Potential and limitations of U-series dating for early to middle Pleistocene chronologies

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U-series dating of secondary carbonates such as speleothems, travertines or corals using high precision mass spectrometry is an important geochronological technique. However, early to middle Pleistocene ages are still analytical challenges for both U-Th and U-Pb dating techniques because U-Th activity ratios are very close to secular equilibrium, and the amount of radiogenic Pb is still small compared to common Pb backgrounds. Higher analytical precisions, smaller detection limits and thus smaller sample sizes that can be analysed could help to extend the dating range of U-Th and U-Pb dating.

Some recent developments in multi collector (MC) inductively coupled plasma mass spectrometry (ICPMS) U-Th and U-Pb dating will be discussed. Technical advances in MC-ICPMS lead to higher analytical precisions potentially enabling U-Th dating beyond 600ka. U-Pb isochron dating has been successfully applied to speleothems younger than 1 Ma. Potential and limitations of U-series dating for early to middle Pleistocene chronologies will be briefly discussed with respect to precision and accuracy of MC-ICPMS methods specifically in the light of instrumental biases.