Age of HP metamorphism from the Escambray Massif, Cuba

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The geochronology of HP/LT metamorphism constitutes a major challenge in the reconstruction of subduction zones. In Cuba, the Escambray metamorphic complex comprises a nappe stack involving both HP/LT subduction-related metamorphic rocks as well as island-arc-related LP/HT units [1]. A Mesozoic age has been suggested for the protoliths of these rocks based on poorly preserved fossils [2]; final exhumation is indicated by the appearance of pebbles of metamorphic rocks in conglomerates at about 45 Ma.

Although the timing of the rapid exhumation of the Escambray nappe stack is well constrained between 75 and 65 Ma [1, 3], available age data on earlier stages of subduction history are in conflict. A concordant U/Pb age of 102±2 Ma for zircons has been reported for an eclogite [4]; however, other eclogites yield discordant populations with a lower intercept at 148 Ma [3]. SHRIMP analyses of single-grain zircon show a broad spectrum of ages between 105 and 176 Ma. Only metamorphic sphene provides a U/Pb age of about 71 Ma interpretable as a “metamorphic age”.

New results from Lu–Hf dating on eclogites and garnet amphibolite from subduction-related nappes help to shed light on this discrepancy. The elcogites and garnet amphibolite yielded ages of 72-67 Ma and 80 Ma, respectively. If garnet nucleated before peak P, eclogite ages may even predate attainment of maximum subduction depth. This new result will have to be integrated into models of the geodynamic development of Central Cuba.

References

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Speciation of organometal(loid) compounds in landfill gas and landfill leachate by hyphenation of GC with ICP-MS

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Organometal(loid) compounds, metal(loid) species bearing at least one metal-carbon bond, are usually more toxic than their inorganic representatives. These compounds can be formed in wet environments and occur as methyl or hydride derivates in the gas phase, while ionic species stay in the liquid phase. Organometal(loids) are also present in landfill gas and landfill leachate. Amongst them toxic compounds like Tetramethyltin, Tetraethyltin, Tributyltin or Dimethylmercury. The total amount of metal(loid)s being alkylized in landfill sites still remains unknown. Organotins are the most abundant metal(loid) species in landfill gas and landfill leachate. Determination of these metal species in landfill samples turns out to be difficult, as they occur in ultratrace levels which requires a good trace-matrix separation and a powerful detection technique. Coupling of capillary gas chromatography (GC) with inductively coupled plasma - mass spectrometry (ICP-MS) provides a very sensitive analytical tool for organometal(loid) speciation.

A self-made cryotrapping (CT) - cryofocussing (CF)-GC-ICP-MS system was used for the analysis of landfill gas. We found more than 15 volatile organotins, with a concentration range from 11 pg/L to 31ng/L. But also Dimethylmercury, Dimethylselenide and Dimethyltelluride were found in landfill gas.

Landfill leachate is analysed using GC-ICP-MS for liquid injections of organic solvent extracts. Water soluble organotins were transferred into peralkylated compounds by derivatization with sodium tetra-(n-propyl)-borate and extracted with n-hexane. By using propylation instead of ethylation we were able to find ethylated organotin species in leachate. For the first time we found more than 10 organotins with concentrations from 0.1 to 7.9 ng/L. But we could not find any Hg, Se or Te species in the leachate yet.

This indicates that organometal(loid)s are produced within a landfill site in large number and can be carried out of the system via gas and leachate.