grain pores in grainstones; most muddy marine rocks interbedded with tidal-flat dolomites were dolomitized. Both the grainstones and dolomites are very porous (up to 35 and 42%, respectively) and permeable (up to 160 and 1,430 md, respectively) because of widespread leaching of cements.

The grainstone-dolomite complex forms a large, tabular body of rock which now is continuously permeable to water and which is enclosed above, below, and along one side by impermeable rocks. The linear carbonate-sand body and associated reefs controlled the distribution of original porosity, and it now marks the northeastern boundary of permeable rocks.

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Late Ordovician–Early Silurian Strata in Mid-Continent Area

Late Ordovician–Early Silurian strata extend from the Texas Panhandle across Oklahoma and Arkansas into eastern Missouri and Illinois. The sequence consists of upper and lower sections of organic-detrital limestone separated by calcareous shales (Sylvan, Cason, Maquoketa Shales); the limestones directly above the shales are commonly oolitic (Keel, Noix Formations). The carbonate rocks have a rich megafauna and microfauna, and the shales yield graptolites and chitinozoans. The Ordovician-Silurian boundary, as here defined, usually falls just above the oolite, but locally it occurs in the shale. The faunal and stratigraphic relations suggest continuous deposition through the oolitic beds, although there is substantial lateral gradation between shale and limestone. At most places, Late Ordovician (late Ashgillian) strata are overlain by Late Silurian (late Llandoverian) strata; earliest Silurian beds are poorly represented or absent. Physical evidence for an unconformity at this horizon is common, pointing to interruption in deposition accompanied, at least locally, by erosion. Late Ordovician glaciation reported from Africa and South America was possibly of sufficient magnitude to have caused an appreciable lowering of sea level; this could explain the absence of earliest Silurian strata. The Late Ordovician shales are almost devoid of benthic fossils, a condition that might have been caused by various factors including colder water; however, these shales are closely associated with organic-detrital limestones and oolites which bear a large, sessile and vagrant benthos, suggesting temperate to tropical waters.

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Antarctic Continental Margin

The positions of Paleozoic depositional basins in Antarctica are determined by examining the paleogeographies of other Gondwana continents. However, because of its ice cover, Antarctica's post-Paleozoic paleogeographic settings are more uncertain. Most of the Antarctic continental margin has remained passive since initial rifting. The only exception is the Bellingshausen-Amundsen margin along which the Aluk Ridge was subducted between 53 and 21 m.y.B.P.

The initial breakup of Gondwanaland resulted in a network of narrow ocean basins in which euxinic claystones were deposited. As spreading continued, enhanced circulation resulted in the deposition of biogenic sediments, mostly carbonate beds, in the juvenile ocean basins bordering Antarctica. At the time of separation of Antarctica and South America approximately 23 m.y.B.P., the Circum-Antarctic Current was initiated. The continent was then thermally isolated and the stage was set for a continental ice sheet to develop. By late Miocene time the ice sheet had advanced onto the continental margin and has dominated marginal sedimentation since that time. The importance of glacial erosion and sedimentation on the continental margin has been profound. In the Ross Sea, the only area where the continental margin has been drilled, the waxing and waning Ross Ice Shelf has eroded hundreds of meters into the continental shelf to within a few tens of meters of basement rock. In its retreat, the ice deposited almost 400 m of glacial-marine sediments. Seismic profiles from the Weddell Sea continental shelf reflect similar deep erosion. Hence, although paleogeographic reconstructions suggest that parts of the Antarctic continental margin may contain rich oil and gas reserves, the combined influence of isostasy and glacial erosion may have reshaped the Antarctic continental margin significantly.

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Glacial-Marine Sediments of West Antarctica and Puget Sound

The ice-covered parts of the world oceans are among the most complex and poorly understood sedimentary environments. Studies of sediments from the Antarctic continental margin and the Pleistocene glacial-marine deposits of the Puget Lowlands are under way, and models for glacial-marine deposition are being developed. These depositional models account for the interrelations among glacial, climatic, oceanographic, isostatic, and sedimentary processes. In particular, glacio-isostatic adjustment and subglacial processes appear to have pronounced effects on sedimentation. Several cruises to the Antarctic continental margin have been conducted and most of the West Antarctic margin has been surveyed.

Piston cores from the West Antarctic margin contain a variety of sediment types ranging from nonstratified, nonsorted marine tills to well-sorted, quartz-rich sands and laminated silts. Debris flows, turbidites, biogenic oozes, and other marine sediments are interbedded with glaciogenic deposits. Lateral and vertical variability of sediments and faunas, well-illustrated by stratigraphic sections from the Puget Sound region, suggests that major shifts in depositional boundaries and environments occur frequently.

Understanding the complexities of the glacial-marine environment is essential for reconstructing past glacial histories. The origin of glacial-marine sediments cannot be understood by considering processes unique to the