Fresh-water lake in the lagoon of Bora Bora?
A glacial-interglacial lagoonal succession

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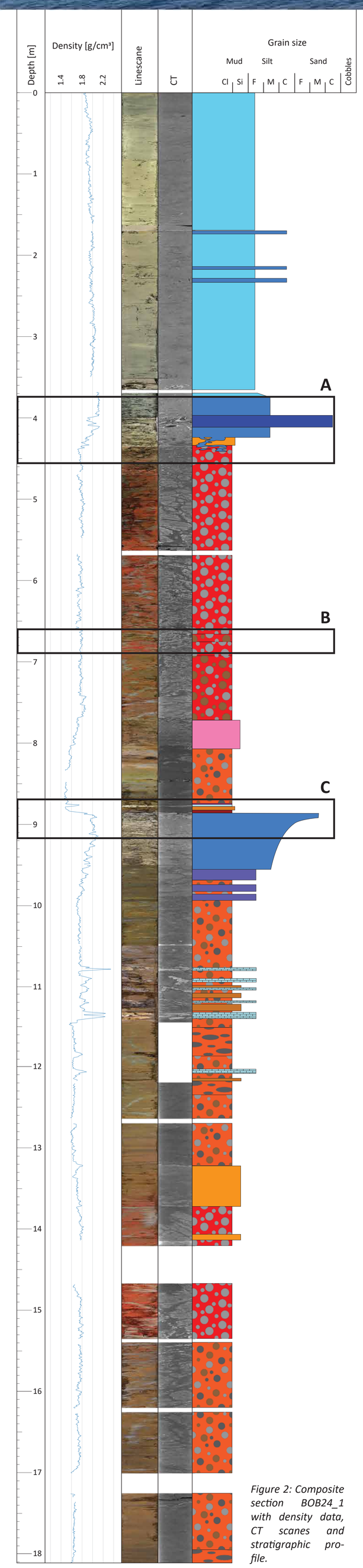

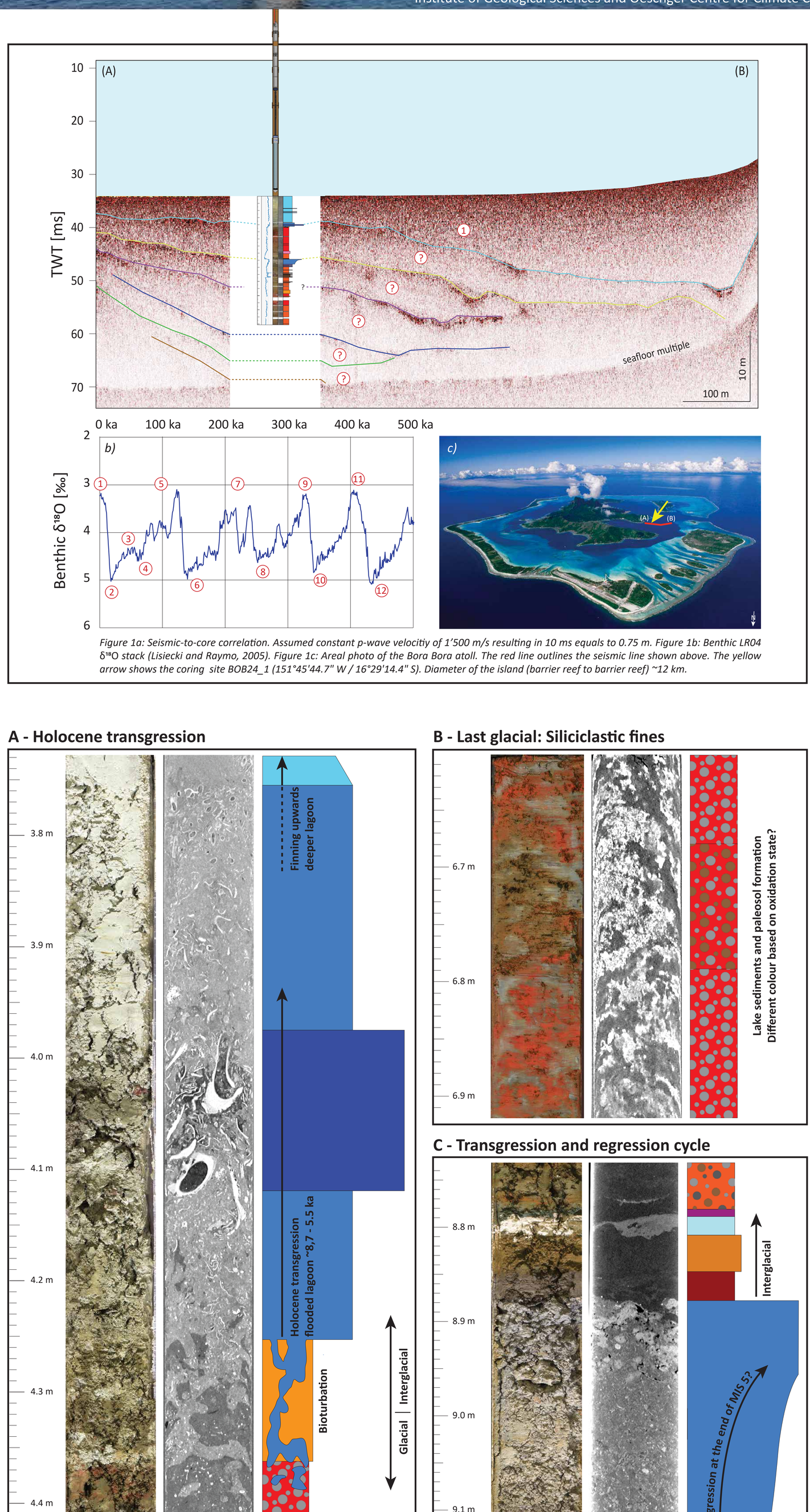

Figure 1a: Seismic-to-core correlation. Assumed constant p-wave velocitiy of 1'500 m/s resulting in 10 ms equals to 0.75 m. Figure 1b: Benthic LR04 δ¹⁸O stack (Lisiecki and Raymo, 2005). Figure 1c: Areal photo of the Bora Bora atoll. The red line outlines the seismic line shown above. The yellow arrow shows the coring site BOB24_1 (151°45'44.7" W / 16°29'14.4" S). Diameter of the island (barrier reef to barrier reef) ~12 km.

Figure 3: Detailed view of different depths;
A - Holocene transgression: Glacial siliciclastic fines are superimposed by transgressional carbonate sediments (fining upward packstone). The silt beds can be interpreted as paleosol formation.
B - Last glacial: Siliciclastic fines: The siliciclastic fines represent a large proportion of the composite section. The siliclastic fines are mainly differentiated by coloure, which could reflect different oxidation states.
C - Transgression and regression cycle: A former (MIS 5?) transgression and regression cycle can be observed from the carbonate sediments in ~9 m depth.

Figure 2: Composite section BOB24_1 with density data, CT scanes and stratigraphic profile.

Carbonates
- Fine sand packstone (Holocene)
- Medium sand packstone (Bioclast < 0.5 cm)
- Large bioclast packstone (> 1 cm)
- Brown packstone
- Pure white carbonate
- Solid carbonate crust

Clays
- Red-grey mottled
- Brown-grey-red mottled
- Grey-blue clay
- Brown clay
- Dark grey cley
- Silty clay
- Brown2grey mottled silty clay

Silts
- Silt
- Dark silt
- Soily!

We aim to fully understand the complex interplay between subsidence and sea- level fluctuation at the Bora Bora atoll by investigating its lagoonal sediment succession. Bora Bora (French Polynesia, South Pacific) is THE EXAMPLE of a Darwin-type atoll: Fringing reef attached to subsiding volcanic island surrounded by a lagoon, sand apron and barrier reef. The sedimentation of the Bora Bora lagoon is of mixed-carbonate-siliciclastic nature. The seismic sequences are represented in the core by a succession of alternating sediments of carbonate and siliciclastic fines (Figure 1). Further analyses will show how these sediments relate to the marine isotope stages (MIS).

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Results and Discussion

- Coring was achieved with an Uwitec coring platform in 27 m water depth. Three holes were made at one location.
- A total of 33 m of sediment cores were recovered and spliced into a composite section with a length of 18.1 m. Figure 2 shows the composite section alongside CT scanes and density measurements (MSCL).
- The sediment core can be divided into two main lithologies: carbonates (blue) and siliciclastic fines (red).
- The first 4.5 m carbonate sediments correspond to the modern marine lagoon established after flooding around 8'700-5'500 cal BP (Isaack et al., 2016).
- The siliciclastic fines lack carbonate sediment. The grain size varies mainly between clay to silty clay. The small grain size suggest a distal alluvial or even shallow lacustrine depositional environment that existed during glacial times with low sea-level.
- The siliciclastic fines serve as an excellent proxy for hydroclimate-dependent weathering and erosion processes on the island during glacial-times.
- Carbonate sediments from 9 to 11 m depth are interpreted as an older transgression and regression cycle (MIS 5?). But a long-lasting, permanent connection to the ocean seems to have existed only during the Holocene.

Outlook

- Detailed analysis of lithotypes: CNS, grain size, XRD, REM
- Dating: ¹⁴C, U-Th isochron dating (no corals), U-Th-He dating on clays?, relative dating?
- Biomarker analysis on comp. section, recent lagoonal and soil samples
- Seismic interpretation and "3D" modelling
- Interstitial water analysis
- Paleontological characterisation

Bibliography

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