

## The halogen (F,Cl, Br) budget of continental granitoid plutonic rocks

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The main goal of this study is to decipher the contribution of various volatile-bearing minerals to the whole-rock halogen (F, Cl, Br) budget of continental granitoid plutonic rocks and how this budget is governed by primary and secondary minerals. For this purpose, we investigated various granitoids with different volatile-bearing silicate mineral assemblages: (1) hornblende + biotite, (2) only biotite and (3) biotite + muscovite. Furthermore, accessory apatite is present in all samples, whereas fluorite and titanite occur only sporadically.

Halogens (F, Cl, Br) were extracted from the whole-rock powders by Pyrohydrolysis and subsequently analyzed by Ion Chromatography. Volatile-bearing minerals were analyzed for F and Cl by means of Electron Microprobe Analysis and for Br by Total Reflection X-ray Fluorescence.

All the investigated rock samples lie in the range of 500-3000  $\mu\text{g/g}$  F and 50-900  $\mu\text{g/g}$  Cl, respectively. In several samples, F and Cl contents of the whole-rocks roughly correlate with the halogen contents of apatite, biotite and mica and with the presence of fluorite. Br in the whole-rock powders is always  $<1 \mu\text{g/g}$  and quantifiable Br concentrations were only found in few hornblende and apatite separates.

Importantly, detailed calculations of the whole-rock halogen budget (based on modal analysis) show strong misfits for many samples and indicate that appreciable amounts of F and Cl are not incorporated in the minerals mentioned before. Indeed, detailed X-ray mapping and short-term leaching experiments (2 minutes) confirm that significant amounts of F and Cl are present (1) in tiny secondary mineral phases, (2) in fluid inclusions and (3) potentially located along grain boundaries. These cannot be accounted for budget calculations based on modal amounts of the various minerals.

Thus, our study shows that great care has to be taken when using the halogen contents of whole-rocks for petrogenetic models, since significant amounts of halogens in whole-rocks might be of secondary origin.

## U-Pb geochronology of detrital zircons from metasedimentary rocks from Formation of Desejosa, Serra do Marão, Portugal

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The Serra do Marão area is located in the Central Iberian Zone and is dominated by an Ordovician sequence that rests on parallel unconformity on Cambrian/Neoproterozoic metasediments, belonging to Group of Douro. Two samples were collected from the upper formation of this Group (Formation of Desejosa): 1) a metapsamite from the top of this formation, which is characterized by a succession of metasilicic and phyllitic layers, and 2) an intraformational metaconglomerate. The U-Pb geochronological data obtained in detrital zircons by Laser Ablation-Quadrupole-Inductively Coupled Plasma Mass Spectrometry will help to constrain their maximum depositional age.

The U-Pb data set (52 detrital zircons with 99–107% and 33 detrital zircons with 85–103% concordant ages for metaconglomerate and metapsamite, respectively, is dominated by Neoproterozoic ages (84.6 % and 57.6 %), but there are few Cambrian (9.6 % and 9.1 %) and Paleoproterozoic (5.8 % and 3.0 %) ages. Mesoproterozoic detrital zircons are also present (6.1 %) in the metapsamite. Furthermore, a cluster of Ordovician ages in the metapsamite (24.2 %) yield a concordia age of  $(465 \pm 16 \text{ Ma})$ , which may reflect some Pb loss induced by the Early Ordovician felsic volcanism ( $470.1\text{--}474.6 \text{ Ma}$ ) in the area.

The detrital zircon population of both samples record a long-lived Neoproterozoic magmatic episode, probably located near or at the northern Gondwana margin. However, the contribution of other sources containing Mesoproterozoic (1151–1088 Ma) and Paleoproterozoic (2257–1821 Ma) zircons must be considered. The U-Pb concordia age suggest a maximum depositional age of  $522 \pm 26 \text{ Ma}$  for the metaconglomerate and an preliminary interval from  $537 \pm 22 \text{ Ma}$  to  $516 \pm 25 \text{ Ma}$  for the metapsamite.

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