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Solid Earth Discussions

Interactive comment on "Tectonostratigraphy of the Mérida Massif reveals a new suture zone exposure in SW Iberia" *by* Rubén Díez Fernández et al.

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Referee's comment #1: "Following the initial sections on introduction, general comments and a summary on the available knowledge for the area, the authors brieïňĆy describe a number of supposed tectonostratigraphic units, one of which, the so-called Merida Ophiolite, is key to the suture zone hypothesis."

Authors' reply #1: The term "supposed" gives an idea of the biased nature of the comments that follow. In a way the reviewer insinuates that what we propose is not based on our own data. We remind the reviewer that the map and cross-section are of our own, were created on extensive fieldwork grounds, and are not like others published

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before because we used different criteria for grouping rock types. Implying that we have not done fieldwork and own observations in the area and that we base our proposal exclusively on what others published before is unnecessary and disrespectful. We interpret the several groups of lithologies as different tectonostratigraphic units. But it is a fact that one can define a group of lithologies based on whatever he/she likes. The question is if such grouping means something in geological terms. We think the grouping we propose reflects different tectonostratigraphic units, each of which accounting for rather different sections of the lithosphere (and that would be the interpretation/conclusion, not the grouping itself, which is the way to reach such interpretation/conclusion). We do not "suppose" that this would be the most appropriate grouping in general terms. We propose a specific grouping aimed to a purpose, as stated in the manuscript.

Referee's comment #2: "Yet, this hypothesis and the ascription of the Merida massif to an oceanic ophiolitic complex are not supported by any petrological, structural or geochemical data, which totally compromises the proposed interpretation."

Authors' reply #2: As structural data is concerned, foliation/bedding measurements show the relative position of the lithological groups presented in the geological map. Based on that, the mafic-ultramafic complex with ocean lithosphere affinity separates two other units with continental crust affinity. It is very simple structural geology. The structural position of the mafic-ultramafic complex speaks for itself. Additionally, we say (and will show in pictures) that each unit is separated from the rest by a large-scale mechanical contact, which is also typical for the underlying and overlying (if any) units relative to ophiolite complexes exposed inland. Petrological evidence is presented concisely, firstly as a list of lithologies that make the Mérida Ophiolite (and the rest of the units). The lithologies in that list are very common for ophiolites worldwide, which show variety of lithological ensembles depending on the origin of their protoliths, and subsequent evolution. We are dealing with hundreds of meters of mafic rocks (amphibolites and meta-gabbros-diorites of different types) intercalated with metaperidotites

(now serpentinites). That set of rocks does not represent a typical continental lithosphere. And secondly, the rather different metamorphism experienced by the rocks of the Mérida Ophiolite compared to that of the, for instance, the overlying units, is another evidence on the lithosphere bearing of the mechanical contacts and also on the different metamorphic evolution each of the sections exposed in the Mérida Massif has experienced. This is also very common in suture zones featured by ophiolites, where each terrane (e.g., upper or lower plate) shows a different evolution compared to the ones that are currently juxtaposed with. As geochemical data is concerned, the truth is that this type of data would not test positive the existence of a suture zone by themselves. Among other things, the geochemistry of a rock may give us an idea of the petrological processes and regional (geodynamic) setting where it was formed, but considered alone it says nothing about the oceanic (ophiolitic) or non-oceanic (non-ophiolitic) nature of it. It is the regional context that should be used to identify an ophiolite. The ophiolitic nature of a rock ensemble is something that should be resolved (or proposed) first, as we are doing in this contribution, based on other grounds (rock associations, structural position relative to other rock associations, comparative metamorphic evolution, nature of lithological contacts, etc.).

Referee's comment #3: "To illustrate the hypothetical tectonostratigraphy, a simpliïňĄed map of the region is presented, which is inconsistent with published geological maps for this area without the authors justifying theirs."

Authors' reply #3: We wonder if the authors of previously published geological maps justified theirs when the maps where published. And if so, how did they do it? In the revised manuscript, maybe we should include (and we will) some pictures to illustrate the statements we make regarding the mechanical nature of the contacts and the existence of some rocks and structures in particular. But in order to justify a geological map (i.e., the distribution of the groups of rocks we propose) we should provide hundreds of georeferenced and oriented pictures, at least one for each of the outcrops we have visited during mapping. We believe this is something that has never been done in the

history of geology. Maybe the referee is trying to take the publishing of geological maps to a next, more demanding level. Yes, we know, the map does not match with the maps others did before. But that does not mean we are not right, does it? Just for the sake of discussion, it is surprising that some or most contacts shown in previous maps do not parallel the foliation or bedding strike in the region (according to our measurements). And it is also surprising none of the former authors recognized the mechanical nature of some contacts, even after calculating the peak metamorphic conditions for some rock exposures. It seems the study area is a box full of surprises.

Referee's comment #4: "The authors must provide the pertinent evidence for their assumptions or refer to publications where these evidence are shown. In the absence of such information, it is impossible for any reader to have the smallest idea of the validity of the hypothesis put forward."

Authors' reply #4: The pertinent evidence to justify the existence of a suture zone, which is the aim of the paper, would be, for example, to test positive the juxtaposition of a section of oceanic lithosphere onto a section of continental lithosphere. We think the mafic-ultramafic complex we have mapped in the Mérida Massif is a good example of an ophiolite. But even if serious doubt is held regarding this, it is clear that at least the mafic-ultramafic complex is somewhat equivalent to a lower crust-upper mantle exposure (note also the metamorphism of this unit). Such section rest on top of a tectonic slice with continental crust affinity, i.e. a lower crust-upper mantle section thrust onto continental crust, a process that we can see in a suture zone sensu lato. This can be easily interpreted from the tectonostratigraphy, map and cross-section we are presenting. We are going to include pictures of relevant observations (structures, rock types, etc.) in the revised version of the manuscript so they can be used as a visual reference for the statements we make in the manuscript. All the comments provided here are largely based on a very simple idea: I/we do not believe the geological map you are presenting. Sorry, we cannot fight back against that. Basically because we cannot discuss the reasoning other authors followed when they did their geolog-

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ical maps of the region before, we cannot know which specific outcrops they visited back then, which were the criteria they followed for discriminating between lithologies and, more importantly, the previous maps look like created for a completely different purpose. We are not saying that previous maps are wrong. They were most likely created to show or solve other things. To illustrate this, you could analyze the grouping criteria followed in previous maps. The Serie Negra Group that is presented in some of these maps includes metasedimentary rocks (paragneisses, schists, phyllites, slates), metagranitoids (granites, tonalities, diorites, gabbros) variably transformed into orthogneisses, metavolcanics, serpentinites, and amphibolites, among other things. All those lithologies were mapped as a single unit. There is no way one can identify the relative position between them, as most of them are simply gathered into the Serie Negra Group. There is no way to discriminate whether there is a section that is composed exclusively of some particular type of rock (e.g. mafic-ultramafic ensemble). Moreover, it is quite shocking that in other maps some major faults or shear zones were not recognized (we did), and so on. We are presenting and discussing the criteria we have followed for tracing the boundaries between the units we propose, and we are (briefly) describing the lithologies included in each of the units. It is the least that must be done for presenting a geological map. The result is a new geological map and cross-section for the Mérida Massif, for which a new understanding is presented based on a different approach. Finally, we would not underestimate the capacity of other readers “to have the smallest idea of the validity of the hypothesis put forward”, i.e. the existence of a suture zone in the Mérida Massif based on the data and arguments we are presenting. There is plenty of smart, quick-witted geologists out there. We know some.

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