

Tectonic Elements of the Philippine Basin and the Mariana Arc System

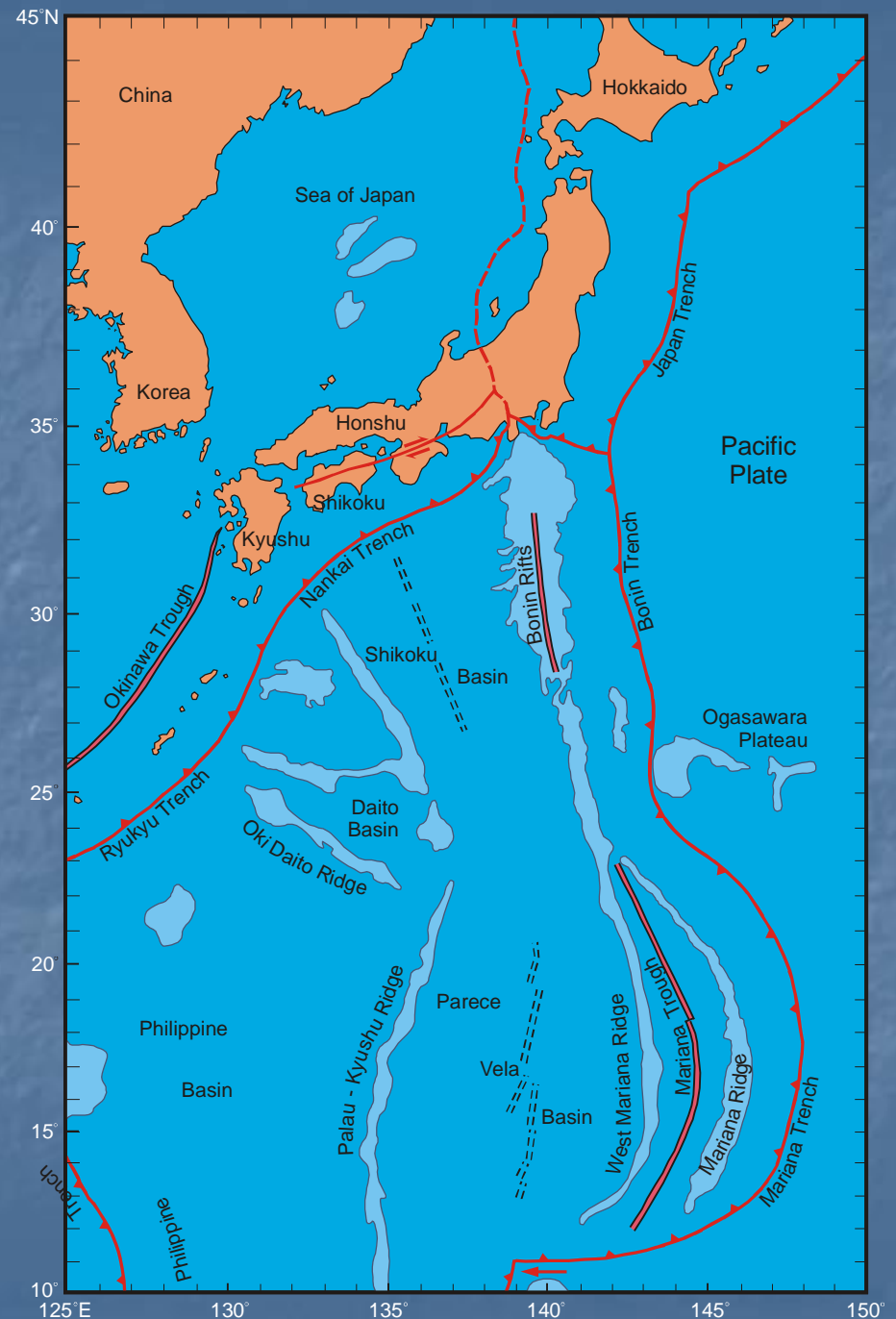
BI 201 Natural History of Guam
Class Presentation 07

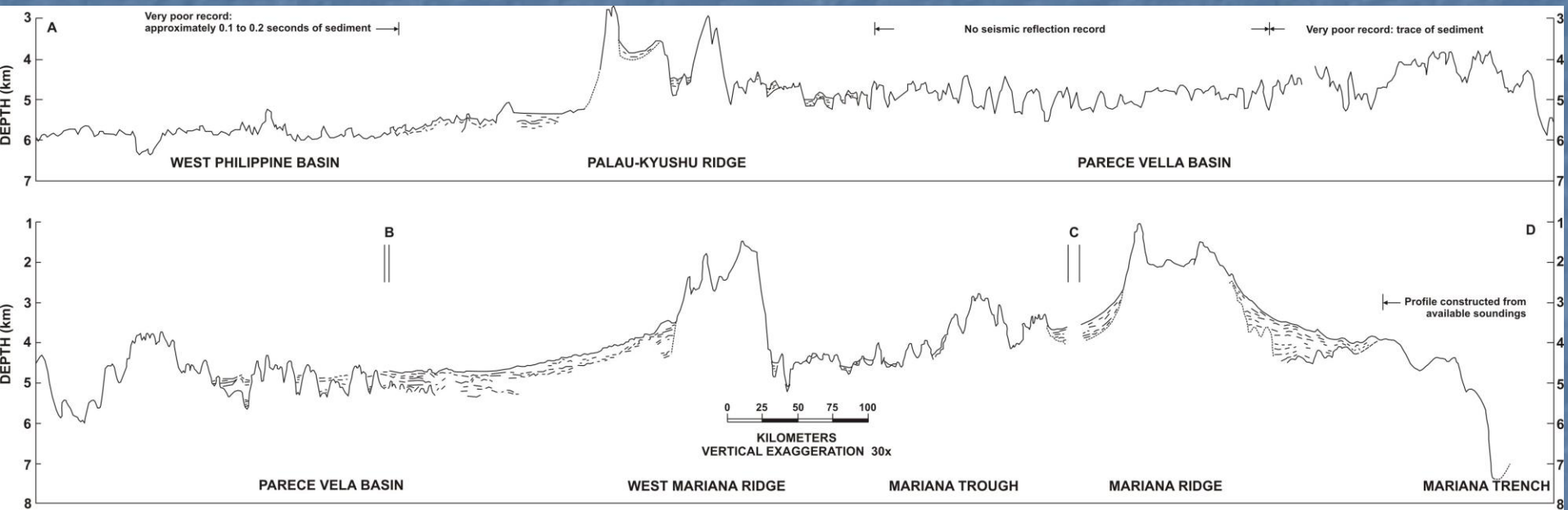
- Arcs and Basins of the Mariana System
 - The ridge systems of Palau, Yap, and the Marianas appear to record various stages in the evolution of the Mariana Arc system as the forearc has migrated towards the Pacific, becoming increasingly convex in the process

- The West Mariana Ridge, Mariana Trench, and intervening Mariana Basin and Mariana Ridge curve eastward from their abrupt southern terminus at the Yap Trench and swing northwards in broad arcs that are convex to the east

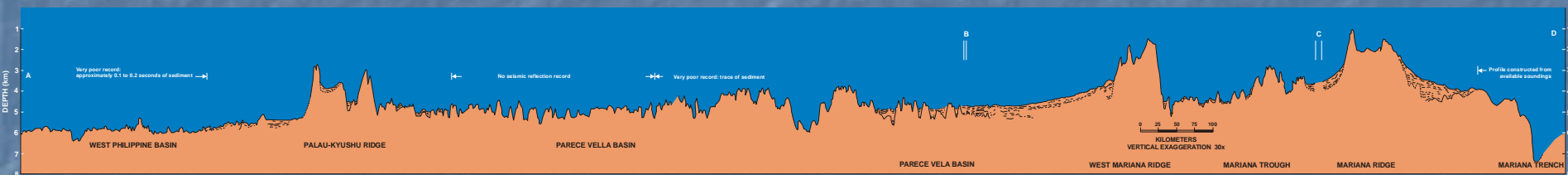
- In the region between Latitude 12° and 23° N, the Mariana system consists of, from east to west, the **Mariana Trench**, the forearc **Mariana Ridge**, the **Mariana Basin**, the **West Mariana Ridge**, the **Parece Vela Basin** (a.k.a. West Mariana Basin of authors), the **Palau-Kyushu Ridge**, and the **Philippine Basin** (a.k.a. East Philippine Basin of authors)

Location map showing major tectonic elements of the western Pacific in the vicinity of the Philippine Sea. Solid lines with solid triangles depict the axes of the trenches bounding the volcanic arcs and backarc basins of the region. Dashed double lines represent extinct spreading centers in the backarc basins. Solid double lines represent the axis of spreading in the active backarc basin--the Mariana Trough and the Bonin Rifts. (Modified from Fryer, 1990. Pacific Science 44:98).





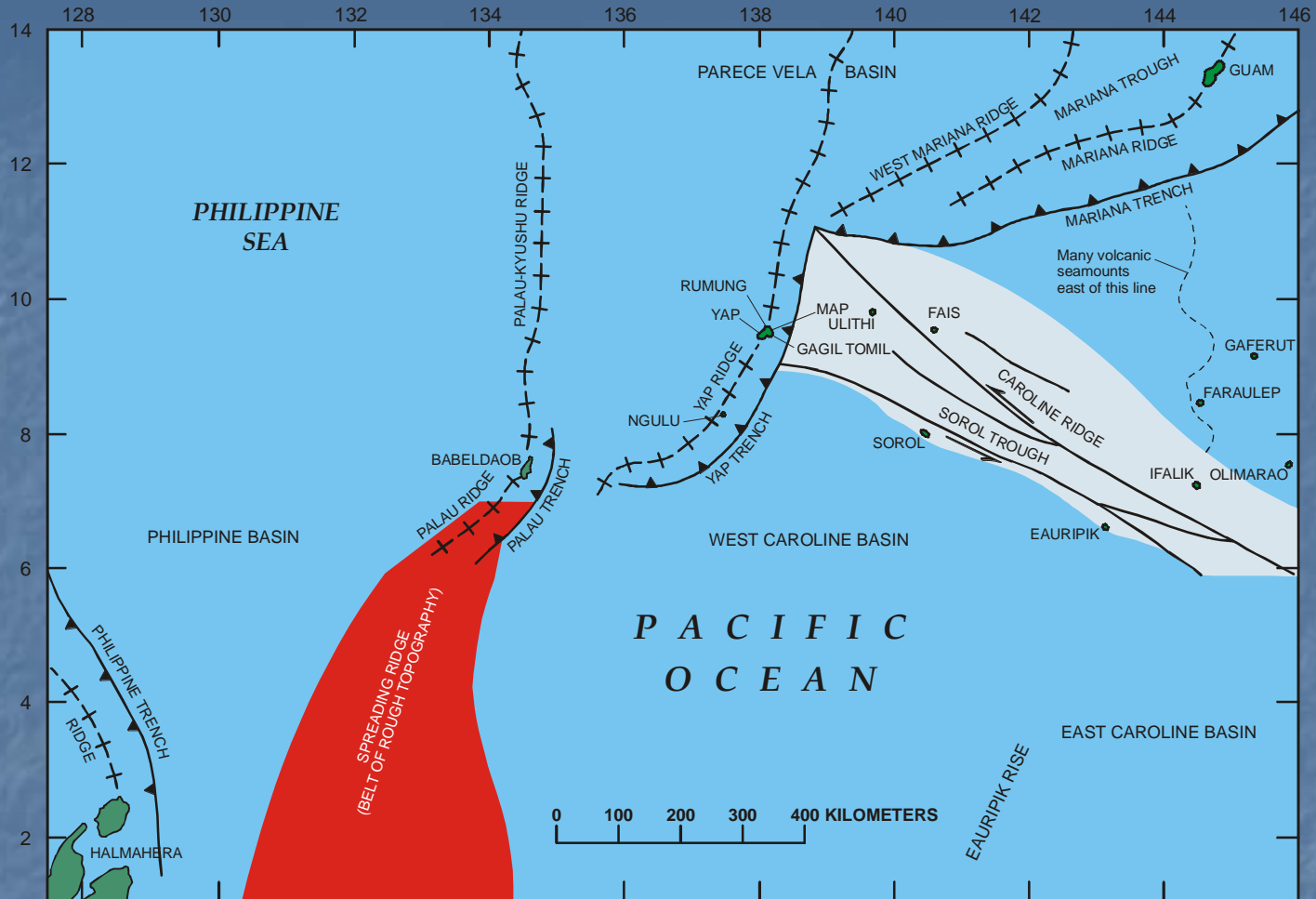
Composite seismic profile across the southeastern Philippine Sea constructed from Scan and Circe data. Bathymetric control is discussed in Chase and Menard (1969). Modified from Karig (1971).



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- The present active Benioff zone dips westward from the Mariana Trench to depths as great as 680 km as the Pacific Plate slides westward beneath the arc system

- Karig (1971) explained the Mariana Arc system in terms of the intermittent eastward migration of the forearc, each time leaving the back part behind and opening a new basin between the migrating and abandoned ridge remnants
- Radiometric dating of seafloor rocks has supported this hypothesis



Structural elements from the Philippine Basin to the Palau-Yap-southern Mariana region. That part of the Caroline Ridge that is complexly faulted and upwarped oceanic crust is shaded pale blue, and the belt of rough topography extending southward from the Palau Ridge and Palau Trench is shaded red. [Adapted from Hamilton, 1979. Tectonics of the Indonesian Region].