

Bottom current deposition in the Antarctic Wilkes Land margin during the Oligocene

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Abstract

Sediment cores collected from the Antarctic Wilkes Land continental rise at IODP site U1356 provide evidence of bottom current sedimentation taking place since the early Oligocene (i.e. 33.6 Ma) (Escutia et al., 2011). Correlation between Site U1356 sediments and the regional grid of multichannel seismic reflection profiles, complemented with bathymetric data, allow us to differentiate a variety of contourite deposits resulting from the interaction between bottom currents and seafloor paleo-topography.

Contourite deposits are identified based on the seismic signature, reflector configuration and geometry of the depositional bodies including elongated-mounded drifts, giant mounded drifts, confined drifts, infill drifts, plastered drifts, sediment waves, and moats. Based on the spatial and temporal distribution of these deposits, we differentiate three phases in contourite deposition in this margin: Phase 1) Early Oligocene, from 33.6-28 Myr, where sheeted drift morphologies dominate, related to high-energy deposits associated with fast flowing currents. Phase 2) at around 28 Ma, mounded drift morphologies and moat channels start forming. Continuous intensification of contour currents develops large contourite morphologies such as giant mounded drifts and moats forming around structural heights present in the Wilkes Land basin (e.g. the Adelie Rift Block). Phase 3) a shift in current configuration is recorded at around 15 Ma above regional unconformity WL-U5, which marks the Oligocene-Miocene Transition. This change is shown by a migration to the North of the drift crests and by a dominance of down-slope sedimentation processes that is indicated by mass transport deposits and channel-levee formation.

We interpret that during the Oligocene the evolution of the contourite deposits in this margin is driven by changes in the intensity of bottom current activity over time. Hydrographic information from Wilkes Land 140°E transect (Boyer et al., 2013) allows us to compare past and present oceanographic processes and configuration. Evolution of water masses through time forms and characterizes the contourite drifts in Wilkes Land basin.

Keywords: Oligocene, contourite drifts, Wilkes Land, IODP

References

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