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Solid Earth Discussions

Interactive comment on "High-grade deformation in quartzo-feldspathic gneisses during the early Variscan exhumation of the Cabo Ortegal nappe, NW of Iberia" *by* F. J. Fernández et al.

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Dear Editor, In the light of comments by both reviewers, while keeping the descriptive data section essentially the same, we have made moderate to substantial changes to the main topic of discussion in the paper to put in context the sequence of structures we report from Masanteo. Rather than focussing the manuscript in discussing whether the channel flow is applicable or not to explain the tectonic evolution from eclogite facies to mid crustal conditions in the gneisses within the Cabo Ortegal nappe, we have decided to take an alternative approach, which is to characterize from the tectonic point of view the exhumation path of rocks from eclogite facies to greenschist facies, linking the pro-

gressive development of structures to evolving metamorphic conditions in gneisses but also in neighbouring metabasic granulites, which tell a similar story. Indirectly, we have removed unnecessary parts of the regional component which may obscure those key features of the exhumation that may be of interest to a wider audience. We would like to portray the gneisses in Cabo Ortegal nappe, but also the whole crustal section, as a key location to study widespread thinning of lower crustal section under evolving conditions from high pressure to mid crustal depths. In this new version we provide robust figures for the exhumation path in PT space, based in the gneisses and supported by those in the literature from neighbouring metabasic rocks with well reported metamorphic evolution during exhumation. The amount of cooling during decompression we report is comparable to what it is estimated for subducting slabs in present day subduction zones and numerical models. This is certainly a feature characteristic of the geodynamic setting. By comparing the metamorphic record during the exhumation of Cabo Ortegal gneisses and mafic granulites with present day examples of subduction zones another important point stands out, which is that the exhumation path is also substantially hotter, in excess of 200 °C, implying that for a great part the exhumation is in slab melting conditions. The lower crustal sequence that at some point was at eclogite facies conditions thinned to just below a kilometre in thickness. In contrast to other high pressure terranes, Cabo Ortegal nappe as a whole shows evidences of intense widespread deformation and this is clearly shown in the various structures described in the gneisses. Given the relative high temperature environment in which the deformation occurred during the ascent though the crust, it is perhaps easy to envisage the amount of strain that must have been accommodated in the development of a widespread foliation in relation to slab stretching at high T. We thank reviewer T Blenkinsop firstly for his general comments, and secondly to his specific comments. Given the changes made, some of the general comments are not applicable to the new version. In this new version, in addition to the changes in the contents of the introduction and discussion, we have taken more care with the language and the terminology. We hope to have minimised the errors in the previous version, both in the English and the

terminology. We have simplified the Introduction and made an effort in explaining better the aim of the work. In agreement with the reviewer's comments, we have simplified figure 16 by highlighting the development of structures during the exhumation from high pressure conditions, which remain the main objetive of the manuscript. Three different stages in the tectonic evolution of Cabo Ortegal rocks are illustrated: 1) the Cambro-Ordovician assembly of rocks in the Qz-Fsp gneisses that include the injection of the felsic dykes at the base of the Qz-Fsp gneisses; 2) the Devonian eclogitization event followed it by a fast exhumation to amphibolite facies conditions, prior to the main Varican collision; and 3) the Variscan deformation that includes the emplacement of the Cabo Ortegal nappe, its recumbent folding and the final upright folding. We hope that the new version is suitable for publication in Solid Earth. Best regards, FJ Rodríguez

Specific Comments:

P2, L15. What does "lateral" mean in this geometry? This is an ambiguous term.

Lateral flow of rock (P2, L15) is substituted by "non lithostatic pressure".

P2. L18. Which figure in Shreve and Cloos?

The figure cited in Shreve and Cloos (1986) is Figure 4.

P2, L20. Give some references to these models P3, L26 and elsewhere.

References to these models P3, L26 are given in Burov et al. (2014a, b).

"orogenic tectonic pile" seems unnecessary. Why not just tectonic pile? P3 L27.

Orogenic tectonic pile is changed by tectonic pile P3 L27.

Geochemical (ultrabasic) and mineralogical (mafic) descriptions should not be mixed. P4, L3.

Ultrabasic is changed by ultramafic P3 L27.

Closer than what? P4.

The Cabo Ortegal complex is located closer than the other allochthonous complexes of the NW Iberia to the foreland basin P4 L3.

Is the lower tectonic unit a formal name? In some cases it is capitalised, but not in others. P4, L13.

The lower tectonic unit is an informal name and now is always written in lower case P4 L7.

What is a neat contact? That is not geological description p6, L16, 17, elsewhere.

Neat contact is changed by straight contact P4 L14.

"Calc-silicates granulite block-in-matrix" is a pretty awkward description for a shear zone rock. Can that be improved? Are these breccias? Block-in-matrix is not a noun on its own. P11, L8.

Block-in-matrix is change by blocks and boudins.

No younging evidence has been presented that would be necessary to conclude about a facing direction. Should this be verging, rather than facing? P11, L17.

Yes, It is verging, rather than facing P11 L8.

No need for both tight and the interlimb angle as a fold description. Tight means interlimb angles less than 30°. P11, L22ff.

Low interlimb angles (<30°) is deleted in the fold description because unnecessary P11 L17.

Using the shapes of the eclogite blocks as a strain marker is a great idea, but it needs some caution. For a start, these are dimensions as measured on exposed faces, and therefore necessarily incomplete. How does that affect the results?

Generally, the dimensions of the eclogite blocks are measured where the three normal sections parallel to the principal strain directions are exposed, however a caution

sentence is added in the paragraph P11 L25-26.

All the technical corrections have been incorporated to the new version of the text.

Interactive comment on Solid Earth Discuss., 7, 3541, 2015.