^{238}U-^{234}U-^{230}Th -^{226}Ra systematics in fossil scleractinian corals

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The ^{230}Th-U dating method is widely used to date reef and deep-sea scleractinian (aragonitic) corals. The method relies on the assumption is that the sample remained in a closed radioactive system with respect to U and Th isotopes through time. This assumption is usually tested through mineralogical examination of the sample (i.e., through the absence of any diagenetic/secondary calcite) and the comparison of its initial $^{234}U/^{238}U$ activity ratio [$(^{234}U/^{238}U)_0$], with that of the global oceanic $^{234}U/^{238}U$ activity ratio [$(^{234}U/^{238}U)_{marine}$]. However, Pons-Branchu *et al*. [1] have shown that this assumption can be violated when a coral experienced an early diagenetic evolution. This results in slight ^{230}Th ages offsets without significant shifts in the initial $^{234}U/^{238}U$, due to the fact that the early diagenetic and syngenetic U-phases had a nearly similar isotopic signature. More commonly, discrete redistribution of U-series isotopes occur through time. When they result in $(^{234}U/^{238}U)_0$ offsets *vs* [$(^{234}U/^{238}U)_{marine}$, age correction models have been proposed (e.g., U-trend; Thompson *et al*.)[2]. We already proposed to use ^{226}Ra to document the relative closure of radioactive system in the ~ 10-50 ka range, through a $^{226}Ra/^{230}Th$ *vs* $^{230}Th/^{234}U$ pseudo-concordia approach (Hillaire-Marcel *et al*., 2006)[3] . Here we demonstrate that slight disequilibria between $^{226}Ra/^{230}Th$ are generally observed in fossil corals of all ages, notably from the last interglacial and point to some Ra-U mobility in their aragonitic skeleton at least during the last 50 ka, thus likely earlier. We will also examine the impact of such isotopic offsets on the calculated ^{230}Th-U ages and estimate the usefulness/validity of age-corrections based on linear trend intercepts with concordia curves.

[1] Pons-Branchu *et al*. 2005, doi:10.1016/j.gca.2005.06.011. [2] Thompson *et al*. 2003, doi:10.1016/S0012-821X(03)00121-3. [3] Hillaire-Marcel *et al*. 2006, doi:10.1016/j.gca.2006.06.506.

Geochemical considerations of the gehlenitic skarns from Valea Crişenilor – Oraviţa (Romania)

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A shallow-level pluton of Late Cretaceous age, belonging to the "banatitic" magmatic and metallogenetic belt, caused extensive contact methamorphism of Cretaceous limestones and marls sequences in the Oraviţa area. In Valea Crişenilor, a small elongate apophysis of this pluton mainly dioritic, with some variations toward quartz diorite and monzonite, intruded a series of calcareous deposits of Crivina Formation deposed in Reşiţa anticlinorum. The intruded formations experienced an extended contact metamorphism with local generation of high-temperature mineral species.

The observed mineral assemblages reflect a wide range of temperature and fluid-composition space. In this respect, the metamorphic peak assemblages in the calcite-saturated rocks include wollastonite, melilite, ellestadite-(OH), titanian grossular and scarce spurrite. The estimated equilibra temperature for this mineral assemblage is about 820-870ºC with a C-rich, internally buffered pore-fluid. The aperence and infiltration of the C-poor fluids, triggering the formation of retrograde mineral assemblages comprising monticellite, vesuvianite, grandite garnets, diopside, clintonite. These assemblages formed probably near 600ºC. A low-temperature retrogression affected the previous mineral paragenesis producing scawtite, hydrogrossular, hibschite, xonotlite, thomsonite.

As it is expected, the intensity of the contact metamorphism decreases from the innermost to the outermost parts of the aureole. In this respect, the mineral reactions involving carbonate and silicate minerals led to the formation of various of Si-poor silicates, but rich in Al and Ti oxides, while the next skarn zone can be circumscribed to a Si- , Mg-rich and Al-poor geochemical system, marked by the formation of gehlenite, vesuvianite ± wollastinite, garnet.

The Ca-Si ratio value is close to that of Mg-Si, suggesting a weak circulation of the fluids and a thermodinamic closed system, followed by the retrograde stage, marked by a high mobility of the chemical elements into an open system.

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