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Straight from the source's mouth; a quantitative study of grain-size export for an entire active rift, the Corinth Rift, central Greece

Stephen E. Watkins (1), Alexander C. Whittaker (1), Rebecca E. Bell (1), Sam A. S. Brooke (1), Lisa C. McNeill (2), and Robert L. Gawthorpe (3)

(1) Department of Earth Science & Engineering, Imperial College, London, SW7 2AZ, United Kingdom (stephen.watkins10@imperial.ac.uk), (2) Ocean and Earth Science, National Oceanography Centre Southampton, University of Southampton, Southampton, SO14 3ZH, United Kingdom, (3) Department of Earth Science, University of Bergen, Realfagbygget, Allégate 41, 5007 Bergen, Norway

The volumes, grain sizes and characteristics of sediment supplied from source catchments fundamentally controls basin stratigraphy. However, to date, few studies have constrained sediment budgets, including grain size, released into an active rift basin at a regional scale.

The Gulf of Corinth, central Greece, is one of the most rapidly extending rifts in the world, with geodetic measurements of 5 mm/yr in the East to 15 mm/yr in the West. It has well-constrained climatic and tectonic boundary conditions and bedrock lithologies are well-characterised. It is therefore an ideal natural laboratory to study the grain-size export for a rift.

In the field, we visited the river mouths of 49 catchments draining into the Corinth Gulf, which in total drain 83% of the rift. At each site, hydraulic geometries, surface grain-size of channel bars and full-weighted grain-size distributions of river sediment were obtained. The surface grain-size was measured using the Wolman point count method and the full-weighted grain-size distribution of the bedload by in-situ sieving. In total, approximately 17,000 point counts and 3 tonnes of sediment were processed.

The grain-size distributions show an overall increase from East to West on the southern coast of the gulf, with largest grain-sizes exported from the Western rift catchments. D_{84} ranges from 20 to 110 mm, however 50% of D_{84} grain-sizes are less than 40 mm. Subsequently, we derived the full Holocene sediment budget for the Corinth Gulf by combining our grain size data with catchment sediment fluxes, constrained using the BQART model and calibrated to known Holocene sediment volumes in the basin from seismic data (c.f. Watkins et al., in review). This is the first time such a budget has been derived for the Corinth Rift. Finally, our estimates of sediment budgets and grain sizes were compared to regional uplift constraints, fault distributions, slip rates and lithology to identify the relative importance of these controls on sediment supply to the basin.