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: Ray Wells
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EVALUATION

Q 1 Please summarize the main findings of the study.

This paper describes a 3D crustal velocity model for the central Cascadia continental shelf and Coast Range constructed from seismic data collected during a number of onshore–offshore experiments over several decades. The authors define a 10 km–wide, WNW–oriented, high velocity vertical slab just offshore that projects downward nearly 25 km to the megathrust contact with the down going Juan de Fuca plate. They interpret this keel–like body to be the feeder dike system below the late Eocene Yachats Basalt exposed along the coast. They show the Moho of the subducting JdF plate to be deflected downward about 4 km beneath the dike complex and that the deflection is recovered downdip from the impingement of the dikes. The authors use these relations to model an elastic thickness of the JdF lithosphere of 2 to 6 km and argue that elastic deformation of the JdF plate may contribute to the unusually low level of seismicity in the Cascadia forearc, and the deflection may represent a stress concentration of interest to rupture behavior on the megathrust.

Q 2 Please highlight the limitations and strengths.

The paper is generally well written, clear, concise, and well referenced. There is one section in the background geology of the Yachats Basalt (a formal geologic name) that I have suggested some revision and references to clarify the relation of the Yachats Basalt flows to the dike swarm that fed it. The geologic relations are described onshore in a couple of published maps, papers, and abstracts. The aeromagnetic map, which is important to the paper should be referenced. I have provided a suggested rewrite of a couple of sentences and provided the references. One hard to find reference is attached.

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.

The authors clearly describe the uncertainties in the velocity model and limitations of their elastic plate modeling. Although I am not a seismologist, the methods, results and conclusions that the feeder dike system of an old, offshore volcanic center are affecting the geometry and behavior of the subducting Juan de Fuca plate are consistent with geological and potential field data that we have analyzed. I think it is an important result with respect to the behavior of the Cascadia megathrust.

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)
Yes.

Does the study adhere to ethical standards including ethics committee approval and consent procedure?
Yes.

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):**

Detailed comments are on the uploaded PDF.

QUALITY ASSESSMENT

Q 6	Originality	
Q 7	Rigor	
Q 8	Significance to the field	
Q 9	Interest to a general audience	
Q 10	Quality of the writing	
Q 11	Overall quality of the study