Climate monitoring before and during limnological studies: a needed integration

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Evaluation and assessment of freshwater quality of lakes, rivers and reservoirs is a complex technical operation. These assessments at present need to be done at local, regional and global levels (McCarthy et al., 2001). Since aquatic ecosystems worldwide are under anthropogenic stress, limnological studies are necessary for evaluation of these stresses and to develop tools to convert speedily scientific information into effective management decisions (Goldman, 2003). From the perspective of the limnological functioning of lakes and reservoirs the effect of climate has been recognized in several sources and studies (Talling, 1966; Goldman, 2000a,b; Goldman and Amezaga, 1984; Tundisi et al., 2004).

Seasonal changes and interrelations of climate, thermal stratification, chemical stratification and phytoplankton succession were described, for example, by Reynolds et al. (1986), Reynolds (1997) and Tundisi et al. (2006).

With the advancement of technologies for measuring rapid climatic changes throughout satellite monitoring it is fundamental for limnologists to assess satellite images and climate variables (solar radiation, air temperature, wind direction and force) before and during limnological studies of freshwater ecosystems (Kumagai and Vincent, 2003).

For example, in the Southern Hemisphere, Stech and Lorenzetti (1992) and Tundisi et al. (2004) demonstrated the impact of cold fronts in the changes of thermal structure and circulation of coastal waters and reservoirs. Wind induced mixing is very common during the passage of cold fronts. Stability and several stratifications follow after the incidence of cold fronts. Any limnological measurements should be related to climate observations and the evolution and development of climatic changes during this period of study. This will provide a more accurate analysis of the limnological events of the freshwater ecosystem and will help the limnologist to anticipate changes in the thermal structure and biological consequences under direct influence of climate.

Since the modeling procedures for management of freshwater ecosystems are becoming a useful and important tool to develop scenarios for present and future changes, climatological observations and measurement should be included in the models in order to integrate these climatological events in the interpretation of functioning of lakes and reservoirs (Legendre, 2003).

Climatological stations today are relatively cheap and reliable. The installation of these instruments at the site level (lake, river and reservoirs) coupled with satellite images of the climate situation and information on general regional trends of climate evolution during the limnological studies should be a powerful tool to anticipate changes and promote a better interpretation of limnological phenomena, such as thermal and chemical stratification and biological responses, for example, phytoplankton and zooplankton succession, primary productivity and the dynamics of biogeochemical cycles (Straskraba, 1993).

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