augitico) ed uno spinello, con contenuti variabili in Cr_2O_3 (30-50%) ed Al_2O_3 (6-18%), essenzialmente incluso in olivina e clinopirosseno. Questi inclusi mostrano tessitura porfiroclastica eterogranulare, più raramente protogranulare e/o a mosaico, tipica di peridotiti mantelliche. Carattere importante è la presenza, nei cristalli di olivina, di bande e pseudogeminazioni dovute a deformazione ("deformation bands and twinning").

Questi materiali ultrafemici risultano in equilibrio con un magma basaltico anidro, o con moderato contenuto in H_2O (3 wt.%), tra 7-12 kbar (ovvero profondità non inferiori a circa 21 km).

La distribuzione delle terre rare sui diagrammi roccia/condrite mostra, per i noduli femici, andamenti simili ed evidenti sovrapposizioni con quelli delle lave basaltiche stromboliane di tipo HKCA e SHO. Gli "spider diagrams" risultano più variabili con una evidente anomalia positiva in Ta (riscontrata nei basalti HKCA e nei suoi inclusi gabbroidi) ed assente nei basalti SHO. Questa appare correlabile con l'abbondanza relativa di clinopirosseno nei primi.

I parametri isotopici del Nd ($\alpha_{Sm/Nd}$ e $\delta_{Sm/Nd}$) suggeriscono una genesi mantellica per fusione parziale di una sorgente di tipo "eclogitico" (*i.e.* pirossenite a granato), con 3-5 % di fusione parziale. Durante la risalita questi magmi stazionano nel mantello superiore dove interagiscono con materiale peridotitico (duniti e wherliti) prima della migrazione verso livelli crostali. L'abbondanza di noduli gabbrici appare, inoltre, come la testimonianza di un prolungato stazionamento in ambiente subvulcanico dei magmi stromboliani, prima di essere eruttati.

Dati isotopici U-Th (utilizzando uno α-spettrometro ORTEC 576A) evidenziano disequilibri correlabili con età variabili tra 396 e 377 ka per le lave basaltiche meno evolute (P.ta dell'Omo e lave di S. Bartolo). Le lave andesitico-shoshonitiche del neostromboli e recenti presentano disequilibri in accordo con età comprese tra 85 e 50 ka. Questi valori suggeriscono che i magmi basaltici stazionino per tempi maggiori in corrispondeuza della transizione crosta-mantello e risalgano più lentamente. Ciò è in buon accordo con la loro maggiore cristallinità e con il grado di contaminazione (abbondanza di materiale xenolitico mantellico e crostale) che caratterizza altresì le proprietà reologiche dei magmi in fase di trasporto.

SAND COMPOSITION IN AN IBERIAN PASSIVE MARGIN FLUVIAL COURSE: THE TAJO RIVER

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The Tajo River (Spain), the 10^{th} largest river in Europe, drains part of the western passive margin of Europe that includes multiple tectonic elements of the Iberian plate.

Modern fluvial sand composition in the Tajo River drainage basin reflects the nature of the source region, which lies in the central part of the Iberian peninsula. The drainage basin comprises four principal structural units: (1) the Iberian Range, (2) the Hesperian Massif, (3) the Tertiary Tajo Basin and (4) the Neogene Santarem-Lisboa Basin. These two last units consist of broad regions of tabular siliciclastic, carbonate and evaporite deposits. Due to a good correspondence between fluvial sand composition and the involved structural units along the Tajo mainstem, four fluvial petrographic provinces can be established.

Province A corresponds to the Tajo River head, that is located in the Iberian Range, a NW-SE training Alpine mountain chain. This chain is largely composed by Triassic feldspathic sandstones, Jurassic and Cretaceous marine carbonates and subarkosic sandstones. Supplies to the headwaters of the Tajo River produce quartzolithic sedimenticlastic sands ($Qm_{67}F_4Lt_{29}$) dominated by multicycle quartz particles and a great variety of limestone and dolostone grains ($Rs_{78}Rg_3Rm_{18}$). The labile behaviour of carbonate grains during transport is manifested by the increase of the ratio Qm/Lt from headstream tributaries (0.66) to the Tajo mainstem (2.31).

Province B represents the upper reaches of the Tajo River course and includes the Tertiary Tajo Basin, largely composed by Neogene clastics, surrounded by the Central System at the North and the Toledo Mountains at the South. These two last structural units comprise Hercynian granitoids (granodiorites and monzogranite) intruding pre-Hercynian metasediments (quartzites, slates and schists). Supplies from northern tributaries are near pure quartzofeldspathic sands with minor amounts of metamorphic lithics ($Qm_{52}F_{47}Lt_1$). Mixing of tributary supplies with sand from the Tajo mainchannel and mechanical abrasion processes produce an increase in compositional maturity of resulting sand products ($Qm_{56}F_{35}Lt_9$). In addition, fluctuation in the content of Ls and Rs grains along the Tajo mainstem (mean of $Rs_{34}Rg_{23}Rm_{43}$) reveals production of these grains by erosion of the Tertiary Tajo Basin by southern tributaries and by the own mainstem.

Province C extends along the pre-Hercynian metasediments of the Hesperian Massif along the middle course of the Tajo River. Metamorphic bedrock includes slates, schists, quartzites and graywackes intruded by several plutonites. In this truck, sand modes of the Tajo River are quartzofeldspathic ($Qm_{60}F_{33}Lt_7$) but metamorphiclastic ($Rs_4Rg_{21}Rm_{75}$). In this province, both Tajo mainstream and tributary sand modes show similar composition, even in the proportion of aphanitic and phaneritic lithic popnlation. This means that in the Tajo mainstem little sand is inherited from previous provinces, and it is mainly provided from their tributaries. The progressive dilution by quartzofeldspathic supplies from tributaries and the effect of mechanical breakdown produces attenuation of the sedimentary signal from the Tajo upstream.

Province D corresponds to the lower reaches of the Tajo River. Here, fluvial courses flow across the Neogene Santarem-Lisboa Basin, composed by siliciclastic deposits. Sand modes are very similar than those of the province C ($Qm_{55}F_{39}Lt_6$) but showing a greater content in coarse grained rock fragments ($Rs_5Rg_{33}Rm_{62}$). Finally, sand of quartzose sedimentaclastic composition ($Qm_{72}F_{16}Lt_{12}$ and $Rs_{65}Rg_5Rm_{30}$) is deposited along the Atlantic coast of the Tajo estuary. These modes are generated from the erosion of Mesozoic and Tertiary to Quaternary sedimentary successions at the distal margin of the drainage basin.

On standard QmFLt and QtFL provenance-discrimination diagrams, sands plot within the recycled-orogen field (Tajo River head) and continental block fields (upper, middle and lower course), yielding a correct interpretation of the complex multiple tectonic setting of the source rocks.

The leaching potential is not very strong and thus, climate does not exert any significant influence on the petrogenesis of the Tajo River drainage basin sand. Erosion in the source areas may be described in terms of weathering-limited denudation regime: high relief and steep interfluve slope of source drainage sub-basins and rapid rates of sediment transfer in the main channel river produce immature sand that accurately reflect source-terrane composition.

Contrast between sand compositional parameters (mainly lithics and rock fragments, L and R, respectively) and the proportion of their related rocks at the source reflects the level of representation of those sources in the sands. Thus, although Ls (sedimentary lithics) and Rs (sedimentary rock fragments) show a direct relationship with respect to the abundance of their sources, always these sources appear underrepresented by those grains in the sand. However, metamorphic lithics and rock fragments appear overrepresenting metamorphic sources. In sands from the upper Tajo River course (Province A and B) proportion of coarse grained rock fragments from total rock fragment population fits well with respect to the proportion of coarse grained rocks (plutonites) at the sources. However, these sources are underrepresented by their corresponding rock fragments in sand from the lower course (Provinces C and D) as a fact of mechanical breakdown during transport.

Finally, the establishment of fluvial provinces related to the main bedrock structural units along the Tajo River course reflects the great relevance of tributaries from each province in the generation of the Tajo River sand, and the low significance of inberited sandy load from previous provinces. Dilution by mixing seems to be the main process that acts modifying sand composition in the Tajo River due to the different potential in sand generation of lithologies at the source.

CRYSTAL-CHEMISTRY OF CLINOPYROXENES AND Cr-SPINELS FROM TWO SERBIAN PYROXENITES: EQUILIBRATION CONDITIONS

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The Dinarides is made up of two distinctly separated units, the Outer and the Inner Dinarides, divided almost simmetrically by a transitional zone of Paleozoic schists and Mesozoic limestones. The first unit is the Central Ophiolite zone, beginning south of Zagreb in the NW and stretching through Bosnia and west Serbia nearly to the northern boundary of Albania in the SE, while the second one represents the Vardar zone.

Aim of this work is to study the crystal-chemistry of some clinopyroxenes and Cr-spinels