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Interactive comment on "Kinematics and extent of the Piemont-Liguria Basin – implications for subduction processes in the Alps" *by* Eline Le Breton et al.

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Any comment, as strongly worded as they might be, to improve our manuscript and discussion on reconstructions of the Alpine-Mediterranean belt is welcome. We thank Stefan Schmid for raising an important discussion on potential deformation within the Adriatic plate and would like to reply below to his critical points.

First, as we wrote in section 3.3 (lines 312-314), the idea of splitting Adria into two plates to solve this "compatibility problem" with Iberia-Sardinia-Corsica at 200 Ma, is not an invention from our part but was proposed by Stampfli and Borel (2002) and applied in the kinematic reconstructions of Schettino and Turco (2011). We follow this

model as it solves paleogeographic problems of Sardinia-Calabria relative to Adria in Permian-Triassic times (section 3.3) and the closing time of the Piemont-Liguria (PL) Ocean between Iberia and Europe-Adria (section 2.3, lines 193-209). We used the rotation poles of Schettino and Turco (2011) for the motion of northern Adria for time prior to 20 Ma, as listed in our Table 1.

Second, we refer to d'Agostino et al. (2008) for the present-day subdivision of the Adriatic plate (indeed clearly identified by GPS data) but not for the deformation along the Mid-Adriatic Ridge. For the latter, we quote Scisciani and Calamita (2009), who introduced the term "Mid-Adriatic Ridge" (not us, and not "mid-Atlantic") and who presented interpretation of seismic reflection and boreholes data from the central Adriatic Sea (including the CROP data). They clearly show that the so-called Mid-Adriatic Ridge formed by transpressional reactivation of pre-existing rift-related Mesozoic structures. The inversion occurs clearly in Plio-Pleistocene time and possibly even earlier. A first inversion phase is indeed observed by lateral thickness variations and unconformities above the Albian-Aptian reflector (please see Figure 6 of Scisciani and Calamita, 2009), especially during the Paleogene-Miocene succession (Figures 3 and 8 of Scisciani and Calamita, 2009). We will add this to our text in section 3.3.

That said, we fully agree that the model we present is a major simplification of the reality. As we wrote in lines 316-325, we support the idea that pre-existing structures related to rifting in the Triassic-Jurassic were reactivated in transpression during the Late Cretaceous-Cenozoic convergence of Africa with Europe not only along the Mid-Adriatic Ridge but throughout the entire Adriatic plate. This deformation was most likely diffuse throughout the entire plate and distributed along several tectonic structures rather than localized along one major strike-slip fault. We had to introduce this simplification for kinematic purposes. But it is important to emphasize that this strike-slip motion along the Mid-Adriatic Transform Fault during the Alpine Orogeny (implemented in our model between 100 and 40 Ma, following rotation poles of Schettino and Turco 2011) does not affect the kinematics of rifting and opening of the PL Basin, which

is the main aim of our paper. However, it does affect the paleogeographic position of Adria with respect to Sardinia-Calabria and Iberia and it affects the closure of the PL Ocean, as mentioned above (also see our manuscript in sections 2.3 and 3.3). We discuss further the implications of our model for subduction processes in the Alps in section 5.3, where we provide estimates of plate convergence between northern Adria and Europe not only for our model but also for two other reconstructions, including the recent model of van Hinsbergen et al. (2020), and thus a range of possibilities to the reader.

In order to make that issue clearer in the text, we propose to present our model as a potential "end-member" (simplified) kinematic model that would imply a maximum amount of strike-slip motion within Adria, as well as between France and Iberia-Sardinia-Corsica, and thus a maximum width of the PL Ocean and of plate convergence during the Alpine Orogeny between northern Adria and Europe. In that view, the model of van Hinsbergen et al. (2020) can be considered as the opposite "end-member" model that would imply on the contrary no deformation within Adria, no strike-slip motion between France and Sardinia-Corsica (but convergence between Iberia and Sardinia, and in the Pyrenees in Early Cretaceous time) and a minimal width of PL Ocean and plate convergence between northern Adria and Europe. While both models are geometrically viable based on rigorous plate reconstruction principles (most importantly rigid body rotations around Euler poles), the geological reality lies surely somewhere in between and would require further work on documenting and implementing intraplate deformation within Adria and also within Iberia (as recently proposed by Angrand et al., 2020), into future kinematic models.

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