TEKTONIKA

Review Report

Senger et al. A Field Guide to the High Arctic Large Igneous Province In and Around Isfjorden, Svalbard, **TEKTONIKA, 2026.**

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1st Round of Revisions

Decision Letter

Dear Kim,

We have now received the reviewers' comments on your manuscript. Both reviewers agree that the paper represents a valuable contribution to the field and is suitable for publication after minor revisions. The manuscript is informative, well written, and contains data that will be of interest to an international readership.

We concur with one reviewer's suggestion that the text could be shortened and streamlined in some sections to improve readability. Some of the more detailed material may be moved to the Supplementary Material where appropriate.

The main concern raised by one reviewer relates to the discussion of large igneous provinces and several inaccurate statements in the Canadian section of the HALIP discussion. Please address these issues carefully in your revised manuscript.

In addition, both reviewers recommend incorporating some of the references cited in their reports, where relevant.

Pleaser consider carefully all the comments and please highlight in the new version all the modifications you made.

Please login to see the detailed comments by the reviewers that I am attaching also to this email for your convenience

Thanks for considering TEKTONIKA for your work

We look forward to receiving your revised manuscript.

Sincerely,

Chiara Montomoli & Graeme Eagles

Comments by Reviewer 1

A1.1.1. The authors describe 15 localities in Svalbard where different aspects of the geology of the High Arctic Large Igneous Province are documented. This synthesis represents a unique and important contribution to previous work on the circum-Arctic LIP by providing geological and geophysical information to non-specialists. The field guide is suitable for publication after minor revisions.

A1.1.2. The manuscript is “top-heavy” with background information that includes a global definition of LIPs, and what is currently known about the HALIP. The details are interesting (15 pages that include geochronology, geochemistry, tectonomagmatic history, basin stratigraphy, plate tectonic reconstructions; etc; see marked copy). However, the main content of the field guide is “drowned” in the process. Would the authors consider reducing the length of these introductory sections and/or split the contents between a more concise Introduction and a Discussion section providing optional reading to the user at the end of the field guide?

A1.1.3. Following up on the comment in A.1.1.2: some of the text and figures in pages 2-15 (marked copy) could be condensed and/or included as Supplementary material.

A2.1. This contribution brings together a unique set of geological and geophysical observations and datasets (via the cited references) on the HALIP in Svalbard. It sets an unprecedented example for other circum-HALIP localities to follow.

The main points of improvement have to do with the definition of large igneous provinces (Comment #6) and incorrect statements on the Canadian portion of the HALIP.

Overall, these constitute minor revisions to the original manuscript.

COMMENTS ON MARKED-UP MS:

Suggested words/sentences are underlined

[Abstract] Consider replacing *collectively formally* by grouped and classified.

[Abstract] Consider replacing *provide an introduction to* by define and introduce major features of the HALIP.

[Abstract] …summarize? the attributes of HALIP outcrops located in and around Isfjorden.

[Abstract] Consider adding of volcanic and intrusive rocks.

[Abstract] General comment on the Abstract: The use of both Diabasodden Suite and HALIP in the abstract leads to confusion. A statement at comment [1] stating that the DS is referred to as HALIP throughout the field guide would be useful. In the same way, HALIP manifestations *beyond* Svalbard can then be referred to consistently as circum-Arctic HALIP throughout the field guide.

[Introduction, 1st paragraph] This statement is misleading. Continental Large Igneous Provinces (LIPs) are **not** strictly defined by being "short-lived" in their entirety, but they are defined as having **short-lived, intense pulses of activity**. Flood basalt volcanism specifically falls into the category of ‘catastrophic’, LIP-related magmatic events, however, the associated intrusive

activity does not. While the total, long-term magmatic activity of a LIP can span up to 50 million years (Myr), much of the volume (often >75%) is typically emplaced in one or more bursts lasting only 1–5 million years. So, if this is a feature of the HALIP, why define this large igneous province as “enigmatic”?

[Introduction, 2nd paragraph] may have

[Introduction, 2nd paragraph] linked to the arrival of a mantle plume

[Introduction, 2nd paragraph] *especially in the Canadian Arctic*: Consider deleting this statement and the supporting references. Firstly, the HALIP has not yet been “introduced” (this happens in the next paragraph) so this statement on ore-forming processes is in the wrong place. Also, when compared to the Siberian Traps and the Midcontinent Rift System (for example), the HALIP is not a major target for Ni-Cu-PGE exploration.

[Introduction, 3rd paragraph] *residing*: found? located in?

[Introduction, 3rd paragraph] Germany

[Introduction, 3rd paragraph] Deegan et al. (2023) g-cubed

[Introduction, 4th paragraph] HALIP

[Introduction, 4th paragraph] geological and geophysical

[The High Arctic Large Igneous…, 1st paragraph] delete *a*

[Zooming out… 2nd paragraph] Chian et al… add Priyanto & Coakley (2025) g-cubed Special Collection

[Zooming out… 2nd paragraph] Consider replacing *an elongate and undulating bathymetric high* with an underwater mountain chain

[Zooming out… 4th paragraph] in Svalbard (based on your statement in Zooming out… 5th paragraph)

[Zooming out… 4th paragraph] ridge (not a basin) and Makarov Basin

[Figure 1, caption] *Alpha R* label on Figure 1: please change to AR to match MR or write in full.

[Figure 2, caption] Looks like purple. Would a warmer colour (yellow or orange?) show up better?

[Zooming out… 5th paragraph (not the only instance)] global: The *HALIP*

[Geochemistry… 1st paragraph] https://www.nature.com/articles/s43247-025-02981-z

[Geochemistry… 2nd paragraph] global: focused

[Geochemistry… 2nd paragraph] Incorrect statement. Primarily driven by mapping initiatives led by the Geological Survey of Canada

[Geochemistry… 2nd paragraph] global: Bédard

[Geochemistry… 3rd paragraph] regional scale

[Figure 5, caption] reference missing

[Regional sedimentation… 2nd paragraph] sequence?

[Svalbard – an accessible… 3rd paragraph] Consider rewriting for clarity, e.g.: Senger et al. (2014) present a comprehensive synthesis of research on the Svalbard dolerites and argue that a strengthened circum-Arctic perspective is essential for deciphering the evolution of the HALIP as an integrated magmatic system.

[Svalbard – an accessible… 4th paragraph] Galland et al. (2025) missing in the list of references

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Comments by Reviewer 2

I found the manuscript in object very informative, very well-written and a really suitable read. I recommend that it is accepted for publication on Tektonika, only pending on extremely minor revision consisting in the incorporation of two seminal references by the late Brian Harland, that are duly enclosed and outlined.

This paper provides a new and original documentation of the geometry, geochemistry and tectonic framework of the High Arctic Large Igneous Pprovince in Isfjorden, in the Svalbard archipelago north of Norway and presents a geological itinerary consisting of n. 15 stops to the most significant outcrops around the Svalbard capital village, Longyarbyen. The analysis builds on extensive geological mapping, coupled with compilation of 3D images and virtual outcrop reconstructions aimed at discussing the origin, age and tectonic significance of the large igneous province. It is suggested that the High Arctic Large Igneous Province is due to the passage of arctic lithospheric domains above a hot plume starting from Early Cretaceous time. The implications of this study will promote extensive discussion on the origin and tectonic significance of large igneous provinces in the High Arctic regions and worldwide.

The manuscript is very well written and very well organised. It represents a particularly interesting, innovative and thought-provoking contribution, that deals with topics of great impact in Structural Geology, Tectonics and Geodynamics. The illustrations and tables are all remarkably clear, legible and very much informative. The quality of the contribution, in all its parts, is overall very high.

Good credit is given to the existing literature, both methodological and regional. However, I believe that the manuscript would benefit from a slight extension of the reference list, that should include two seminal papers by Brian Harland: these consist of historical contributions, the very first to have outlined the occurrence of oblique deformations and transpression using the Svalbard Isles as a field case. Therefore, I believe that the manuscript would greatly benefit by the incorporation of these two references that provide a sound analyses of the Arctic obliquely-converging margin setting.

The manuscripts to be included are:
1) Harland, W.B. (1969) – Contribution of Spitzbergen to understanding of the tectonic evolution of the North Atlantic
region. Can. Geol. Surv. Pap., 78, 3-11.
2) Harland W.B. (1997) – The geology of Svalbard. Geol. Soc. Mem. 17, 521 p.

Overall I found this an extremely stimulating contribution and believe that it will make a very interesting title for a genuinely international and multidisciplinary audience. It is my opinion that the manuscript may be accepted for publication almost as it stands, with the only suggestion to include the abovementioned references in the general introductory sections. I recommend without reservations that this manuscript is

accepted for publication on Tektonika only pending on the very minor suggested revisions outlined above.

I require no anonimity and wish that all my comments are forwarded to the Authors. I hope that my review is received as a constructive and supportive indication, that may assist the Authors to further slightly improve a very informative and exhaustive paper, and the Editor/s in formulating a final, positive decision in the interest of Tektonika and of its wide, international readership

Authors' Reply to Reviewer 1

Thank you for the suggestions. We have shortened the introduction and made it clearer that it applies to the circum-Arctic part of HALIP. The lengthy sedimentology part and the Svalbard-focussed paleomagnetism part we have included in optional reading at the end of the manuscript.

All minor comments from the marked up manuscript were accepted and acted on.

Authors' Reply to Reviewer 2

Thank you for the suggestions. We agree that Brian Harland's seminal works are important to decipher the geological evolution of Svalbard. We included the Harland (1997) reference in a news short section introduction Svalbard geology.

As for the Harland (1969) paper we chose not to include it – the main focus of that work is the tectonic evolution which is not the main focus of this work. When it comes to the HALIP rocks the publication maintains that they are of late Jurassic age, which has been updated to early Cretaceous following radiometric and stratigraphic dating since then. So in this context we rather not include the publication to prevent confusions.

Acceptance Letter

Dear Dr.Senger, and co-Authors

Thank you for submitting the revised version of your manuscript “A field guide to the High Arctic Large Igneous Province in and around Isfjorden, Svalbard” to **TEKTONIKA**.

After careful consideration of the reviewers' comments and your revised manuscript, we are pleased to inform you that your paper has been **accepted for publication** in **our Journal.**

We appreciate the care you have taken in addressing the reviewers' comments and believe that your work will make a valuable contribution to the field.

Congratulations, and thank you for choosing **TEKTONIKA** for the publication of your research.

Kind regards,

Chiara Montomoli and Graeme Eagles