

The background of the slide is a geological map. It features a mountainous terrain with green areas representing higher elevations or specific geological units, and blue areas representing lower elevations or other geological units. The map shows complex topography with ridges and valleys.

CHAPTER 8

GROSS DEPOSITIONAL ENVIRONMENT MAPS

JURASSIC TO YPRESIAN SEQUENCES

Gross depositional environments from early Jurassic (J200) to early Eocene

The **J200** boundary corresponds to the transition from late Triassic to early Jurassic (Rhaetian to Hettangian). Stratigraphic event: shallow marine condition; deposits are mainly representative of continental to shallow water environments.

J200–J163 extends from Early to Middle Jurassic.

Early Jurassic sediments lie just above the autochthonous salt (1-5-6). The thickness map (4) shows the distribution of depocenters following the rifting phase. Thick accumulations are associated to the development of the Ancestral St Laurent River (3). Thick series accumulate over inherited rift sub-basins (6-5) but in the Laurentian Basin no well has reached formations older than middle Jurassic. Those series are inferred to be shallow marine deposits with potential source rock for the Bathonian MFS. The early Jurassic corresponds to the transition from continental to shallow marine condition. From late Jurassic to early mid-Jurassic there is a deepening trend related to thermal subsidence. Sediment deposits are formed of continental and deltaic deposits along the North-eastern edge (1-5-6). Clastic channel complexes form on the slopes. Clastic turbidite systems form on the rise. From Bajocian to Callovian (171 to 163Ma), transition from transgressive conditions to a regressive trend that ends with the base Callovian MFS, occurred. For this interval sediments are more continental and sandy around rivers outlet, and carbonate platforms develop along the South Whale Basin.

The interval **J163–J150** comprises the upper Jurassic series from Callovian to Tithonian.

The interval corresponds to the development of rimmed shallow-marine carbonate platform (1) except around the Ancestral St Laurent River outlet where deltaic deposits are observed (1-5-6). Sediment inputs tend to decrease in the Laurentian Basin but remain significant southwest of the margin near Sable and Huron basin. This time frame corresponds to a flooding period allowing the development of source rock, the main one being the Tithonian source rock. The shelf is largely eroded (Figure 1) and in places the erosion almost reached the base Callovian MFS. This implies that the source rock is largely missing in the upper part of the area. The sequences are well preserved offshore characterized by well-developed turbiditic systems (mix carbonate and clastic). Salt tectonic is already active and controls sediment distribution..

The interval **J150–K137** comprises the upper Jurassic and lower Cretaceous series from Tithonian to Valanginian.

This time frame represents the onset of the Avalon uplift (3) characterized by a major regressive sequence (Berriasian sands). The uplift induces a starting shift to the south of the ancestral St Laurent River (3). On the shelf the J150 – K137 unit is nearly absent (1-4-5-6). Carbonate Fms are better preserved. The vertical thickness gradually decreases northeastward except where carbonate Fms are found (4). The interval is better preserved in deep water where the J147-K137 is observed as well as the Tithonian shales (1-4-5-6). The depocenter observed southwest of the margin (4) corresponds to the Banquereau syn-kynematic wedge that developed during the Berriasian.

The interval **K137 – K130** comprises the early Cretaceous series from Valanginian to base Barremian.

The interval corresponds to a major erosive and regressive phase of deltaic progradation during early Cretaceous (5-6) followed by a transgressive phase (major drop in sediment supplies) which ends up with the Hauterivian MFS (K130 marker) and the onset of a mixed carbonate-terrigenous platform (1). Sediment input is mostly oriented to the south (3) following the migration of rivers outlet. To the East-northeast, the margin is starved and eroded. Carbonate platforms development occurs at the end of the Valanginian and the beginning of the transgression. Due to high stand conditions at the end of Hauterivian times (MFS) the facies distribution is dominated on the shelf by carbonate sands and on the slope by shale (1-5-6).

The interval **K130 – K101** comprises the early Cretaceous series from Barremian to top Albian.

It starts with the top of the Hauterivian MFS formed of mixed carbonate-terrigenous. The MFS is overlaid by a regressive episode (Hauterivian –Aptian) of deltaic progradation ended by a major unconformity (equivalent of the Upper Missisauga Fm). The unit consists then of a transgressive trend with deposition of shallow marine with alternating estuarine and open shelf deposits on the shelf (3). In the meantime, the St Laurent River has totally shifted to the south and the Laurentian and South Whale Basin correspond to a starved margin (3-4). The GDE map shows reduced carbonate formation (Emerillon) (1), and mostly shale in the deeper part of the basin (1-5-6). Although a large part of the shelf could not be identify due to lack of data (1), by extrapolation of wells data and former PFA study, we can infer that the shelf is mostly shaly.

The interval **K101 – K94** comprises the mid Cretaceous series from top Albian to Cenomanian.

The K101 – K94 unit represents a late Albian shallow marine regressive episode before flooding at the onset of Cenomanian. Due to the K94 unconformity, a large part of the sedimentary record is missing. Moreover, the ancestor St Laurent River is still flowing to the south, therefore starving the Laurentian Basin (3-4). The main depocenters are observed in South Whale Basin and Sable Basin (4). A shelf edge delta develops around Sable basin (1-4-5-6), whereas a zone of canyon and bypass forms on the slopes. The East-northeastern part of the area and part of the South Whale Basin is dominated by carbonate deposits, mostly chalk and marl from Bandol to Emerillon and carbonate banks near Heron (1). On the slopes, the sedimentation is dominated by clastic turbidites where prograding delta are found and calciturbidite offshore carbonate banks (1-5-6). The sedimentation pattern offshore is still strongly controlled by salt tectonic.

The interval **K94 – T50** comprises the mid Cretaceous to early Eocene series from top Cenomanian to top Ypresian.

The K94-T50 unit is marked by the deposition of clastics on the shelf, bypass area to Sable Basin slopes, thick detrital carbonate, marl and chalk packages over most of the slope and deep offshore area (1-5-6). The South Whale Basin side is mostly carbonate dominated environment (1).The K94-T50 isopach (3) map shows a well-defined shelf edge with sedimentary accumulation separated from the inner basin where sediment accumulation is reduced. The development of prograding wedge during this time frame coincides with the migration eastward of the St Laurent river.The impact of salt tectonic on sedimentation pattern tends to decrease particularly when approaching the Eocene period.