The Westernmost Mediterranean evolution: A review of the Alboran and Algero-Balearic basins stratigraphy

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→ Based on ~4500 km of new and reprocessed multichannel seismic profiles (Fig. 1), together with well and dredge data (Fig. 1), we are able to review the westernmost Mediterranean stratigraphy at a regional scale.

→ We have correlated the sediment units deposited since the beginning of the formation of the different sub-basins (including the Miocene emerged sub-basins onshore South Iberia, Fig. 1), and we present for the first time a coherent stratigraphy (Fig. 2) and large-scale tectonic evolution of the whole region.

→ The results provide the information to test and refine models of the geodynamic evolution of the westernmost Mediterranean (Fig. 5).

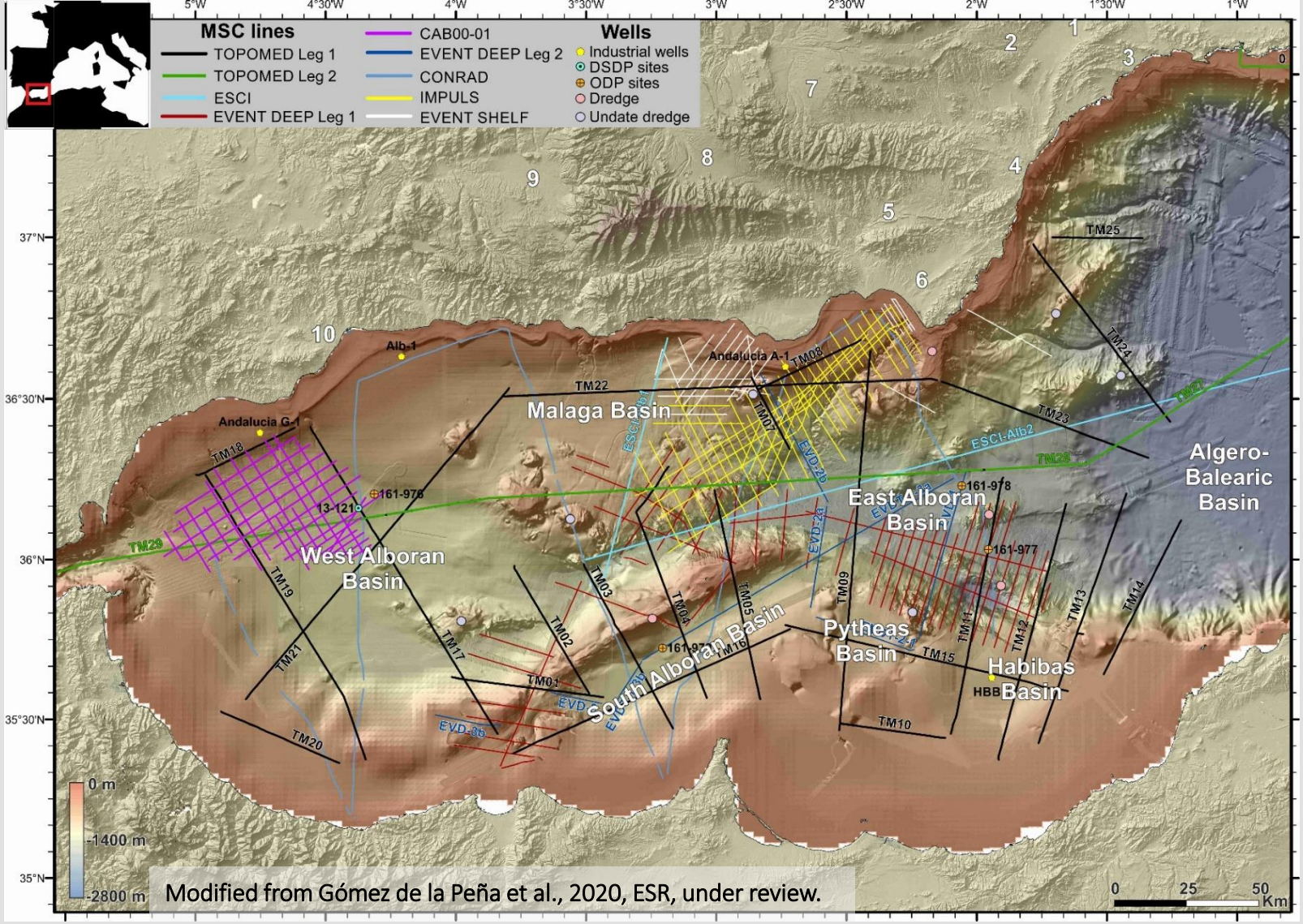
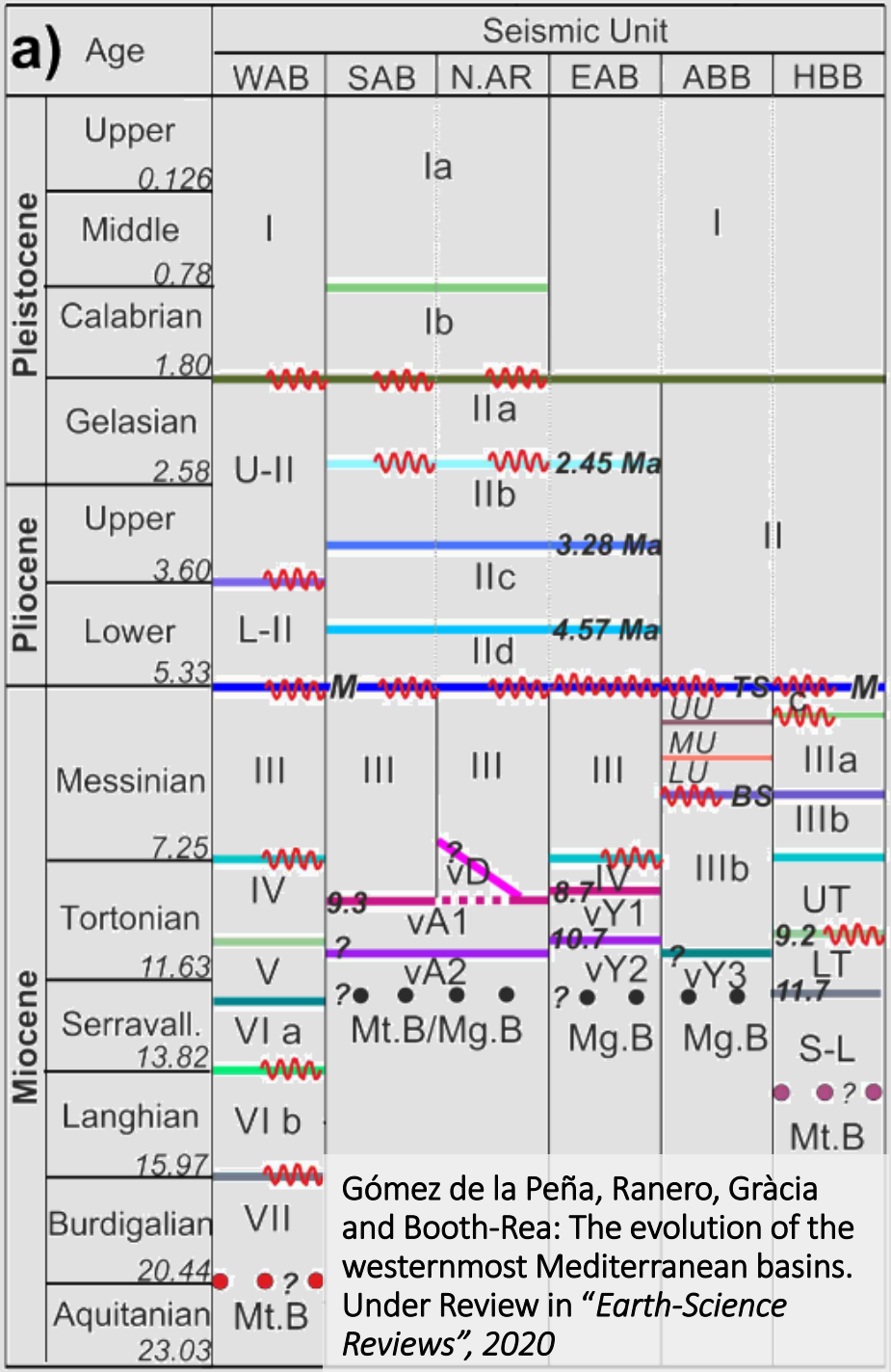


Figure 1: Bathymetric map of the Alboran Sea from digital grids released by SRTM-3, IEO bathymetry (Ballesteros et al., 2008, Gómez de la Peña et al., 2016), GEBCO compilation and data acquired during B-CSI cruises (Gràcia et al., 2006, 2012). Location of MCS profiles, commercial and scientific wells and dredges used in this study is shown (see map legend with the details). **We integrated into the existing database a new grid of MCS profiles from the B-CSI: TOPOMED, EVENT-DEEP and ESCI.** White numbers depicted the location of the main sedimentary depocentres onshore the Betics: 1: Fortuna Basin, 2: Lorca Basin, 3: Mazarrón Basin, 4: Vera Basin, 5: Tabernas-Sorbas Basins, 6: Níjar Basin, 7: Baza Basin, 8: Guadix Basin, 9: Granada Basin, 10: Málaga Basin.



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→ **Main results** shed light on the particular evolution of each sub-basin as well as in the entire basin evolution.

→ The **Late Oligocene - Miocene** represents the formation stage of the basins, controlled by the evolution of the Gibraltar subduction system. During this period, each sub-basin shows different sedimentary units, supporting differences in their evolution.

→ The **Plio-Quaternary** corresponds to the deformation stage, driven by the Eurasian-African plates convergence. The Plio-Quaternary sediments are covering the entire area, instead of being restricted to the sub-basins. This latter period is characterized by contractional and strike-slip deformation, accommodated mainly by re-activation of pre-existing crustal structures.

Figure 2: Ages and seismostratigraphic units identified in the westernmost Mediterranean. Each column in the table represents a geographical area: WAB: West Alboran Basin, MB: Malaga Basin, SAB: South Alboran Basin, N. AR: North Alboran Ridge (Alboran Channel), EAB: East Alboran Basin, ABB: Algero-Balearic Basin and HBB: Habibas Basin (see Figure 1 for location). Red wavy lines represent unconformities.

Example of the TOPOMED MCS profiles: Malaga Basin

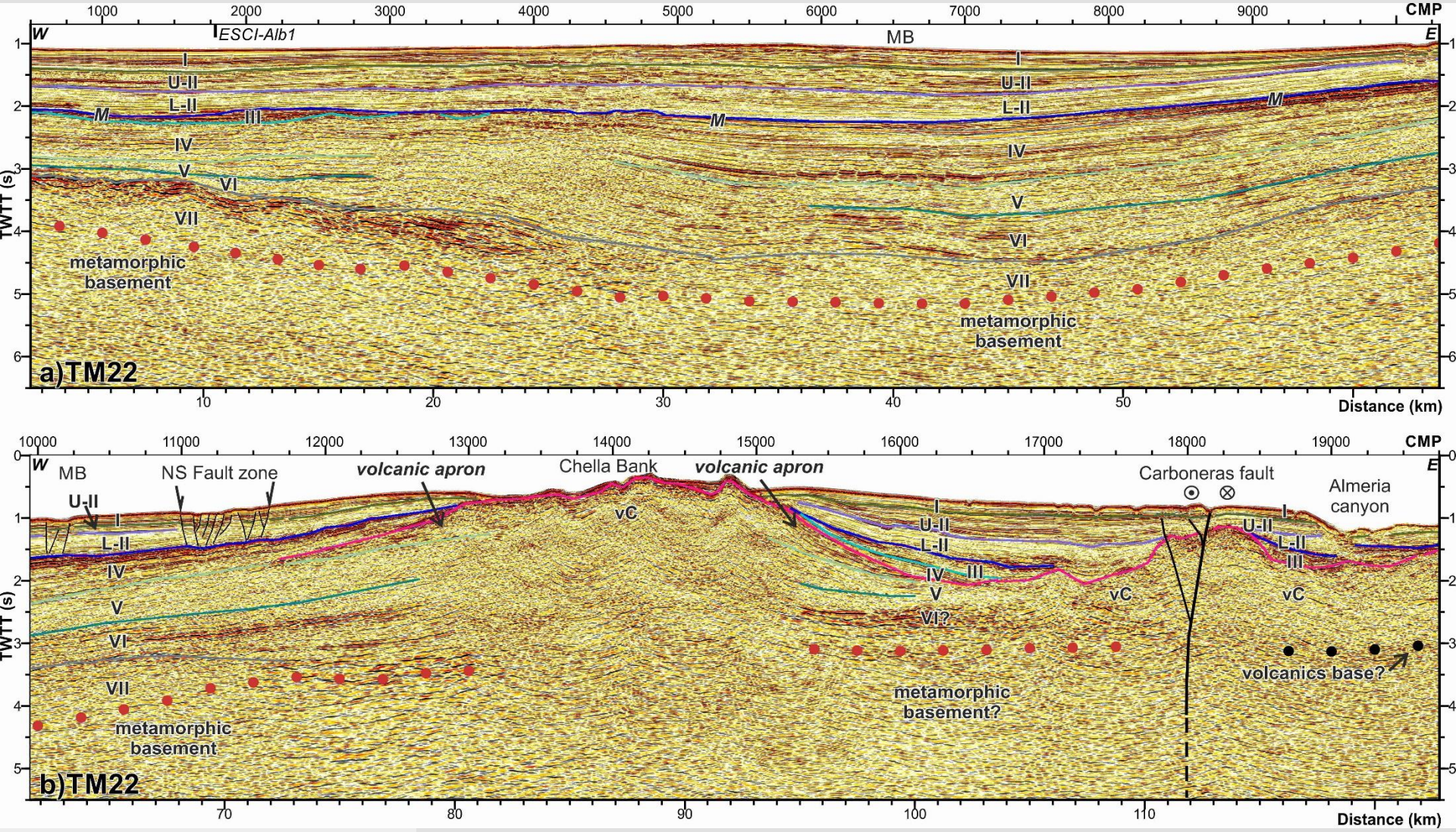

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Figure 3: Time migration of profile TM2 running along the Malaga Basin (MB, North Alboran Basin). This profile is divided in a) Western section and b) Eastern section. Main structures and seismostratigraphic units are identified. Age of the units is defined in Figure 2. Vertical exaggeration is of ~x:2.5.

However, there are still uncertainties about the age of the reflections…

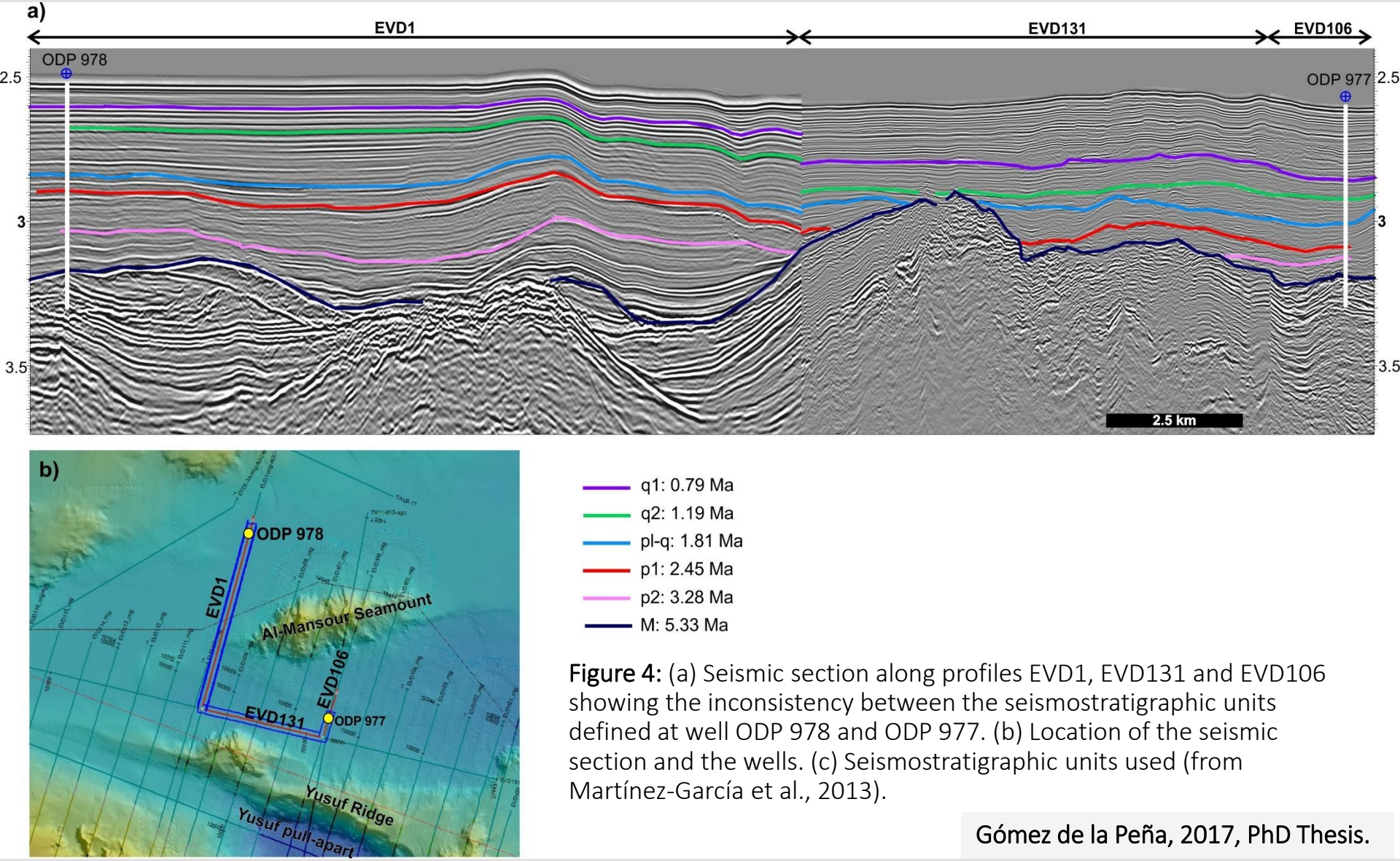

Figure 4: (a) Seismic section along profiles EVD1, EVD131 and EVD106 showing the inconsistency between the seismostratigraphic units defined at well ODP 978 and ODP 977. (b) Location of the seismic section and the wells. (c) Seismostratigraphic units used (from Martínez-García et al., 2013).

Gómez de la Peña, 2017, PhD Thesis.

Based on the distribution of the marine sedimentary units, currently offshore and onshore, together with the distribution of crustal domains, and available information on upper mantle tomographic images and volcanic rock types distribution, **we propose a refined kinematic model to explain the Latemost Oligocene to present day evolution of the westernmost Mediterranean basins.**

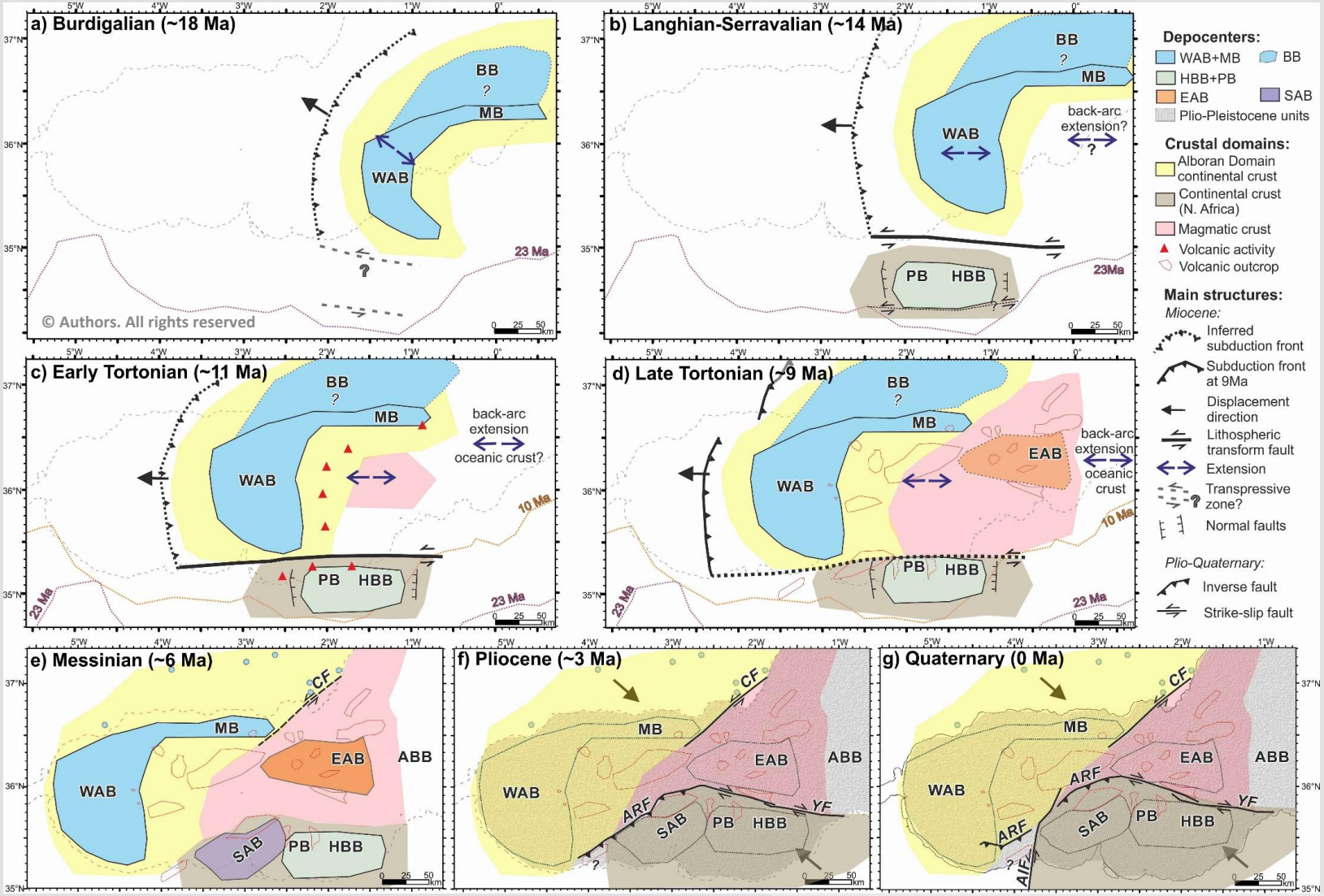

Figure 5: Kinematic model. WAB+MB: West Alboran and Malaga basins, BB: Betic Basins, HBB+PB: Habibas and Pytheas basins, EAB: East Alboran Basin, SAB: South Alboran Basin. CF: Carboneras Fault, ARF: Alboran Ridge Fault, YF: Yusuf Fault, AIF: Al-Idrissi Fault

Modified from Gómez de la Peña et al., 2020, ESR, under review.

Thank you!

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