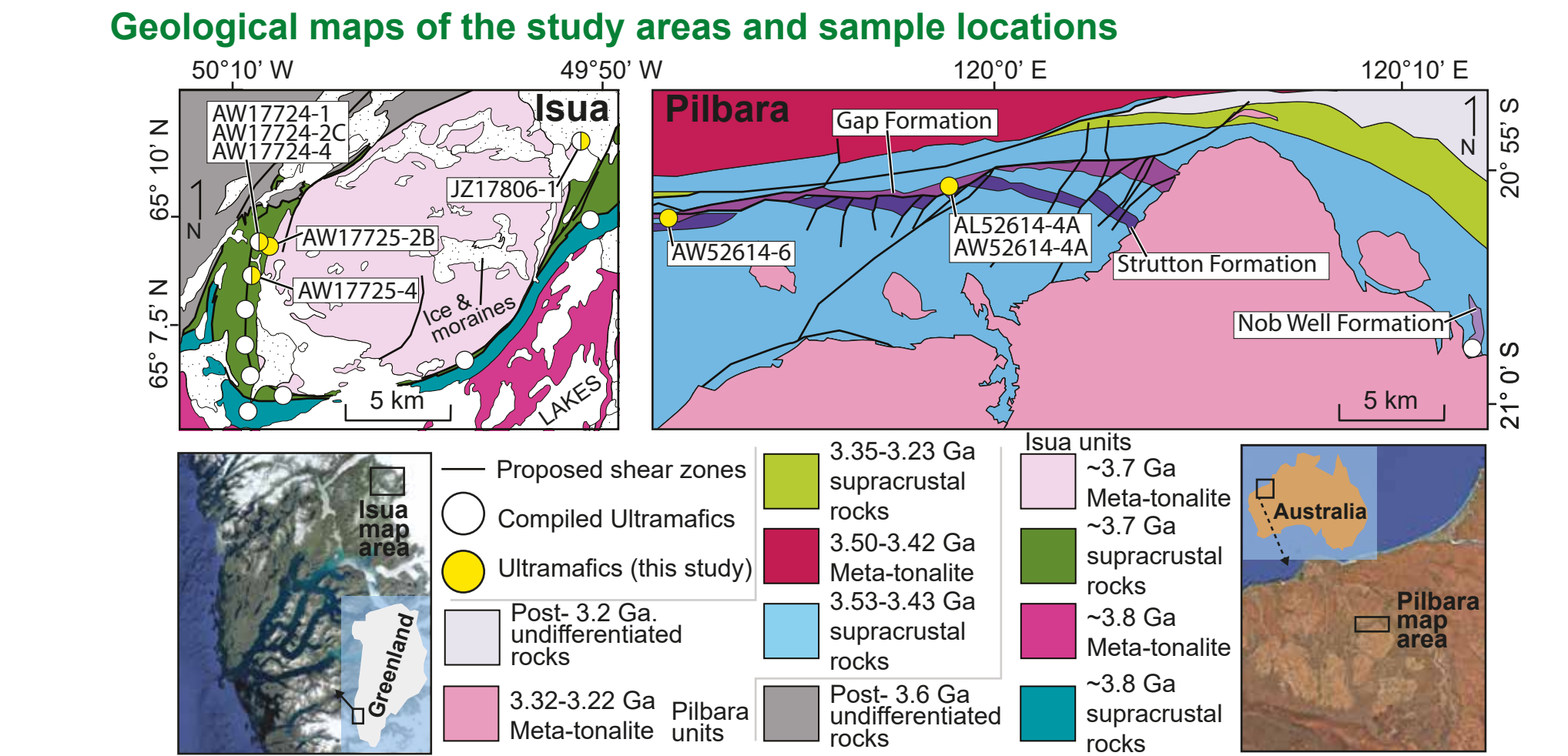


Isua supracrustal belt (~3.8-3.6 Ga, SW Greenland) stands out as the only >3.2 Ga terrane that has mostly been proposed as representing early subduction zones in plate tectonic settings.

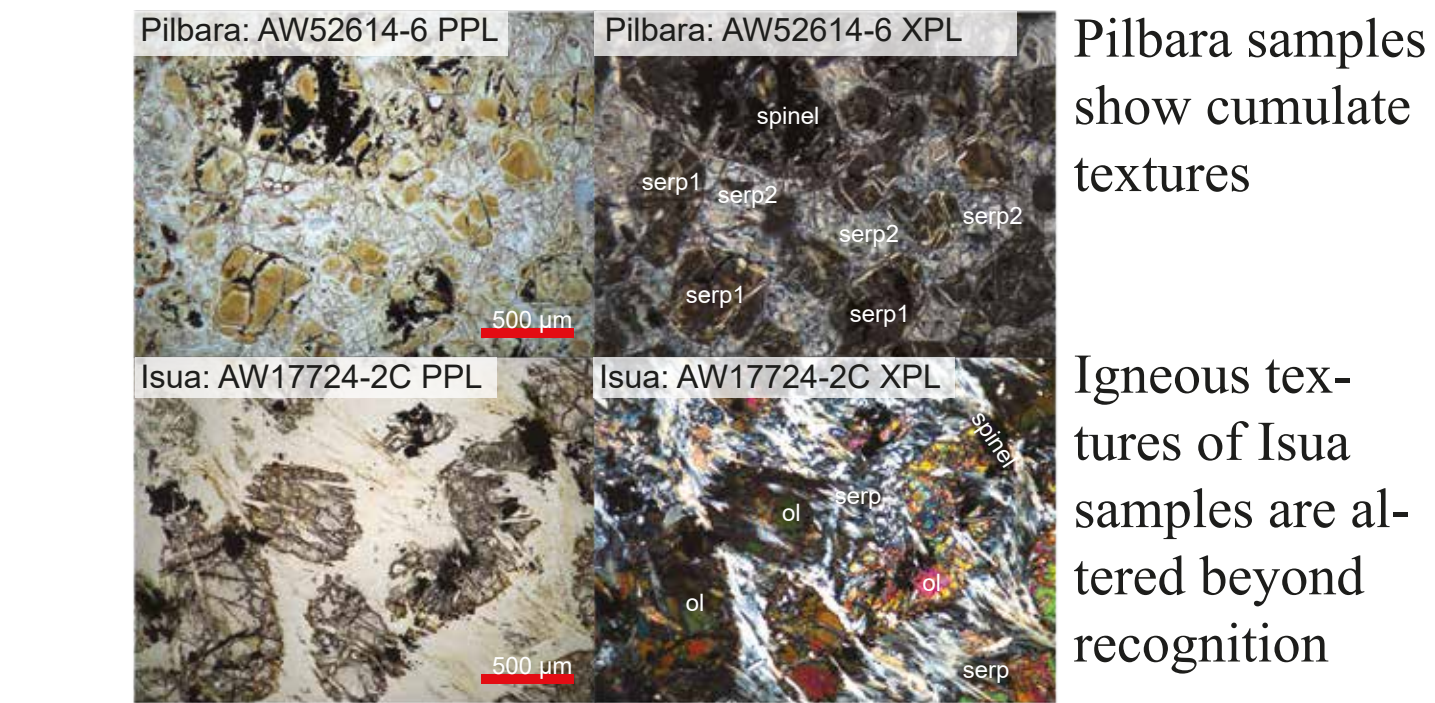
3

We investigate photomicrographs, whole-rock major and trace geochemistry, and spinel geochemistry from ultramafic rocks of Isua supracrustal belt and East Pilbara Terrane to explore their origins.

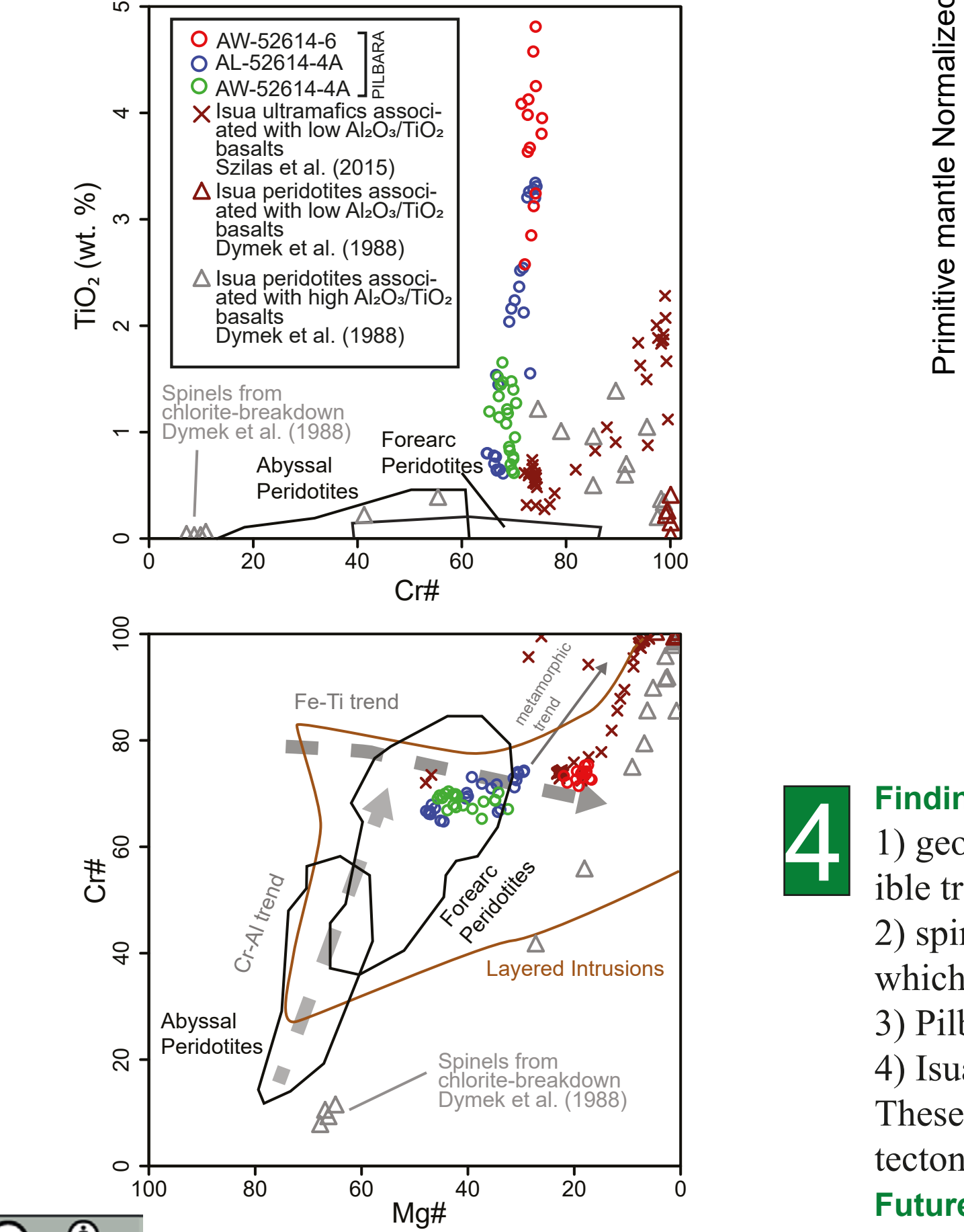
If they are not consistent with mantle-origins, or they can be viably interpreted as crustal ultramafic rocks (e.g., cumulates), then plate tectonics is not required to interpret their origins.



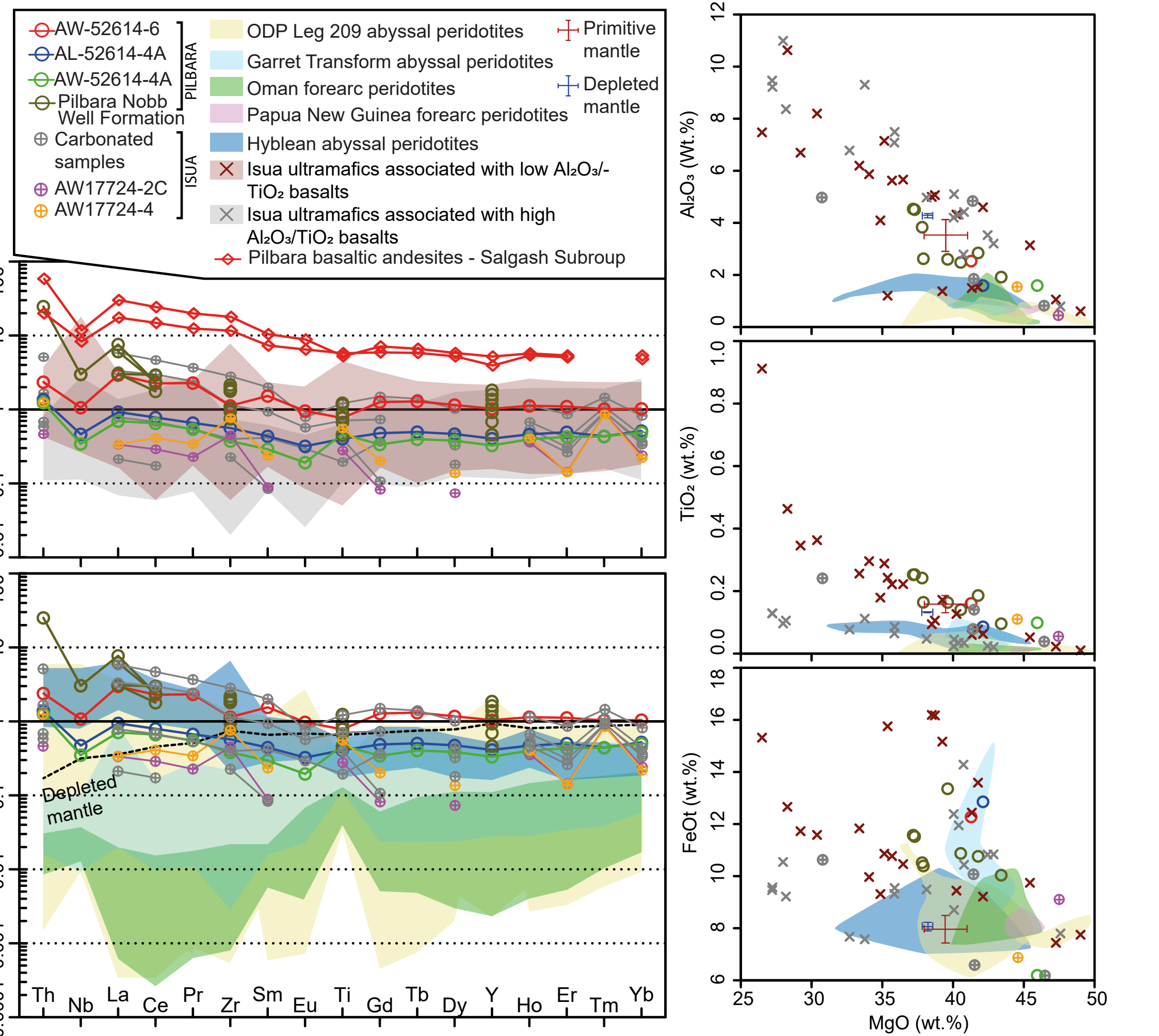
Representative thin section photos



Comparison of spinel geochemistry of Isua & Pilbara samples and depleted mantle rocks



Comparison of whole-rock geochemistry of Isua & Pilbara samples and depleted mantle rocks



4

Findings:

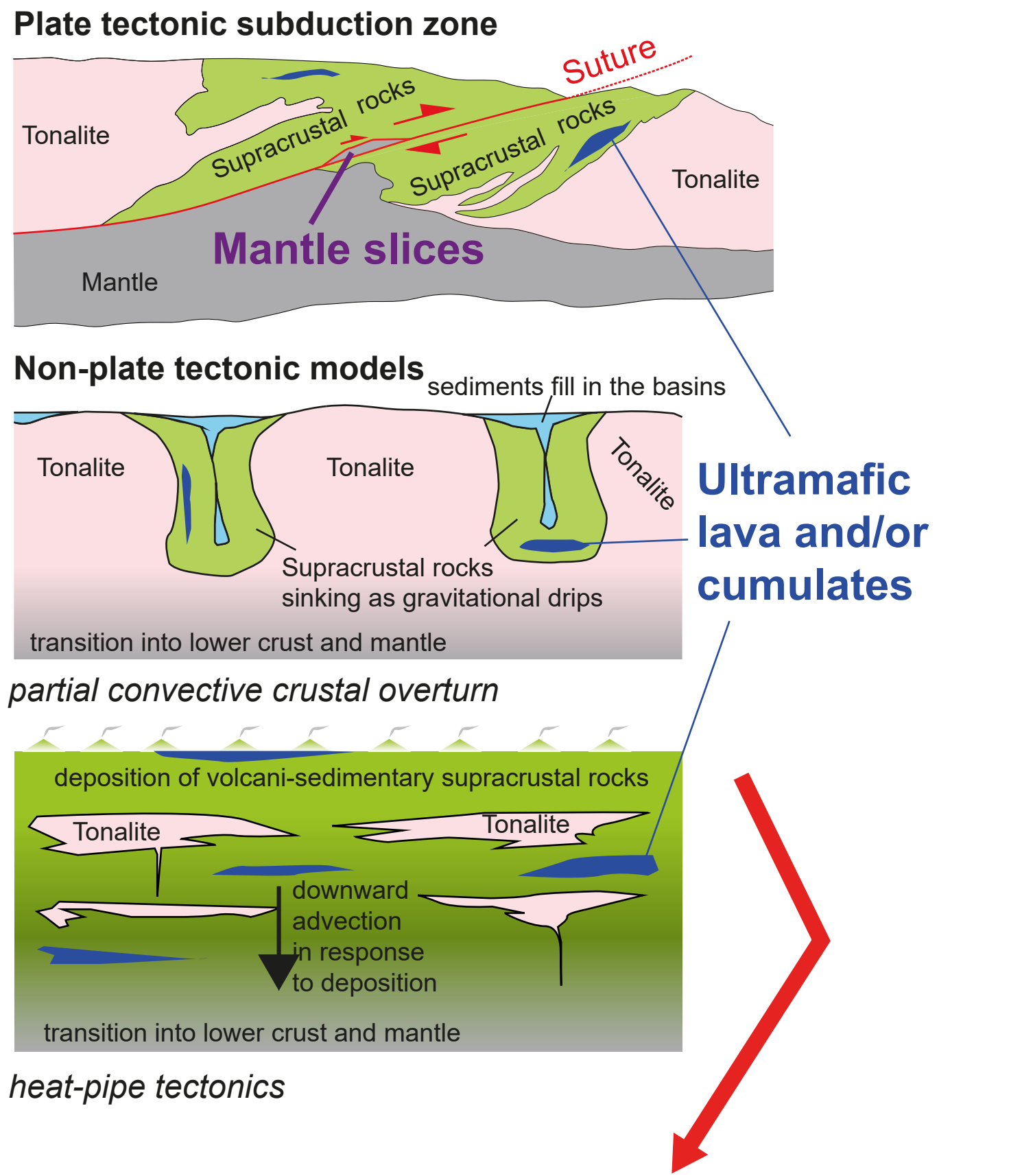
- 1) geochemistry of Isua and Pilbara ultramafic samples are similar, and are more enriched in incompatible trace elements than most of the depleted mantle rocks;
- 2) spinels of Isua and Pilbara ultramafic rocks show moderate to high Cr# and low to moderate Mg#, which are inconsistent with the depleted mantle rocks;
- 3) Pilbara samples show cumulate textures;
- 4) Isua and Pilbara ultramafic samples show co-genetic relationships with local supracrustal rocks.

These findings indicate a cumulate origin, and are incompatible with a mantle origin. Therefore, plate tectonics is not required to explain these rocks.

Future targets: geochemical modeling to check whether refertilization to depleted mantle rocks could produce the whole-rock and spinel geochemical patterns observed in Pilbara and Isua samples.

2

Isua supracrustal belt dunites have been dominantly interpreted as depleted mantle slices. **Mantle rocks that juxtaposed with crustal rocks via thrusting are only predicted by plate tectonic models.**



East Pilbara Terrane (~3.5-3.2 Ga, Western Australia) is dominantly interpreted by non-plate tectonic models.