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Paleoclimatic reconstruction studies in lake sediments: major proxies, technical evolution and database

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Paleoclimate studies in different temporal and spatial scales provide important information on long-term statistics required to test hypotheses about climate changes. Comprehensive high-quality data sets and a solid understanding of dynamic climate processes in different temporal variations are essential to evaluate the sensitivity of the climatic system. Moreover, these data sets and dynamic analyses can help to distinguish the variability of natural and anthropogenic factors, reducing uncertainties about the magnitude and impact of future global climate changes. A common way to conduct paleoclimatic studies is through high resolution multiproxy lake sediments. Lake environments have been increasingly used in recent years to infer past fluctuations in climate, and many studies that comprise different locations and timescales demonstrate the great value of lakes as paleoclimatic archives. Because lake sediments are continental indicators sensitive to environmental changes, they can be used to reconstruct climate parameters, such as past rainfall, area management and environmental or limnological lake conditions. Changes of rainfall quantity can be recorded in lake archives by the variation of sedimentary input, which is related to changes in drainage basin and erosion rate. Beside of sedimentary input, lake sediments also exhibit physical and chemical changes in water bodies which, in turn, induce transformation in geochemical composition caused by changes in runoff or other allocated components. Thus, there is a variation in the proxies used in the studies, both in relation to the type of proxy used and the relationship used. In this context, we made a compilation of paleoclimatic studies on lake sediments (about 350 lakes), focusing on the main proxies used. Our study shows that there has been a change in the major proxies used along decades and with the emergence of new analysis techniques. In addition, we notice that lake characteristics (e.g., shape, geomorphological context, formation, etc.) have directly influence the proxies used and the quality of the information obtained. This compilation provides a database with an analysis of several lakes around the world, which can help future works and enable the identification of commonly used proxies according to the different variables that should be used, promoting more objective analyzes.