Constraining the P-T conditions of melting in stromatic migmatites from Ronda (S. Spain)

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We have studied fine-grained stromatic metatexites occurring c. 400 m below the contact with the Ronda peridotite (Ojén unit, Betic Cordillera, SE Spain). These rocks contain Qtz + Pl + Kfs + Bt + Fib + Grt + Ms + Ap + Gr ± Ilm and have a main foliation defined by alternating layers of biotite and fibrolite and thin (~ 0.5 cm) leucosomes. Garnet occurs in very low modal amount (<1%). Muscovite is an armored inclusion or texturally retrograde.

Microstructural evidence of melting in the migmatites includes *pseudomorphs* after melt films, euhedral feldspars, and *nanogranite* inclusions in garnet. Remelted nanogranites show granitic compositions. The latter microstructure demonstrates that garnet crystallized in the presence of melt.

We have constructed two pseudosections: one for the bulk rock in the MnNCKFMASHT system, and the other for the composition of the remelted nanogranite inclusions in the NCKFMASH system. Calculated isopleths for chemical parameters of garnet (X_{Mg}, X_{Grs}), biotite (X_{Mg}, X_{Ti}) and plagioclase (An content) in the Qtz-Pl-Kfs-Bt-Grt-Sil-melt field match the actual values in the rock. The *P-T* conditions of equilibration were estimated at 4.5-4.8 kbar, 680-700 °C. These *P-T* conditions overlap with the low-T tip of the melt field in the pseudosection for the nanogranite composition. They are also consistent with the complete experimental remelting of nanogranites at 700°C.

These results indicate that nanogranites represent the anatectic melt generated at, or soon after, muscovite melting, and that garnet is able to trap melt inclusions also at temperatures lower than those of biotite breakdown melting.

Projection of future climate change by aerosols along the Representative Concentration Pathways (RCPs) with a global climate model

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Projection of climate change in the 21st century due to aerosols is simulated by an aerosol global climate model, SPRINTARS [1-4], along the emission scenarios of the Representative Concentration Pathways (RCPs) in this study. SPRINTARS is coupled to an atmosphere-ocean general circulation model, MIROC, developed by the Atmosphere and Ocean Research Institute (AORI)/University of Tokyo, National Institute for Environmental Studies (NIES), and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) [5]. It includes the radiation, cloud, and precipitation processes related with the aerosol direct, semi-direct, and indirect effeects of main tropospheric aerosols (black carbon (BC), organic matter, sulfate, soil dust, and sea salt) as well as the transport processes. The model treats not only the aerosol mass mixing ratios but also the number and mass concentrations of cloud droplets and ice crystals as prognostic variables. All RCPs' scenarios (RCP2.6, RCP4.5, RCP6.0, and RCP8.5) which are used in climate simulations for the Fifth Assessment Report of the Intergovenmental Panel on Climate Change (IPCC AR5) are applied in this study. Sulfate aerosols, which have the negative direct radiative forcing and a role of cloud condensation nuclei, are gradually decreasing almost over the globe, on the other hand, BC aerosols, which have the positive direct radiative forcing and a role of ice nuclei, are still increasing. Therefore the total aerosol effects on the climate system may be largely different between 20th and 21st centuries.

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