UNIVERSITA' DEGLI STUDI DI PADOVA
DIPARTIMENTO DI GEOSCIENZE
Via Gradenigo 6
35131 Padova
www.geoscienze.unipd.it

DIPARTIMENTO DI GEOSCIENZE

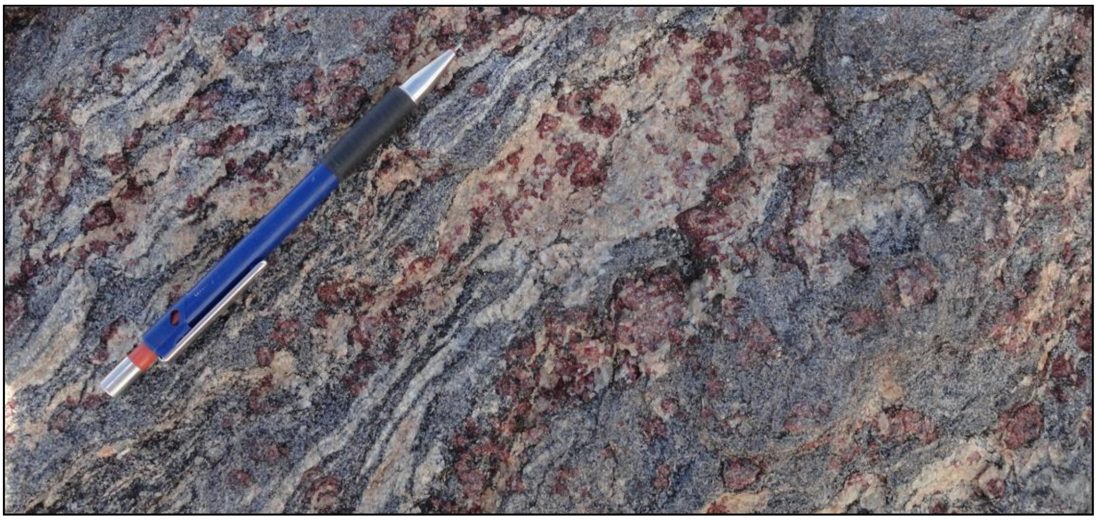
Seminario

Heat and temperature – two sides of the same coin?

Martedì 7 maggio 2019 – ore 16:30
Aula Arduino

Relatore: **Simon Schorn**

Department of Geological Sciences, University of Cape Town, South Africa



Conventional thermodynamic modelling of a conformable sequence of supracrustal lithologies from the Bushmanland Subprovince of the Namaqua–Natal Metamorphic Complex (South Africa) reveal a disparity of some 60–70°C in estimated peak metamorphic temperature, with aluminous metapelite defining the lower thermal extreme at ~770–790°C and two-pyroxene granulite and garnet–orthopyroxene–biotite gneiss recording distinctly higher conditions of ~830–850°C. All samples equilibrated at peak pressure of ~5–6 kbar, followed by near-isobaric cooling. The disparity in peak temperatures appears to be robust, as the low-variance assemblages in all samples reflect well-known melting reactions that only occur over narrow temperature intervals. The coexistence of products and reactants of these melting reactions indicates that they did not go to completion before metamorphism waned.

Calculated pressure–enthalpy diagrams show that the melting reactions are strongly endothermic and therefore buffer temperature while heat is consumed by melting. Because the respective reactions occur at distinct P–T conditions and have different reactant assemblages, individual lithologies are thermally buffered at different temperatures and to different degrees, depending on the occurrence and abundance of reactant minerals. If limited thermal communication is assumed, this implies that lithology exerts a first-order control over the heating path and the peak temperature that can be attained for a specific heat budget, with lower peak temperatures manifested in more fertile and strongly buffered metapelites compared to more refractory rock types. Our results question the undisputed validity of temperature as key geodynamic parameter, and we suggest that the metamorphic heat budget should be included in geodynamic considerations. The thermal conditions derived from metapelites should not be assumed or extrapolated to larger sections of orogenic crust that consist of other, more refractory lithologies.

Proponente: **Richard Spiess**