Web applications for equipment and data analyses and dissemination.
The project modules include: (1) data repository using a developed tool, Mo Porã, which functions as a collaborative repository manager (2) DCPs controller, which monitors all sensors and equipment installed at the towers (3) prior data analyses that can indicate data abnormalities of data sets collected recently, aiming to diagnose equipment malfunctions that can affect data quality (4) data and information dissemination that will be made available via a collaborative Web portal, where researchers will get access to several tools, including controlling and monitoring of the DCPs linked to the Web environment. Information security is enforced during all phases of the telematic project development by using backup routines and data cryptography during data transmission over a local network or Internet.

LC (Land Use and Land Cover Change)

LC.1-P: Detecting phenology and relating to turbulent fluxes over an intensive agriculture field in the Amazon

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We present analysis of 5 years of micrometeorological data made in agricultural field in the eastern Amazon. We develop relationships between a remotely-sensed observations (enhanced vegetation index, EVI) and in situ measurements such as the radiometric and turbulent fluxes. There are clear differences that appear in the turbulent fluxes (CO2, H2O, and sensible heat), radiative parameters (albedo and PAR-albedo) due to the landscape changing from pasture to crop field. Since September 2000, agricultural practices in the Santarém, Pará, have changed rapidly from cattle grazing, to upland (non-irrigated) rice cultivation, and then to soybean cultivation. The pattern we witnessed in the sampled field is characteristic of the entire region along the BR-163 highway that runs south from the city of Santarém.

Seasonal changes in greenness and reflectivity measured in situ follow the patterns of daytime evaporation and carbon uptake, which depend on crop type. For instance, the lowest values of the Bowen ratio were observed during the wet season during rice plantation. After plowing and tilling, the bare field emits a small efflux of CO2 comparable to nocturnal respiration rate during pasture conditions. Changes in the albedo depend on crop type, and they not only indicate changes the net radiation regime, but they also mirror changes in energy partition and CO2 fluxes. Data obtained from MODIS sensor on the Terra satellite indicate that the enhanced vegetation index (EVI) can detect seasonal changes, but it cannot clearly distinguish the crop type nor follow the rapid rate of crop phenology as well as do in situ measurements. Therefore, to estimate NEE based on remote sensing platforms, better techniques for the detection of the field state are needed. However, the in situ radiative parameter PAR-albedo, the ratio between the upward and downward PAR radiation, does not yield a unique pattern for each crop (rice or soil). The relationship between net ecosystem exchange (NEE) and PAR-albedo resulted in different relationships each year, indicating that other parameters than radiative fluxes must be included in parameterizations.

LC.2-P: The Amazon River Mainstem Mapping

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The Amazon River and its tributaries have an extensive floodplain subjected to seasonal inundation, which has a key role in the earth system biodiversity, carbon dynamic and global climate. Information on the open water surface of rivers and lakes and its seasonal changes in response to flooding are crucial to understand and model the hydrological and biogeochemical fluxes in the aquatic ecosystems and contributes to understanding of habitat biodiversity for better conservation practices and for an effective management of Amazon fisheries. Remote sensing images are an effective tool for mapping and delineating the extent of open water and sand banks of vast river basins. This work presents a methodology used to map the Amazon River mainstem based on a Landsat Thematic Mapper (TM) digital mosaic composed of Forty-seven almost cloud-free TM Landsat scenes covering a period from 1985 to 1995 acquired from July to September, at the beginning of high water and ending of receding water. Radiometric normalization was applied to the images to reduce variability of environmental conditions during image acquisition, allowing the production of an almost uniform dataset for the entire Amazon River mainstem. A Linear Spectral Mixture Model was then applied in bands 3, 4 and 5 to produce soil, water and vegetation images. The water and vegetation images were then classified to obtain an open water map that was visually edited to correct some misclassified pixels. The result was a thematic map of the Amazon River mainstem and its tributaries and lakes larger than 90 x 90 meters resolution, from the Andes to its mouth at Pará covering an area 84081 km², which includes open water and sand banks in the rivers. Hence this product is essential for ecological and biogeochemical studies of the Amazon floodplain and for an effective management of várzea ecosystem.

LC.3-P: Mapping of Fractional Forest Cover in Rondonia, Brazil with a Combination of Terra MODIS and Landsat TM Images

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High deforestation rates in Amazonia have motivated considerable efforts to monitor land-cover changes based on satellite images and image processing techniques. Most commonly, MODIS images are used to provide low-cost region-wide coverage at nearly monthly frequencies, but they offer only coarse resolution; Landsat TM has been used in a majority of studies for nearly two decades, but these data are expensive, and provide, at best, yearly coverage because of clouds. Here, a new approach to estimate forest change is proposed based on the integration of TM and MODIS images. TM images are processed using a hybrid approach including spectral mixture, expert rules, and unsupervised classification, to generate a reference forest image. Three fraction images are derived from MODIS surface reflectance data; expert rules are used to generate a refined vegetation image; and a regression model is then developed between the TM-derived forest and MODIS-derived vegetation data to assess the fractional forest area. This approach was