We present a garnet crystal size study of regional metamorphic rocks. The studied area is the Mesozoic cover sequence of the Gotthard Massif in the upper Rhone valley (Swiss Alps), between the Nufenen Pass and Termen near Brig. We followed a graphite rich layer in a 35 km long profile between Termen (lower greenschist facies) and the Nufenen pass (lower amphibolite facies). The selected lithology is a meta-marl with up to 2% graphite. Its mineralogical assemblage consists of garnet, plagioclase, clinzoisite, white mica, biotite, carbonates, pyrite, ilmenite, and accessories minerals such as zircon, titanite, rutile and apatite. Higher grade samples contain some amphibole. The garnets are idiomorph prophyroblast that grew in a fine grained matrix. Their sizes range from a few millimetres to a centimetre. The resistance of garnet to erosion, the difference of colour between garnets and the surrounding matrix, and the large exposed surfaces revealing a large number of garnets makes them good candidates for image analysis. High resolution pictures of the outcrops surfaces were taken using a digital camera, parallel and perpendicular to the schistosity planes (2048 pixels/1536 pixels). This resulted in a resolution per pixel of roughly 0.0083 cm. The 2D garnets distribution, their shape, and area were determined using the Aphelion™ image analysis program. The diameters measured on the pictures were interpreted as maximum diameter whenever the garnets protruded significantly from the rock surface. In all other cases, 2D data were converted to 3D data using the Saltikov correction method implemented in the CSDcorrection program (Higgins, 2000).

Images were collected on the Nufenen Pass and on the Corno Pass (South West from the Nufenen; lower amphibolite facies). All CSD’s are slightly curved or nearly linear (fig. 1). Photos from four different outcrops from the Nufenen Pass area show a large variation in garnet CSD as the variation between outcrops from middle greenschist facies to lowermost amphibolite facies. This difference seems to be related to variations in bulk rock composition and mineral mode, e.g. higher plagioclase content. The outcrop from the Corno area has garnet CSD’s with larger crystal diameters.

The method used in this study is an effective way to determine garnets CSD’s with a minimal effort. The differences observed in CSD slopes from low to high grade samples are relatively small. Care must be taken to compare garnet CSD’s of rocks with very similar chemistry, since CSD’s are apparently a very sensitive function there off.

Reference