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# Clay Mineral Diagenesis and Thermal History of the Thonex Well, Western Swiss Molasse Basin

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**Abstract:** Results are presented of a diagenetic study from the 1300 m thick Oligocene Molasse deposits penetrated by the Thônex geothermal exploration well (Geneva, Switzerland). The x-ray diffraction (XRD) studies of fine-grained rocks indicate the following diagenetic changes: a decrease of illite/smectite (US) expandability from approximately 90% to 30% with depth, a decrease of the amount of US in the clay mineral fraction, and the appearance of corrensite at depths >750 m. The transition from random US to ordered I/S occurs at the base of the Thônex well (1200 to 1300 m) and is associated with a coal rank of about 0.7% Rr (mean random vitrinite reflectance) corresponding to paleotemperatures of 110 to 115 ° C. Corrensite appears at a vitrinite reflectance value of 0.6% Rr and a corresponding paleotemperature of 100 ° C. The amount of post-Molasse erosion is estimated to be approximately 2 km. Thermal history modeling of the Thônex well suggests maximum paleotemperatures of 80 to 115 ° C and an average paleogeothermal gradient of 27 ° C/km during Late Miocene maximum burial conditions.

**Key Words:** Chlorite/Smectite • Corrensite • Diagenesis • Erosion estimate • Illite/Smectite • Paleotemperatures • Thermal modeling • Vitrinite reflectance • XRD

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