

EGU2020 Sharing Geoscience Online

TS6.2 Tectono-magmatic-sedimentary processes of the
marginal basins in the West Pacific: from convergent to divergent

Remote predictive geological mapping as a tool for the reconstruction of the complex geodynamic evolution of Melanesia

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@lithophilipp

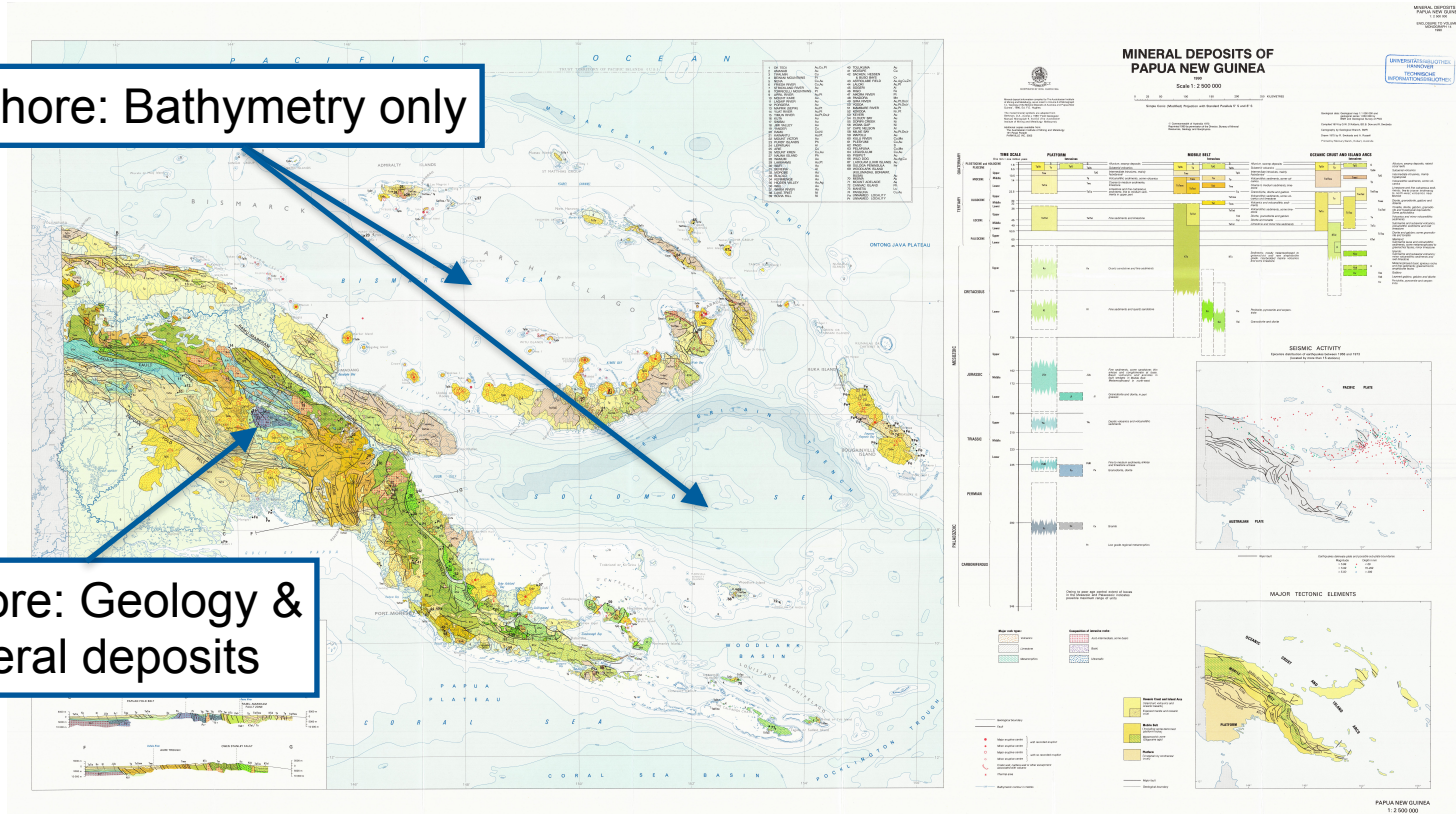


- Geological maps play an important role not only for **mineral exploration targeting** but also for the further **understanding of the regional tectonic evolution**, especially when combined with remote sensing techniques to cover large areas (e.g., Goetz and Rowan, 1981; Brimhall et al., 2006)
- To date, no regional-scale (i.e. scale of 1:1 mio. or similar) geological maps **combining on- and offshore areas** have been published because of the scarcity of data used for conventional geological mapping
- Remote predictive mapping allows to create **first-order geological maps in highly remote or largely underexplored areas** (cf. Schetselaar et al., 2007)

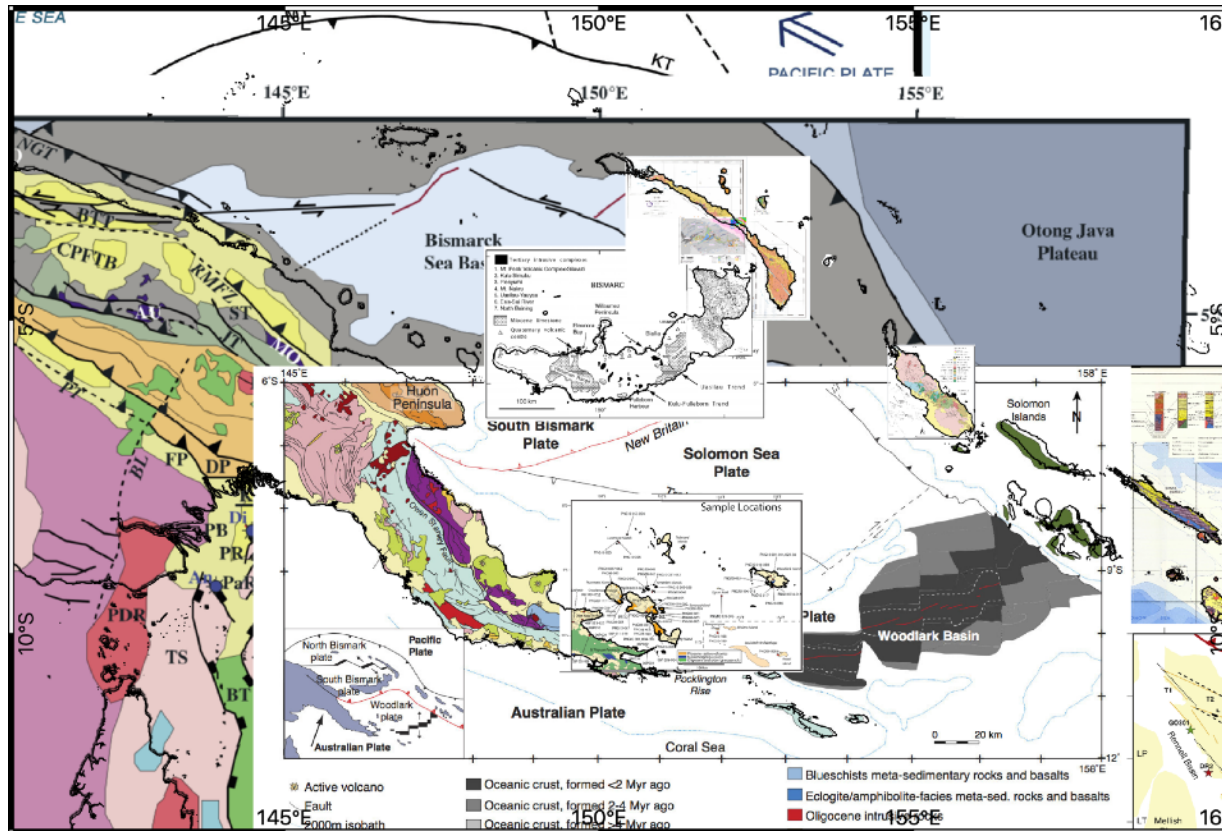
Limited knowledge of the offshore

Offshore: Bathymetry only

Onshore: Geology & Mineral deposits



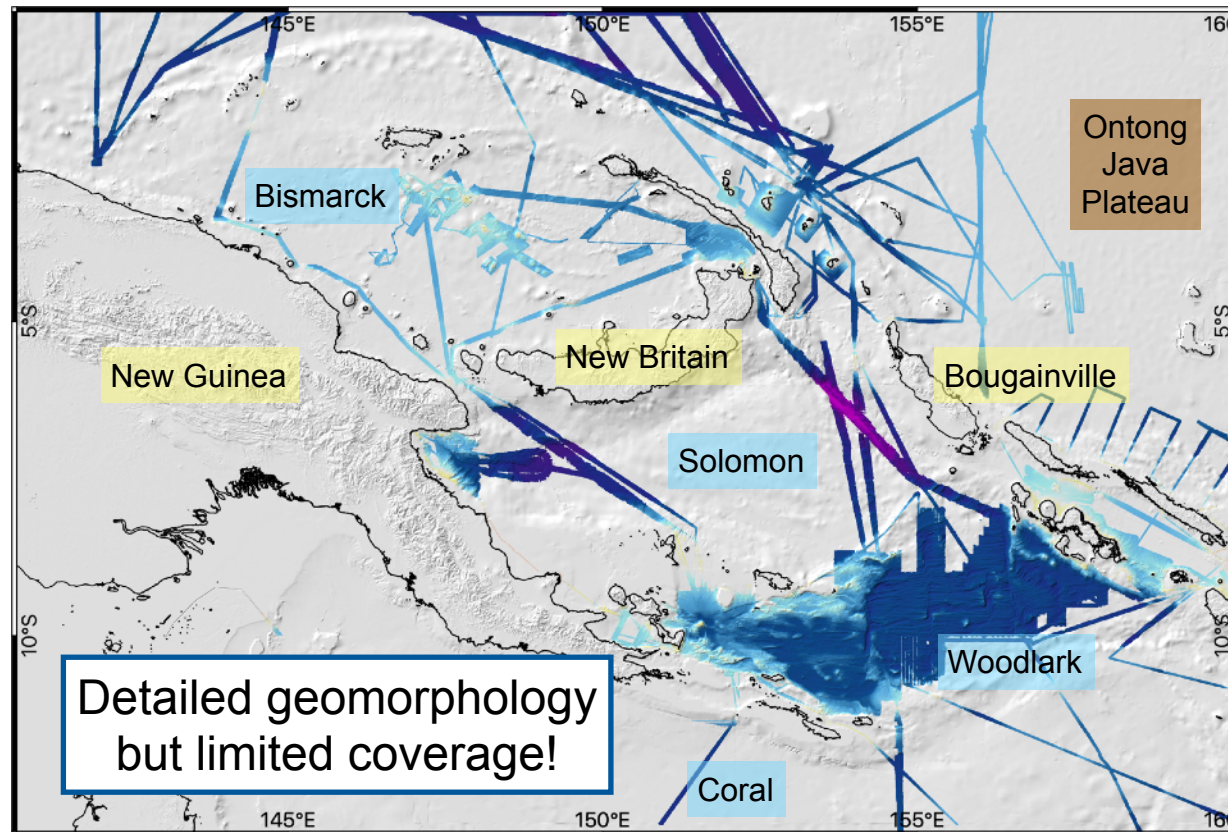
Stack of geological maps



Used for the creation of a simplified regional geological map (onshore)

Used for the informed geological interpretation of submarine features

Integrating global and ship-based bathymetry



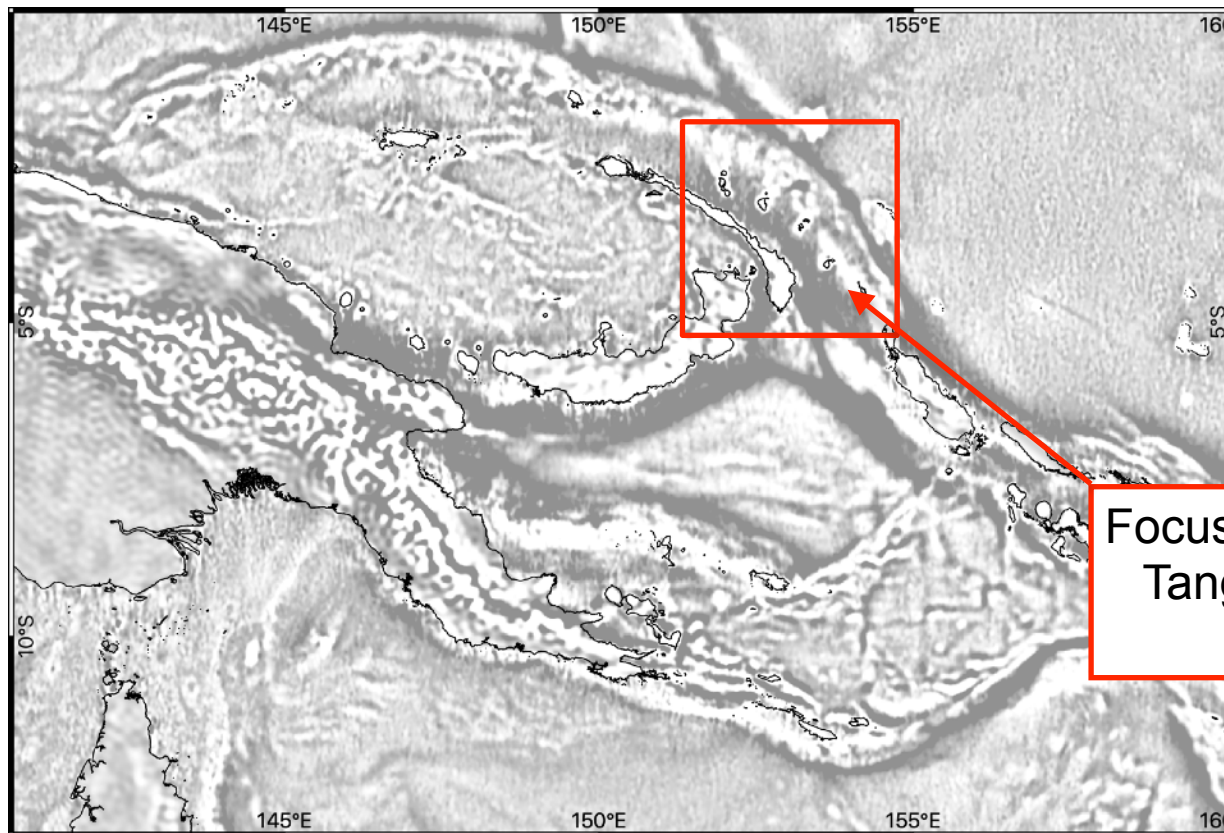
Compilation of ship-based bathymetry

US, Japanese, Australian, French and German research cruises

Fused with GMRT

400,000 km² at 35-50 m resolution

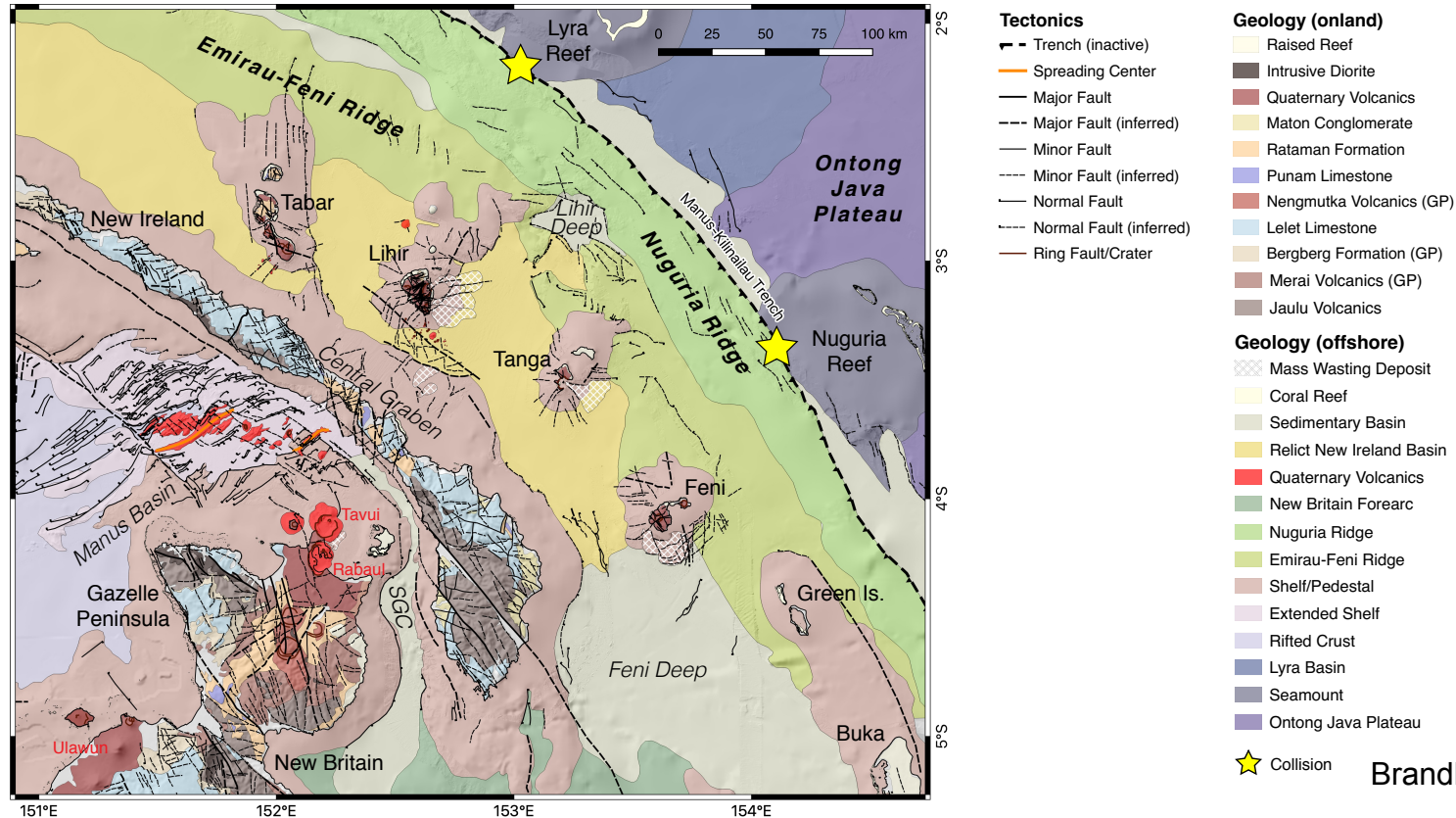
Vertical gravity gradient (VGG): guiding RPM



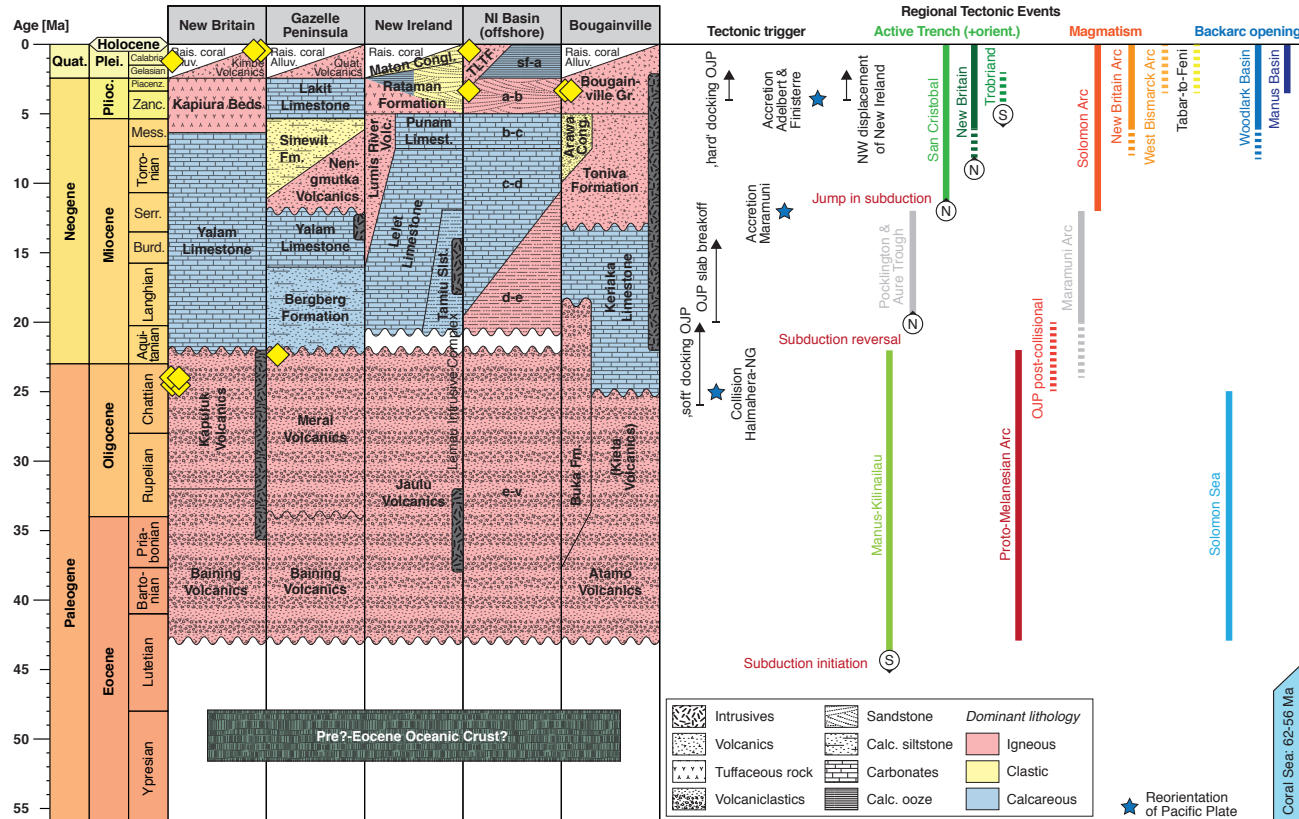
VGG: Important for the interpretation of tectonic elements and geological units (bedrock) under cover

Focus site: The Tabar-Lihir-Tanga-Feni island chain (next slide)

One step forward: Geomorphological maps



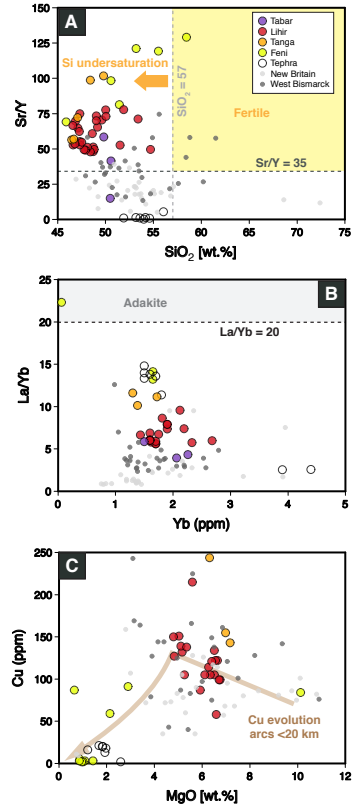
Reconstruction of the geodynamic evolution



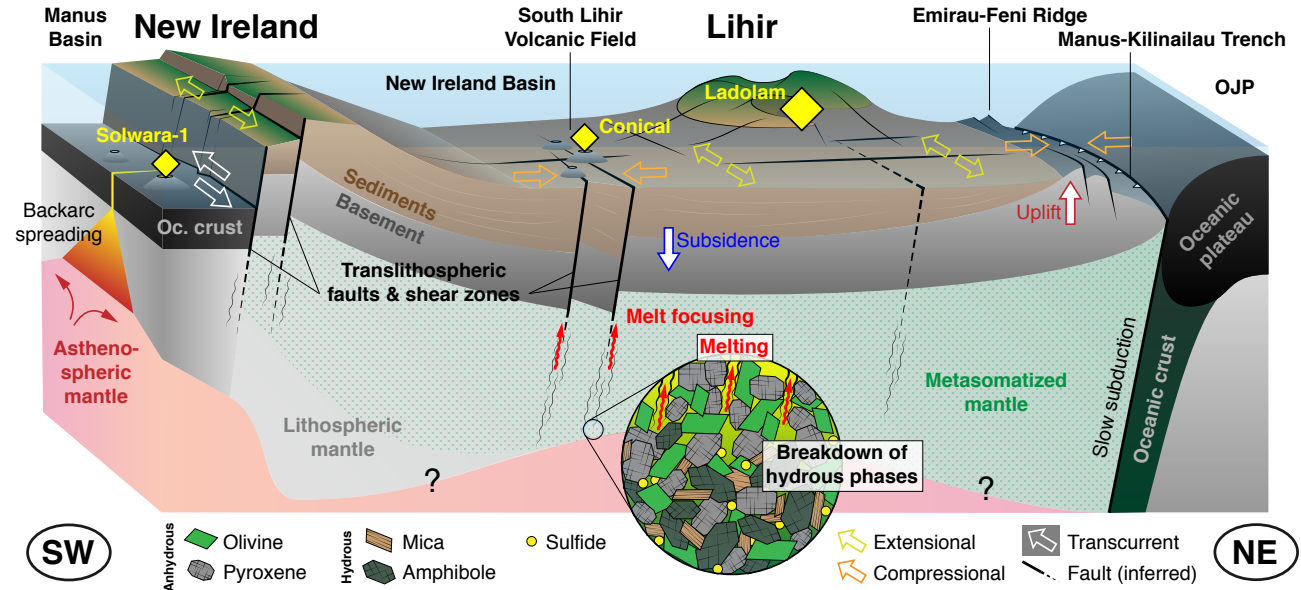
Lithostratigraphy is used for the creation of lithotectonic assemblages:

Regions that share a common geological and geodynamic history

Brandl et al., 2020



Development of an ore deposit model:



Brandl et al., 2020



Brandl et al., 2020 Ore Geology Reviews, 121 (open access)

<https://www.sciencedirect.com/science/article/pii/S0169136819306067>

Summary

- Remote predictive geological mapping is a powerful tool for the **geological understanding of largely underexplored areas** (e.g., the deep sea)
- Based on existing knowledge and geophysical data
- **Iterative process** that will require future ground-truthing and revision
- Reconstruction of the geodynamic evolution using lithostratigraphy
- Integration of petrology & geochemistry helps to **develop ore deposits models** and may help to delineate future exploration targeting