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Sea Salt, Erosion, and Sediments

Salt in the Sea

Many processes continually add salts and other chemicals to the waters of the earth's oceans and seas, particularly weathering and erosion of land surfaces, and river transportation of chemicals and sediments. However, these salts aren't as readily removed from the sea, resulting in a steady increase in the sea's saltiness. How much salt is in the sea and the rates at which salts are added into and removed from the sea can be calculated from appropriate measurements. Assuming how these rates varied in the past and how much salt was in the sea originally, it is possible to calculate a maximum age for the sea. This method of estimating the age of the earth was first proposed by Halley in 1715.[1] Subsequently, Joly estimated that the oceans were no more than 80-90 million years old.[2] Obviously, even this estimate is far too young for uniformitarian geologists and evolutionists, who believe that the oceans are at least three billion years old.

The most common chemicals in ocean water are sodium and chlorine, which are the constituents of common table salt (sodium chloride). Measurements reveal that every kilogram of seawater contains about 10.8 grams of dissolved sodium. Because the ocean contains 1,370 million cubic kilometers of water, there is a total of 14,700 trillion tons of sodium in the oceans. It is thus easy to make a calculation of the age of the oceans by analyzing data from conventional geological sources of the input and output rates of sodium.[3]

Every year, rivers and other sources dump about 457 million tons of sodium

1 E. Halley, 1715, A short account of the saltness of the ocean, and of the several lakes that emit no rivers; with a proposal, by help thereof, to discover the age of the world, *Philosophical Transactions of the Royal Society of London*, 29: 296-300.

2 J. Joly, 1899, An estimate of the geological age of the earth, *Science Transactions of the Royal Dublin Society, New Series*, 7 (3); Reprinted in *Annual Report of the Smithsonian Institution*, June 30, 1899, 247-288.

3 S. A. Austin and D. R. Humphreys, 1990, The sea's missing salt: A dilemma for evolutionists, in *Proceedings of the Second International Conference on Creationism*, vol. 2, R. E. Walsh and C. L. Brooks, eds., Pittsburgh, PA: Creation Science Fellowship, 17-33.

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into the oceans[4] For example, water on the land leaches sodium from weathered minerals, and that sodium is carried into the ocean by rivers. Some salt is also supplied by water flowing through the ground directly into the sea. This water often has a high salt concentration. Furthermore, ocean-floor sediments release sodium into the ocean water, as do hot springs (hydrothermal vents) on the ocean floor. Volcanic dust also contributes some sodium. Even if sodium input to the oceans in the past was less, using assumptions for inflow rates that are most generous to evolutionists, the minimum possible amount in the past would have been 356 million tons of sodium input per year.

However, the rate of sodium output is far less than the input. In fact, only about 122 million tons of sodium, or 27 percent of the sodium input, manages to leave the sea each year.[5] The major process that removes sodium from the sea is salt spray. Some sodium is lost from the ocean when water is trapped in pores and sediments on the ocean floor. Another major process of sodium loss is ion exchange, when clays absorb sodium in exchange for calcium that is released into the ocean water. There are also minerals with crystal structures that absorb sodium from the ocean water. The maximum possible amount of sodium that leaves the oceans every year, even if assumptions that are most generous to evolutionists are used in the calculation, is 206 million tons per year.

All observations suggest that all of the incoming sodium that isn't returned to the land simply accumulates in the oceans. Thus, if the oceans originally contained no sodium, then the sodium in them today would have accumulated in less than 42 million years at today's input and output rates. Even this maximum age for the oceans is far less than the uniformitarian age of at least 3 billion years. The usual response from uniformitarian evolutionists is that this discrepancy is due to past sodium inputs being much less and outputs being much greater. However, if input and output rates are used in the calculations that are most generous to evolutionary scenarios, then the estimated maximum age is still only 62 million years. Nevertheless, a more recent study shows that salt is entering the oceans even faster than previously thought, because groundwater directly discharging to the sea is as much as 40 percent of the discharge via river flow, much greater than the previously estimated 10 percent.[6] Furthermore, additional calculations for many other seawater elements yield much younger ages for the oceans.[7] Therefore, it is quite obvious that even 42 million years may be a generous maximum age for the

4 M. Meybeck, 1979, Concentrations des eaux fluvials en majeurs et apports en solution aux oceans, *Revue de Géologie Dynamique et de Géographie Physique*, 21 (3): 215-246; F. L. Sayles, and P. C. Mangelsdorf, 1979, Cation-exchange characteristics of Amazon with a suspended sediment and its reaction with seawater, *Geochimica et Cosmochimica Acta*, 43: 767-779.

5 F. L. Sayles and P. C. Mangelsdorf, 1979; S. A. Austin and D. R. Humphreys, 1990.

6 W. S. Moore, 1996, Large groundwater inputs to coastal waters revealed by ^{226}Ra enrichments, *Nature*, 380 (6575): 612-614; T. M. Church, 1996, An underground route for the water cycle, *Nature*, 380 (6575): 579-580.

7 S. Nevins, 1973, Evolution: The Ocean Says NO!, *Acts & Facts*, 2 (11).

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oceans using all these calculations.

However, it's important to stress that this is not the actual age of the oceans, but only a maximum age based on the assumption that there was no salt originally dissolved in the oceans. On the other hand, in the biblical model of earth history, there can be no doubt that God created the oceans initially containing some saltiness, in order that saltwater fish could live within them. Furthermore, during the Flood cataclysm much more salt would have found its way into the oceans due to all the erosion, sedimentation, and volcanism. During this time, the sodium input would have been an order of magnitude or more higher than current input rates. Furthermore, there would have been a much higher input rate of salts as the Flood waters retreated and eroded the current land surface. Thus, the true age of the oceans, using realistic assumptions governed by the biblical framework of earth history, would more likely be only thousands of years.

Erosion of Continents

The earth's land surfaces are constantly being weathered and eroded by the water falling on them as rain and flowing over them. Soil, rock, and mineral grains are washed into rivers that transport these as sediments out to the oceans. The rate at which sediments have been transported to, and deposited in, the ocean basins can easily be estimated by measuring the volume of sediments rivers carry at their mouths. River sediment measurements can also be used to calculate the rate at which rivers are eroding the land surfaces they drain. Such measurements show that some rivers are eroding their basins at a rate of 35 inches (900 mm) or more in height per thousand years, while others erode only 0.04 inches (1 mm) per thousand years.[8] Thus, the average height reduction for all the continents across the earth's surface is estimated to be about 2.4 inches (61 mm) per thousand years.

This average rate of land erosion might seem quite slow, but it needs to be seen from the perspective of the uniformitarian geologic timescale, and the current thinking that there has been exposed land surfaces available for erosion for 3.5 billion years.[9] As has already been pointed out, using an estimated average erosion rate of 61 mm per thousand years, the North American continent would be eroded flat to sea level in "a mere 10 million years."[10] Even if the slowest erosion rate of

8 J. N. Holleman, 1968, The sediment yield of major rivers of the world, *Water Resources Research*, 4: 737-747; E. W. Sparks, 1986, Geomorphology, in *Geographies for Advanced Study*, S. H. Beaver, ed., London and New York: Longman Group, 509-510; J. D. Milliman and J. P. M. Syvitski, 1992, Geomorphic/tectonic control of sediment discharge to the ocean: The importance of small mountainous rivers, *Journal of Geology*, 100: 525-544; A. Roth, 1998, *Origins: Linking Science and Scripture*, Hagerstown, MD: Review and Herald Publishing, 264.

9 R. Buick, J. R. Thornett, N. J. McNaughton, J. B. Smith, M. E. Barley and M. Savage, 1995, Record of emergent continental crust ≈3.5 billion years ago in the Pilbara Craton of Australia, *Nature*, 375: 574-577.

10 S. Judson and D. F. Ritter, 1964, Rates of regional denudation in the United States, *Journal of*

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