

Terrigenous sedimentary material as the source of dissolved calcium in the ocean

A.V. SAVENKO* AND V.S. SAVENKO

Moscow M.V. Lomonosov State University, 119991, Moscow,
Russia

(*correspondence: Alla_Savenko@rambler.ru)

It was shown that calcium lixiviation from the solid phase at the interaction between terrigenous pyroclastic and seawater is carried out. However this process cannot compensate the deficiency of calcium following from balance of carbon in the ocean. One more source of dissolved calcium in the ocean maybe terrigenous sedimentary material which immobilized CO₂ as a result of silicates carbonatization at stage of diagenesis in conditions of high carbonate alkalinity of pore waters.

The interaction between terrigenous material and pore waters of marine and ocean deposits in a range of carbonate alkalinity from 8.4 to 30.2 meq/l at the absence of supersaturation on CaCO₃ is experimentally studied for check of this hypothesis. Samples used in experiments are the oxidized lake mud and rock-forming silicates with high calcium content (9.65 and 10.68% in labradorite and hornblende, respectively).

Experimental results have shown, that calcium lixiviation intensity does not depend on the saturation degree of solutions on CaCO₃.

It is established that the interaction with seawater causes mobilization about 2.3 mg Ca²⁺ from 1 g of terrigenous deposit that is equivalent to passing into solution of 37 million ton Ca per year in recalculation on the total mass of solid matter continental runoff which equal, according to last assessments, 16 billion ton per year. This value should be considered as obviously underestimated because advance of the reaction front in solid phase occurs extremely slowly and superficial layers of grains have time to react only at the compelled small duration of the experiments. The assessment of input of dissolved calcium into the ocean due to its release from terrigenous sedimentary material in view of natural observation results on halmyrolysis speed of rocks with low content of iron (II) should be increased at least up to 250–440 million ton Ca per year. These values in 3–5 times exceed quantity of calcium which passes in the dissolved forms as a result of silicate rocks weathering on a land (83 million ton per year).