Common-Pb correction in laser U-Pb geochronology using MC-ICPMS and a multi-ion counting system

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Prior to measure common-Pb in zircon when using laser ablation, two external sources of common-Pb must be eliminated: one is present on the surface of the mount and the second is in the Ar gas. The pre-ablation procedure makes the effect of surface contamination negligible [1]. The measurement of the blank from the gas before and after each spot analysis is also supposed to allow this contribution to be subtracted. Finally, the remaining common-Pb is mainly originated from the sample.

Similarly to ion probe [2], when using our LA-MC-ICPMS system, three methods can be employed for correcting measured isotopic ratios for common-Pb. (i) The ^{204}Pb method requires no assumption except the knowledge of the common-Pb composition at the time of zircon crystallisation. However, it requires correcting for ^{204}Hg interference by using ^{202}Hg peak. In addition, the precision on ^{206}Pb/^{204}Pb ratio becomes critical for "young" samples (e.g. < 600 Ma). (ii) The ^{207}Pb method is based on TW's representation [3] which only requires precisely measured ^{207}Pb/^{206}Pb and ^{238}U/^{206}Pb ratios. This method is efficient through the Phanerozoic times and becomes the unique method for Quaternary zircons [4]. (iii) The third method, ^{208}Pb, is much less commonly used. It requires the measurement of both ^{208}Pb/^{206}Pb and ^{232}Th/^{238}U ratios, and it works well if the Th/U ratio is low (e.g. < 0.5).

We selected the UQ-Z1 zircon [5] already dated by conventional TIMS (1142±1 Ma). A set of 16 spot analyses were measured using LA-MC-ICPMS equipment and corrected for common-Pb according to the three methods. It was demonstrated, for that sample which shows low Th/U ratio (~0.25), that the best precision and accuracy are achieved by applying the ^{208}Pb method.

Nevertheless, using a LA-MC-ICPMS equipped with a multi-ion counting system, one of the three methods can be selected according to the age and the chemistry of the zircon.

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Microbial geomorphology – The role of a biota in coastal erosion

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Microbes are known to play an important role in rock weathering. This work investigated the hypothesis that microorganisms contribute to coastal erosion and are agents in shaping the Earth's coastlines through weathering activity. The geobiology of the surface of weathered shale on the coast of North-East England, which dislodges during weathering, leading to large-scale cliff wastage, was examined.

The bacterial community is dominated by Proteobacteria, with phylotypes closely associating with *Methylocella* and the γ-subdivision. The second largest number of phylotypes corresponded to *Nitrospira*. Acidobacteria are also abundant. Archaea most closely associated with the crenarcheota SAGMA group and phylotypes previously associated with coal seams. Their putative metabolisms suggest biogeochemical cycling of gases and organic material at the rock-gas interface within the cliff fractures.

The organisms populate a thin (1-10μm) iron-rich layer on the surface of the weathered shale which XRD shows is formed by conversion of silicates to clays. XAS at the Fe-K edge, Raman (532 nm) and SEM analysis shows the surface to be heterogeneous at the micron scale and Fe to be primarily in the form of disordered iron oxides with some goethite.

NanoSIMS reveals the spatial distribution of organisms in relation to weathered silicates and trace gypsum. The data may either be interpreted as a random distribution of organisms in relation to shale mineralogy or representing specific microbe-mineral interactions caused by different metabolisms.

We propose that through their metabolic activity organisms contribute to surface weathering, rock weakening and coastal geomorphological changes that have been measured at the kilometre scale.