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High-resolution multi-proxy reconstruction of Lake Ighiel (Western Carpathians, Romania): processes and controlling factors of lacustrine dynamics during the mid and late Holocene

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Concerns about current and prospective environmental change have increased the interest in past climate variability and its impact on the bio-hydro-atmosphere and human society. Acting as high-resolution terrestrial archives, lacustrine sediments are the result of the complex interaction between internal and external forcing and an important tool in efforts to resolve questions related to the palaeoclimatic and palaeoenvironmental conditions of the recent past.

Here we discuss a new, high-resolution sedimentary record from the Romanian Carpathians (central-eastern Europe). Lake Ighiel (46˚10'50"N, 23˚22'00"E) is a small lake located in a mid-altitude mountain belt (Trascau Mountains) at an altitude of 924 m (lake maximum depth 9 m; catchment area 487 ha). We employ detailed ^{210}Pb and ^{14}C dating coupled with high-resolution X-ray fluorescence scanning (μ-XRF) measurements, long-core sedimentary logging, environmental magnetic proxies (susceptibility, natural and induced remanences) in an attempt to trace the 6000 years evolution of lake-catchment system. More specifically, we discuss: i) the temporal evolution of the main sedimentation phases of the lake based on sedimentological, geochemical and magnetic proxies; ii) the amplitude and interplay of processes (natural and/or anthropogenic) controlling the depositional environment through time; iii) assess the contribution of each controlling factors and reconstruct the evolution of lacustrine system and palaeoclimate forcing using multivariate statistics. The sedimentary record can be divided into six phases based on alternating high and low detrital fluxes, oscillating lacustrine productivity and redox conditions. A series of detrital events (5200; 4800; 5400; 5250; 4500; 4050; 3800; 3500; 3250; 3050; 2650; 2350; 2250; 1400; 1100; 500; 100 cal yr BP) were identified by microfacies analyses and X-ray fluorescence scanning (μ-XRF) analysis. These events are reflected in most of the parameters and appear synchronous with climatically induced forcing such as increased regional precipitation and decreased total solar radiation. These changes are superimposed on clear anthropogenic derived contributions reflecting natural and mineral resource exploitation during the early metal ages, the Roman and Medieval periods, as well as during the recent period.

The comparison of the our proxies with similarly resolved records from central-eastern Europe highlight the potential of Lake Ighiel as a record of palaeoclimatic and palaeohydrological conditions in a region still lacking high-resolution multi-proxy palaeoenvironmental archives.

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