Geophysical Research Abstracts,
Vol. 11, EGU2009-4935, 2009
EGU General Assembly 2009

Continental fragmentation and the strontium isotopic evolution of seawater.

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The time evolution of the strontium isotopic composition of seawater over the last 600 million years has the form of an asymmetric trough. The values are highest in the Cambrian and recent and lowest in the Jurassic. Superimposed on this trend are a number of smaller oscillations. The mechanisms responsible for these global isotopic fluctuations are subject to much debates.
In order to get a quantitative picture of the changing paleogeography, we have characterized land-ocean distributions over Late Proterozoic to Phanerozoic times from measurement of perimeters and areas of continental fragments, based on paleomagnetic reconstructions. These measurements served to calculate geophysically constrainted breakup and scatter indexes of continental land masses from 0 to 1100 Ma (Cogne and Humler, 2008).
Both parameters (strontium isotopic ratios of seawater and continental fragmentation indexes) are obviously highly correlated during the last 600 Ma. Low continental dispersion (that is large continental land masses) are associated with low seawater strontium isotopic ratios (that is when the continental inputs to oceans are minimum) and high continental dispersion (that is relatively small and widely distributed continents) with high seawater strontium isotopic ratios (that is when the continental input to ocean is maximum). Importantly, this first order evolution appears to conflict with the common idea of mountains erosion as a source for radiogenic strontium to oceans because high strontium isotopic ratios in seawater correspond to period of maximum dispersion of continents and not with period of general collisions. At first glance, it would seem that continental erosion increases with the degree of continental dispersion.

Models showing that continental precipitation increases when continental masses are smaller and more widely dispersed and/or the length of continental margins available for rivers to carry continental material to oceans are thus favoured in order to resolve the paradox.