



Centaurs and icy planetary body impacts on ocean volumes and chemistry through time

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The number of icy bodies reported in the solar system has increased dramatically in the past few years suggesting their potential importance in Earth history via impacts. Wilde (1987) proposed that icy bodies may be a significant source of the oceans during the later stages of accretion. Wilde and Quinby-Hunt (1997) discussed the chemical consequences of impacts of ice-volatile bolides of various compositions. The 'rain' of icy bodies hitting the Earth throughout time suggests implications for the following Earth processes.

PLATE TECTONICS AND THE EVOLUTION OF GRANITIC CRUST.

Earliest sediments thus found are greenstones, basically basaltic sediments suggesting lack of a granite source. Without a granite-oceanic basaltic crustal difference, early surface terrains would be limited to a relatively low relief consisting of abyssal plains, seamounts, and the ridge-rise system. Incrementally the impact of icy objects would provide fluid for the then shallow ocean basins. During subduction at depth the pressure and temperature plus fluids could hydrate the basaltic crust producing granitic compositions. With time the production of granite could produce the continental blocks raising the present freeboard of the continents and the relief of the ocean basins. Chondritic compositions are too water poor to support Rubey's (1951) theory that volatile components such as water largely come from expression from the mantle.

SEISMIC STRATIGRAPHY AND TIME SCALE OF ICY IMPACTS.

Third-order sea level rises of durations of a few million years can not be related to

known glacio-eustatic climatic events. These sea level rises may be the result of impacts of icy Centaur-like bodies briefly adding to the ocean volume and eventually being absorbed in the granitizing process of subduction. The frequency of the third-order events could record the timing of icy impacts of significant size.

VARIATIONS IN OCEANIC COMPOSITION

Berner (2004) and others have discussed changes in the bulk composition of the oceans during Phanerozoic time. A potential contribution to such variations would be the introduction of icy planetary bodies with the variation a function of bolide composition. Such events may be seen in the delta spike of C and S isotope values against the background of terrestrial isotopic processes.

TESTS OF CONJECTURES

Upcoming missions to analyze the composition of comets and other icy bodies, thought to be remnants of original solar system building blocks, will be useful in discerning the contributions of icy extraterrestrial bodies to on-going Earth processes.

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