Radiogenic isotope geochemistry of Cabo Ortegal pyroxenites: origin and age of a sub-arc mantle domain

R. TILHAC[1,2]*, W. L. GRIFFIN[1], S. Y. O'REILLY[1], G. CEULENEER[2], B. F. SCHAEFER[1], H. HENRY[1,2] AND M. GRÉGOIRE[1,2]

[1] ARC Centre of Excellence for Core to Crust Fluid Systems (CCFS) and GEMOC, Department of Earth and Planetary Sciences, Macquarie University, Australia

[2] Géosciences Environnement Toulouse (GET), CNRS, CNES, IRD, Université Toulouse III, France

(*correspondence: romain.tilhac@mq.edu.au)

Pyroxenites exposed in orogenic peridotite massifs illustrate the diversity of petrogenetic processes in supra-subduction environments. However, the source of their parental melts and the timing of their formation remain poorly constrained due to overprinting by metasomatism and metamorphism. We here report Sr-, Nd-, Hf- and Os-isotope compositions of a well-characterized set of pyroxenites from the Variscan Cabo Ortegal Complex, Spain. Previous petrological and geochemical data showed that these pyroxenites formed following melt/rock interaction associated with the intrusion of picritic to boninitic melts at shallow levels of a sub-arc mantle domain [1]. Our data yield age-corrected $^{87}Sr/^{86}Sr$ = 0.7037-0.7045 and ε_{Nd} = 0.3-7.5, interpreted as the result of mixing the depleted MORB mantle (DMM) and enriched mantle components (EM I and/or II). Along with strikingly unradiogenic initial Hf-isotope compositions (ε_{Hf} = -205-41), this mixing may point to the contribution of an old and metasomatized mantle domain and/or subducted sediments.

Most internal and external Nd isochron ages (421-592 Ma), and second-stage Nd model ages (502-762 Ma) specify that the main magmatic episode occurred in Ordovician to Neoproterozoic times, in good agreement with a Re-depletion model age and Os isochron ages (588-801 Ma). We thus suggest that Cabo Ortegal pyroxenites recorded arc magmatism re-working a northern margin of Gondwana, or pre-Gondwanan continental blocks. In addition, based on Sr-isotope compositions of clinopyroxene and amphibole, we argue that previous ages reported at *ca* 390 Ma correspond to a metamorphic episode related to the syn-subduction exhumation of the Cabo Ortegal mantle, accompanied by extensive amphibolitization and metasomatic remobilization of Re, as recorded by the wide range of Os-isotope compositions ($^{187}Os/^{188}Os$ = 0.16-1.44) and $^{187}Re/^{188}Os$.

[1] Tilhac *et al.* (2016), *Journal of Petrology* **57**, 1921-1954.