysis stage consisted of treating the results of turbidity data using descriptive statistics and further analysis by geostatistical interpolation to describe visual behavior of data set.

Table 1: Descriptive analysis of data collected in situ.

<table>
<thead>
<tr>
<th>Estatistics</th>
<th>Disco de Secchi (cm)</th>
<th>Turbidity (+NTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum value</td>
<td>19</td>
<td>36,867</td>
</tr>
<tr>
<td>Maximum value</td>
<td>25</td>
<td>45,171</td>
</tr>
<tr>
<td>Mean</td>
<td>21,780</td>
<td>40,457</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1,346</td>
<td>1.858</td>
</tr>
<tr>
<td>Data amplitude (%)</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>
Results

2. Correlation expected, but very strong differences in precision
3. The change in turbidity was also observed in a direct relationship with larger transparency regions had lower turbidity record.
Results

3. The highest concentrations of turbidity may also indicate regions of greater longitudinal velocity.

Figure 3: Behavior of the spatial variation of turbidity and flow velocity at its meeting in Porto Velho.
Future research

• Establish a series of points of interest for in situ investigation considering hydrodynamics of suspended solids flow.

• Remote sensor monitoring to understand the modifications of river patterns once the hydroelectric plants are concluded.
Thanks:

SIPAM
UNIR
MARINHA DO BRASIL
CPRM