The transition from an intraoceanic submarine acretionary prism to the onland fold-and-thrust belt in the Taiwan arc-continent collision

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1. Introduction

The region of Taiwan is undergoing active, oblique arc-continent colision between the Luzon Arc on the Philippine Sea Plate and the continental margin of Eurasia. The Fold-and-Thrust Belt (FTB) in Taiwan passes southwards into a submarine accretionary wedge at the Manila subduction zone. The aim of this contribution is to examine how an on land FTB changes into a marine accretionary prism in the context of an oblique arc-continent collision. Preliminary results are presented in this poster.

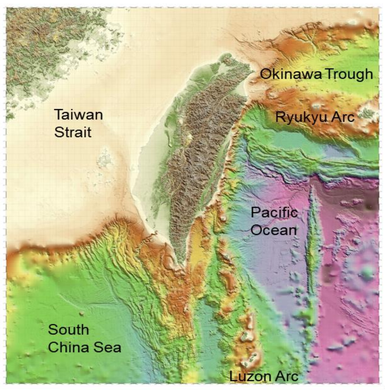

Figure 1 (above): Tectonic setting of the study área.

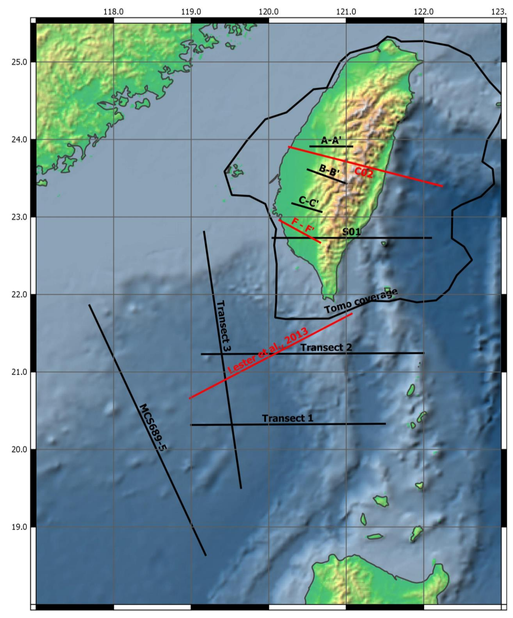

Figure 2 (above right): Datasets used in this work:

- Geological map and geological cross-sections of southern Taiwan from Brown et al, 2017, Biete et al., 2018.
- Published seismic lines highlighted in the figure. C02 and S01 are tomography profiles from Kuo-Chen et al., 2012. Offshore depth converted seismic line from Lester et al., 2013. Transects 1 and 2 are from Eakin et al., 2014. Transect 3 is from Lester et al., 2014. Offshore seisc line MCS689-5 is from Yeh, 2010.
- Tomography data from the area enclosed in curved line in the figure, we use a Vp proxy of 7.5 km/s extracted from the seismic tomography (construction of a 3D block is ongoing).

2. Data and methods

Here we use the island surface geology, marine reflection seismic profiles, and seismic tomography models to construct contour maps of the basal thrust and the depth to the Moho across a transition area from near 23° to near 21° latitude.

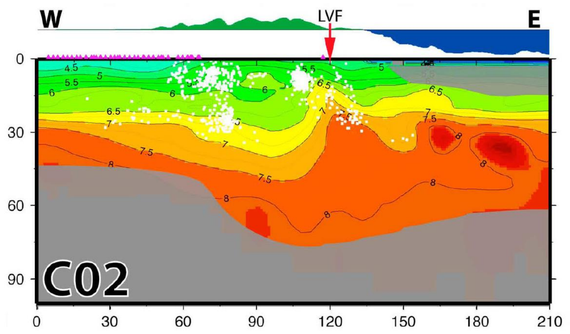

Figure 3: East-west tomographic section of absolute velocity in central Taiwan, from Kuo-Chen et al, 2012.

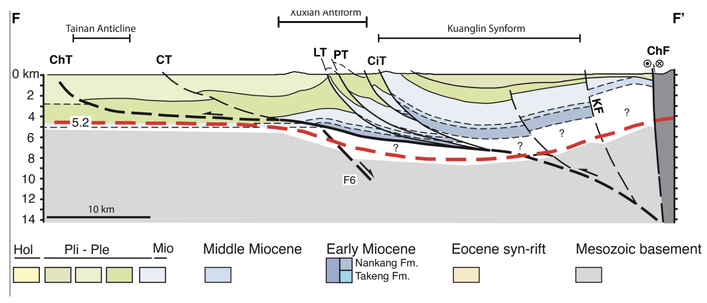

Figure 4: Geological cross-section of the Fold-and-Thrust Belt in southern Taiwan. Miocene pre-orogenic sediments of the continental margin are involved in the thrust wedge. The sole thrust reaches 1 km depth at the front. It shows a gentle dip beneath most of the wedge up tp over 7 km deep. At the rear of the FTB it ramps into de basement to merge into the Chaochou fault at depths over 10 km.

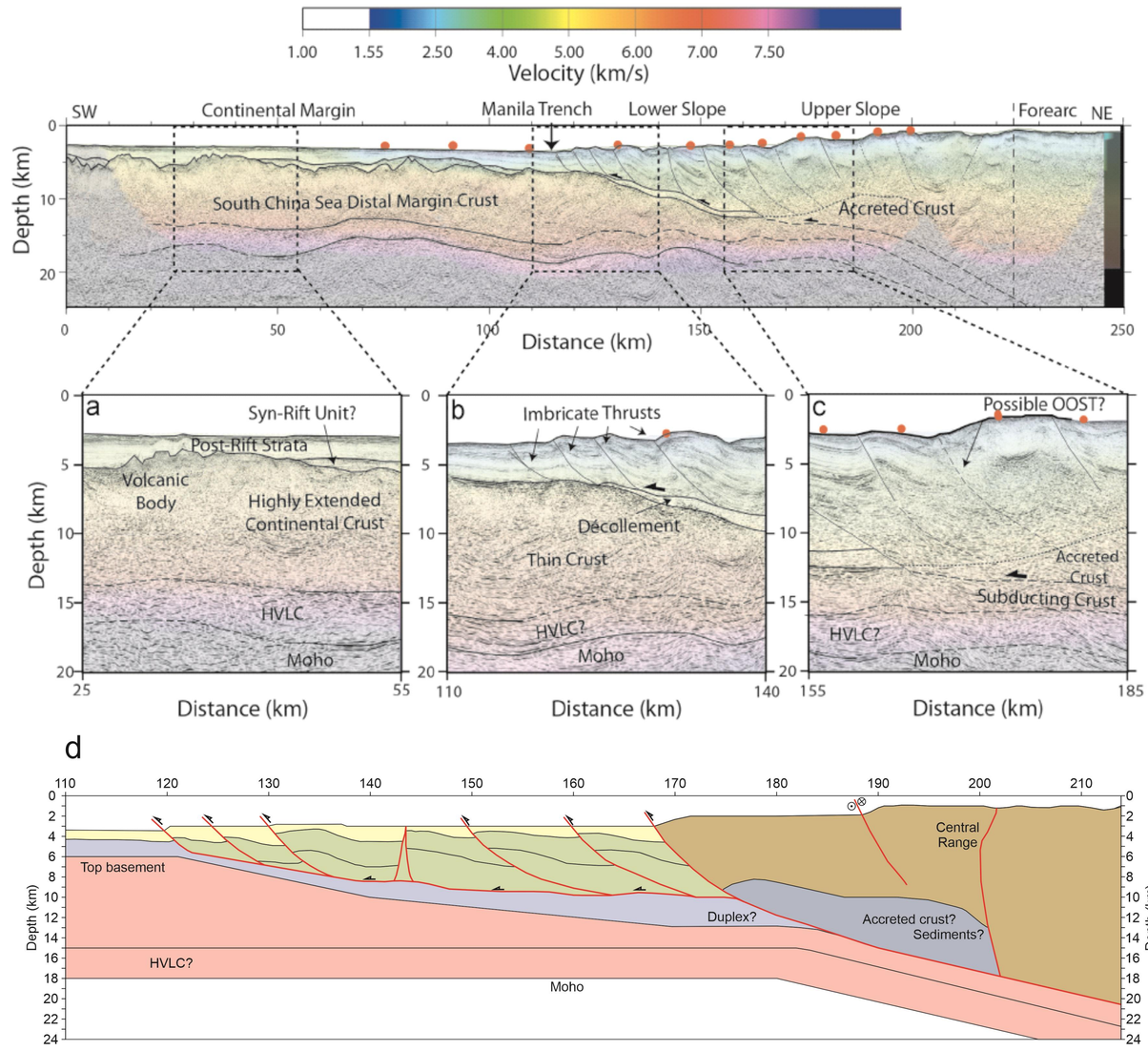

Figure 5: Cross-section showing the accretionary prism, redrawn from seismic profile in Lester et al., (2013). The accretionary prism is built up dominantly by Pliocene to recent syn-orogenic sediments. In this section of the offshore wedge, there are not sediments from the continental margin incorporated into the wedge.

3. Results

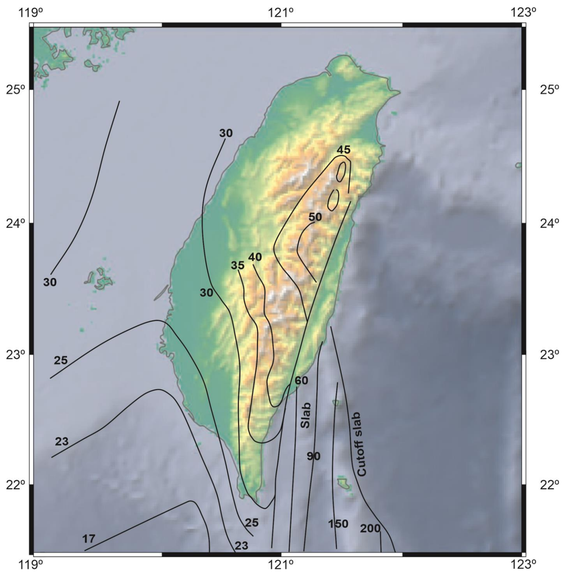

Figure 6: Moho depth contours are taken from Kuo-Chen et al. (2012) and correspond to the 7,5 km/sec iso-surface from the local tomographic model, here taken as a proxy for Moho depth.

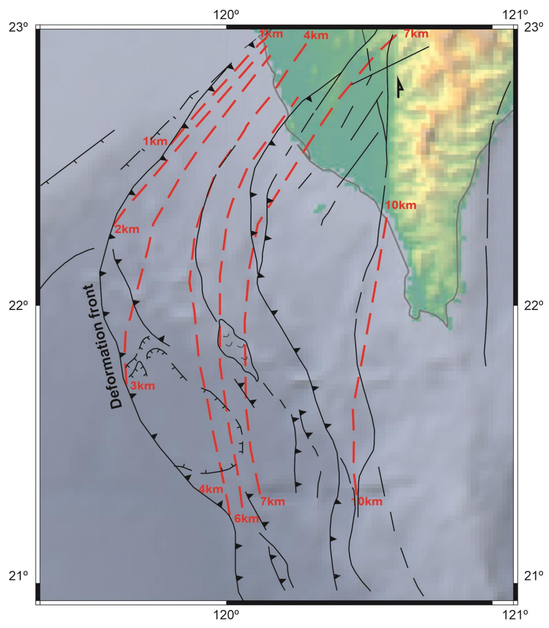

Figure 7: The basal thrust surface shows a scoop shape as its dip changes from southeast near the coast line to east southward. The basal thrust reaches over 7 km deep beneath the rear of the FTB before ramping into de basement and merging into the Chaochou fault at 10 km depth. Offshore, it shows a gentler dip from 7 km to c. 10 km depth before getting steeper towards the east below the Hengchung Ridge.

4. Conclusions

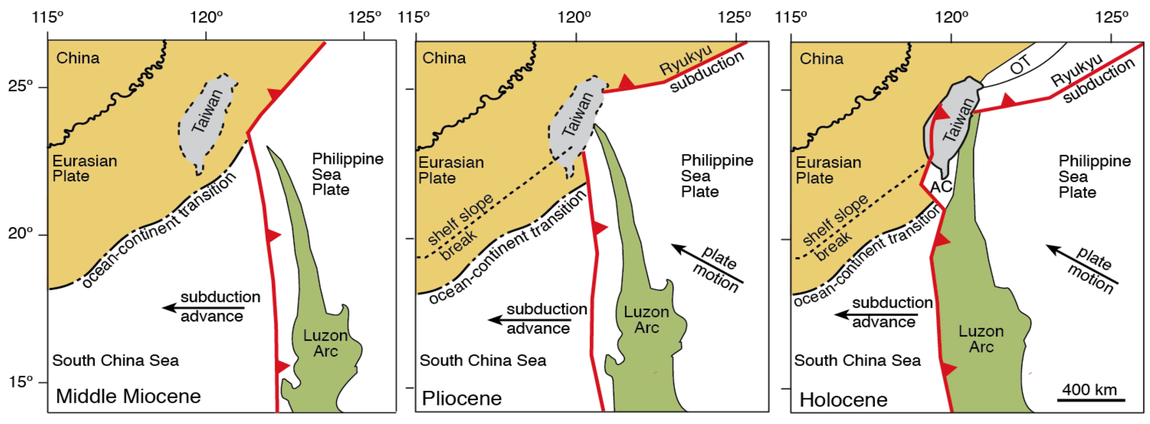

Figure 7: Arc-continent collision in Taiwan is the result of the subduction of the Eurasian margin beneath the Luzon arc. A number of models have been proposed for how this collision progressed, but all agree that from at least the Late Miocene onward the subduction zone has moved westward. Therefore, the orientation of the plate boundary and its overall westward movement means that collision is taking place with a high angle between the overriding plate and the structure of the continental margin. Redrawn from Sibuet and Hsu (2004).

Our results indicate that the basal thrust cuts laterally along-strike through the margin's sedimentary cover to incorporate thicker Miocene pre-orogenic sediments onto its hanging wall as it passes from the offshore wedge to the on land FTB. The complex morphology of the Moho may be related to the changes in crustal thickness and the obliquity of the collision. Because of this, crustal thickening is less pronounced beneath southern Taiwan where the thinner part of the margin is colliding with the arc.

References

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