Strain Rates from Snowball Garnets?

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Spiral inclusion trails in garnet porphyroblasts are likely to have formed due to simultaneous growth and rotation of the crystal during syn-metamorphic deformation. Thus, they contain information on the strain rate of the rock. Strain rates may be interpreted from such inclusion trails if two functions are known: 1) The relationship between rotation rate and shear strain rate. 2) The growth rate of the crystal. We have investigated details of both functions using a garnetiferous mica schist from the Gleinalm Complex as an example. The rotation rate of garnet porphyroblasts was determined using finite element modeling of the geometrical arrangement of the crystals in the rock. The growth rate of the porphyroblasts was determined by using the major and trace element distributions in garnet crystals, thermodynamic pseudosections and information on the grain size distribution. For the largest porphyroblast size fraction we constrain a growth interval between 540°C and 590°C during the prograde evolution of the rock. Assuming a reasonable heating rate and using the angular geometry of the spiral inclusion trails we are able to suggest that the strain rates decreased from 1.2 x 10^{-13} s^{-1} to 1.6 x 10^{-14} s^{-1} during the growth of the crystal. While many of the assumptions we had to make for these calculations may be subject to large uncertainties, most of these errors are systematic, so that they may shift the estimates to higher or lower strain rate values, but the qualitative result that the strain rates decrease during crystal growth is robust towards errors. Our estimates are also consistent with independent estimates for the strain rates during the evolution of this part of the Alpine orogen.

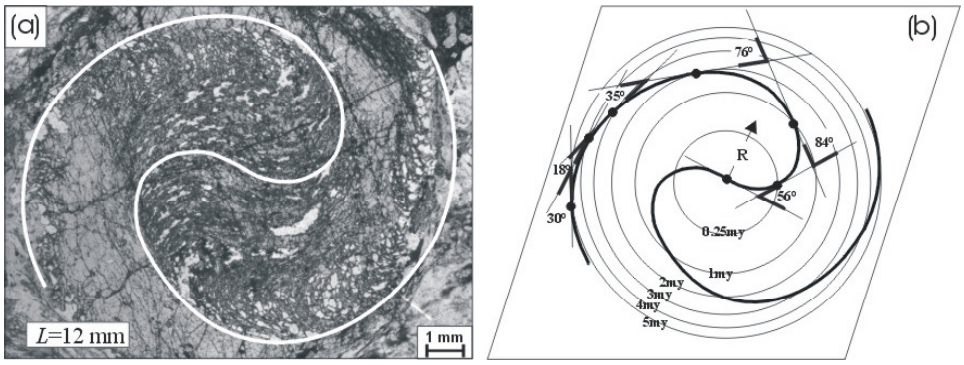

***Figure 1**. (a) Spiral inclusion trail in a snowball garnet from the Gleinalm Complex in the Eastern Alps (3 Pfarren locality). (b) Schematic sketch of the crystal from (a) contoured from crystal sizes during the growth as constrained from petrological data and labeled for angular change of the inclusion trail during different growth stages. These angles were then used to calculate stain rates.*

Seismicity and deformation in Surma Basin (Bengal Basin, Bangladesh)

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The Surma Basin, an oval shape sub-basin of the Bengal Basin, is characterized by active faults and lineaments forming conjugate sets of active zones. The seismic activity is an indication of ongoing tectonic activity characterized by propagation of fractures from the adjacent EW trending Dauki Fault System in the north and NNE-SSW Tripura Folded Belt in the east.

Possible interaction of Dauki Fault and northwestward compression from Tripura Folded belt produces complex tectonics and increasing seismicity in the Surma Basin. The earthquake data and few focal mechanism solutions show that seismicity in the east margin of the basin mainly in the Tripura Folded belt correlates with its north-striking structures and reflects the westward convexity of Burmese arc. In the north, it follows east-west trend of southward thrusting of Dauki Fault zone. Few earthquake activities also follow the NW trending Modhupur lineament in the west of the basin. The majority of the tectonic activity concentrates along the junction of NW-SE compression from Tripura belt and

southward thrusting from Dauki Fault. It follows the direction of Sylhet lineament, which is NE direction in the northern part of the basin, extends up to Disang-Naga thrust in the northeast, and curves southward in the southern part. This direction also follows the Miocene depositional depocenter, which is according to few authors a Paleo-Brahmaputra channel. Since the great Srimangal earthquake in 1918 (Ms 7.6), no seismic events with magnitudes larger than 6.3 have been occurred. In the last 40 years, more than 40 events (focal depth 10-51 km) were recorded in the basin, among them >30 were Ms 4.0-Ms 5.0 and the rest were above Ms 5.0. Focal mechanism of recent earthquakes suggests a strike-slip nature in the east, and thrust and strike slip nature along the Dauki Fault zone. The deformation velocities shows a N-S compression and E-W extension in Shillong Plateau area, adjacent to north margin of the basin while the general trend of compression (P-axis) is N50°W in the eastern margin of the Basin.

Bestimmung troposphärischer Parameter mit der VLBI als Beitrag zu klimatologischen Studien

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Die VLBI (Very Long Baseline Interferometry) beruht auf der Beobachtung extragalaktischer Radioquellen mit einem weltumspannenden Netz von Radioteleskopen, welche die Signale im S- und X-Band registrieren (2.3 bzw. 8.4 GHz). Die eigentliche Meßgröße ist die Laufzeitdifferenz zwischen den Ankunftszeiten einer Wellenfront an zwei Stationen. Aus diesen Beobachtungen können geodätische Parameter wie die Erdrotationsparameter oder die Längen der Basislinien zwischen den Radioteleskopen mit höchster Genauigkeit abgeleitet werden. Bis vor wenigen Jahren galt die Laufzeitverzögerung der Radiowellen in der Troposphäre nur als Störfaktor bei der Bestimmung geodätisch relevanter Größen. Mit geeigneten Modellen wird versucht, den Einfluß der Troposphäre zu eliminieren. Man trennt dabei die troposphärische Laufzeitverzögerung in einen hydrostatischen und einen feuchten Anteil. Weiterhin verwendet man spezielle Funktionen, sog. mapping functions, mit denen die Laufzeitverzögerung in Zenitrichtung auf eine beliebige Elevation abgebildet wird. Mittlerweile hat man aber erkannt, dass die troposphärischen Parameter, die mit diesen Modellen gewonnen werden, für meteorologische bzw. klimatologische Studien verwendet werden können. Im Speziellen ist hierbei der feuchte Anteil der Laufzeitverzögerung in Zenitrichtung von großem Interesse. In der VLBI liegen für einige Stationen Beobachtungsreihen seit Anfang der 80er Jahre vor, aus denen die oben genannten troposphärischen Parameter bestimmt werden können. Mit Zeitreihen des feuchten Anteils der troposphärischen Laufzeitverzögerung in Zenitrichtung verfügt man damit über integrale Werte der Luftfeuchte, die mit anderen Datensätzen wie jenen vom ECMWF (Europäisches Zentrum für mittelfristige Wettervorhersage) verglichen werden können.

Stable isotope analyses of Early Badenian Pectinides from Retznei Quarry, Styrian Basin: implications for growth rates and seasonality

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The shells of Pectinides are known as well suited to provide environmental information through isotopic analysis. We analysed three large calcitic shells of *Gigantopecten nodosiformis* and one brachiopod shell of a Terebratulidae indet., which were collected from the Early Badenian deposits of the Retznei quarry. The quarry is situated within the Styrian basin and crops out patch reef deposits covered by clastics. The whole sequence has an Early Badenian age (Friebe, 1990, 1991).

Study of thin sections under polarised light show preservation of the internal structure of shells. Microbeam analyses indicate that shells entirely consist of low-magnesium calcite. According to these data we consider that the effect of diagenesis was minimal.

The shells were sequentially sampled along the dorso ventral axis (average sample separation 1.5-2 mm).