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Age of the J/K boundary using Re-Os geochronology of black shale from Central Spitsbergen, Svalbard

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Establishing radiometric ages for stages bracketing the J/K boundary has been problematic because extreme faunal provincialism at this time led to different stage names and durations in the Boreal realm (Volgian-Ryazanian) than in the Tethyan realm (Tithonian-Berriasian)[1]. We build on recent ammonite biostratigraphy[2] across the J/K boundary in the Agardhfjellet Formation, Svalbard, adding Re-Os ages for three black shale intervals from two drill cores (DH2 and DH5) located ~7 km apart in Central Spitsbergen. An isochron age of 147.3 ± 7.6 Ma for samples from DH2 (497 m) suggests deposition in the late Volgian rather than Ryazanian. The large age uncertainty is typical near the J/K boundary for this region[3, 4]. Large uncertainties preclude unequivocal linking of biostratigraphic and radiometric ages. Re-Os isochrons for two correlative[5] sections from DH2 at 724 m and DH5 at 658 m yield similar ages of 157.7 ± 2.6 Ma and 160.7 ± 3.3 Ma, respectively. The nominal ages are near the Oxfordian – Kimmeridgian stage boundary (Late Jurassic) and, within uncertainties, confirm Oxfordian-Kimmeridgian deposition. The agreement between these correlative intervals lends credence to the accuracy of the Re-Os age. Biostratigraphic data, however, suggest a somewhat older age[2]. Consistently low $\delta^{34}S$ (ca. -40‰) and low TOC in these intervals suggest a depositional environment connected to open ocean. The near-shore environment for these correlative sections, however, permits scouring and redeposition of sediment (and fossils) that could create the discrepancy between geochronologic and biostratigraphic age determinations. Given that biostratigraphy between the Boreal and Tethyan realms at the J/K boundary is poorly correlated, the radiometric ages provided here advance our confidence in connecting the two realms.

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