A composite speleothem paleoclimate record for the last 400 ka from Romania

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Paleoclimate studies based on speleothem records from Romania have seen a constant increase in the last 15 years. Hence, an increasing number of speleothem isotope records have become available form the karst regions of both SW and NW Romania. Here we review the available data and present a composite speleothem $\delta^{18}O$ record that spans roughly over the last 400,000 years. The record is based on several high resolution dated speleothems from the SW Carpathians and is correlated with coeval samples from the NW Carpathians. The record (Figure 1) shows a higher variability for the SW Carpathians when compared with the NW Carpathians. This is considered as a direct effect of the Mediterranean climate influence as opposed to the distal-NAO influence on the climate from the inner part of the Carpathian arch, i.e. the NW Romania. Probability density function graphs based on dated speleothems were constructed for both regions and they too show a much higher response during warming periods for regions located in the southern part of the Carpathians. The record is compared with known composite records from the Eastern Europe and Eastern Mediterranean and potential biasing factors when comparing other $\delta^{18}O$ records are discussed.

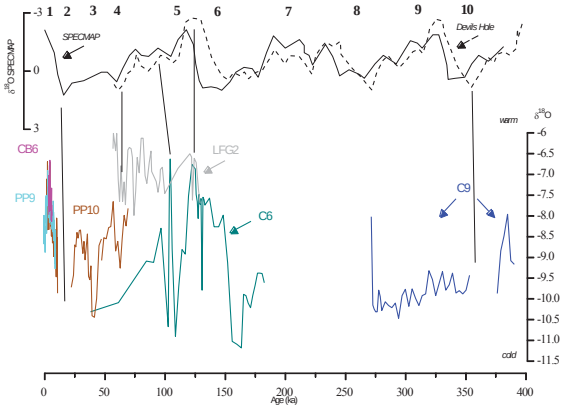

Figure 1: A cumulative speleothem record from Romania showing higher variance of the $\delta^{18}O$ values for the Mediterranean-influenced SW Romania when compared with the NW Romania.

Petrogenesis of recent trachytic eruptions from Sete Cidades volcano, São Miguel, Azores (Portugal)

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Sete Cidades has produced 12 intracaldera, trachytic eruptions (Sete A-L) within the last ~4-5 ka [1,2]. We have completed detailed petrographic, major and trace element, Sr, Nd and Pb isotope and U-series disequilibria studies of whole rock samples from the Sete A-L deposits to constrain petrogenetic processes, eruptive ages and repose intervals associated with the Sete Cidades magmatic system [3]. Major and trace element analyses were performed on a suite of 16 samples representing all of the deposits from Sete A-L. The data show limited major element variation (~63% SiO_2) but highly variable trace element abundances (e.g. >1.6-fold variations in Zr and ~4-fold variations in Sr). Trace element abundances show a complex relationship with stratigraphy that we interpret to reflect a 3-stage evolutionary process. Stage 1 (Sete A-B), characterized by an increase in Zr concentration with stratigraphic height, reflects evolution of a trachytic magma via 35% fractionation of the observed mineral assemblage including sanidine>biotite>clinopyroxene>Fe-Ti oxides>apatite. Stage 2 (Sete B-F) is characterized by decreasing Zr concentrations with stratigraphic height, suggesting injection of a less evolved trachytic magma into the Sete Cidades magma chamber. Stage 3 (Sete F-L) is recorded by an increase in Zr with stratigraphic height, and is consistent with 54% crystallization of the observed mineral assemblage. Sr isotopic variation in leached whole rock samples ($^{87}Sr/^{86}Sr$=0.70375-0.70439) further requires assimilation of hydrothermally altered syenite wall-rock [4,5]. Nd and Pb isotopic compositions are essentially invariant ($^{143}Nd/^{144}Nd$=0.51287; $^{206}Pb/^{204}Pb$=19.52-19.56) and within the range of local basalts, consistent with trachytic magma evolution from parental basalts derived from a single mantle source over the past ~4-5 ka. Six samples have also been analyzed for U-series disequilibria, and all are Th-enriched and Ra-depleted. With one exception, $^{238}U/^{232}Th$ and $^{230}Th/^{232}Th$ activity ratios are constant with ($^{238}U/^{232}Th$)≈0.88 and ($^{230}Th/^{232}Th$)≈0.96, similar to basalts from the Sete Cidades region, and consistent with the trachytes deriving from parental basalts that evolved rapidly (within ~10 ka) to produce the Sete A-L trachytic magmas. Present-day $^{226}Ra/^{230}Th$ activity ratios range from 0.32-0.75, consistent with recent and extensive sanidine fractionation during trachyte magma evolution, and further allowing constraints on the maximum eruptive ages. Preliminary data indicate a maximum eruptive age of 912 years B.P. for Sete B, which suggests that the recent recurrence interval of Sete Cidades may be only ~42 years, much shorter than the recurrence intervals of 200 and 1200 years at neighboring Furnas and Fogo volcanoes [6].

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