Peer Review Report

Review Report on From Continent to Ocean: investigating the multi-element and precious metal geochemistry of the Paraná-Etendeka Large Igneous Province using machine learning tools

EVALUATION

Q 1 Please summarize the main findings of the study.

Lindsay et al. present new bulk rock geochemical data (including platinum group elements) from lavas of the Parana-Etendeka LIP from both sides of the Atlantic. The authors use three different multivariate tools to simplify this high dimensional dataset into something that can more readily be interpreted by the human observer. First, they use principal component analysis to explore the principal variability of the dataset and discuss consistent behaviour between different elements. Secondly, by extracing the most significant principal components they identify 'clusters' in the data using k-means clustering. These clusters are broadly consistent with pre-existing groupings of the samples in question. Finally, the authors use the relatively novel non-linear manifold learning technique tSNE to provide an additional reduction, to just two dimensions. These learned manifolds are compared to those from a similar dataset gathered from the analogous North Atlantic Igneous Province. Using these simplified geochemical datasets the authors propose a model for how the interaction between mantle plumes, continental edges and rifting can generate lavas with high levels of PGEs.

Q 2 Please highlight the limitations and strengths.

Please see attached file.

Q 3 Please comment on the methods, results and data interpretation. If there are any objective errors, or if the conclusions are not supported, you should detail your concerns.

Please see attached file.

Q 4 Check List

Is the English language of sufficient quality?
    Yes.

Is the quality of the figures and tables satisfactory?
    Yes.

Does the reference list cover the relevant literature adequately and in an unbiased manner?
    No.

Are the statistical methods valid and correctly applied? (e.g. sample size, choice of test)

No.

If relevant, are the methods sufficiently documented to allow replication studies?
   Yes.

Are the data underlying the study available in either the article, supplement, or deposited in a repository? (Sequence/expression data, protein/molecule characterizations, annotations, and taxonomy data are required to be deposited in public repositories prior to publication)
   Yes.

Does the study adhere to ethical standards including ethics committee approval and consent procedure?
   Not Applicable.

If relevant, have standard biosecurity and institutional safety procedures been adhered to?
   Not Applicable.

Q 5 Please provide your detailed review report to the editor and authors (including any comments on the Q4 Check List):

Please see attached file.

QUALITY ASSESSMENT

Q 6 Originality — ▮▮▮▮▯ (4 of 5)

Q 7 Rigor — ▮▯▯▯▯ (1 of 5)

Q 8 Significance to the field — ▮▮▮▯▯ (3 of 5)

Q 9 Interest to a general audience — ▮▮▮▯▯ (3 of 5)

Q 10 Quality of the writing — ▮▮▮▯▯ (3 of 5)

Q 11 Overall quality of the study — ▮▮▯▯▯ (2 of 5)

REVISION LEVEL

Q 12 What is the level of revision required based on your comments:

Substantial revisions.