Alkaline and subalkaline intrusives within the post-collisional Uluk__la basin, Central Anatolia, Turkey: Transition from extentional to compressional tectonics

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Three intrusive units were recognized in the study area. These are Ucurum alkaline gabbro, Ciftehan transitional gabbro and Yaglitas subalkaline diorite. Alkaline intrusives exhibit significantly enrichments in LILE and LREE whereas subalkaline diorites are relatively depleted in LILE and LREE. Their HFSE contents also represent that the Ucurum alkaline gabbro is more enriched relative to Ciftehan gabbro and Yaglitas diorite. Nb-Ta troughs in the spider diagrams gradually increase from the Ucurum alkaline gabbro to Yaglitas subalkaline diorite. Tectonic discrimination diagrams reveal that the Uçurum gabbro has a within-plate, and Ciftehan gabbro and Yaglitas diorite have the syn-COLG character. Major and trace element data on the Ciftehan gabbro reveal the hybrid character between the Uçurum gabbro and Yaglitas diorite.

When the data on three intrusives have been taken account together with the regional geological context, the Ucurum gabbro and Yaglitas diorite emplaced into the volcano-sedimentary succession during the extentional and compressional period, respectively. Ciftehan gabbro reflects the hybrid nature of the magma source. These properties imply that the Ciftehan gabbro emplaced during the transition between extentional and compressional tectonics.

Helium isotopic ratios and geochemistry of volcanic fluids from the Norikura Volcanic Chain, central Japan: Implications for crustal structures and seismicity

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The crust beneath the Norikura Volcanic Chain (NVC), Hida Highland, central Japan, is tectonically active and characterized by frequent shallow microearthquakes at depths 2-5 km. Recent seismic tomography studies of this area indicate zones of low seismic wave velocities (V_p and V_s) beneath the NVC at depths of 5-15 km. Fluid and light gas isotope geochemistry were used to clarify the relationships between hydrothermal activity and seismic activity of this area. The geochemistry of gases from fumaroles, boreholes and hot springs, found along the NVC volcanoes, reveals that (1) water vapor in the fumarolic gases is a mixture of arc-type magmatic water and local meteoric water, (2) some of the hot spring waters have fluid-mineral equilibration temperatures up to 200°C, (3) high $^3He/^4He$ ratios of 10.3-11.2 $\times 10^{-6}$ in fumarolic gases from the Tateyama, Yakedake and Ontake volcanoes suggest a MORB source for the helium, (4) slightly lower $^3He/^4He$ ratios in gases from the boreholes and hot springs indicate a significant contribution of mantle helium, and (5) the ultimate source of carbon is derived mainly from decarbonation of the subducting sediments based on the $\delta^{13}C$-$CO_2/^3He$ relationship.

The distribution of fumaroles, boreholes and hot springs that are characterized by high $^3He/^4He$ ratios coincides well with the distribution of low V_p zones seismically estimated at the depth of 5 km, whereas the spatial coincidence between the high $^3He/^4He$ sites and low V_p zones at the depth of 10 km is poor. This suggests that the shallow V_p zones beneath the NVC can be better explained by the extensive development of hydrothermal systems driven by magmatic heat of the NVC volcanoes, rather than by the existence of magma. This is consistent with the shallow occurrence of seismicity that suggests the brittle-ductile transition beneath the NVC is also shallow. The frequent microearthquakes might be produced by hydro-fracturing of the crystalline rocks by invading fluids under compression.