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How sensitive are sediment routing systems to tectonics and climate? A comparison of sediment fluxes and depositional volumes in the Corinth rift, Greece, over the past 130 ky

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Sediment supply is a fundamental control on the stratigraphic record. However, a key question is the extent to which tectonics and climate affect sediment fluxes in time and space. To address this question estimates of sediment fluxes must be compared with measured sediment volumes within a closed basin. The Corinth rift in Greece is one of the most actively extending rift basins on Earth, with modern day extension rates of up to 15 mm/yr. The Gulf of Corinth is a closed system and has periodically become a lake during marine lowstands over at least the last 400,000 ky.

We have estimated suspended sediment fluxes through time for rivers draining into the Gulf of Corinth using an empirically-derived BQART method. WorldClim climate data, palaeoclimate models and palaeoclimate proxies were used to estimate discharges and temperatures over the last 130 ky. We used high-resolution 2D seismic surveys to interpret the 12 ky highstand, 70 ky lowstand and 130 ky highstand horizons to derive actual basin sedimentary volumes to compare with our sediment input flux estimates.

Our results estimate integrated Holocene sediment fluxes into the Gulf of Corinth to be 19 km^3 and we constrain how they vary spatially around the Gulf. This number compares exceptionally well with Holocene basin deposit volumes measured from seismic data (30 km^3). We estimate sediment fluxes during the last glacial maximum to be significantly lower than the Holocene, likely driven by lower mean annual temperatures.

Our results demonstrate that sediment routing systems and sediment export to the Gulf of Corinth is sensitive to glacial-interglacial climate changes from the late Pleistocene to recent.