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XIV SOUTH AMERICAN SYMPOSIUM ON ISOTOPE GEOLOGY
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Igneous Isotopic Geology: Alkaline Magmatism and Sr–Nd–Pb Signatures of Magma Plumbing Systems

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This pre-symposium short course is designed as an intensive 8-hour training module for undergraduate students and early-career geoscientists. The course integrates theoretical foundations of radiogenic isotope geochemistry with real Sr–Nd–Pb datasets from alkaline provinces, emphasizing magma plumbing systems in intraplate tectonic settings.
The course is structured to fit a single congress day and combines lectures, guided interpretation of published datasets, and collective discussion of geological scenarios.
Participants learn to distinguish source-related isotopic signatures from magmatic processes.
Special emphasis is placed on recognizing metasomatized lithospheric mantle domains, asthenosphere–lithosphere interaction, and the preservation of isotopic signatures through complex alkaline plumbing systems. Brazilian alkaline provinces are treated as reference natural laboratories for discussing mantle heterogeneity, plume-related versus structural controls, and long-lived isotopic domains. The course will be taught in English.

Time	Module	Content
8.30 – 9.30	Module 1	Fundamentals of radiogenic isotopes and mantle reservoirs
9.30 – 10.30	Module 2	Sr, Nd and Pb isotope systems: behavior and interpretation
10.30 – 11.30	Module 3	Alkaline magmatism: mantle sources and tectonic context
11.30 – 12.30	Module 4	Magma plumbing systems and isotopic coherence
13.30 – 14.30	Module 5	Effects of melting, FC, AFC and magma mixing on isotopes
14.30 – 15.30	Module 6	Hands-on interpretation of Sr–Nd–Pb diagrams
15.30 – 16.30	Module 7	Brazilian alkaline provinces as case studies
16.30 – 17.00	Module 8	Synthesis, discussion and Q&A

Real Sr–Nd–Pb Isotopic Datasets Used

All datasets employed in the course are derived from peer-reviewed literature and represent classical examples of alkaline magmatism and intraplate mantle heterogeneity.

Province	Rock type	87Sr/86Sr(i)	eNd(i)	206Pb/204Pb	Reference
Trindade Island (Brazil)	Nephelinite–Phonolite	0.7032–0.7048	+2.5 to -4.0	18.7–19.4	Marques et al., 1999
Fernando de Noronha (Brazil)	Basalt–Trachyte	0.7035–0.7045	+3.0 to -1.0	18.8–19.2	Almeida et al., 2011
Vitória–Trindade Ridge	Alkaline Basalts	0.7030–0.7046	+4.0 to -3.0	18.6–19.5	Szatmari et al., 2020
St. Helena (Atlantic OIB)	Basanite–Trachyte	0.7040–0.7060	+1.0 to -5.0	19.0–20.5	Chaffey et al., 1989

Key References (Downloadable, Peer-Reviewed)

Marques, L.S., Dupré, B., Piccirillo, E.M. (1999). Mantle source compositions of the Paraná Magmatic Province. Journal of Geodynamics, 28, 439–458.

Almeida, F.F.M., et al. (2011). Tectonic setting and isotopic constraints of Fernando de Noronha magmatism. Journal of South American Earth Sciences, 32, 373–388.

Szatmari, P., et al. (2020). Alkaline magmatism along the Vitória–Trindade Ridge: isotopic constraints. Tectonophysics, 776, 228305.

Chaffey, D.J., Cliff, R.A., Wilson, B.M. (1989). Sr–Nd–Pb isotopes of St. Helena basalts. Earth and Planetary Science Letters, 92, 61–74.

Hofmann, A.W. (2014). Sampling mantle heterogeneity through oceanic basalts. Phil. Trans. R. Soc. A, 372, 20120216.

White, W.M. (2015). Isotopes, mantle reservoirs, and geodynamics. Reviews in Mineralogy and Geochemistry, 80, 1–39.