

Accretion rates of ferromanganese nodules from Oneida Lake, New York, determined by Ra-226 dating, average a few millimetres per 1,000 years. These nodules do not grow continuously but exhibit episodic growth, which is characterized by periods of rapid growth (about 1 mm per 100 years) alternating with growth hiatuses that may last more than 1,000 years. Normal lacustrine sedimentation rates (about 1 mm per year, determined by Pb-210 dating) prevail in much of the lake. However, in those areas where nodules are present, either sediments are not accumulating at present or they are so highly turbated that sedimentation rates cannot be measured by the Pb-210 method. We conclude that the Oneida Lake nodules grow rapidly while at the sediment-water interface, but stop growing when they become covered with sediment. Disturbance of the sediment may give the nodules a fresh exposure to lake waters and allow active growth to continue.

GEOCHEMISTRY OF SELENIUM IN GROUND WATER NEAR GOLDEN,
JEFFERSON COUNTY, COLORADO

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Water from 56 domestic wells in the vicinity of Golden, Colo., contained as much as 450 micrograms per litre selenium; water from 34 of the wells exceeded the U.S. Public Health Service drinking-water standard of 10 micrograms per litre. Sources of selenium are continental sedimentary rocks of the Arapahoe and Laramie Formations, of Cretaceous age. As much as 10.7 milligrams per kilogram selenium were found in well cuttings from these formations. Original deposition of selenium may have been controlled, in part, by relatively high concentrations of organic carbon and reduced nitrogen species present in the sediments. Selenium concentrations are areally discontinuous in the ground water. In wells with high selenium concentrations (greater than 40 micrograms per litre), positive correlations, in decreasing magnitude, exist between selenium and iron, sodium, chloride, dissolved solids, and calcium. Negative correlations, in decreasing magnitude, were noted between selenium and fluoride, nitrate, and strontium in these same wells.

Ion-exchange experiments indicate that the dissolved selenium is present as an inorganic selenite (SeO_3) or selenate (SeO_4). Solubility of the selenium seems to be largely controlled by adsorption on colloidal particles of hydrated iron oxide.

Water from wells with high selenium concentrations had anomalously high gross alpha levels (80 to 160 micrograms per litre, as equivalent uranium). Available data indicate similarities between the geochemical environment of the study area and environments associated with uranium roll-front deposits.

A MULTI-TECHNIQUE APPROACH TO THE EVALUATION OF SUBSURFACE HYDROLOGIC
AND HYDROCHEMICAL CONDITIONS AT A PROPOSED STRIP MINE AND GASIFICATION
PLANT

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In an environmental impact assessment of a proposed strip mine and lignite gasification plant in western North Dakota, an integrated multi-technique approach was used in an evaluation of the subsurface hydrological and hydrochemical conditions. During this one-year investigation the following activities were undertaken, with single activity periods during the initial few months, leading to multi-activity periods