Weathering of rocks, denudation of continental surfaces, hydrodynamics of drainage basins, and estimates of fluxes of chemical elements delivered annually to the oceans by the rivers are among central themes in many geochemical studies of continental surface and shallow subsurface waters. Oxygen and H stable isotope geochemistry has long proved very useful in addressing problems in hydrologic studies. But only recently analyses of some commonly occurring natural radiogenic isotopes have become popular means of investigating hydrodynamics of surface and shallow ground waters and modes of present-day continental denudation, although these isotopes had been known as very useful natural tracers for studies of origins of rocks and minerals. Radiogenic isotopic characteristics of rocks and minerals are widely varied due to their varied

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ages and parent to daughter isotope ratios. Natural hydrologic systems evolve through complex mineral-water interactions. Hence common radiogenic isotopes may serve as tracers in defining weathering of rocks, water provenance in drainage basins and average compositions of annually delivered components to the oceans.

Recent literature on radiogenic isotopes in surface and shallow subsurface waters is heavily slanted toward Sr isotopic measurements. This bias is primarily a reflection of the commonly high abundances of Sr in natural waters. Interest in Nd isotopic compositions of waters is growing, but nearly a vacuum exists in the field of Pb isotope geochemistry. The aim of this chapter is to discuss the available isotope data of dissolved Sr and Nd in surface and shallow subsurface waters. As run-off and shallow ground waters are intimately connected, these two water types have been considered as one hydrologic unit in the discussion.

**STRONTIUM ISOTOPE COMPOSITIONS OF SURFACE WATERS**

Strontium contents in surface waters are widely varied between 0.02 and 2 mg/l and average about 0.06 mg/l (Alexander et al., 1954; Nichols and McNall, 1957; Faure et al., 1967; Mueller, 1969; Vernet et al., 1971; Harmeson et al., 1973; Goldstein and Jacobsen, 1987; Palmer and Edmond, 1989). Values as high as 60 mg/l of Sr are known, but these high values have been related to dissolution of Sr-enriched carbonate and sulfate minerals in the drainage basins (Feulner and Hubble, 1960; Skougstad and Horr, 1963; Carpenter and Miller, 1969). By contrast, Rb contents in surface waters are generally low, ranging between 0.0002 and 0.02 mg/l and averaging about 0.003 mg/l. Rb/Sr ratios commonly vary from 0.003 to 0.06, although values as high as 0.70 were obtained in some instances.

**Isotopic Compositions of Strontium in Rivers and Lakes**

The study of Faure et al. (1963), reporting on the Sr isotopic