
Origin of Cretaceous and Oligocene Kaolinites from the Iwaizumi Clay Deposit, Iwate, Northeastern Japan

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Abstract: Hydrogen- ($\delta D = -106$ to -97‰) and oxygen- ($\delta^{18}O = +14.0$ to $+16.6\text{‰}$) isotope compositions of kaolinite from late Cretaceous and Oligocene deposits at Iwaizumi, northeastern Japan, indicate that these clays formed by weathering of volcanic parent rocks, rather than during hydrothermal ($>100^\circ\text{C}$) alteration. The Iwaizumi kaolinites also are depleted of D and ^{18}O relative to kaolinite formed during modern, tropical weathering, suggesting that the kaolinite developed under cool or cool-temperate conditions. The oxygen-isotope compositions of the kaolinite increase slightly upward through the deposits, perhaps implying a modest increase in temperature from late Cretaceous to Oligocene time. The δD and $\delta^{18}O$ results for kaolinite from the Oligocene deposits closely follow the kaolinite weathering line. However, a small but systematic deviation from this line for the Cretaceous kaolinites is most simply explained by post-formational, hydrogen-isotope exchange between these clays and downward percolating meteoric water.

Key Words: Climate • Cretaceous • Hydrogen-isotopes • Iwate • Japan • Kaolinite • Oligocene • Oxygen-isotopes

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