

Sea-level 81,000 years ago in Mallorca

Jeffrey A. Doracle, Bogden P. Onac
2010

Presented By
Richard Barnes
(Today)



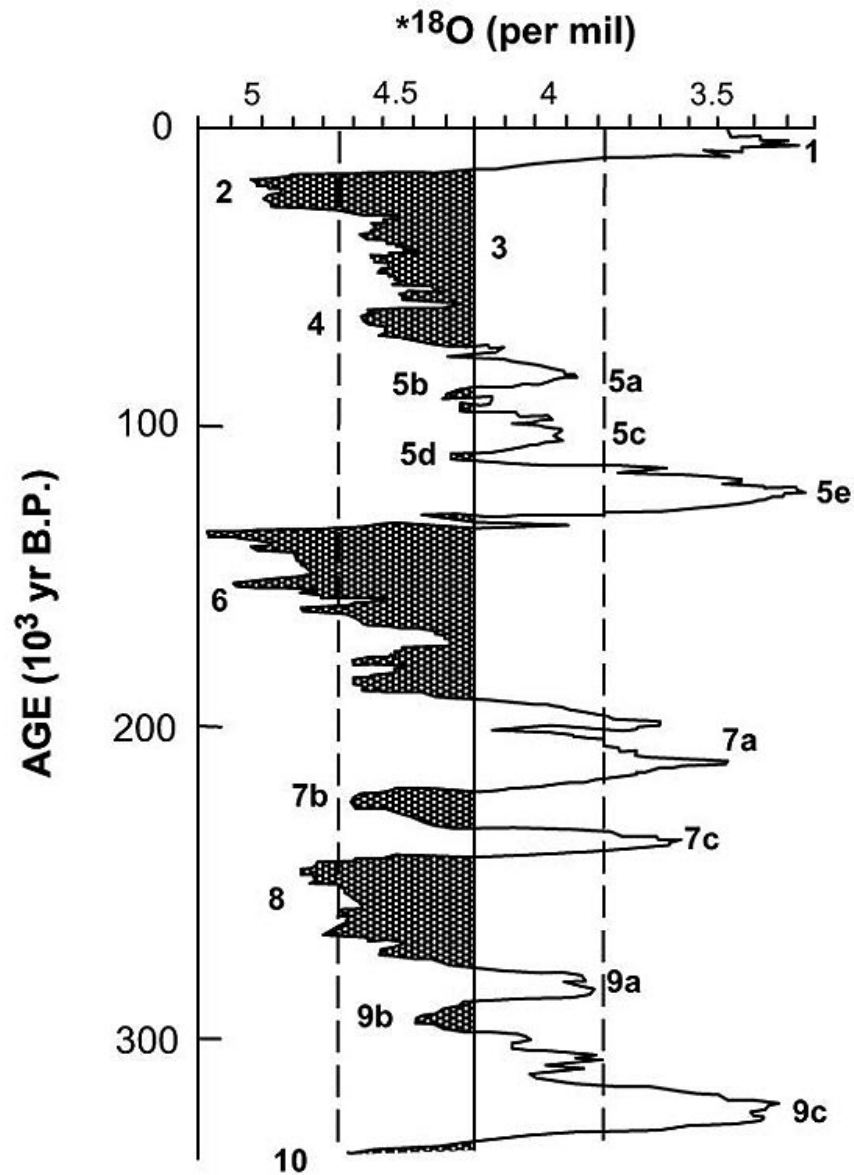
Claims

Sea-level 81,000ka was $\sim 1\text{m} > \text{pdsI}$

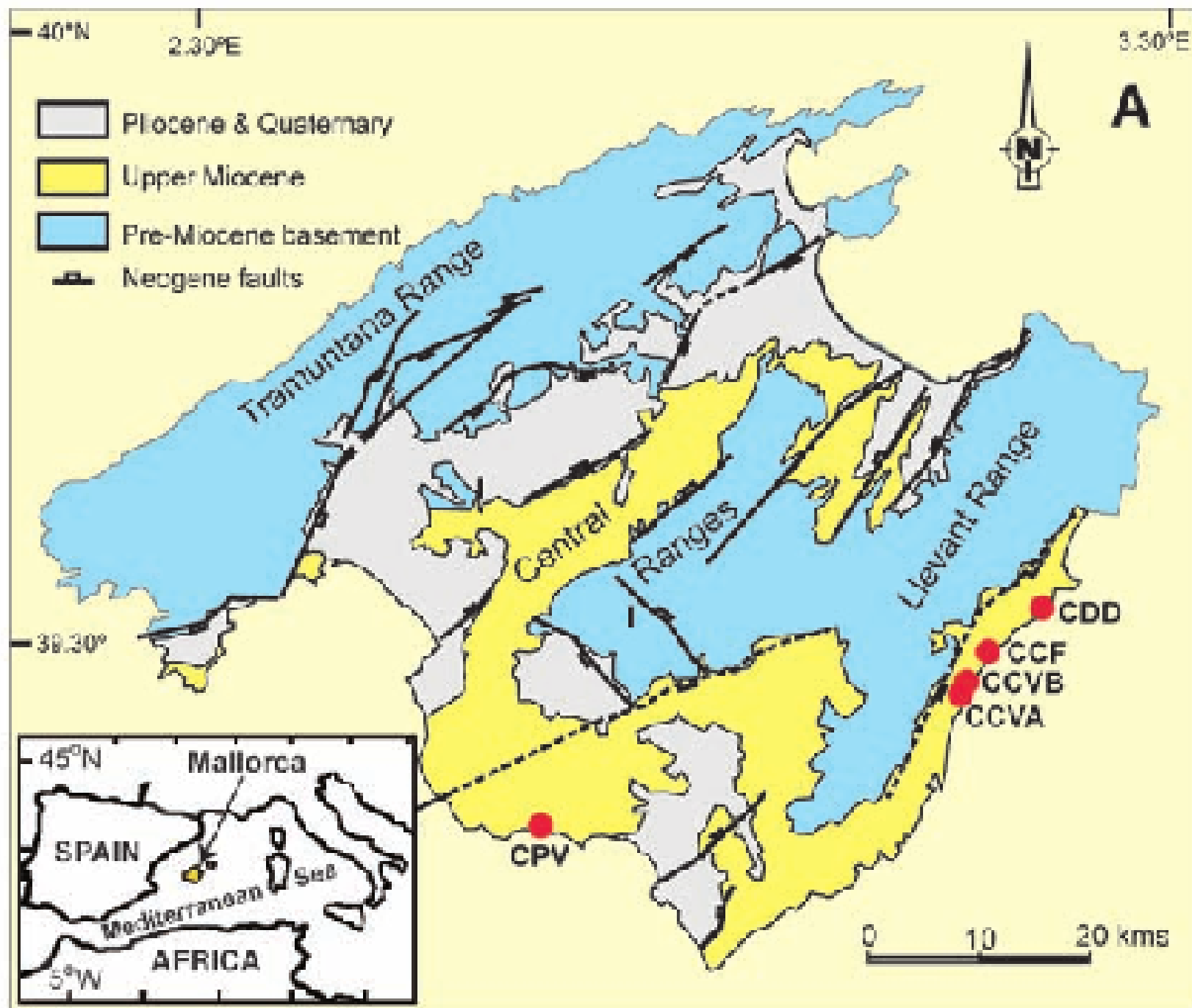
Rise was rapid

Supports MIS-5a's similarity to present

Challenge prevailing MIS-5/ice-age theory



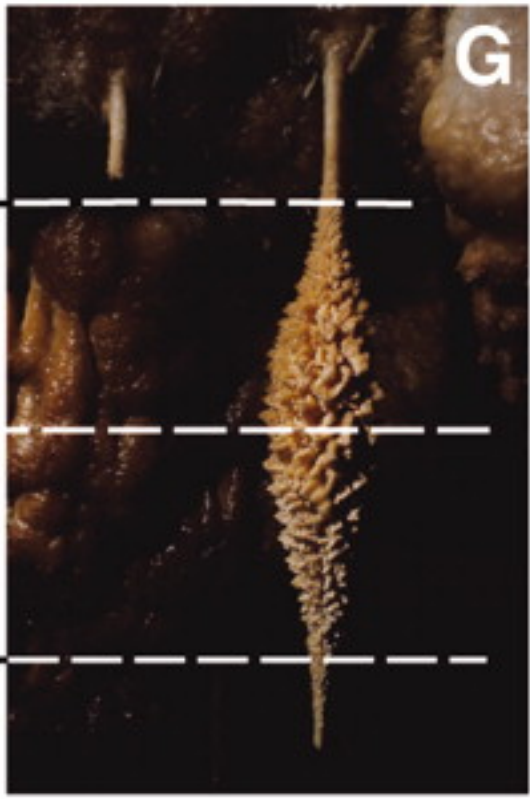
Marine oxygen isotope record. The peak of oxygen isotope stage 2 (about 20,000 years BP, or about 18,000 ¹⁴C years BP) is generally considered the Last Glacial Maximum. The Pinedale, or Wisconsin glaciation spans stages 2-4 (and possibly to 5d), and the Bull Lake, or Illinoian glaciation is thought to be correlative with stage 6. This plot is a composite of oxygen isotope records of benthic foraminifera from several deep sea cores reflecting global ice volume, and was constructed using data from Shackleton and Pisias (1985) and Martinson et al. (1987). (After Porter, 1989)

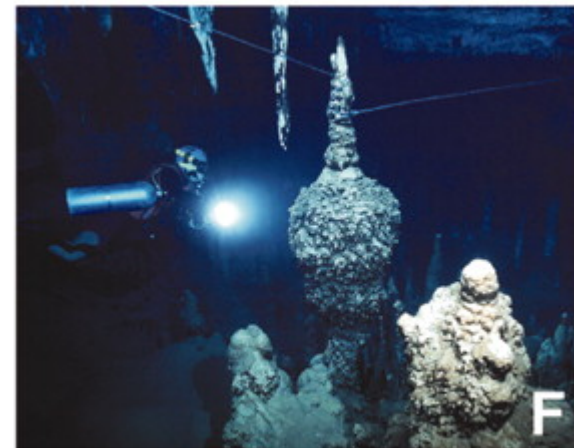
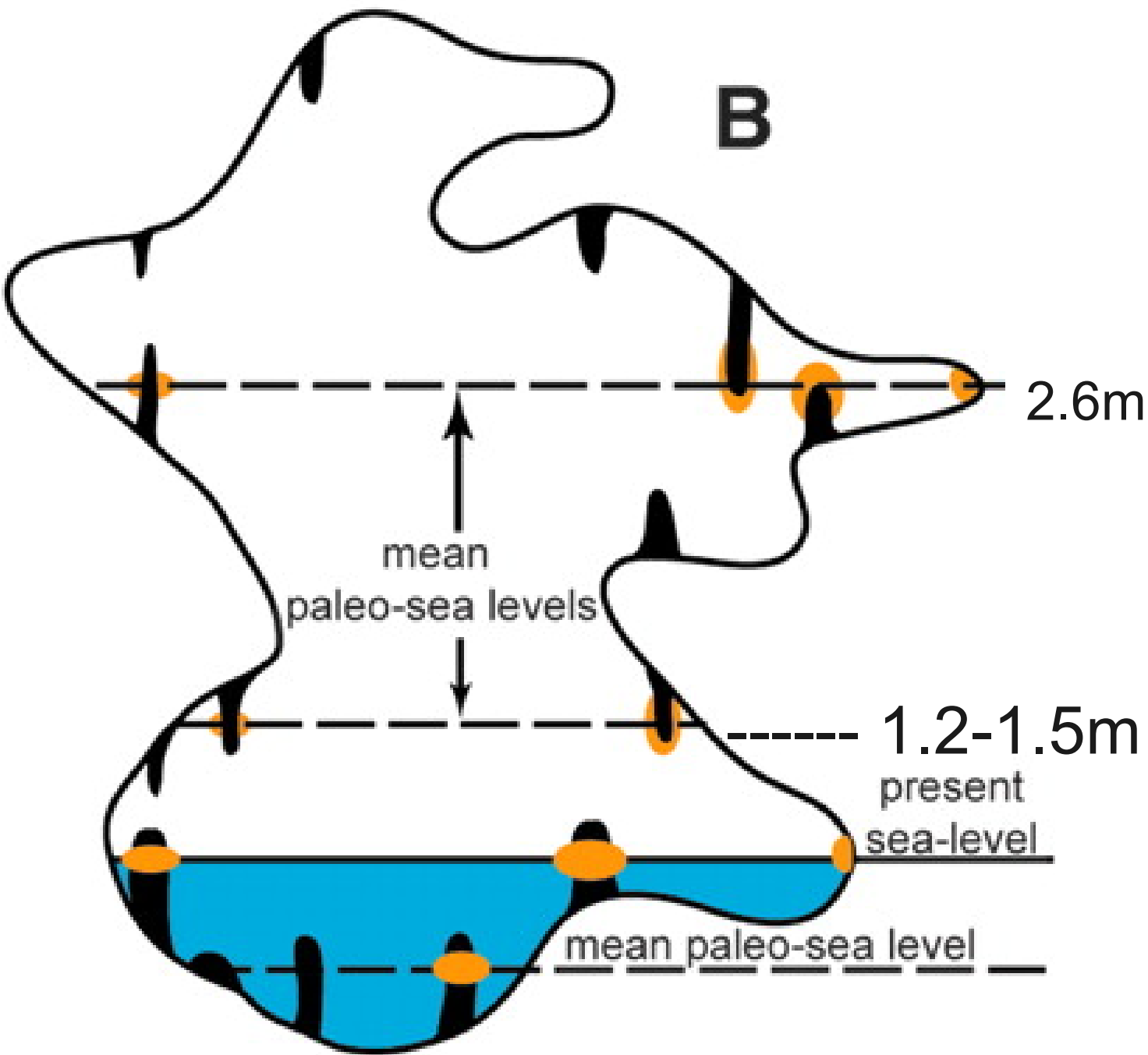




tidal range

t
e
l





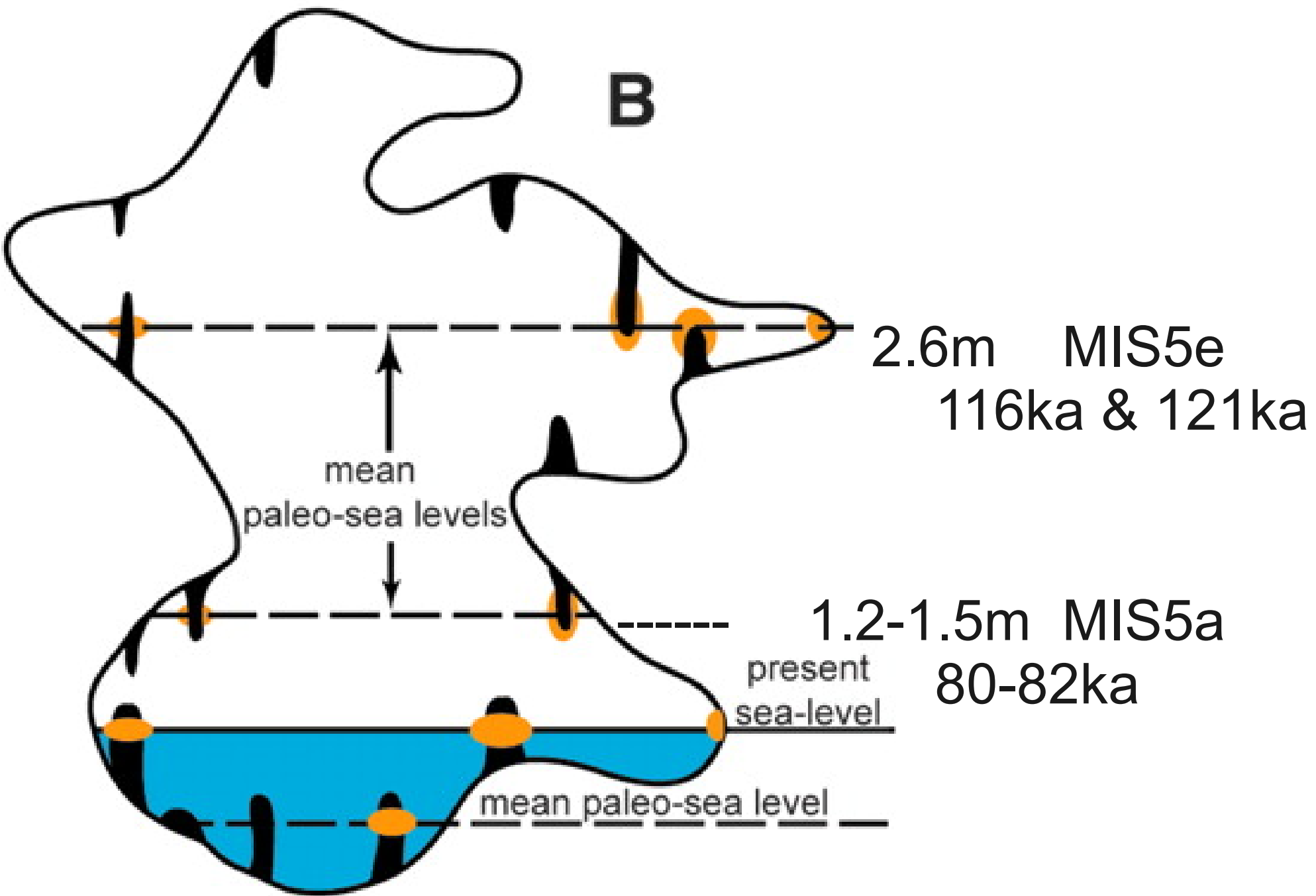
Sources of Change

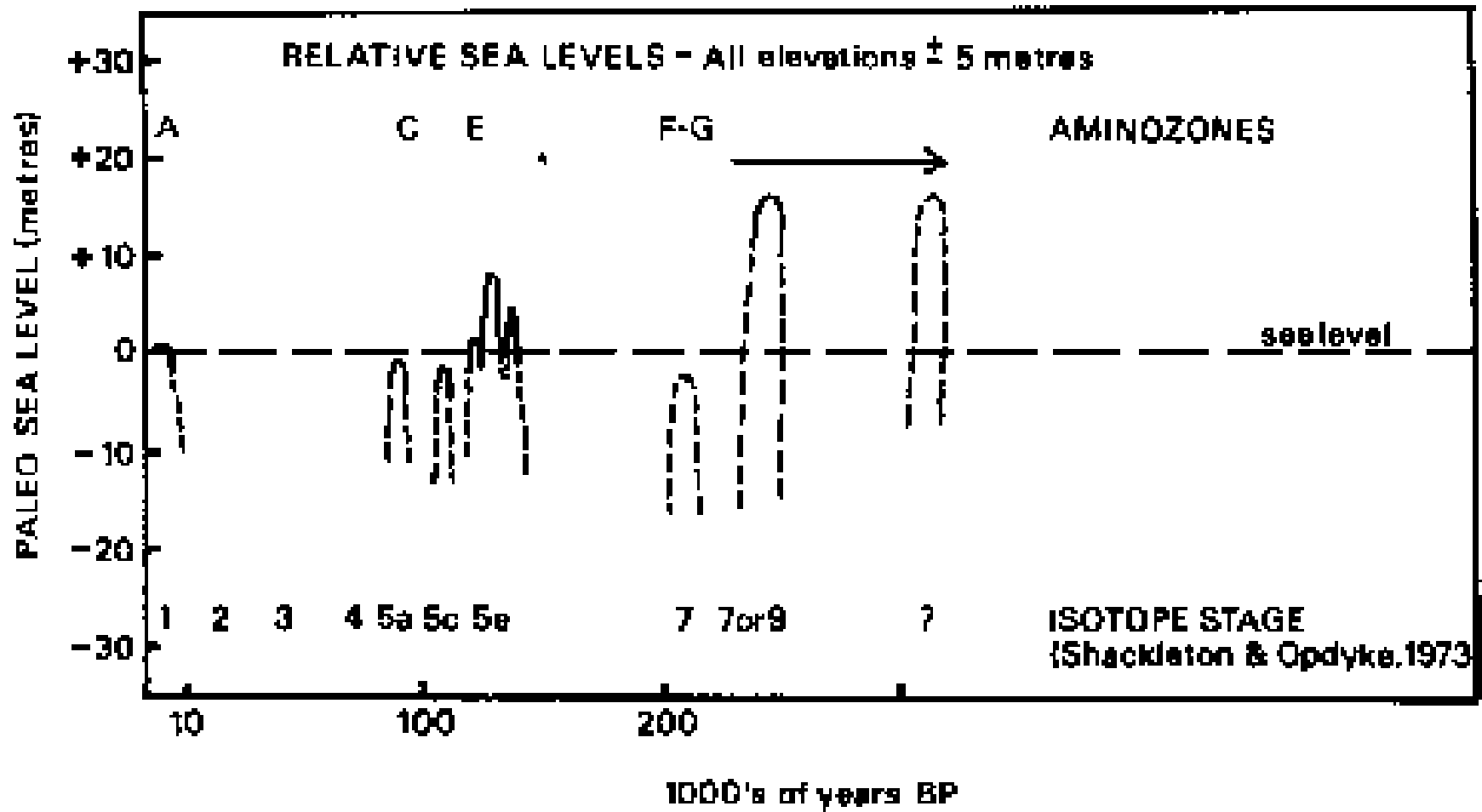
Thermal Expansion

Plate Tectonics

GIA (Glacial Isostatic Adjustment)
(Includes hydrologic adjustments)

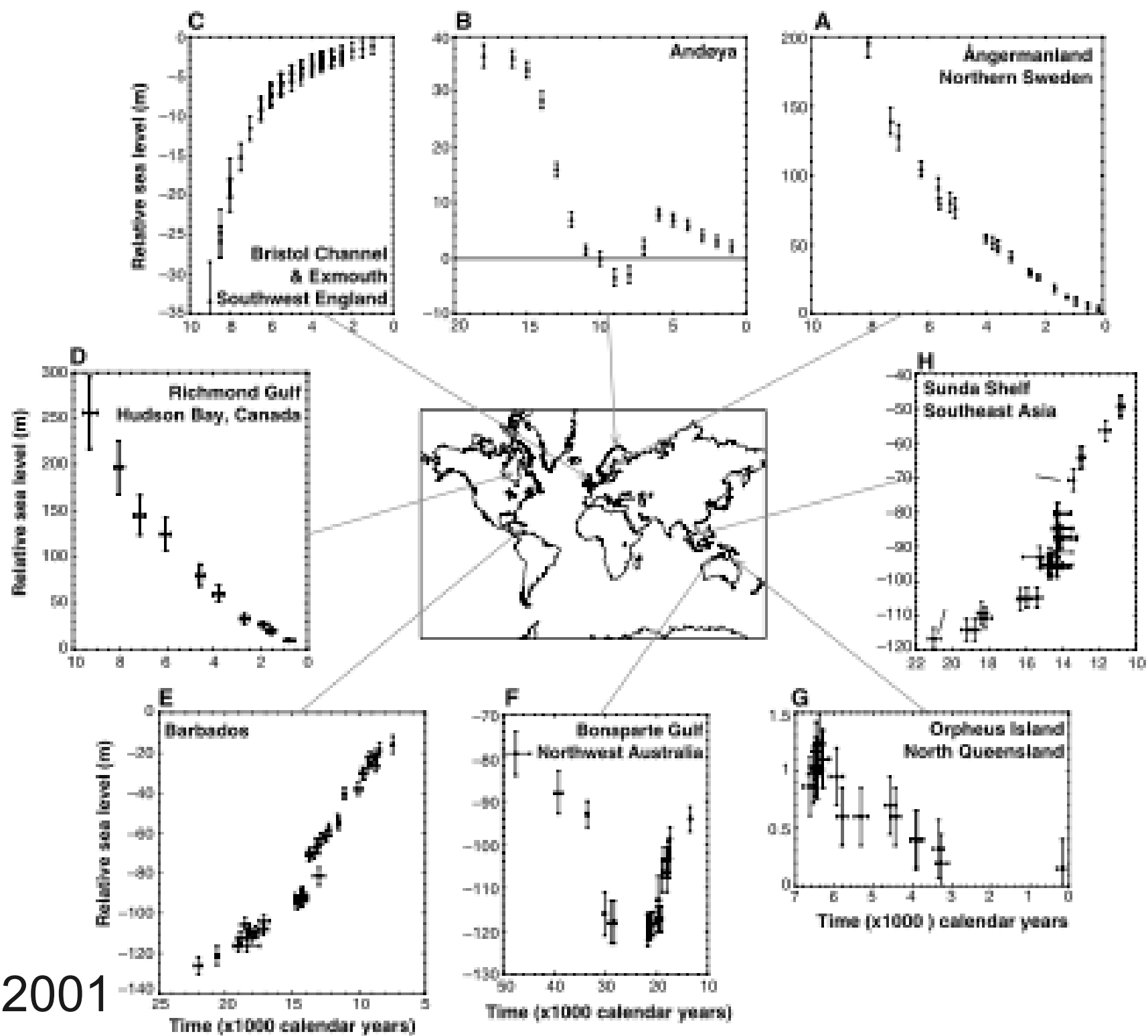
Eustatic sea-level changes



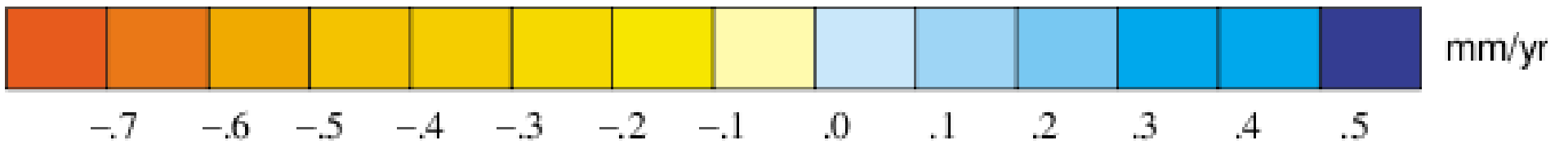
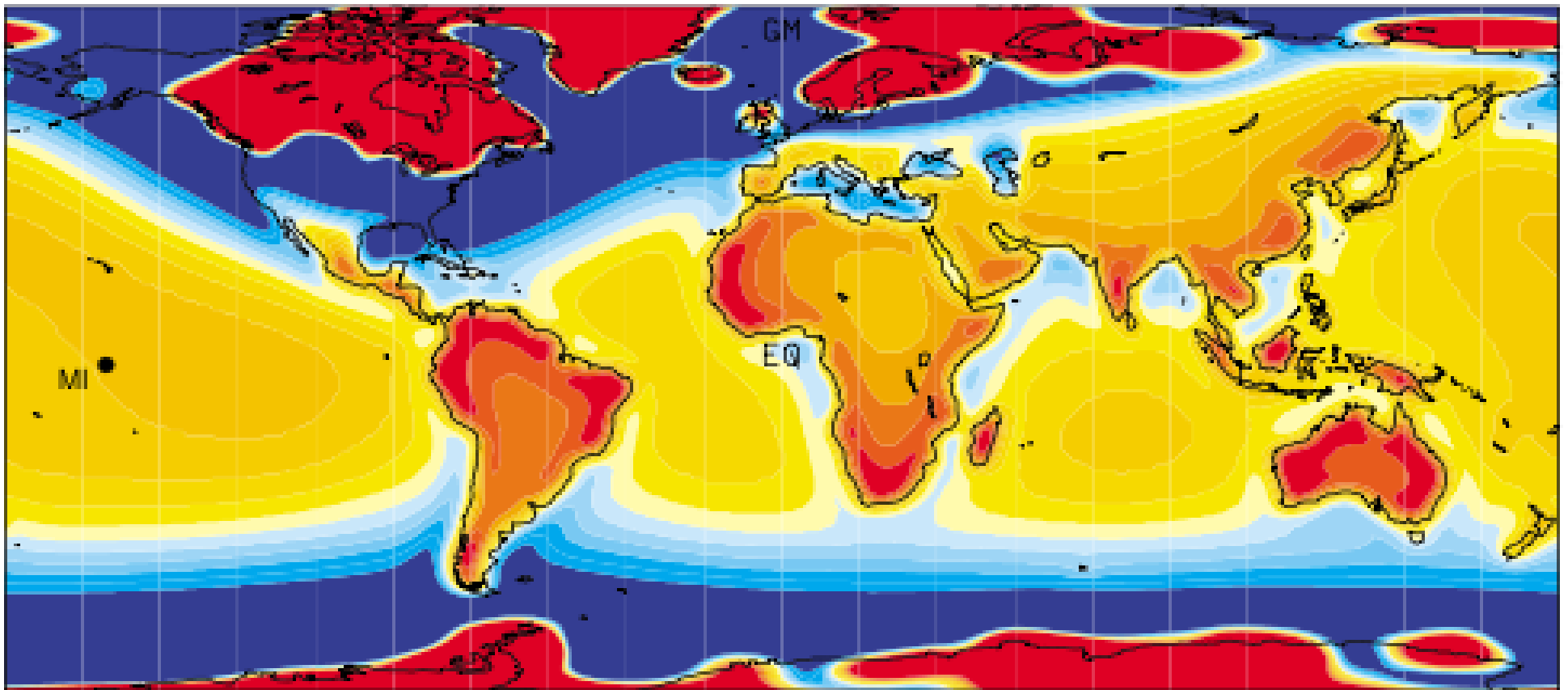


Harty, 1987

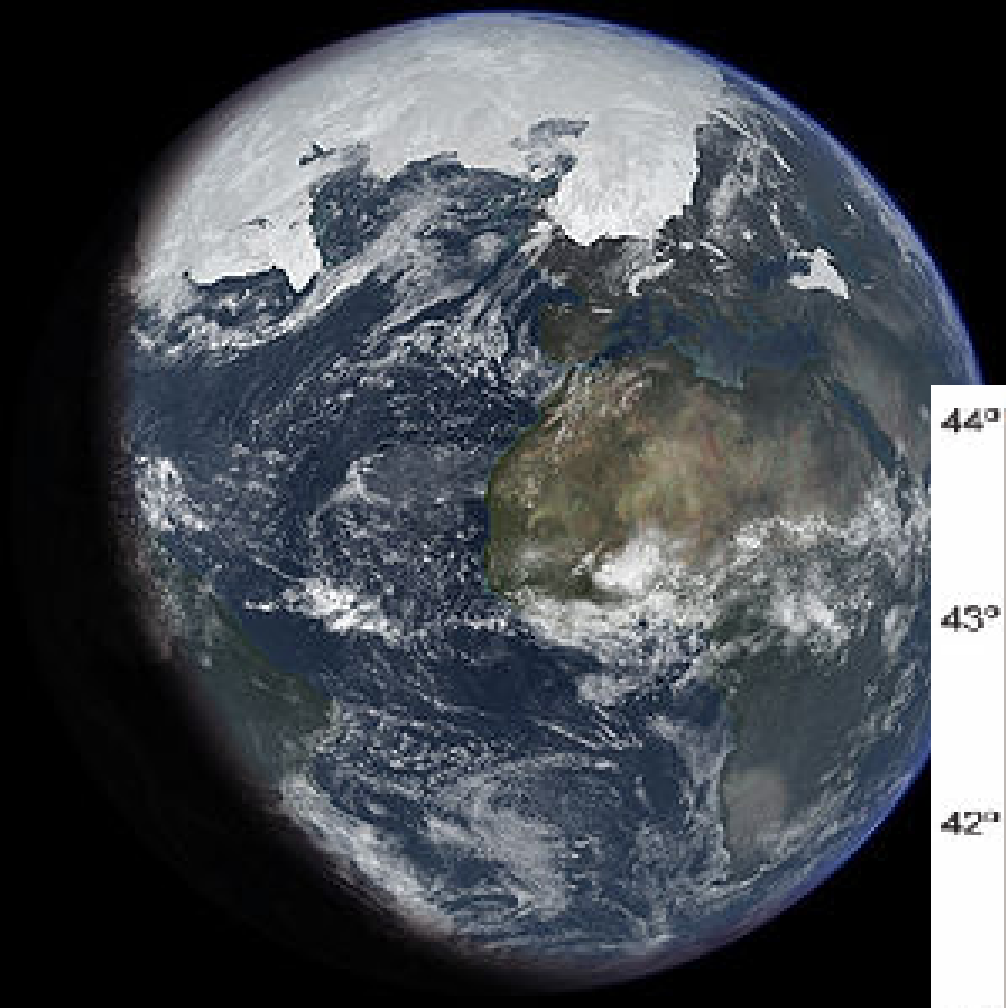
Fig. 2. Observed spatial variability of sea level change since the time of the LGM from tectonically stable areas or areas where the tectonic rate is known and has been removed from the observed signal. (A) Ångerman, Gulf of Bothnia, Sweden (13). (B) Andøya, Nordland, Norway (12). (C) South of England (14). (D) Hudson Bay, Canada (4). (E) Barbados (16–18). (F) Bonaparte Gulf, northwest Australia (27). (G) Orpheus Island, North Queensland, Australia [(23) and unpublished Australian National University data]. (H) Sunda Shelf, southeast Asia (15). Note the different time and amplitude scales. In the examples illustrated, all observed depths or elevations of the sea level indicators have been reduced to mean sea level. All time scales are in calendar years.



Lambeck, 2001

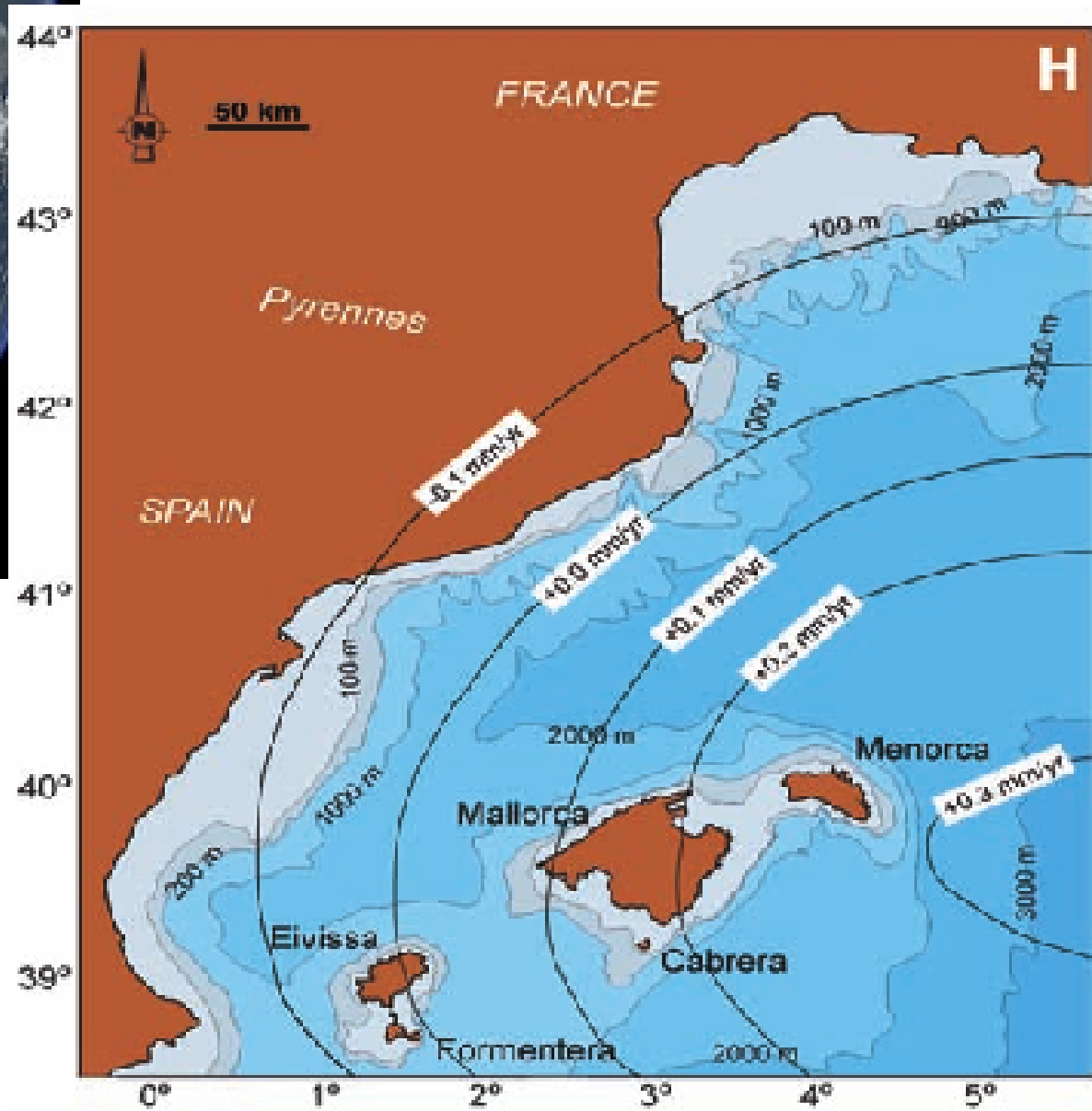


Mitrovica, 2002



Crowley, 1995

Mitrovica, 2002



Coral Problems

Uncertainty in water levels above reef

Coral habitat can be a range of >10m

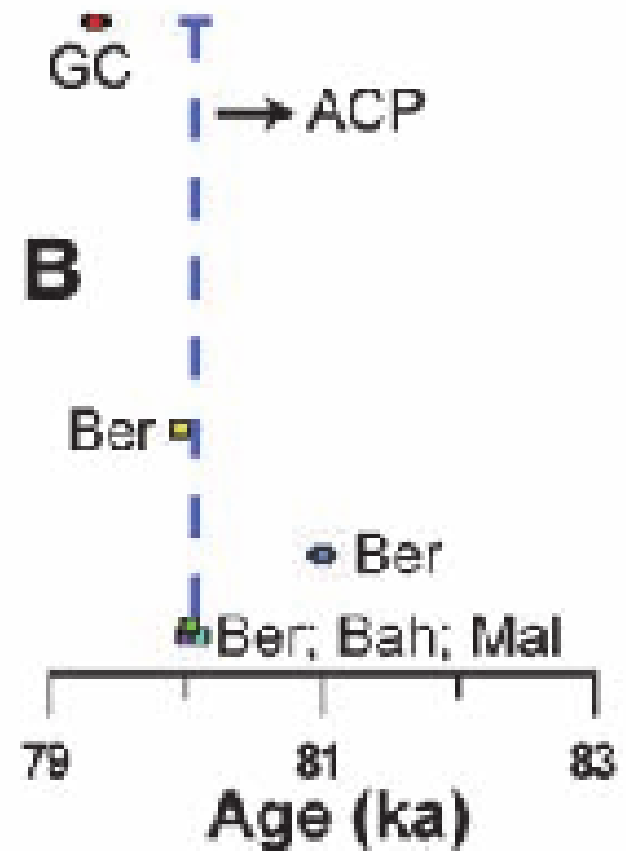
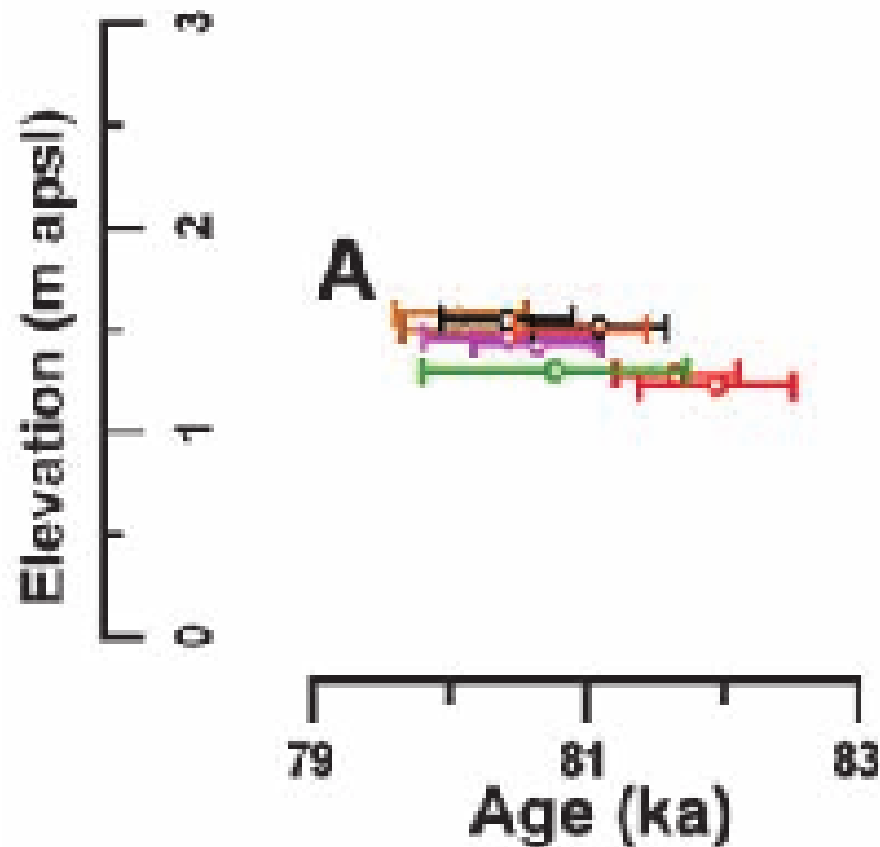
Dating Issues

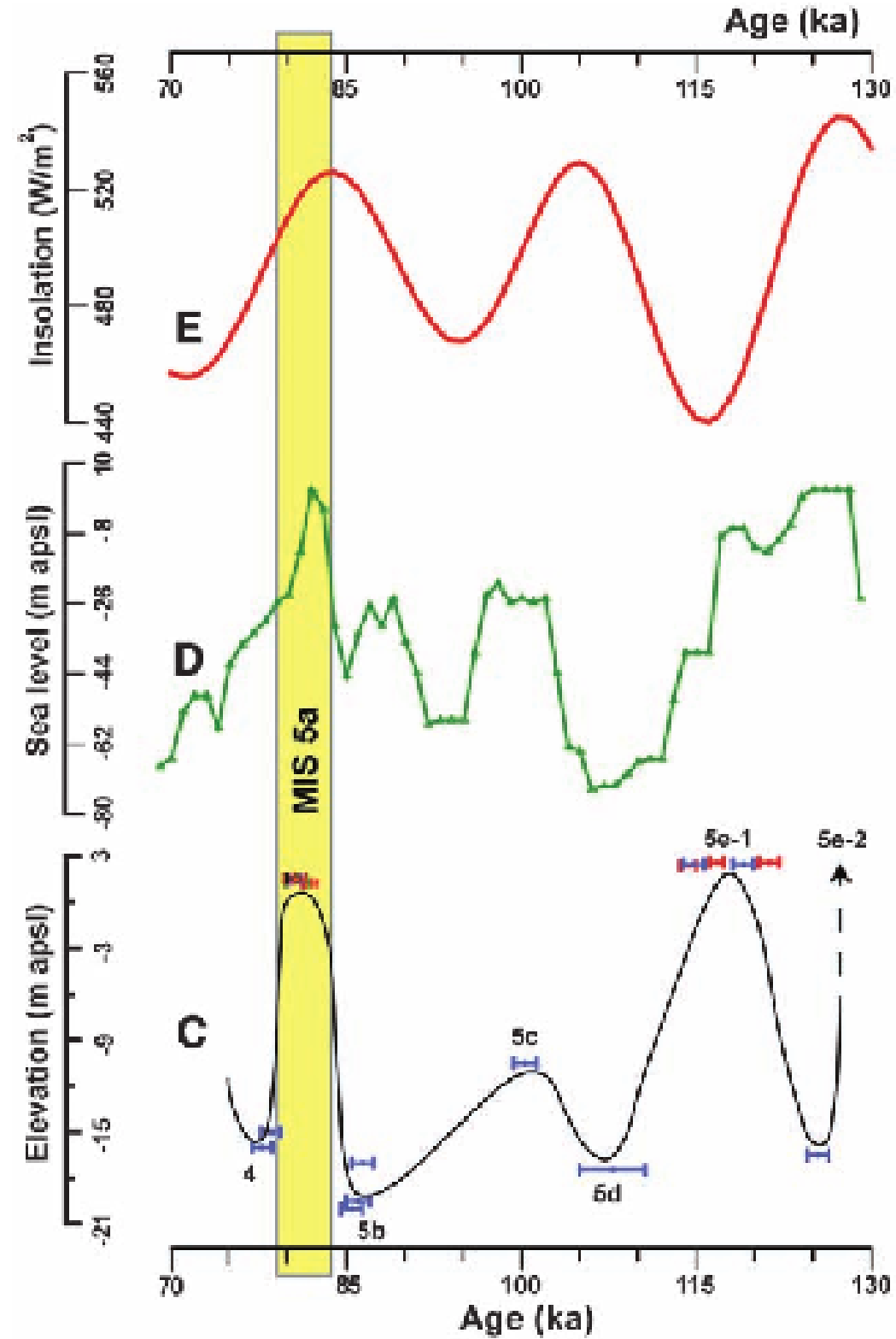
Reef-type: keep-up, catch-up, give-up

Lags in growth (up to thousands of years)

Sea-Levels

- 20m at 95.4ka +/- 0.9ka
- +1m at 94.2ka +/- 1.0ka
- 15m by 78.6ka +/- 0.8ka





Sea-Levels

-20m at 95.4ka +/- 0.9ka

+1m at 94.2ka +/- 1.0ka

-15m by 78.6ka +/- 0.8ka

Rapid Sea-Level Rise

“Nominally approach 20m/kyr”

→ **1m/50yr**

Min-span increase: Arbitrarily high

Max-span increase: 6.77 m/ky

Min-span decrease: 4.2 m/ky

Max-span decrease 0.9195m/ky