

Stable isotopes in Lochseiten calc-mylonite of the Glarus thrust

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Abstract

Oxygen and carbon isotopes have been measured on three samples from the Glarus thrust Switzerland.

Along this thrust Helvetic nappes were transported North over Infrahelvetetic Units during the early Miocene when Apulian collided with the European continent (Winter et al. 2004).

In the Glarus thrust zone the Lochseiten calc-mylonite formed which has been sampled for this study at Foostock (FO) in the north and Vorab Pign (VP) further south.

Isotope ratio measurements were performed on a Finnigan MAT-253 mass spectrometer employing a gas bench II. Carbon isotope data are reported relative to PDB and oxygen isotopes relative to SMOW. Errors of $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ measurements, calculated by multiple analyses of an inhouse marble standard, were $\pm 0,08\%$ and $\pm 0,06\%$ (1σ).

$\delta^{13}\text{C}$ -values of the Foostock sample varies between 0.0-0.6‰ and $\delta^{18}\text{O}$ varies between 17.4 and 19.8‰. This is within the range of former reported analyses of the Lochseiten calc-mylonite in the north ($\delta^{13}\text{C}=2$ to -6% and $\delta^{18}\text{O}=17$ to 24%) and in the underlying flysh ($\delta^{13}\text{C}\approx 1-2\%$ and $\delta^{18}\text{O}\approx 17-25\%$) (Abart et al. 2002). Therefore, the FO sample exhibits the same isotopic distribution as the Tertiary flysch.

The VP sample show $\delta^{13}\text{C}$ -values from -2.3 to $+2,3\%$ and $\delta^{18}\text{O}$ -values from 15.4 to 16.5‰. In the Grauberg area, south of the Glarus thrust, Verrucano samples give $\delta^{13}\text{C}$ values from -1.5 to -5.0% and $\delta^{18}\text{O}$ from 6 to 13‰; the cretaceous limestone is homogeneous at $\delta^{13}\text{C}\approx 2\%$ and $\delta^{18}\text{O}$ ranges from 10 to $\sim 25\%$ (Abart et al. 2002). The isotopic composition of the Lochseiten mylonite at Vorab Pign and Verrucano are identical.

This result is consistent with the following model. At Foostock the Tertiary flysch provides the source of fluids for the Glarus thrust zone, which also alter the hanging Verrucano. At Vorab Pign the Verrucano has been hydrated by more evolved fluids transported subhorizontally along the Glarus thrust zone and overprinted a underlying cretaceous limestones.

References

Abart, R., Badertscher, N., Burkhard, M. und Povoden, E. (2002): Oxygen, carbon und strontium isotope systematics in two profiles across the Glarus thrust: implications for fluid flow. *Contrib. Mineral. Petrol.* 143, 192-208

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