

Peer Review Report

Review Report on Deformation of the Juan de Fuca plate beneath the central Cascadia continental margin (44°–45°N) in response to an upper plate load

Original Research, Earth Sci. Syst. Soc.

Reviewer: Nicholas Hayman

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EVALUATION

Q 1 Please summarize the main findings of the study.

Trehu et al. compile both legacy and recently acquired seismic data to produce a velocity model of the Juan de Fuca plate at approximately the latitude of central Oregon. The authors walk the reader through, in order: (i) the geological rationale, (ii) the history and details of the data sets, (iii) the resolution of the data and central findings, and (iv) the geodynamic implications. In short, the downgoing slab contains a high velocity region that is likely the sheeted dike complex of the late Eocene forearc basin and this configuration facilitates assessment of several key features of the subduction zone, including its propensity to be seismically quiet. Ultimately, the paper provides a quantitative assessment of the elastic strain and comes to the provocative, but well supported conclusion that the elastic strain in the downgoing plate is contributing to the seismogenic strain at the plate interface. Though not mentioned, these observations are also consistent, I think, with ETS (episodic tremor and slip) patterns up and down the margin. The paper ends on a note about future directions.

Q 2 Please highlight the limitations and strengths.

The paper is eminently readable yet thorough, which is no small accomplishment! The results are impressive, and the details of resolution tests is done in a highly deductive and robust manner. The paper could be a model for how to write a data-rich paper rather than the short Nature-paper snapshots we tend to see.

Minor suggestion is a few more geographic references in the figures and text would help; maybe a larger scale map to start with?

I have made a few comments on an annotated pdf and highlighted a few writing problems (very few), which I attach.

I think toward the end of the Discussion the paper goes on a little too long about tangential items, but this is really a value judgement; it's perfectly fine and the authors' clearly want the paper to frame the next steps.

Lastly, there are a few model-dependent aspects on the geologic history of the margin (e.g. the rotational history of the forearc etc...), but they are well cited and the results don't really depend on them.

Oh, the data management could use a glance – a few "contact the authors" prompts for original data.

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.

Though not a seismologist, having worked alongside seismologists doing similar work, and having taught the basic principles of the technique in the classroom, I think the paper covers all the bases. The geological and geodynamic approaches and conclusions are well explained and robust.

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?

Yes.

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

Yes.

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)

No.

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):

Nothing to add other than my comments above. This is an accept in my view, though the authors may want to make a few last tweaks.

I am agnostic about being identified as the reviewer; up to the journal.

QUALITY ASSESSMENT

Q 6 Originality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 7 Rigor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 8 Significance to the field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 9 Interest to a general audience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 10 Quality of the writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 11 Overall quality of the study	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>