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The water budget of a subtropical coastal lagoon: a monitoring system that combines traditional and opportunistic observations

Monitoring system for a small coastal watershed

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The Peri Lagoon Watershed is 20 km² located in Southern Brazil (Figure 1) in a transition between tropical and temperate climates (27°S). It is surrounded by hills covered by some of the remains of Subtropical Atlantic Forest. It is an important ecosystem for biodiversity preservation and the lagoon is the main fresh water supply for the Florianópolis Island, Capital city of the Santa Catarina State. Even though there is a clear social and economic importance, the information on this ecosystem is scarce, especially regarding the dynamics of water balance and quality. Our objective was to install a low cost monitoring system that would allow us to gather as much information about the components of the water budget in a short period of time as a base for building a long term experimental basin. We began the installation of the monitoring system in 2014 and approached the monitoring of this catchment from several spatial (from plot, to hillslope to river basin) and temporal (continuous and field campaigns) scales as well as with a diverse range of field equipment, from handmade to commercial ones. We installed traditional and commercial meteorological stations and continuous pressure gauges sensor for streamflow estimation. Streamflow and water quality in several small headwater rivers (0.026 to 5.33 km²) were measured in field campaigns with current meters and with the dilution method. Handmade rain gauges were used for the estimation of throughfall at the plot scale. In a hillslope we installed several handmade runoff detectors and groundwater level gauges that were checked after rainfall events. As example of preliminary results, we found that the precision of the dilution method for streamflow estimation in small basins was 5% and its accuracy 17%. We estimated response time by combining those measurements of streamflow during baseflow conditions with automatic stream gauge at the biggest catchment. The runoff detectors allowed the estimation of the density of the active drainage network in the hillslope which varied up to 77% from dry and wet periods. The frequency of activation of each ephemeral channel increases with the contribution area following a logarithmic function. The dominant runoff generation mechanism in this area was found to be is saturation excess. The combination of several measurement techniques in a range of scales allowed us to have several preliminary results which would not be possible otherwise.

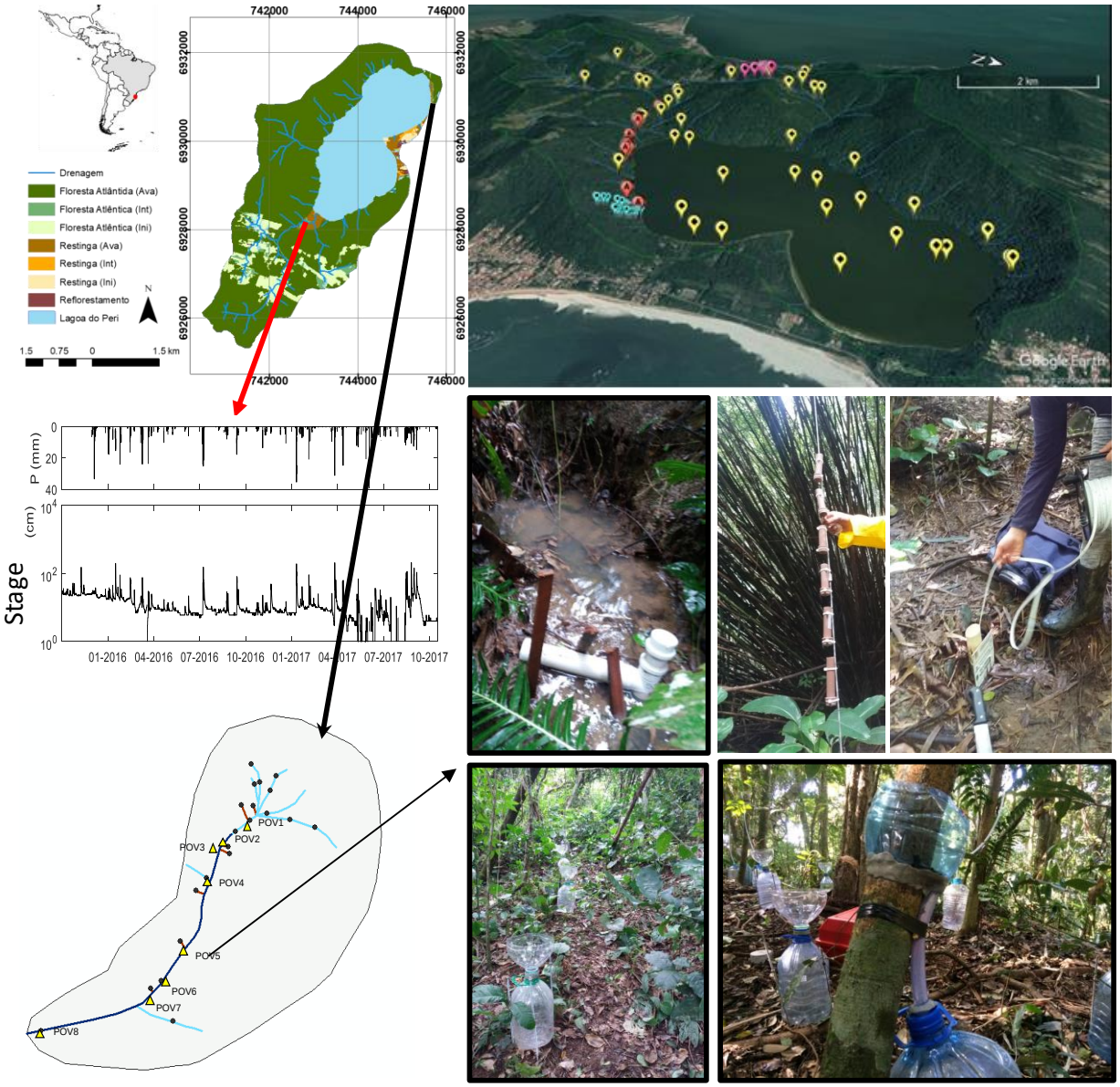

Figure 1 – The Peri Lagoon watershed is located in Southern Brazil where we are combining point to hillslope to watershed measurements. Several tracks where opportunistic measurements were done during baseflow conditions are shown in the top right corner. In the main catchment there is an automatic streamflow gauge (hydrograph in the red arrow). In one hillslope (2.6ha) on the northeast of the catchment there are several handmade pluviometers (for rainfall interception estimation), runoff detectors and measuring groundwater wells.