Identifying upper crustal contamination along the Java segment of the Sunda Arc, Indonesia

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There are varying opinions as to the source of magma contamination at subduction zones. Some authors regard the downgoing slab as a more important source of contamination e.g. [1]. Others however, view the upper crust as a considerable contributor to contamination e.g. [2]. This upper crustal contamination could have implications for the explosivity of volcanic eruptions, especially for those volcanoes on carbonate crust e.g. [3].

The subducted sediment along the Java segment of the Sunda Arc is fairly homogenous in composition [4], providing an ideal opportunity to investigate upper crustal lithology and its influence on crustal contamination. A pilot study where volcanic gases were sampled from 8 volcanoes on Java was undertaken in 2006, the results provided evidence for upper crustal contamination using He and C isotopes. Carbon isotope values are mantle like unless the volcano lies above limestone. In comparison with the variations in subducted material along the arc, He isotope values do not show any corresponding changes, indicating there are other influences on these values.

New data from the 2008 Java-Bali traverse will be presented. The data provides He and C analyses of fumarolic gas and He analyses of pyroxene crystals. The data set represents a high-resolution sampling scheme allowing a detailed insight into the effects of the upper crust on contamination of an individual volcanic system.

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Last Glacial rapid climate shifts in Central Europe: Environmental and chronological considerations from precisely dated cave carbonates

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Stalagmites from selected cave sites in Austria and Switzerland represent a valuable terrestrial inorganic climate archive and are currently being studied using high-resolution stable isotopic and petrographic data, fluid-inclusion and U-Th techniques. The cave sites are situated at the northern rim of the Alps, which encounters a dominant influence of air masses from the N-Atlantic and their location thus supports our ambition to compare rapid climate shifts of the Last Glacial (Dansgaard-Oeschger or 'D-O' events) recorded both in the Greenland ice cores and in the stalagmites. Moreover, the limestone host rock of these caves promotes high U concentrations (0.5 to 2 ppm) and typically very low detrital Th contaminations of the precipitated cave carbonates, a precondition to constrain precise and accurate U-Th based chronologies.

Results show that the time interval between D-O events 25 and 18 is well represented in the speleothems and typical 2-sigma dating errors are in the range of 0.3 to 0.8 %, i.e. climate events during the first half of the Last Glacial cycle can be dated to within a few hundred years. The O isotope data show several pronounced shifts of up to 4 ‰ during D-O transitions and mimic the variability seen in Greenland based on this common proxy. Favourable climate conditions during Greenland Interstadials (GIS) are well represented, next to some major Greenland Stadials (e.g., GS 22, 19, 18), thus demonstrating sustained water supply in the karst aquifer during these cold and presumably also dry intervals. As a consequence of the very high temporal resolution of the stalagmite isotope data (typically ranging from near-annual to a few decades), remarkable details of the fine structure of the Greenland O isotope profiles are recorded in some of the samples (e.g. a distinct temporary warming during GS 22).

Our study demonstrates that speleothem deposition locally did not came to a halt during cold and dry glacial climate and thus provides a unique millennial-scale archive of the isotopic composition of meteoric precipitation. The data underscore the sensitivity of the Alpine region with regard to rapid climate changes during glacial periods and also the common climate forcing of Greenland and the Alps in a N-Atlantic context.