Monitoring of plagiogranite of the Yeşilova Ophiolite: Geochemistry and confocal Raman spectroscopy, Southwest Anatolia, Turkey

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In most ophiolitic suites observed around the world, there are small bodies of intrusive leucocratic rocks, usually called plagiogranites. It has clear differences from other subunits of the ophiolite in colour, texture and geochemical character. Yeşilova ophiolite exhibits an incomplete oceanic crust stratigraphy with missing sheeted dykes and epioceanic sediments. It is composed of tectonites, ultramafic-mafic cumulates, isotrope gabbros, plagiogranites and pillow basalts from the bottom to the top. Diabase and microgabbro usually cross-cut the peridotites. Plagiogranites crop out as veins, dikes and small intrusive bodies intruded into the isotrope gabbro having a sharp contact. They have light green, white in color and fine to medium-grain size, consisting predominantly of quartz, plagioclase, uralitized pyroxene, opaque minerals and supported by the Confocal Raman spectrometry. Plagiogranites have hypidiomorphic granular texture and mainly characterized by the micrographic and myrmekitic groundmass texture under the microscope.

Whole rock geochemical of plagiogranites are characterized by high SiO_2 (73.44±2.81) with remarkably low K_2O (0.62±0.48), and generally higher MgO (1.66±1.30), CaO (3.89±1.82) than the continental granite. Moreover; they have slightly high amount of Fe_2O_3/MgO ratio and similar Rb, Sr and Zr values to oceanic plagiogranite composition. On variation diagrams, CaO, Fe_2O_3, Sr, V, Co and Ta display clear negative correlations, whereas Na_2O, P_2O_5, Y, Zr, Hf, La, Ce show positive correlation with increasing of SiO_2 ratio. These can be explained by fractional crystallization processes in the late stage of magma generation. Plagiogranite samples display enrichment in LILE relative to HFSE in MORB and ORG normalized multi-element diagrams. In these diagrams, they exhibit depletions in Rb, Ba, Nb, P and Ti as characteristics of subduction-related magmas. Rare earth element (REE) patterns for plagiogranite show REE enrichment with respect to chondrite values. They exhibit slightly depletion in LREE ($(La/Sm)_N$ = 1.43-2.83) relative to HREE ($(Sm/Lu)_N$ = 0.43-0.92). Furthermore, all the samples of the plagiogranites have small positive Eu anomalies ($(Eu/Eu^*)_N$ = 1.14-1.35), indicating the significant role of plagioclase in the fractional crystallization.

As a result, despite the lack of isotopic data, the petrographic and geochemical results suggest that plagiogranites of the Yeşilova ophiolite are the most probably related to crystal-liquid differentiation process of the oceanic crust of the Alpine belt.

Urban dead seas: Natural and anthropogenic influences on redox-stratified lakes and wetlands

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Redox-stratification is a pervasive feature of dynamic near-surface earth systems, occurring on scales of micrometers to kilometers. Examples can be found in systems as diverse as microbial mats, soils and sediment pore waters, groundwaters, lakes and seas. Physical processes, such as advective flow through pores or wind mixing of surface waters, interact with chemical factors, for instance the availability of electron acceptors and donors, and biological processes, including organic matter fixation, macrophyte root exudation, bioirrigation, bioturbation and microbially-mediated reactions, to produce spatially and temporally heterogeneous systems.

Anthropogenic activities can also have an enormous influence on redox-stratified systems. For example, the addition of limiting nutrients and labile organic matter to surface and groundwaters leads to substantial, widespread problems such as eutrophication and the creation of dead zones. There is increasing recognition that the introduction of other contaminants, such as road salt deicers, may also have important biogeochemical consequences, albeit often through subtle or indirect effects. Deciers, typically NaCl or $CaCl_2$, are applied in enormous and growing quantities in urbanized settings throughout the world. In the U.S. alone, >15, 000, 000 tons of decier are applied to roads each year. It is well-known that application of these salts can have a profound impact on macro- and micro- biological communities, yet remarkably few studies have examined the effects on biogeochemical processes.

Recent work suggests that such effects could be quite significant. For example, mesocosm data show that addition of NaCl, and especially $CaCl_2$, can stimulate anaerobic respiration in wetland soils. Furthermore, an increasing body of literature demonstrates that road salt deicers may suppress physical mixing in lakes, potentially resulting in transition from dimictic to monomictic or even meromicitic conditions, and in pronounced redox-stratification of lake column waters. Particularly in eutrophic urban lakes, this is expected to have enormous consequences for biogeochemical cycling, and could lead to saline, persistently anoxic lake bottomwaters: ‘urban dead seas’. This emerging environmental problem deserves greater attention and further study.