Stable isotope analysis of water from fluid inclusions: progress report on the development of the method

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Isotopic composition of water trapped in fluid inclusions could provides important direct paleo-climatic and paleo-hydrogeological information. These data could also beare also of interest in applications of of the economic geology, metamorphic geology, and as well as mineralogy. However, Tthe recovery and analysis of minute (0.n to 0.0n ml) amounts of water from inclusions, however, remains a challenge. An analytical line comprising: (1) an electromagnetic crushing cell, ; (2) a cryogenic trap and gas interface; , (3) a Thermo Finnigan TC/EA unit including a glassy carbon pyrolysis reactor and a gas chromatographic column; , and (4) a Thermo Finnigan Delta^{Plus} XP mass-spectrometer equipped with a ConFlo III interface has been designed at the Museo Tridentino di Scienze Naturali and assembled at IGG-CNR (in Pisa). The line operates in the continuous He flow mode. Calibration with standard water showed the reproducibility of delta hydrogen isotope measurements within ± 4.8 ‰. Although this would be satisfactory for many geological applications, paleoclimatic for applications require paleo-climatic research reproducibility and requires further improvement of precision.

AAn dedicated upgraded fluid fluid-inclusion line will be built atinstalled in Innsbruck University during the second half of 2006, hooked up to a ThermoFinnigan Delta V Advantage mass spectrometer equipped with a TC/EA pyrolysis unit. Modifications will include: (1) modification ofchanges to the glassy carbon pyrolysis reactor; (2) passivation of inner surfaces of the line with adsorption-preventing coating; (3) incorporation of the cryo-focusing device, and; (4) construction of a conditioning block for the crushing cells. In addition, a second line will Experimentsexplore the possibility of with opening the inclusions with using the an IR-(CO_2) laser are planned. The design of the new line will include the possibility for eventual stable isotope analysis of other volatiles released from inclusions (e.g., CO_2 and CH_4).