
Chemical Weathering of Crystalline Rocks in the Catchment Area of Acidic Ticino Lakes, Switzerland

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Abstract: Atmospheric acidic deposition introduces hydrogen ions to terrestrial and aquatic ecosystems, which become partially neutralized by chemical weathering. In the southern Alps of Switzerland, small catchments containing little or no soil and lacking carbonate minerals represent sensitive hydrological settings in which the relationship between alteration of granitic gneiss by acid deposition and the resulting composition of lake waters can be studied. Transmission and scanning electron microscopy, coupled with X-ray powder diffraction of lake sediments from such areas showed mainly unaltered minerals from parent rocks and no secondary silicate minerals. Element mapping indicated noncrystalline aluminum hydroxide as a product of the chemical weathering of silicates. Noncrystalline iron hydroxide was also observed. Mass balance calculations and the stoichiometry of suitable chemical reactions representing the weathering processes were used to derive a plausible reaction sequence on the interaction of the predominant reactive rock minerals with acid precipitation that accounted for the measured chemical composition of the acid lakes.

Key Words: Acid precipitation • Aluminum hydroxide • Gneiss • Iron hydroxide • Weathering

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