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QUALI-QUANTITATIVE TABLES WATERS MONITORING IN AREAS OF TRANSITIONAL FOREST, HANDLING FOREST AND PASTURE IN THE NORTH OF MATO GROSSO

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1. INTRODUCTION

The native forests, in special Amazon region, one of the most important ecosystems of the planet, due to the extension of its humid tropical forests, its biodiversity and to the taxes where they are being modified play a role for the planet environmental maintenance.

Changes in the land use and soil covering are determinant in the delineation of global, regional and local environment scales. They influence the biological diversity, the biogeochemistry and water cycles; climatic factors can interfere directly on radiation, the surface temperature, precipitation and humidity, as well as in the dynamics of the hydrics resources.

In many tropical regions, large-scale changes in land cover involve the replacement of the natural vegetation by crops or pastures (Costa et al., 2003). In the north of the state of Mato Grosso - Brazil, the changes in the land use have been a constant, either for plantation of crops, either for the conversion of the native vegetation in pastures.

Many studies today are trying to identify the possible changes that intervene in the conservation and behavior of hydrics regional systems.

The present work is an integrant part of the Large Scale Biosphere-Atmosphere Experiment in the Amazon, LBA, and its objective is to evaluate quali-quantitative the waters table in the transitional forest, handling forest and pasture in the North of Mato Grosso.

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2. MATERIAL AND METHODS

2.1. Study area

The region of study is located approximately 60 km from Sinop, Mato Grosso, Brazil (11°24.75'S; 55°19.50'W, co-ordinated by the micrometeorological tower LBA), with eight monitoring wells were installed in transition forest Amazonia Cerrado (P1, P2, P3), in handling forest (P7, P8) and in pasture (P4, P5, P6) (Figure 1).

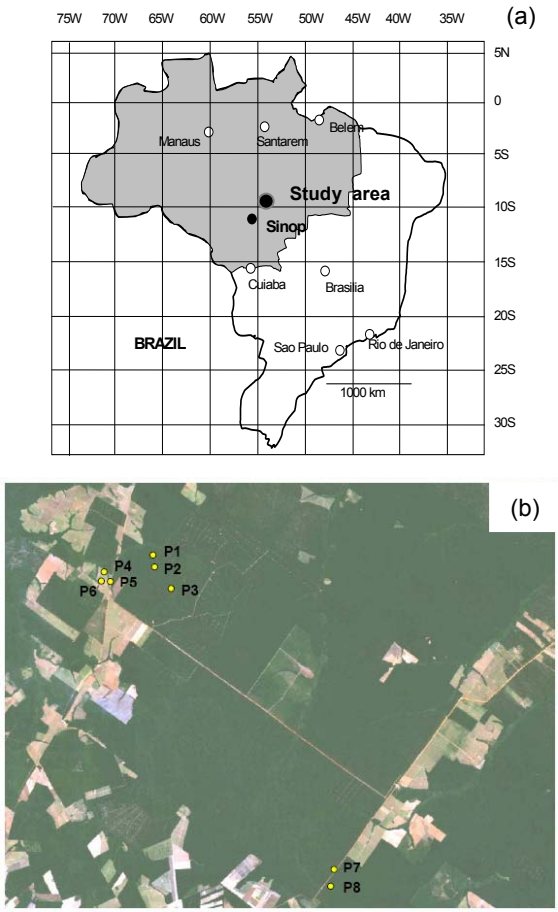

Figure 1. Location of (a) the study area and (b) the monitoring wells. P1 (55º19'W, 11º24'S); P2 (55º19'W, 11º24'S); P3 (55º19'W, 11º14'S); P4 (55º21'W, 11º25'S); P5 (55º21'W, 11º26'S); P6 (55º21'W, 11º26'S); P7 (55º10'W, 11º39'S); P8 (55º10'W, 11º39'S).

The region presents the dry season (May, June, July and August) and wet season (November, December, January and February) well definite, with annual average air temperature of approximately 24°C in the region of transitional forest, and annual average precipitation of 2000 mm.

2.2. Management of the water table

Water level measures have been carried monthly (quantitative analysis); of the pH and water temperature in loco with the use of a metric ribbon equipped with a water sensor in the extremity. It did not have on May and July. They had been carried through average monthly for each ecosystem.

2.3. Collets and laboratory analyses of water table

Measures of the tables water have been carried monthly by manual pump; the water pH (Check-Mite pH Sensor (pH-30) CE) and water temperature in loco (Multi Digital Thermometer CE), and samples have been collected from October 2004 to August 2005. The samples have been analyzed qualitatively in a physics-chemistry laboratory, according to the recommendations of the Standard Methods for the Examination of Water and Wastewater (APHA et al., 1998). In laboratory, the parameters analyzed had been electric conductivity, color, turbidity, total phosphorus (P) and total Kjeldahl nitrogen (N-TKN).

3. RESULTS AND DISCUSSIONS

The water table presents the minimum value in the dry season and the maximum value in the wet season in the three studied ecosystems.

The maximum variation of the water table of transitional forest, handling forest and pasture was 1.31, 0.87 and 1.67 m, respectively (Figure 2).

Analyzing the topography and localization of the monitoring wells in the area, it can be assumed that the same ones have approximately the same underground hydric behavior.

However, in the pasture area there is a bigger variation of the water table due probably to the withdrawal of the forest covering, causing to a higher incidence of solar radiation in the ground, increasing the superficial temperature and provoking the increase of the evaporation of the superficial underground water in the pasture area.

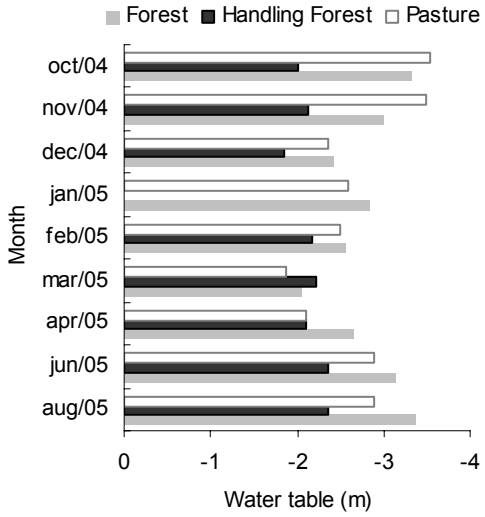

Figure 2. Variation monthly of water table of transitional forest, handling forest and pasture area.

The annual average of the water table in the transitional forest, handling forest and pasture area were -2.82; -2.19 and -2.71m, respectively.

The variations of the level of the water table in the monitoring wells of the forest and pasture had presented significant correlation (r^2=0.738), although it did not have significant correlation between the transitional forest and the handling forest, and the handling forest and the pasture area.

In this region, the precipitation in the wet season represented approximately 50% of the annual total precipitation and during the dry season it practically did not have precipitation occurrence (Vilani et al., submitted).

Significant correlation was not verified between the behavior of the water table in different ecosystems and the precipitation. The precipitation is admittedly a determinative parameter in the hydrological cycle of an ecosystem and consequently in the underground water table.

However, a recharge time becomes necessary, that is some time necessary for the percolating of the precipitated water to reach the sheet, this time not only depends on the amount of precipitated water, but also on the type of vegetal cover, of the soil type, inclination of the land among others factors.

The values of physic-chemistry variables pH, conductivity, color and turbidity, in three ecosystems in study, are described in the Table1. It shows that the biggest values of pH and turbidity and the lowers values of color and N- TKN (Figure 3b) had been observed in the wet season.

Table 1. pH range and averages of the electric conductivity (µS/cm), color (uC) and turbidity (uT) in transitional forest, handling forest and pasture in the dry and wet seasons.

Parameter	Season	Transitional forest	Handling forest	Pasture
pH	Dry	4.0 - 6.3	5.0 - 6.2	5.0 - 6.5
	Wet	5.3 - 6.7	5.0 - 7.0	5.5 - 6.8
Conductivity	Dry	21.8	24.2	27.8
	Wet	20.3	22.9	34.1
Color	Dry	396	447	577
	Wet	94	69	141
Turbidity	Dry	72	91	79
	Wet	312	295	231

In the dry season, it had a considerable increase in the precipitation of the region, resulting in an increase in the amount of water infiltrated for the ground that loads obtains an amount of suspended solids reaching the water table, responsible for the turbidity increase. The responsible constituent for the coloration in the water is the dissolved solids; lesser values of color in the wet season can be resulted of the lesser dissolved solids concentration in this season.

The conductivity presented a reduction of the dry season for wet season of 7 and 6% for ecosystems forest and forest handling, respectively. However it presented for the pasture an increase of the dry season for wet season of approximately 19%.

For the ecosystems in study, the values of the macro-nutrients N-TKN and P had presented inverse behavior, being the first minor in the wet season, and as lesser in the dry season (Figure 3a and 3b), what it influences directly in relation N-TKN:P, being greater during the dry season.

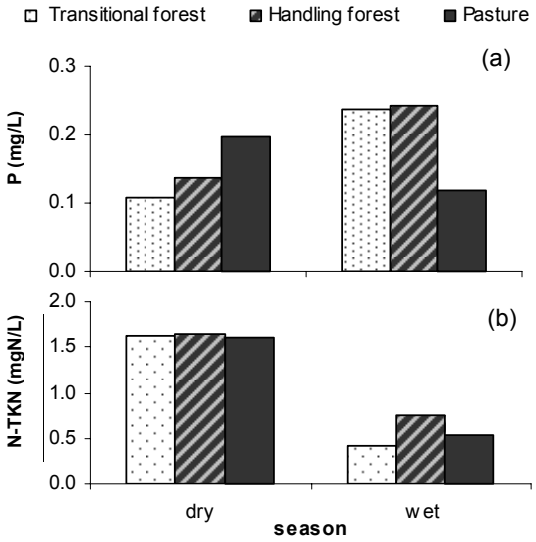

Figure 3. Average of (a) total phosphorus and (b) total kjeldhal nitrogen in the Transitional Forest, Handling forest and Pasture in the dry and wet seasons.

In the dry season, the relation N-TKN for transitional forest, handling forest and pasture was approximately 15:1, 14:1 and 12:1, respectively, while in the wet season they were approximately 2:1, 4:1 and 2:1, respectively.

In the wet season probably it had an increase in the suspended solid concentration in waters of the water tables in the forest and forest handling, and consequently an increase in the concentration of total phosphorus with relation to the dry season, while in the pasture the total phosphorus concentration was lesser in the wet season.

In the compared to the dry season, approximately 74, 55 and 33% for the transitional forest, handling forest and pasture, respectively. It probably happened because in the dry season there was a hydric deficit in the ecosystems, decurrently to the precipitation scarcity, there was a reduction of the water table in the monitoring wells, and an

increase in the concentration of present organic substance in the water.

The monthly average of the air temperatures had been superior to the water temperature of the water table around 4°C in the pasture and 3°C in the forests.

The water pH of the forest presented greater variation between the dry and wet season, being these waters more acid than the waters table of the others wells.

The waters alkalinity presented variations seasonal and between ecosystems, with bigger values in the transitional forest and handling forest in the wet period, and in the dry period, bigger values in the pasture.

The turbidity presented biggest values in the rainy period that in the dry period. The relation N-TKN:P in waters of the wells of the transitional forest and handling forest presented biggest values in the wet season.

4. CONCLUSIONS

- The water level varied seasonality. The pasture presented a bigger variation approximately two times that in the transitional forest and handling forest, probably there was the biggest losses for evaporation;
- Lesser seasonality in the color and conductivity parameters was observed in the forest ecosystem;
- The handling forest ecosystem presented minor variation in the N-TKN and P concentrations;
- The transitional forest, handling forest and pasture presented in the dry season superior values of N-TKN:P relation, approximately 7.5; 3.5 and 6 times, respectively, that in the wet season;
- The behavior of the analyzed variables mainly showed to seasonal variations between the different ecosystems, as for the level of the water table and the concentration of macronutrients (N-TKN and P), what it indicates that the land cover is a determinate factor in the quantitative and qualitative behavior of the subsurface hydrics resources.

5. REFERENCES

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