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EARTH SCIENCE

# SPEAKERS CLUB

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## Testing the consistency of four age modeling techniques using Iberian Margin sediment cores

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*Interpretations of paleoclimate records from ocean sediment cores rely on age-depth models, which provide estimates of sediment age as a function of core depth. Here we compare four methods used to generate age models for cores from the past 40 kyr. The first method is based on radiocarbon dating and uses the Bayesian statistical software, Bacon [Blaauw and Christen, 2011], to produce continuous age estimates (i.e., between radiocarbon dates) and their uncertainties. The second method is to perform benthic d18O alignments to a target core; here we use the probabilistic alignment algorithm, HMM-Match, which runs in an automated way (requiring no tuning) and generates 95% confidence intervals [Lin et al., 2014]. The third and fourth methods are to perform planktonic d18O and sea surface temperature alignments to a target core; here we use Match [Lisiecki and Lisiecki, 2002]. Like HMM-Match, Match is automated, but it requires tuning and does not produce uncertainty estimates. We present results from 9 high-resolution cores from the Iberian margin for which multiple age model types were produced. Our benthic alignment target is core MD95-2042 on the regional age model for the deep North Atlantic developed by Stern and Lisiecki [2014]. We find that all four age model strategies usually produce results which agree with one another to within age uncertainty estimates. We also compare the 95% confidence widths produced by HMM-Match and Bacon. We conclude that, for Iberian margin cores with sufficient resolution, all techniques appear equally effective; however, planktonic d18O and SST alignments should only be applied to nearby cores and cannot be used to generate age uncertainty estimates.*

## Geochemistry of Lamprophyres, Dry Valleys, Antarctica:

### Insight into the end of a subduction regime

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*Lamprophyres are mafic dikes characterized by an abundance of volatile-bearing silicate minerals such as amphibole and biotite-phlogopite, enrichment in both Mg and in incompatible elements such as Rb and K, and intermediate to low SiO2 content. They are often among the final plutonic rocks intruded during subduction regimes, and they are found cross-cutting subduction-generated plutons in regions such as the Sierra Nevada, the Variscan Orogeny of western Europe, and the Ross Orogeny of Antarctica. The Dry Valleys of Antarctica lie along the margin of the Ross Orogeny (c. 615-480) and provide a valuable record of a subduction regime and its end because of exceptional exposure, a wealth of previous data on the age, chemistry, and extent of older rocks in the region, and the unusually dense concentration of lamprophyre dike swarms in several areas.*

*To better understand why lamprophyres often appear during and after the termination of subduction, whole-rock major- and trace-element geochemistry was performed on lamprophyre dikes from the Dry Valleys. This research addresses several questions related to the generation of lamprophyre dikes, primarily 1) whether these rocks originate as primary melts 2) whether lamprophyres derive from melting of enriched mantle domains and 3) whether, and if so how, the generation of porphyritic felsic dikes often found alongside lamprophyres is linked to the formation of lamproic melts. The results suggest that the lamprophyres found in the Dry Valleys include samples of primary composition, although most of the samples have undergone mixing with an as-yet unidentified source during ascent. The incompatible element concentrations of even the most primitive melts are too elevated for lamprophyres to derive from depleted mantle, supporting the hypothesis that they derive from enriched mantle domains. Furthermore, geochemical data support the hypothesis that porphyry dikes are differentiates of lamprophyres, and cross-cutting relationships suggest that these dikes differentiated from a lamproic magma after the main intrusion of lamprophyre dikes. The geochemical data obtained from the Dry Valleys are consistent with those obtained by previous workers elsewhere along the Ross Orogeny margin, suggesting widespread intrusion of enriched mantle melts during the termination of subduction.*