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The North Atlantic deep-sea floor – glacial versus interglacial controls and comparisons between the eastern and western North Atlantic

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The seabed of the North Atlantic continental margin displays a wide range of sediment transport processes including both alongslope and downslope processes. Some spatial control on sedimentation may result from the regional tectonic setting, but a temporal control results from the cyclicity of major paleoclimatic and paleoceanographic events (i.e. glaciations, sea level oscillations, and changing current patterns or water masses). There are strong similarities between the eastern and western margins but also some important differences. Each margin can be divided into three primary margin types:

The glaciated margin North of 56˚N in the east and 41˚N in the west the margin is heavily influenced by glaciomarine processes during glacial times, which build glacial trough-mouth fans such as the North Sea Fan and leave iceberg scour marks on the upper slope and shelf. During interglacials the Norwegian margin has been greatly influenced by alongslope currents, with less influence by turbidity currents than on the lower latitude margins. Landsliding is a prominent feature off Norway and the Faeroes but less so on the Canadian margin. Some of these landslides have occurred during the Holocene, though high glacial sedimentation rates may have contributed to the instability. In general, the glaciated margin of the western North Atlantic shows much more evidence for an important role for glacial meltwater in both erosion and deposition. Along the margin of southern Canada, large turbidite systems, more similar to mid-latitude submarine fans, were developed and the slope was incised by muddy turbidity current generated by plume fall-out, hyperpycnal flows from the ice margin and slumping of proglacial sediments.

The glacially influenced margin On both sides of the Atlantic canyons dominate across a latitudinal range where there was elevated sediment supply during glacials,

but where the ice did not reach the shoreline. On the western side this was from 33-41˚N whilst on the eastern side canyons range from 26-56˚N. During low sealevels these canyons were very active though many are now inactive. Fans are common in the east but less so in the west presumably due to strong bottom currents such as the WBUC. In the east the Mediterranean outflow is a particularly strong bottom current in the Straits of Gibraltar and Gulf of Cadiz. Landslides are widespread on the western margin but not on the east. Small slumps are related to canyon incision and widening, while large slide complexes originate from a combination of intrastratal deformation, salt intrusion, melting of gas hydrates and earthquake triggering.

The non-glaciated margin. These margins do not compare so well due to their setting. Off most of the NW African margin, south of 26˚N, upwelling produces elevated accumulation rates, though there is little fluvial input. This area is subject to infrequent but large- scale landsliding, giving rise to debris flows and turbidity currents. The latter traverse the slope and deposit thick layers on the abyssal plains, whilst debris flows deposit on the continental slope and rise. On the western margin, south of 33˚N, three distinct depositional environments can be identified: (1) a sediment-starved eastern Florida margin, (2) the carbonate-dominated Bahama platform and surrounding areas, and (3) the active margin of Puerto Rico. Sea-level fluctuations affect biogenic production on carbonate banks and downslope deposition results. This is enhanced during highstands when the banks are flooded. Downslope processes, however, occur at a much smaller scale than further north or on the eastern Atlantic margin.