Your abstract submission has been has been submitted for the 2014 AGU Fall Meeting. You will receive an email confirmation.

Click HERE to print this page now.

Receipt of this notice does not guarantee that your submission was accepted for the 2014 AGU Fall Meeting. All submissions are subject to review and acceptance by the Program Committee. You may review or edit your abstract submission until the deadline of 7 August 2014 23:59 EDT/03:59 +1 GMT. After this date, no further edits will be made to the submission.

Hotspots in Hindsight

Bruce R Julian[1], Gillian R Foulger[1], Oliver Hatfield[2], Samuel Jackson[2], Emma Simpson[2], Jochen Einbeck[2] and Andrew Moore[3], (1)University of Durham, Department of Earth Sciences, Durham, United Kingdom, (2)University of Durham, Department of Mathematical Sciences, Durham, United Kingdom, (3)Rhodes University, Department of Geology, Grahamstown, South Africa

Abstract Text:

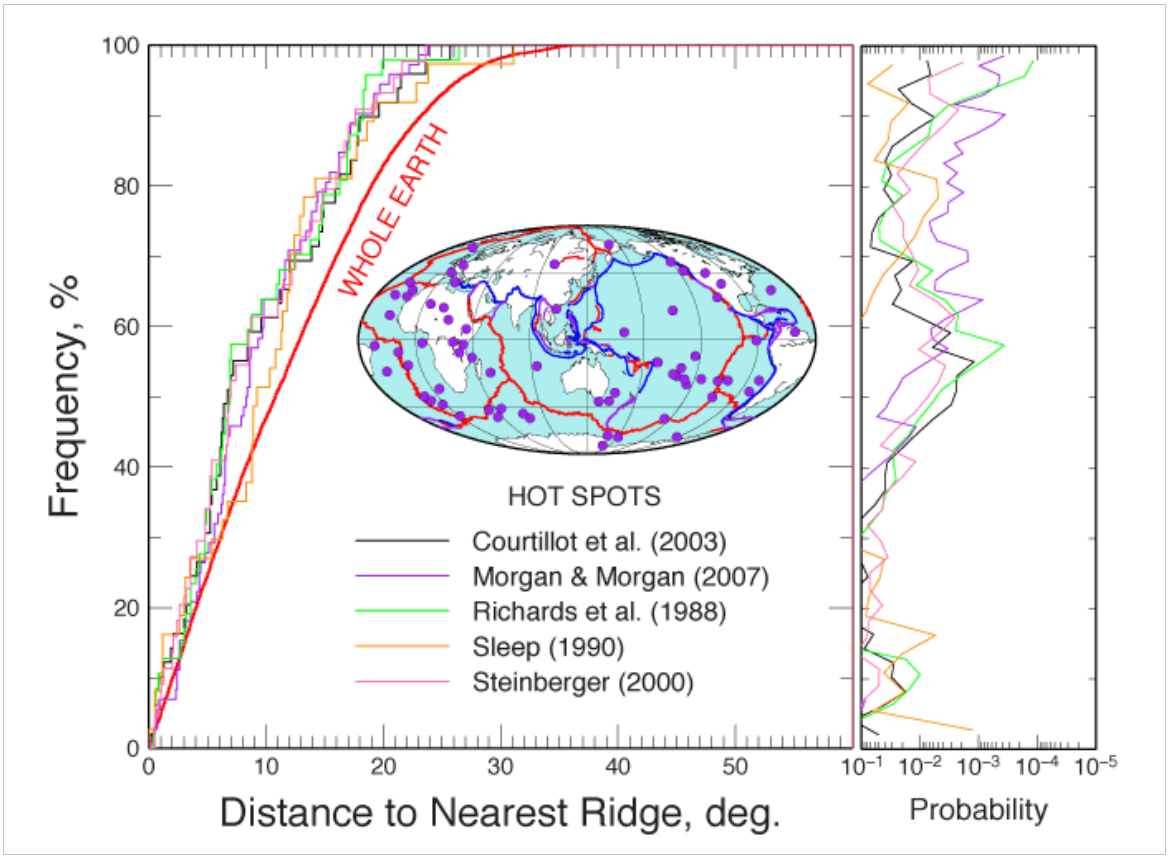
Torsvik et al. [2006] suggest that the original locations of large igneous provinces (“LIPs”) and kimberlites, and current locations of melting anomalies (hot-spots) lie preferentially above the margins of two Large Lower-Mantle Shear Velocity Provinces” (LLSVPs), at the base of the mantle, and that the correlation has a high significance level (> 99.9999%). They conclude the LLSVP margins are Plume-Generation Zones, and deep-mantle plumes cause hotspots and LIPs.

This conclusion raises questions about what physical processes could be responsible, because, for example the LLSVPs are likely dense and not abnormally hot [*Trampert et al.*, 2004].

The supposed LIP-hotspot-LLSVP correlations probably are examples of the “Hindsight Heresy” [*Acton*, 1959], of basing a statistical test upon the same data sample that led to the initial formulation of a hypothesis. In doing this, many competing hypotheses will have been considered and rejected, but this fact will not be taken into account in statistical assessments. Furthermore, probabilities will be computed for many subsets and combinations of the data, and the best-correlated cases will be cited, but this fact will not be taken into account either.

Tests using independent hot-spot catalogs and mantle models suggest that the actual significance levels of the correlations are two or three orders of magnitude smaller than claimed. These tests also show that hot spots correlate well with presumably shallowly rooted features such as spreading plate boundaries. Consideration of the kimberlite dataset in the context of geological setting suggests that their apparent association with the LLSVP margins results from the fact that the Kaapvaal craton, the site of most of the kimberlites considered, lies in Southern Africa. These observations raise questions about the distinction between correlation and causation and underline the necessity to take geological factors into account.

Fig: Left: Cumulative distributions of distances from hotspots to nearest ridge for 5 hotspot lists; heavy red curve: Distribution function for a random point on Earth’s surface. Hotspots are closer to ridges than expected at random. Right: For each list, the probability of at least as many random points being as close to a ridge. Values to right have higher significance.



Session Selection: Theory of Earth

Title: Hotspots in Hindsight
Submitter's E-mail Address: bruce.r.julian@gmail.com
Preferred Presentation Format: Assigned by Program Committee (Oral or Poster)

First Presenting Author

Presenting Author

Bruce R Julian

Primary Email: bruce.r.julian@gmail.com
Phone: 6504932553

Affiliation(s):

University of Durham
Department of Earth Sciences
Durham (United Kingdom)

Second Author

Gillian R Foulger

Primary Email: g.r.foulger@durham.ac.uk
Phone: 441913342314

Affiliation(s):

University of Durham
Department of Earth Sciences
Durham (United Kingdom)

Third Author

Oliver Hatfield

Primary Email: oliver.hatfield@hotmail.co.uk

Affiliation(s):

University of Durham
Department of Mathematical Sciences
Durham (United Kingdom)

Fourth Author

Samuel Jackson

Primary Email: jackson300@hotmail.co.uk

Affiliation(s):

University of Durham
Department of Mathematical Sciences
Durham (United Kingdom)

Fifth Author

Emma Simpson

Primary Email: e.s.simpson@outlook.com

Affiliation(s):

University of Durham
Department of Mathematical Sciences
Durham (United Kingdom)

Sixth Author

Jochen Einbeck

Primary Email: jochen.einbeck@durham.ac.uk

Affiliation(s):

University of Durham
Department of Mathematical Sciences
Durham (United Kingdom)

Seventh Author

Andrew Moore

Primary Email: andy.moore.bots@googlemail.com

Affiliation(s):

Rhodes University
Department of Geology
Grahamstown (South Africa)

If necessary, you can make changes to your abstract submission

- To access your submission in the future, point your browser to: Full Menu Options.
- Your Abstract ID# is: 20489.
- Any changes that you make will be reflected instantly in what is seen by the reviewers.
- After the abstract proposal is submitted, you are not required to go through all submission steps to make edits. For example, click the "Authors" step in the Abstract Submission Control Panel to edit the Authors and then click save or submit.
- When you have completed your submission, you may close this browser window or submit another abstract http://fallmeeting.agu.org/2014/Sessionviewer.

Tell us what you think of the abstract submission process