Remote Sensing for sampling station selection in the study of water circulation from river system to and Amazon floodplain lakes: a methodological proposal

Cláudio Barbosa, Evlyn Novo ,Maycira Costa

Instituto Nacional de Pesquisas Espaciais
Sao Jose dos Campos, SP, Brasil

ABSTRACT

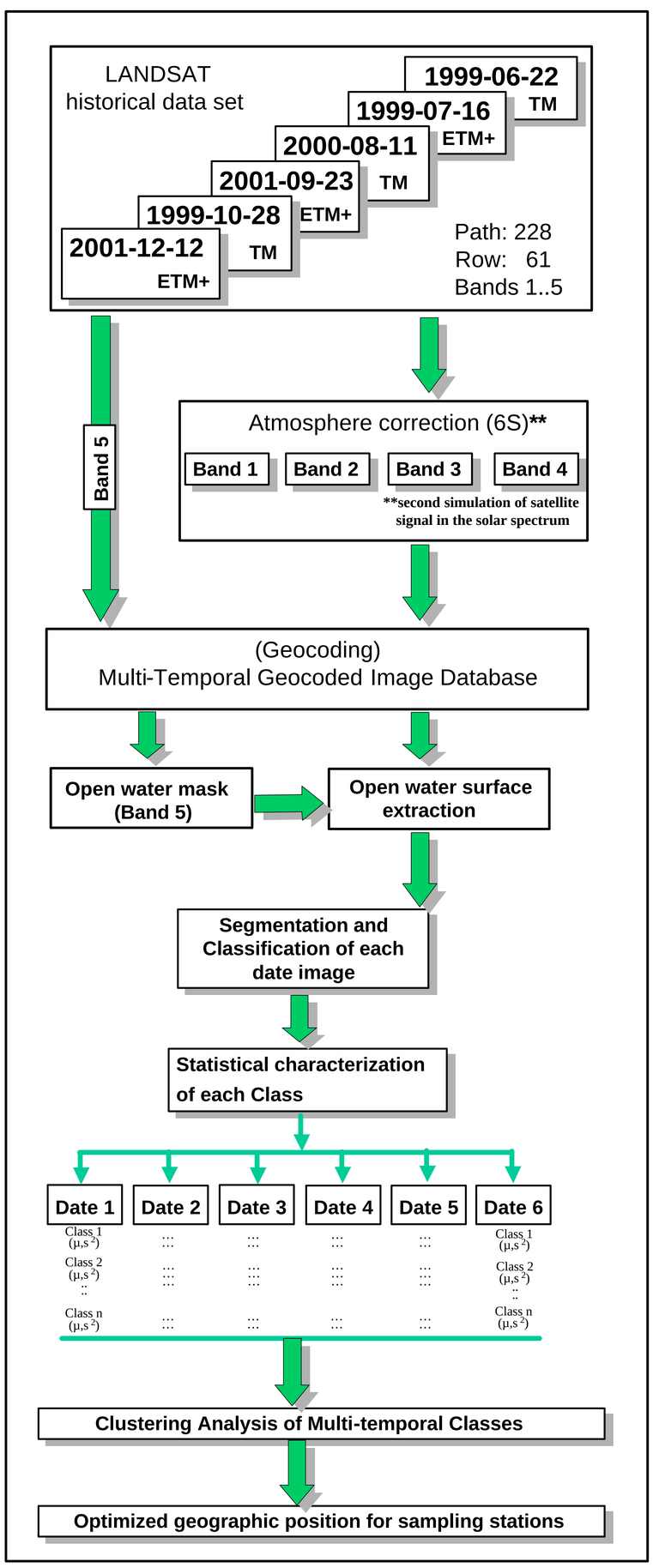
Although remote sensing is a suitable tool for monitoring vast remote areas such as the Amazon floodplain, the accurate extraction of information must rely on ground validation sampling, through burdensome and expensive field campaigns.

This paper proposes a methodology for planning and optimizing the acquisition of water quality parameters during field campaigns aiming the study of water circulation between Amazon River and Amazon floodplains lakes and wetlands. The objective of the approach is to settle an optimized geographic position data set spatially representative of water quality parameters revealing water circulation patterns.

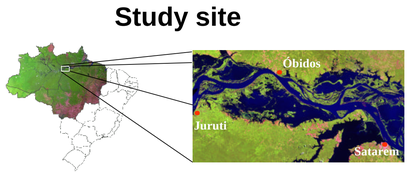
The first step in the study was to build a georeferenced image database consisting of seven dates of Landsat-TM/ETM+ images selected according to Amazon River water level. Each image date was then submitted to the following processing: 1) atmospheric correction 2) region growing segmentation, 3) unsupervised segmented-based classification.

Each resulting class for each date was then characterized by the statistical attributes estimated from bands TM1, TM2, TM3 and TM4 of Landsat Thematic Mapper, which are the bands sensitive to water optical properties. Changes in the spatial dynamic of each class from images acquired at different water level were then mapped and the number of sampling stations and the geographic position of each station were defined analyzing the results of the previous step.

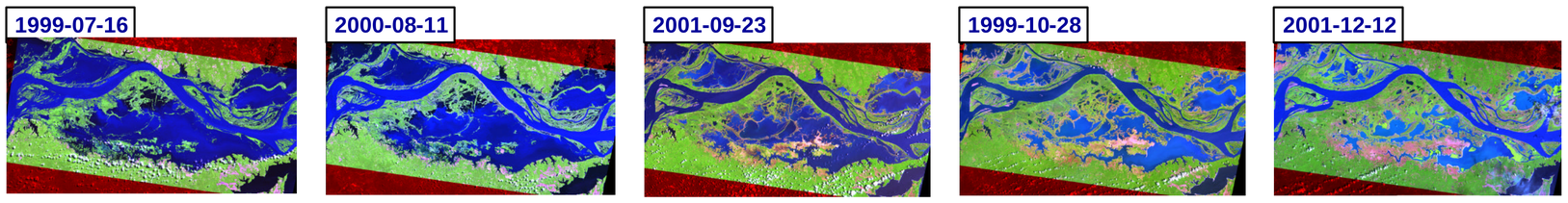
METHODOLOGY

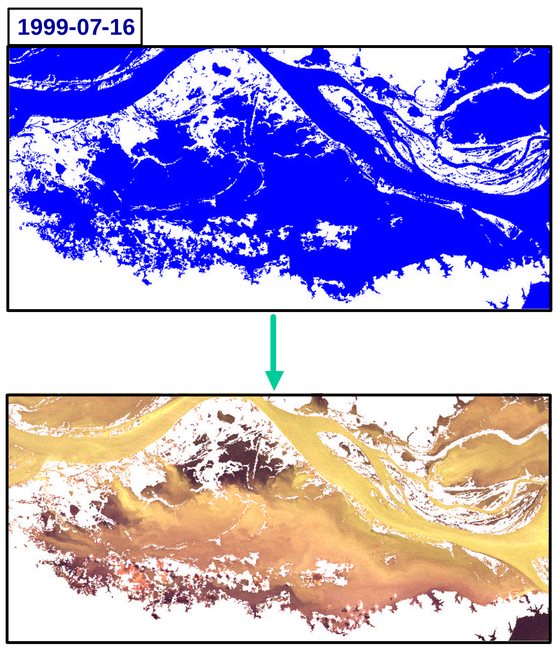


Study site



DATA and RESULTS



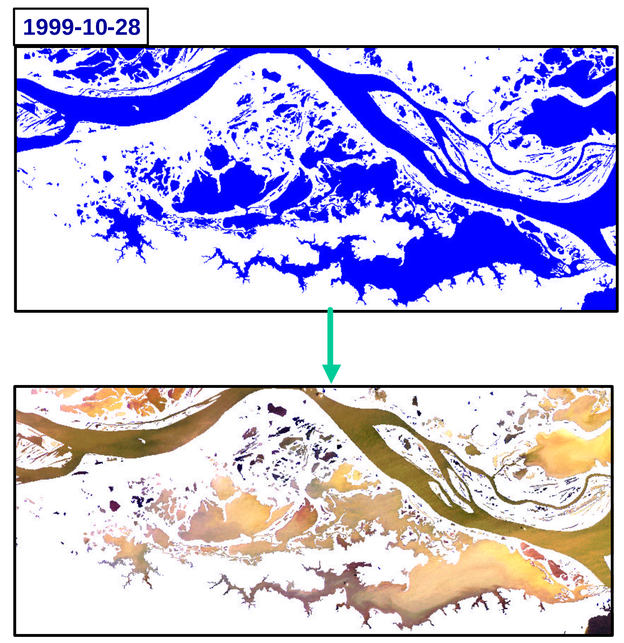


Open water mask

Landsat TM band 5 was segmented and classified into two classes: open water and non-open water. It allowed creating a mask to isolate the open water area from the remaining environment reducing the computation time in the following steps.

Open water surface extraction

The open water mask was applied to Landsat TM bands 1 to 4 to generate a spectral open water data set. This procedure allowed enhancing watercolor features related to different water optically active components.



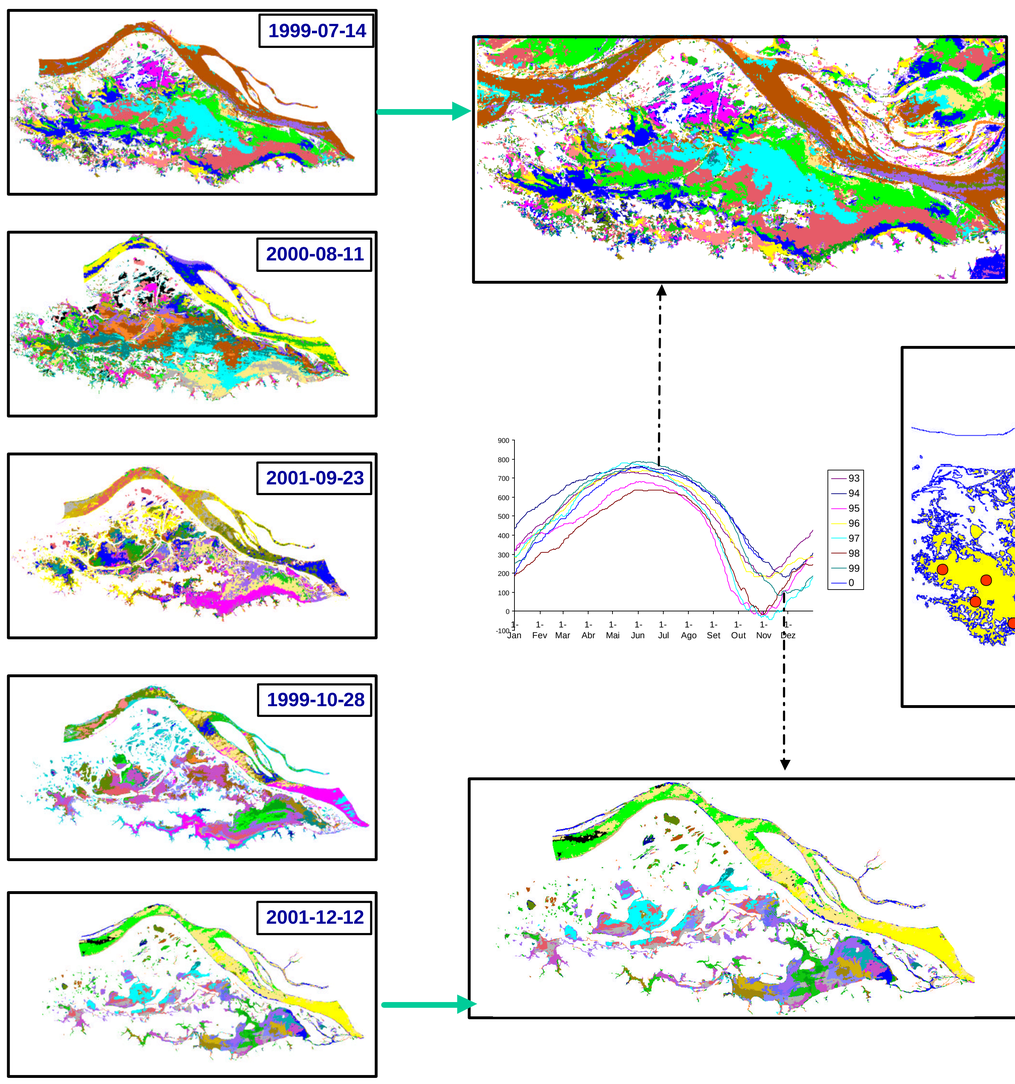


Image Segmentation and unsupervised Classification

The open water spectral data set for each date was submitted to segmentation and unsupervised classification. This procedure allowed identifying optically distinct water masses.

Results

The number, shape and spectral signature for each class at each date were submitted to statistical analyses in order to assess the main water components affecting changes in water color and to track the water masses across time.