MAGNESIUM ISOTOPE EVIDENCE FOR ENHANCED CRUSTAL REWORKING IN EARLIEST CAMBRIAN SEDIMENTS – A CASE STUDY FROM KAZAKHSTAN

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The initiation of the Phanerozoic eon was accompanied by a unique (bio-)geochemical revolution in Earth´s history, leading to the rise of metazoan life. Concomitant geodynamic or tectonic changes, such as continent re-organization and collision, is associated with enhanced crustal reworking, affecting the weathering of rocks and consequently the oceanic nutrient balance. Further, changing global ocean currents caused mixing of water masses. A causal relationship between these geological events and timing of the biologic turnovers, however, remains unclear. In this study, we investigated phosphatic shallow water sedimentary rocks from Kazakhstan, key deposits from the Precambrian-Cambrian (Pc-C) boundary. We show that a rapid increase (ca. 1 Myr) in the stable Mg isotope composition within these phosphorites, which we consider representative for ocean chemistry, show co-variations with radiogenic Sr isotope signatures. We interpret this co-variation as a swift and severe response in ocean chemistry to riverine influx from continents, which is directly related to enhanced crustal reworking. Our data strongly suggest that ocean chemistry at the Pc-C boundary, represented through deposits in Kazakhstan, was strongly affected by continent re-organization and subsequent weathering. A rapid recovery of the isotope signatures towards signatures that existed prior to this excursion likely reflects a shift towards ocean-spreading dominated signatures. Thus, a direct link between the coupled positive seawater Sr-Mg isotope excursion to concomitant Gondwana assembly at the Pc-C boundary and the marked change in marine fauna at this time seems plausible.