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SEDIMENTATION MODEL OF EOCENE CONTINENTAL SHELF DEPOSITS OFFSHORE THE BELGIAN COAST

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Four wells drilled on the Belgian part of the continental shelf display a sediment series of nearly 200 m ranging from Lowermost Eocene to Lower Oligocene. Sedimentary facies analysis and grain size trends were used to unravel sediment genetic history and sequence stratigraphy.

During Earliest Eocene times (Phase 1), sediments were deposited in a distal position on an open mud shelf, at the moment the uplift of the Artois-Weald axis accelerated, causing the separation of the southern North Sea bight from the opening North Atlantic. The first 4 stacked TST parasequences topped by a HST indicate a constantly rising relative sea level.

In Mid Early to Late Early Eocene times (Phase 2), in a more proximal position nearer to the coast, sedimentation first shifts from a delta front back to an offshore mud shelf and than back again to a delta complex. An ebb tidal delta starts prograding onto the shelf, fed by a precursor of the Rhine-Meuse-Scheldt fluvial drainage system, with a southern sediment supply caused by the Alpine uplifting hinterland. At the end of Early Eocene times, tidal influence becomes prominent and general relative sea level is becoming somewhat lower. After a short period of locally greater water depth, (responsible for the last reappearance of the offshore mudshelf in the basal portion of the Uppermost Lower Eocene sediments), the constantly rising but relatively lower sea level induces in Late Early Eocene times the deposition of the delta complex as TST and HST of the prograding delta in the early highstand, mainly by loss of accommodation space.

In Middle Eocene times (Phase 3), the sedimentation system shifts even further to the coast towards a most proximal position, characterized by higher energetic conditions. Higher wave energy and long-shore currents replace the ebb tidal delta by a series of sand waves and barriers protecting a lagoon with estuaries and tidal flats. Large coarse sediment supply and loss of accommodation space are responsible for the wave influenced intertidal and supratidal sand shoals (LPW), the wave influenced subtidal and intertidal sedimentation with subtidal gullies and mixed intertidal flats (TST), and even the outbuilding of a submarine coastal barrier and a lagoon open to the sea (lagoonal storm deposits) as stacked HST-HPW parasequences, indicating the constant shoreline regression and the shallowing of the basin.

In Late Eocene times (Phase 4), the sedimentary environment shifts from a tidal mud flat to a coastal mud plain for the predominant clay layers to a tidal sand flat sedimentation for the sand layers, bounded by two major sedimentary and erosive hiatuses. The distal muddy portions of terminal fans are interbedded with coarser sandy packages of more medial sediments (on a scale of a few to ten meters), and display the progradational pulses of the delta fan lobes. Proximal sandy sediments with a southern origin are trapped at the basin margins, the basin itself being dominated by the monotonous distal facies. Aggradation produces rather thick sedimentary sequences with a regular geometric architecture predicting very gentle intra-basin relief.

The Upper Eocene units are deposited in relatively greater water depths with a finer sediment supply. They display 3 stacked (LPW) - TST - HST sequences, separated by 2 unconformities documenting 2 SB.
The sandy tidal flat sedimentation is again installed during Early Oligocene times (Phase 5). After a new but minor sea level drop responsible for the thin peat layers and burrows filled in with peaty sand at the top of the Upper Eocene unit, stacked LPW-TST parasequences develop in the Lower Oligocene.

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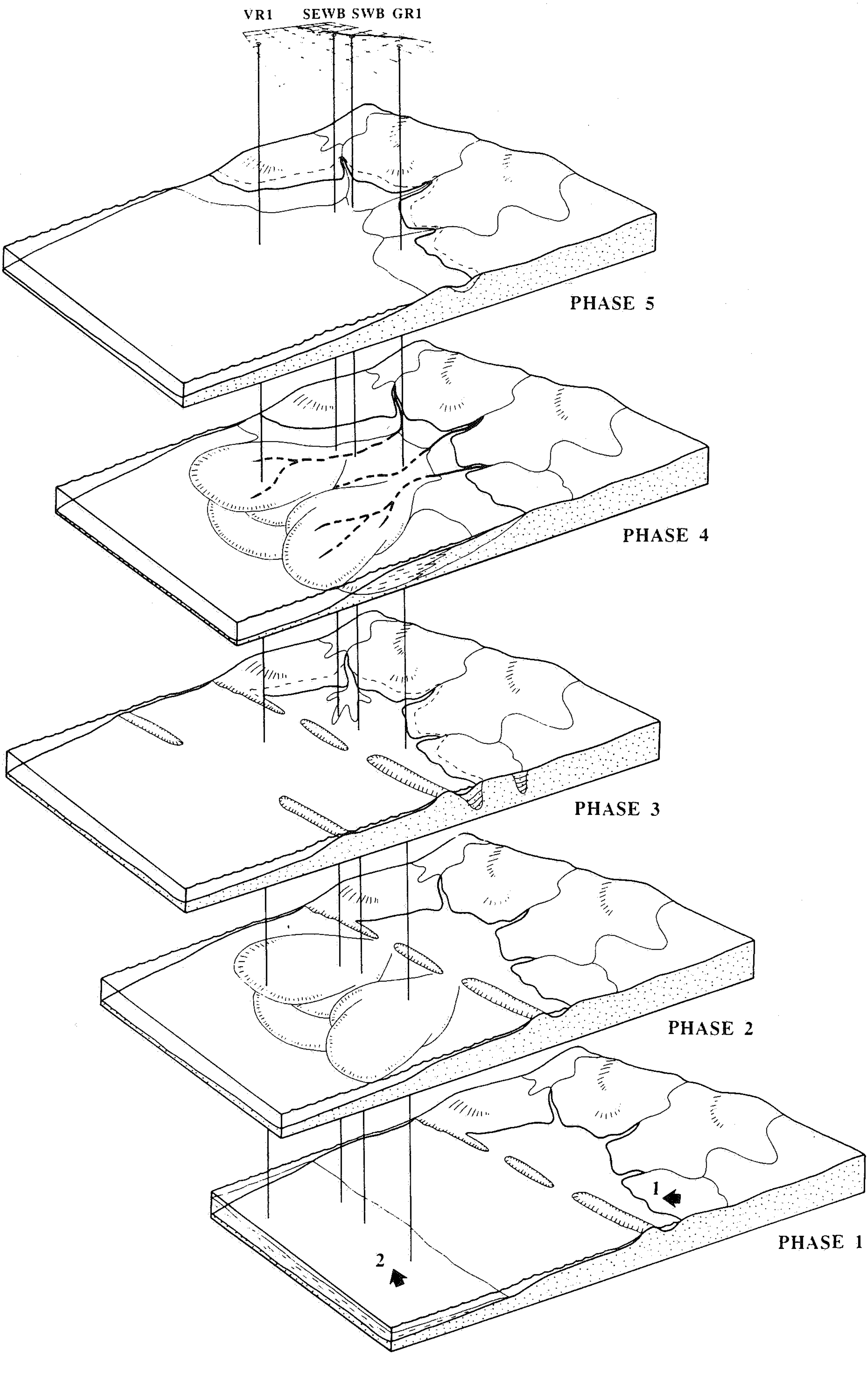
VR1
SEWB
SWB
GR1
PHASE 5
PHASE 4
PHASE 3
PHASE 2
PHASE 1
1
2