# The early Holocene deglaciation of the East Antarctic margin from Site U1357 (Adélie Land).

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The East Antarctic Ice Sheet (EAIS) is the largest on Earth. The EAIS has long been viewed as very stable, but recent works doubt on this view (Pingree et al., 2011; Cook et al., 2013). In this sense, the role of Antarctica during the last deglaciation and its contribution to the melt water pulses remains poorly known and few studies inferred certain contribution to the Meltwater Pulse 1a (Deschamps et al., 2012). This poor knowledge is related with the complex shelf sedimentation, low sedimentation rates, large reservoir age and dating problems among others. In order to reconstruct in detail the last deglaciation paleoenviromental changes in EAIS domain we selected marine site U1357 and applied a wide range of geochemical, paleontological and sedimentological techniques. This site was recovered from the Terre Adélie margin (East Antarctica) during the IODP Expedition 318 contain an unique ~200 m sequence of likely annually layered sediments of the Holocene for at least the past 10 kyr (Yamane et al., 2014). The laminated sediments consist predominantly of diatom and radiolarian remains and cyclic coarse detrital layers in the lowermost part. Geochemical studies have been conducted on cores from holes U1357A and B at ultra-high (seasonal to decadal) resolution using X-Ray Fluorescence scanning, allowing to reconstruct detrital input, paleoproducitivity and redox conditions. The ratio of the concentrations of highly branched isoprenoid (HBI) diene/triene (D/T), a diatom specific biomarker, also has been used as a proxy for relative inputs of sea-ice algae and open water phytoplankton that gives indication on past sea-ice cover. The use of CT-Scanner allowed to characterize at high detail the presence and relationship between iceberg raft debris, silty layers and the biogenic lamination.

Deepest levels (between 176 to 185 mbsf) are characterized by the presence of *E. antarctica* spores with values >15%. This diatom indicates strong water column stratification. High values in D/T and ice sea proxy species (e.g. *Fragilariopsis curta* + *F. cylindrus*) indicate abrupt variations in sea-ice during this interval and shows a good correlation with bottom redox proxies (U/Th), pointing to lower oxygen availability when sea-ice is present. Comparison between CT-Scan images and geochemical data demonstrate that the intervals with high Ba/Al and Si/Al are associated to poor detrital levels (Fig. 2), allowing to use these ratios along the entire core as detrital/paleoproductivity proxies. CT-Scan images also corroborate an erosional character for these silty layers. Detrital proxies (e.g., Zr content) are anticorrelate respect to bottom redox conditions proxies (U/Th), pointing to well oxygenated deep waters as generator for silty layers. All these preliminary evidences allow us to recognize an unprecedented high resolution ice fjord-like sequence in the studied region with strong water column stratification and pulsational detrital input acting as a main forcing for environmental variations. Ongoing radiocarbon analysis, performed in the bulk fraction and also in compound-specific, will allow us to recognize timing, cylces and if major variations occurred in the reservoir age during the deglaciation.

After this fjord-like environment preliminary data indicate less stratified waters and silty layers almost disappear. Detrital proxies (e.g., Ti content) are associated only to summer conditions and allow distinguish multi-annual lamination. Preliminary interpretations based on diatoms analysis indicate high occurrences of sea ice-related diatom species (e.g. *F. curta* + *F. cylindrus*) together with high D/T values, allowed us to distinguish periods of long persistence of sea ice during the year (> 9 months per year) with late spring melting from those with shorter duration of sea ice cover (< ~8 months per year) with high occurrences of open ocean diatom species (large centrics, *F. kerguelensis*, Chaetoceros Resting Spores - CRS) and low D/T values. The obtained robust age model will allow us to conduct a cyclostratigraphic analysis where paleoclimate cycles at under decadal scale will be identified.

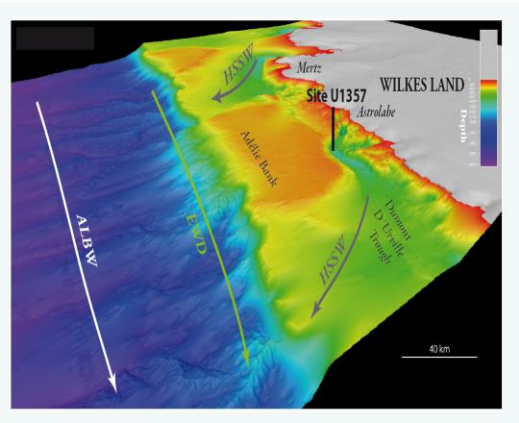


Figure 1 (up). Site U1357 location. Is recovered at the Adelie Drift, and contain a 170 m of Holocene sediment triple cored, Feb, 2010 during IODP Exp 318. Entire sequence is laminated at cm-scale. Laminations also present at mm-scale. Figure from J. Etourneau.

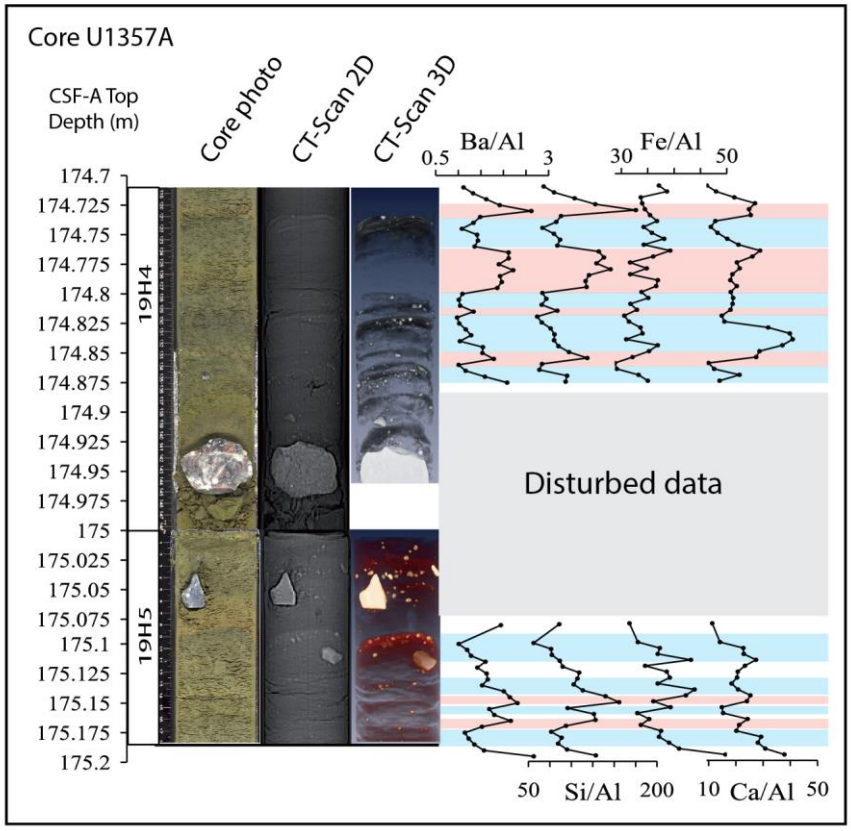


Figure 2 (left). CT-Scan 3D and 2D and core photo images from sections U1357-19H-5 and 4, compared with XRF-Scanner data. Variations in the detrital input can be observed and the correlation between detrital levels and low Ba/Al and Si/Al values (blue bars).

**References**

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