Combined Th/U, Pa/U and Ra/Th dating of fossil reef corals

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Open-system behaviour in fossil reef corals is a major problem for accurate absolute dating. The commonly used ^{230}Th/U-system can be disturbed by post-depositional diagenetic alteration, which results in wrong apparent ^{230}Th/U ages. Since fossil reef corals are important palaeoclimate archives, precise absolute dating is essential for sea-level reconstruction and high-resolution climate reconstruction.

In order to identify diagenetically altered corals, we combine the traditional ^{230}Th/U-method with the ^{231}Pa/U-method. Discrepancies between fossil coral ages determined by the two methods show post-depositional disturbance of the isotope systems [1]. Furthermore, comparison of the two systems on concordia diagrams reveals additional information, such as the timing of the diagenetic processes [2]. In addition, we apply the ^{226}Ra/^{230}Th-system, which has a significantly shorter half-life and enables to study open-system processes occurring on shorter time scales.

Here we present the first combined application of all three isotope systems to fossil last interglacial corals from the Gulf of Aqaba, northern Red Sea. Previous studies have shown that these corals were subject to substantial open-system behaviour [3] [4]. In addition, we simulate the temporal evolution of the three isotope systems and model the effects of different open-system processes.

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