CLAY MINERALS IN QUATERNARY LAKE SEDIMENTS RESPOND TO CLIMATIC CHANGE

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The clay minerals found in modern and Quaternary lake sediments are products of several major processes:the lithology of the parent material will dictate the initial composition of the principal clay minerals; weathering rates will the subsequent evolution of the clay-mineral assemblages in soil profiles; and redistribution and segregation during transport may change the abundance of mineral types before they reach the lake basin. Additionally, clay minerals react with lake water or interstitial water and change their characteristics post-depositionally. Despite these complications, the clay minerals in many Quaternary lacustrine deposits can be used to indicate prevailing climatic conditions. Examples of successful paleoclimatic applications include Lake Baikal in Siberia, where the relative abundance and composition of interstratified illite-smectite mirrors the changes in global ice volume. Changes in weathering conditions were also found in the clay minerals in cores from lakes in the Venezuelan Andes. In Laguna Los Lirios, a major change in clay-mineral assemblage occurs at the time of resumed deglaciation in this area. In nearby Lago de Urao, the abundance of illite-smectite also undergoes periodic fluctuations, which may be caused by shifts in the hydrological balance of the surrounding watershed. The clay minerals in Rogers Dry Lake, California show similar regular alternations. Despite the differences among these lake basins, all show little geographic variability in sedimentary clay minerals, and the water composition ranges from fresh to only mildly alkaline, which minimizes short-term diagenetic reactions. Lakes with these characteristics are the most suitable for a paleoclimatic interpretation of the clay minerals.