QUIlF equilibria for trachytes and pantellerites from the Kenya Rift

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Whole rock and mineral compositions have been determined for samples from the Eburru volcanic complex. Mineral assemblages contain alkali feldspar, fayalite, clinopyroxene, ilmenite, and magnetite, making the use of QUILF equilibria appropriate.

Mineral compositions are alkali feldspar $Ab_{62}Or_{38}$ in trachytes and $Ab_{58}Or_{42}$ in pantellerites. Cpx in the pantellerites have a step-wise shift towards higher Na_2O contents and are aegerine-augite. They, like the cpx in the trachytes, are essentially pure-end member Fe compositions. Olivines follow suite and are typically Fa_{99}. Amphibole in pantellerite is ferrorichterite.

Controversy exists over whether peralkaline rocks such as these are generated by fractional crystallization of mantle magmas or partial melting of crustal rocks. Mineral compositions, because they tend to be pure end member compositions, suggest extensive fractional crystallization. Magma temperatures also provide a means to evaluate the competing hypotheses. QUILF calculations for the trachytes range from 719-756 °C and pantellerites from 665-708 °C. These temperatures are probably above the solidus for crustal melting for the trachyte, while the lowest temperature pantellerites would represent approximately solidus temperatures. Finally, the QUILF thermobarometer demonstrates that Eburru magmas existed at very low (ΔFMQ is +0.5 to -1.6) oxidation states. Low oxygen fugacity plays a major role in the stability fields of mineral phases during crystallization.

Grenville U–Pb zircon ages of surface and subsurface samples from Texas and southern New Mexico

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Bimodal magmatism at 1340–1370 Ma and ~1250 Ma is well known from the basement of Texas and New Mexico. Younger, Grenville-age magmatism has been thought to be restricted to the Llano uplift of central Texas and the Franklin Mountains of west Texas. New U-Pb zircon ages on subsurface samples show that compositionally diverse Grenville-age (1070–1110 Ma) magmatism was widespread in the region. In addition to 1110±19 Ma, bimodal, A-type magmatism in the El Paso area, an anorthosite xenolith from a shallow Eocene intrusion yielded 1068± 30 Ma. In the center of the Rio Grande rift, retrogressed monzonitic granulite xenoliths from Potrillo Maar have zircon ages of ~1072 Ma. The suite of exposed and subsurface samples is suggestive of AMCG magmatism.

The largest Grenville age intrusion in the region is the ~1160 Ma Pecos mafic intrusive complex (PMIC), with subcrop > 200 km long beneath the Central Basin Platform. This layered complex is distinct in the predominance of noritic cumulates.

Between the PMIC and the Llano uplift, core from an alkali-feldspar granite yielded a 1078±23 Ma age. This age is similar to undeformed granites in Llano uplift. In the Texas Panhandle, core from a thick tholeiitic sill yielded a zircon age of 1081±8.3 Ma. These ages, A-type characteristics of granitic rocks, and Fe-enrichment in mafic suites indicate that Grenville-age magmatism in the TX–NM subsurface was widespread, this magmatism was coeval with granites in the Llano Uplift of central Texas, and compositions of dated samples suggest “A-type” magmatic affinities rather than a subduction-related tectonic setting.