
Patterning Holocene lake dynamics and detecting human impacts as far back as Prehistory: palaeoecological and data mining key tools for eutrophic lake management

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Résumé

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Recent research has highlighted that the overloading of water bodies with nutrients is a widespread environmental problem, which leads to ecological disturbances, public health problems and erosion of ecosystem services. Feedbacks to society are expected and restoration of eutrophic freshwaters is an environmental top-priority.

In the Chaîne des Puys (Auvergne, France), lake systems such as the hypereutrophic lake Aydat (837 m a.s.l.), suffering from recurrent cyanobacterial blooms, are under increasing stress from anthropogenic impacts, and vulnerable to the Earth's changing climate. The registration of this area at the UNESCO's world heritage list is subject to the formulation of viable mitigation and conservation strategies guaranteeing both the environmental quality of freshwaters systems and the socio-economic development, vital for this rural territory.

Current management options of lake Aydat aim at reducing present-day nutrient inputs. But the current ecological status of this lake is also determined by the legacy of long-term cumulative impacts caused by natural and anthropogenic stressors over the seven last millennia. Palaeoecological research was thus undertaken at a high temporal resolution in order to analyse the natural and anthropogenic modifications of its catchment, which induced disturbances on lake Aydat system. A careful selection of proxy bioindicators (pollen, non-pollen palynomorphs, diatoms) were combined in an innovative approach of time-constrained data mining (MOBI-PALEO: <http://mobipaleo.univ-bpclermont.fr/>) in order to characterize sets of specific and multi-variate indicators of the lake Aydat states and trajectory through time. This research aims to address more specifically:

- (1) the baseline conditions of the lake system, prevailing prior to extensive human impact;
- (2) the pace, direction, magnitude and reversibility of aquatic transitions;
- (3) the apportionment between natural and anthropogenic drivers;
- (4) the timing and nature of human impacts which are complex and variable;
- (5) the model of past lake behaviour and sensitivity assessment, useful for directing feasible management interventions.