**Abstract**

We present the first neon data, as well as new helium data, on Terceira Island (Azores archipelago, Portugal). Clear 20Ne and 21Ne excesses compared to air are observed (20Ne/22Ne > 11.2) and moreover, the samples show a more primitive 21Ne/22Ne ratio than MORB, confirming that the Azores hotspot can be considered as sampling a “primitive”, relatively undegassed, reservoir. Most 4He/3He isotopic ratios range between 80,000 and 63,500 ( 9 to 11.5 R/Ra), being similar to those previously reported by [1] [M. Moreira, R. Doucelance, B. Dupré, M. Kurz, C.J. Allègre, Helium and lead isotope geochemistry in the Azores archipelago, Earth Planet. Sci. Lett. 169 (1999) 189–205] . A more primitive 4He/3He ratio of  50,000 (R/Ra  15) was obtained in one sample, but we cannot completely exclude the possibility of a cosmogenic 3He contribution for this sample. Our study illustrates that the neon systematics can be more capable than helium to constrain the ultimate origin of hotspots in geodynamic settings dominated by plume–ridge interaction.

**Article Outline**

1. [Introduction](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx1)

2. [Geology of Terceira and sample locations](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx2)

3. [Analytical procedure and results](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx3)

3.1. [Analytical procedure](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx4)

3.2. [Helium](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx5)

3.3. [Neon](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx6)

4. [Discussion](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx7)

4.1. [Origin of the Azores hotspot](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx8)

4.2. [Mixing vs. heterogeneous plume source](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx9)

4.2.1. [Heterogeneous 3He/22Ne plume source](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx10)

4.2.2. [Binary mixing](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx11)

5. [Conclusions](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#secx12)

[Acknowledgements](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#ack001)

Appendix A. [Supplementary data](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V61-4FXWWVW-2&_user=2459685&_coverDate=05%2F15%2F2005&_alid=1590632689&_rdoc=5&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5801&_sort=r&_st=4&_docanchor=&_ct=12&_acct=C000057392&_version=1&_urlVersion=0&_userid=2459685&searchtype=a&_fmt=full&_pii=S0012821X05001482&_issn=0012821X&md5=fe01e0d567c98eb6a50b7b72f5520f60#app1)

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