Detrital Modes and U-Pb Ages of Zircons from Middle Ordovician Strata of the Murzuq Basin, Libya: Implications for Provenance and Tectonics of the Western Gondwanan Margin

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Middle Ordovician strata of the Murzuq Basin consist of quartzarenites recording deposition in transitional to shallow-marine environments related to the western Gondwanan margin. We studied the composition of 154 samples of sandstones and analysed 28 single detrital zircon grains from the Middle Ordovician Hawaz Formation (Ramos et al., 2006).

Detrital modes indicate a quartzose petrofacies (Q97F2L1) for the whole of the Formation with slight vertical variations. Quartz grains are mainly monocrystalline, unondulatory grains, suggesting an igneous origin. This origin is also supported by the analyzed zircon grains, which have (except two of them) Th/U ratios ≥ 0.2.

Detrital zircons were analysed by the ID-TIMS U-Pb dating technique. The results can be grouped into six age clusters: 1) early Cambrian (531 to 536 Ma); 2) Ediacaran (550 to 600 Ma); 3) Cryogenian (620 to 660 Ma); 4) late Mesoproterozoic (910 to 1070 Ma); 5) early Mesoproterozoic (1562 Ma); and 6) Paleoproterozoic (1966 Ma).

Age groups 2 and 3 are characteristic of igneous and metamorphic events (Ediacaran and Cryogenian) that took place within the Panafrican peripheral orogenic belts. Age groups 4 and 5 are found in the orogenic belt (Kibaran event) situated in south-central Africa (cf. De Waele et al., 2003). These age clusters are also represented elsewhere in detrital zircons from Cambrian sandstones (cf. Avigad et al., 2003). Group 6, at ca. 1.96 Ga is typical of the Eburnean (ca. 2±0.2 Ga) basement found in the NW African craton.

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