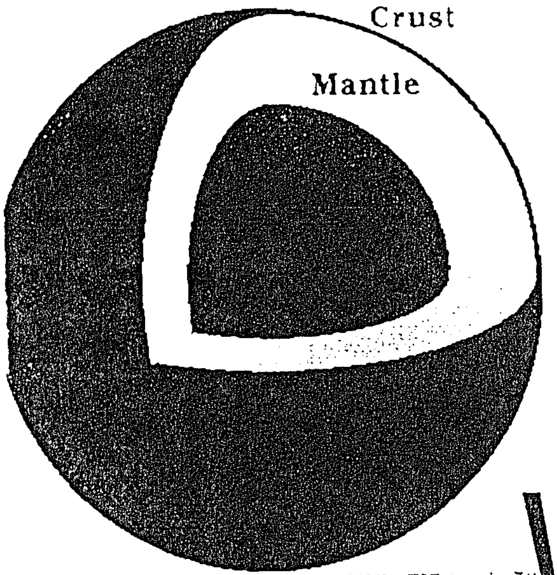
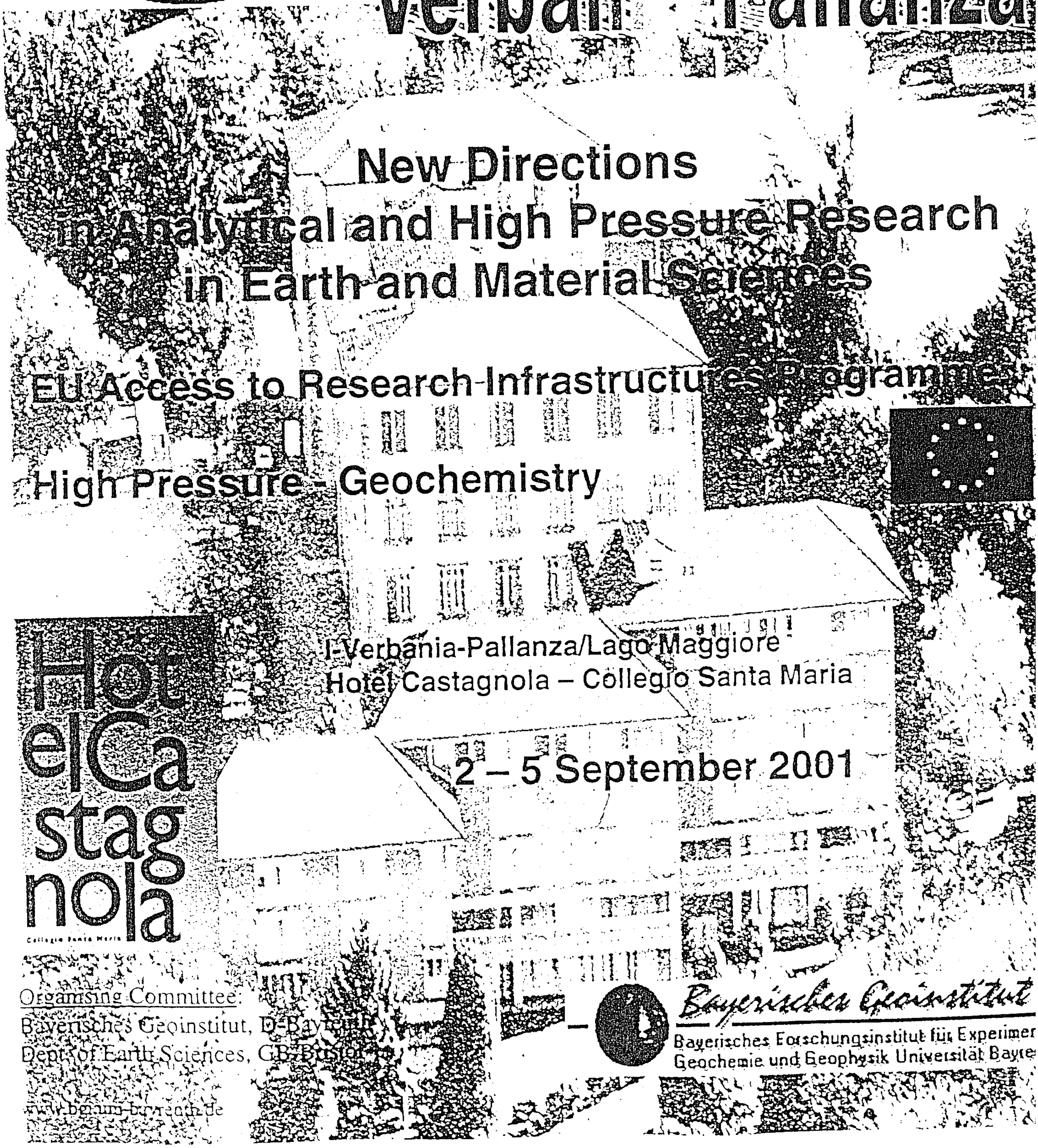


From Crust to Core

Verban Pallanza



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Geochemistry of micas of granitic rocks and associated quartz veins from Segura, Central Portugal

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At Segura, Hercynian two-mica granite, muscovite granite, granodiorite porphyry veins and Li-bearing granitic pegmatite veins containing cassiterite and lepidolite intrude the Cambrian schist-metagraywacke complex. Aplite veins intrude this complex and granites, whereas quartz veins with cassiterite and wolframite intersect the schist-metagraywacke complex. Quartz veins with barite, galena and sphalerite intersect this complex and the muscovite granite. Two-mica granite, muscovite granite, aplite veins and Li-bearing granitic pegmatite veins contain quartz, microcline, albite, muscovite, apatite, zircon, rutile and ilmenite. Two-mica granite also has biotite, chlorite, tourmaline and sillimanite, while muscovite granite contains the secondary phosphate gormanite. Aplite veins have tourmaline, while Li-bearing granitic pegmatite veins contain lepidolite, topaz, cassiterite, columbite, montebrasite and natromontebrasite, which are frequent. Granodiorite porphyry veins contain phenocrysts of plagioclase, quartz and biotite and the matrix consists of quartz, microcline, andesine-albite, biotite, chlorite, sillimanite, apatite, pyrite and cobaltite. The quartz veins with cassiterite and wolframite also have muscovite, monoclinic pyrrhotite, arsenopyrite (locally altered to scorodite), pyrite, sphalerite, chalcopyrite, matildite, schapbachite and stannite. The quartz veins with barite, galena and sphalerite correspond to a later generation and also contain muscovite, chlorite, apatite, cobaltite, pyrite and chalcopyrite, but galena is locally altered to anglesite, mimetite and kintoreite.

Mg-biotite from granodiorite porphyry veins is richer in Mg, Mg/(Mg+Fe) and poorer in Ti and Fe than Fe^{2+}-biotite from two-mica granite and consequently these granitic rocks are not related. All granitic rocks contain dominantly primary muscovite, but muscovite granite and aplite veins also have some hydrothermal muscovite. There is decrease in Ti, Fe, Mg, Mg/(Mg+Fe) and increase in Al^{VI} from primary muscovite of two-mica granite to that of Li-bearing pegmatites. These fractionation trends suggest that these pegmatite veins are derived from the two-mica granite magma. Primary topaz, montebrasite and natromontebrasite from Li-bearing pegmatite veins confirm that these pegmatite veins are derived by fractional crystallization of a granite magma. Muscovites from muscovite granite and aplite veins have similar compositions, but they are not related to that sequence. Aplite is probably related to muscovite granite, which is formed by partial fusion of metasedimentary materials. Lepidolite from Li-bearing granitic pegmatite is richer in Si, F, Rb and poorer in $Al^{IV}+Al^{VI}$ than coexisting primary muscovite. The chemical compositions suggest that muscovite and lepidolite are not genetically related, because there is no continuous evolution from muscovite to lepidolite, which is in accordance with the fact that lepidolite partially replaces muscovite. Hydrothermal muscovites from muscovite granite and aplite have more Fe+Mg and less $Al^{IV}+Al^{VI}$ than coexisting primary muscovite. Quartz veins contain hydrothermal muscovites, which have more Mg, Mg/(Mg+Fe) and Fe+Mg and less Al^{VI}, $Al^{IV}+Al^{VI}$ and paragonite content than primary muscovite from granitic rocks. Later radial hydrothermal muscovite associated with wolframite contains higher Mg and Mg/(Mg+Fe) than coexisting hydrothermal muscovite locally associated with cassiterite. Hydrothermal muscovite of barite-galena-sphalerite quartz veins has more Al^{IV} and less F and Mg/(Mg+Fe) than hydrothermal muscovite from quartz veins with cassiterite and wolframite.

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