CHAPTER VI

STRONTIUM IN FLORIDA WATERS

by

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Heretofore analyses for strontium have apparently not been made in Florida waters. Table No. 3 includes some analyses that have recently been made of several representative types of waters in North Central Florida. These analyses have been made by evaporation of 4 liters of the water, precipitation of the calcium and strontium as oxalates, ashing the precipitates to carbonate, and an estimation of the elements in a flame photometer. The accuracy is 5 to 15%.

Strontium is associated with calcium in nature but there is only about one atom of strontium for every 1000 atoms of calcium. Although strontium and calcium are chemically related, most processes have an action on strontium that differs slightly from their action on calcium. The analyses of strontium are reported in Table 3 as ratios of strontium to calcium because the ratio of the elements is a clue to the source of the elements. The ratio can be compared with the ratio in source rocks.

The ocean has a Sr/Ca ratio of 9.23 atoms/1000 atoms,[6] whereas most surface freshwaters have much smaller ratios as in Sweden and eastern United States. On the other hand lakes in deserts, and ground waters everywhere have a high Sr/Ca ratio like that of the ocean.

Although the Sr/Ca ratio of Florida waters is greatest in ground waters and lowest in lakes as in other regions, all phases, especially streams, contain more strontium than other regions studied. Probably this is in part due to the large amount of ground water being contributed to Florida streams.

High Sr/Ca ratios in ground waters apparently result from a different rate of solution for the two elements. Water percolating through strata picks up strontium faster than calcium. The Sr/Ca ratio in the water rises while the Sr/Ca ratio of the rock strata is lowered. However, waters recovered close to their point of entry seem to have Sr/Ca ratios more nearly equal to the surface rocks of the area.

Attempts have been made to identify the origin of water by the ratios of chemical elements. Thus upon finding elemental ratios in a well like those in the ocean one might infer that the water was circulating in from the ocean or had been imprisoned for years in deep beds. Unfortunately, this is a dangerous conclusion for it is thought that fresh waters percolating through sedimentary strata tend to pick up the elements found in the ocean in the largest amounts, such as sodium and strontium. Notice the high Sr/Ca ratio in the spring waters containing much sodium in Table 3. The Sr/Ca ratios of Homosassa, Salt, and other springs are high but not identical with the 9.23 atoms/1000 in the sea. It is possible to account for the composition of these waters without postulating "Fossil water" or connection with sea. Salts distributed throughout the strata or in old salt beds would be expected to produce upon solution a high, but varying Sr/Ca ratio. If sea water is involved, it has been much modified or mixed with other waters. These considerations may be important in understanding salty waters in oil fields as well as origin of salty springs.

In lakes the Sr/Ca ratio tends to be slightly higher in seepage lakes than in drainage lakes because the calcium is low in the seepage lakes. The strontium in such cases may come from rainwaters and minerals that have high Sr/Ca ratios rather than from the limestones, many of which have fairly low Sr/Ca ratios.

The mineral Celestite (strontium sulfate) has rarely if ever been reported from Florida. It is a paradox that the mineral has not been found in a region whose waters have an unusually high Sr/Ca ratio. Apparently the high rainfall keeps the concentrations of sulfate too dilute for mineral formation.

Strontium is no more toxic than calcium and never approaches harmful concentrations.
