Re-Os systematics of Archean spherule layers from the Barberton Greenstone Belt

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We have measured Re and Os abundances and Os isotopic composition of samples of the spherule layers S1 (Onverwacht Group) and S2, S3 and S4 (Fig Tree Group) in the Barberton Greenstone Belt, Mpumalanga, South Africa. The origin of these spherule layers is probably impact-related (Lowe et al., 1989, Kyte et al., 1999). All measurements were done on a *Nu Instruments* MC-ICP-MS, using the direct evaporation technique of Schoenberg et al. (2000) for Os.

Os concentrations in S1 and S2 are elevated (0.2-1 ppb) whereas those in S3 and S4 are very high 50-200 ppb). Variabilities and ranges agree with those found for Ir (Lowe et al., 1989). The samples from S1 and S2 have $^{187}Os/^{188}Os$ ratios between 0.16 and 0.49 and superchondritic apparent initial $^{187}Os/^{188}Os$ ratios (0.13-0.23) which lack reliability because of possible subrecent Re loss. Those from S3 and S4 have subchondritic $^{187}Os/^{188}Os$ ratios (0.1069 to 0.1193) and variable but subchondritic Re/Os ratios. With the exception of one sample for which a recent extreme Re loss is assumed, the initial $^{187}Os/^{188}Os$ ratios at 3.4–3.2 Ga are also sligthly but significantly subchondritic (0.1011 to 0.1038; chondrites at 3.4-3.2 Ga ≈ 0.105). The combination of very high Os concentrations (up to > 40% chondritic) and robust subchondritic $^{187}Os/^{188}Os$ ratios in these beds suggests that the bolides may have consisted of, or included, core material. Further, no extreme Re/Os fractionation occurred during spherule bed formation, in agreement with the notion of a reducing atmosphere.

As similar spherule layers are found in the Pilbara Greenstone Belt (Lowe and Byerly, 1986), Os studies could aid correlations between the Kaapvaal and Pilbara cratons.

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Novel Metalloproteins in Marine Phytoplankton

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Although most of the ocean surface is characterized by very low concentrations of major plant nutrients, marine phytoplankton are responsible for nearly half of primary production on Earth. We know little of the biochemistry of these organisms and do not understand how they can grow rapidly when the concentrations of trace metals that are essential cofactors in the acquisition of nutrients are also extremely low in surface seawater. It appears that marine microalgae have evolved unusual strategies to acquire essential nutrients, including the synthesis of metalloenzymes with no homology to their counterparts in other organisms. Some of these enzymes, such as carbonic anhydrase or alkaline phosphatase, possess unusual metal cofactors, cobalt or cadmium being used for catalysis instead of zinc. The enzymatic role of these exotic metals is key to their biogeochemical cycling in the oceans and to the ecological success of certain families of marine primary producers.