# *Lower crustal rocks in the Gruf Complex (eastern Central Alps): new geological map*

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We present a new geological map of the central and northern part of the Gruf Complex, an area of about 50 $km^2$ between Val Codera and the southern part of Val Chiavenna. Migmatitic ortho- and paragneisses, recording mid-Tertiary metamorphic conditions of upper amphibolite-facies (Bucher-Nurminen and Droop, 1983), form the main part of the Gruf Complex. Small lenses of ultramafic rocks, amphibolites and calcsilicates occur throughout the migmatitic gneisses. Large, E-W striking, sheet-like bodies of orthopyroxene-bearing granitoids (charnockite) outcrop along the crest between the two valleys. Charnockites occur as large boudins within migmatitic orthogneisses, separated by few cm-thin mylonitic zones from the country rock, associated with lenses of websterite and gabbro-norite.

Dark, Mg-Al-rich sapphirine-bearing granulites had been reported as rare boulders from two scree fans by Cornelius (1916) and Wenk and Cornelius (1977) but had never been found in their geological context. A detailed field and petrological study documents different types of granulite outcrops that we have discovered during the mapping of this part of the Central Alps. Field observations show that sapphirine-bearing granulites are schlieren within the charnockites and restitic enclaves both in the charnockites and the migmatitic orthogneisses.

Benefiting from recent improvements in the P-T quantification of high-grade rocks (review in Harley, 2008), metamorphic conditions for the Gruf granulites and charnockites have been calculated. They yield peak conditions of T = 920-960°C and P = 8-10 kbar. These temperatures at lower crustal level are 150°C higher than previous estimates (Droop and Bucher-Nurminen, 1984) and are difficult to integrate within the frame of the Alpine regional metamorphism, as inferred by these authors and by Liati and Gebauer (2003).

Instead, we interpret the Gruf granulites as lower crustal relicts of a late-Variscan event similar to that in the Ivrea zone and Malenco units. The Gruf Complex appears to be a block of lower crustal rocks, including granitoids, charnockites, granulites, websterites, formed in Permian times and exhumed together but only partially reworked during the Oligocene Bergell intrusion.

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