Beryllium isotopes as tracers of Dead Sea hydrology and the Laschmap geomagnetic excursion

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The content of the cosmogenic isotope 10Be (t1/2= 1.39 Ma) in lacustrine sediments that deposit in lakes with a large watershed is susceptible to both climate and cosmogenic production rate variations. In order to distinguish between these two controls, we measured 10Be and major elements in several sections of the annually laminated sediments of the last glacial Lake Lisan that are composed of detrital sediments and primary (evaporitic) aragonite. The sections were selected to represent different lake configurations (level rise, drop and high-stands) that reflect the regional hydrology and climate and rapid change in the 10Be production rate during the Laschamp geomagnetic excursion. The recycled 10Be was evaluated by measuring the short-lived cosmogenic isotope 7Be (t1/2=53.3d) in modern flood suspended matter, dust and mud cracks. During periods of moderate 10Be production rate variations the 10Be content in the Lisan detrital sediments correlates with lake level and Al+Fe content. During periods of rapid increase in the 10Be production rate, (e.g. the Laschamp excursion) 10Be showed a ~2 fold increase, beyond the above-mentioned correlations (lake levels and Al+Fe contents). This observation suggests that Lake Lisan can serve as a potential high-resolution archive of 10Be production rate variations during periods of geomagnetic excursions. A comparison between 14C and 10Be data in the Lisan Formation shows that the D14C deviation lags the Laschamp induced 10Be peak by ~1000 y.