Geochemical records of Qionghai Lake sediments in southwest China linked to late Quateranry climate changes

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Major element and rare earth element (REE) compositions of the Qionghai Lake sediments in Sichuan Province, southwest China were analyzed, aiming to provide information on sediment source discrimination and history of chemical weathering intensities and its responses to variations of southwest summer monsoon and paleoclimate conditions. As revealed by the A-CN-K diagram and other provenance proxies including TiO2/Zr ratio, La/Sc vs. Th/Co, La-Th-SC, Th/Sc vs. Zr/Sc and La/Th vs. Hf diagrams, as well as the REE characteristics, the source of Qionghai Lake sediments were felsic rocks. Additionally, these sediments were mainly subjected to small changes in provenance, sedimentary sorting and recycling, and diagenesis after deposition and/or metasomatism, indicating original signals were maintained on the intensity of chemical weathering of source area and its associations with southwest summer monsoon and global/regional paleoclimate conditions. The chemical weathering intensities inferred from CIA (chemical index of alteration) values have significantly fluctuated during the past 30 cal ka BP, reflecting three stages of paleoclimate evolution, which is principally dominated by the monsoonal climate conditions in the study area. Furthermore, the CIA values behaved significantly during the typical warm and cold climate events including the Last Glacial Maximum, H1 cold event, Younger Dryas, 8.2 ka cold event and Holocene Climatic Optimum, and generally exhibited an increasing trend in amplitude with decreasing age of these climatic phases, in concert with the climate shifting from cold and dry to warm and humid conditions. Sequential variations of the CIA values during the past 30 cal ka BP may reflect changing chemical weathering processes, in responses to the varying intensities of southwest summer monsoon and the climate conditions forced by the Northern Hemisphere solar insolation.