

^{238}U - ^{230}Th and ^{235}U - ^{231}Pa disequilibria from the island of Fogo, Cape Verde

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The Cape Verdes Archipelago sits on one of the largest bathymetric swells in the ocean, rising 2.2km above the abyssal plain in the tropical North Atlantic. The rise is located near the point of rotation of African plate, such that the islands have experienced very little lateral movement in relation to the underlying plume over their ~20Ma lifespan. This makes Cape Verde an excellent location to examine plume dynamics under an ocean island, without the complication of lateral plate movement. There are ten islands arranged in a horseshoe, open to the west. The northern and southern islands display distinct isotopic signatures, despite their close proximity to one another. A suite of samples historical samples has been collected from the island of Fogo in the southern island chain. Samples have been collected from the 1995, 1951, 1852, 1847, 1816, 1785, 1769 and 1680-1725 eruptions, all located within the caldera. These samples have been analysed for Pb isotopes show little significant variation $^{206}\text{Pb}/^{204}\text{Pb} = 18.93$ - 19.24 , $^{207}\text{Pb}/^{204}\text{Pb} = 15.55$ - 15.63 and $^{208}\text{Pb}/^{204}\text{Pb} = 38.81$ - 39.04 . On the contrary the samples show a notable range in ($^{230}\text{Th}/^{238}\text{U}$) disequilibrium (1.091-1.226). The variation in ($^{230}\text{Th}/^{238}\text{U}$) is not clearly related to crustal contamination and we are exploring the influence of melting rate.

Coupled ^{238}U - ^{230}Th and ^{235}U - ^{231}Pa disequilibrium measurements from young mafic lavas are strongly dependent on the melting rate of their mantle source. Pyroxenite and egolite lithologies have much higher melt productivities than peridotite and this is reflected in ^{230}Th and ^{231}Pa excesses. We will attempt to explore the range in ($^{230}\text{Th}/^{238}\text{U}$) by coupling these measurements with analyses of ($^{231}\text{Pa}/^{235}\text{U}$) to get a more detailed picture of the melting process and to see if this variability can potentially be related to changes in the modal mineralogy of the source. Initial data shows large excesses for ($^{231}\text{Pa}/^{235}\text{U}$). We will present a fuller data set and its interpretations for the melting processes occurring beneath the Cape Verde Islands.

N isotope geochemistry during low grade metamorphism of coal and coal-related rocks: Case study of the anthracite field of Pennsylvania

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The evolution of the nitrogen speciation and isotopic composition in sedimentary rocks undergoing burial diagenesis and very low grade metamorphism has been seldom investigated so far. Yet it is a key issue in the reconstruction of the past nitrogen biogeochemical cycle, in the estimation of nitrogen input fluxes in subduction zones and in the understanding of molecular nitrogen genesis in the crust. Here we intend to partly fill this gap by studying the nitrogen partitioning and isotope fractionation between organic matter and minerals in coals and carbonaceous shales of the anthracite field of Pennsylvania. In this work, $\delta^{15}\text{N}$ results have been obtained on fixed-ammonium in the mineral phase of samples for which previous results on the kerogen $\delta^{15}\text{N}$ were available [1,2]. Taken together these results show that in organic and ammonium-rich samples, ammonium $\delta^{15}\text{N}$ values are more positive than the source organic nitrogen. Since, during the maturation process, nitrogen is liberated from the organic matter without isotopic fractionation [1,2], it comes that part of the generated nitrogen must have been lost with a lower $\delta^{15}\text{N}$ than its source organic matter. This nitrogen may have been lost in the form of molecular nitrogen which can then migrate and accumulate in reservoir structures. In contrast, in organic and ammonium-poor samples, ammonium $\delta^{15}\text{N}$ values are similar to those of the organic matter, suggesting that the generated nitrogen has been quantitatively fixed as ammonium in the mineral phase. In these samples, the efficiency of nitrogen retention as fixed-ammonium in the rock seems to be controlled by the ratio of generated nitrogen over the amount of host minerals for ammonium. The possibility that nitrogen was lost at this stage therefore needs to be carefully considered in studies aiming at reconstructing the past nitrogen biogeochemical cycle from bulk sedimentary rocks $\delta^{15}\text{N}$.

[1] Ader *et al* (1998) *org. geochem.* **29**, 315-323. [2] Boudou *et al* (2008) *GCA* **72**, 1199-1221.