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Detrital zircon U-Pb geochronology of the basal Saiq siliclastics – A complete magmatic record from the Archean to the Permian/Triassic of NE Sultanate of Oman

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Northeastern Oman is located near a Late Paleozoic rift-rift-rift triple junction as part of the Pangea breakup. Above a major and plate-wide unconformity (“basal Saiq Unconformity” or “Hercynian Unconformity”), Late Permian shelf carbonates deposited in much of Arabia and northeastern Oman. In the southeastern Saih Hatat area of NE Oman, near Quriyat, a ~10-100-m-thick conglomerate to sandstone siliciclastic unit (basal Saiq) is sandwiched between the unconformity and the carbonates. We investigated 519 detrital zircons from 7 samples of different intervals within the ~80 m thick basal Saiq. The composite age distribution depicts Archean (2.998 ± 0.007 Ga) to early Mesozoic ages (248 ± 3 Ma). Minor age peaks are at ~2.3-2.6 Ga and 1.6-1.9 Ga. The majority of detrital zircons yield a Neoproterozoic to Paleozoic age (~0.3-1.0 Ga), with most of the ages between ~0.7-0.8 Ga. One sample from the middle part of the section contains zircon grains with a major age distribution of ~300-500 Ma and a peak at ~460-480 Ma. The same sample and a further sample from the lower part of the section contains a significant amount of zircon grains with ages at ~330-350 Ma. The youngest measured ages of 248 ± 3 and 254 ± 3 Ma are detected from two grains of two samples.

Our Precambrian detrital age distribution pattern is similar to patterns known from NW India and eastern Oman (comp. Gomez-Perez & Morton, in press). The Archean and Mesoproterozoic ages likely to have a Neoproterozoic Indian origin. Tonian to Cryogenian ages are the dominant ages, reflect crustal growth of the Omani crystalline basement, with identical U-Pb zircon ages from igneous basement rocks and with flysch-type rocks, formed in the surroundings of a volcanic arc outcropping at the surface in northeastern Oman (Bauer et al., 2025). Infra-Cambrian ages were produced during the final closure of the Mozambique Ocean, as part of the Angudan Orogeny (Gomez-Perez & Morton, in press). Ordovician ages of two samples reflect a regional to local alkaline magmatic event related to continental rifting. Abundant lower to mid-Carboniferous zircon ages (~330-350 Ma) within two samples documents for the first time that the Hercynian event in Oman produced magmatic rocks, beside known rock tilting. Finally, two Permian/Triassic zircon grains ages are derived from volcanic rocks during the Pangea rifting, overlapping in age with the depositional ages of the shallow-marine carbonate of the Saiq Formation. This suggests that the Pangea rifting produced minor acidic igneous rocks in NE Oman.

References

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