content (853% by dry weight), porosity (89%), and plasticity as well as very low bulk density (1.09 Mg/m^3). The undrained shear strength (cohesion) of these sediments is also unexpectedly high, resulting apparently from some form of bonding of the sediment particles by organic matter. Sensitivity (ratio of natural to remolded or disturbed shear strength) is also unusually high (21), indicating a high susceptibility to failure if the sediments should become severely disturbed. All sediments along the margins behave as if they are overconsolidated. The greater the organic content the greater the degree of overconsolidation. In some areas this degree is on the order of six to seven times that of similar slope deposits but with relatively low organic contents. This degree of overconsolidation suggests that organic-matter related, interparticle bonding may be responsible for the apparent overconsolidation.

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Controls on Diatomaceous Lithofacies in Obliquely Rifted Marginal Basin: Gulf of California

DSDP Leg 64 dissected Quaternary sedimentation patterns in the Guaymas Basin which confirm many similarities but underline some differences with other Neogene circum-Pacific diatomite basins. Tectonic setting in this morphologically complex basin includes broad hemipelagic slopes, fault-controlled outer slope basins and highs, and relatively small transform-bounded, obliquely rifted deeper basins with complex ocean crust. Frequent mass flows are triggered from either muddy delta foreslopes or hemipelagic diatom ooze drape. These accumulate as mud turbidites in the narrow rift zones at rates exceeding 2,000 m/m.y. Interaction of climatic and oceanographic parameters control the intensity of biogenic productivity (ergo, the oxygen budget) producing alternating sequences of laminated and homogenous diatomaceous ooze, generally confined to slope regions (400 m/m.y.). Laminated diatom-ooze also accumulated in deeper basins which were deprived of turbidity flows during limited periods.

Sediments in slope areas contain a uniform 4% carbon but $CaCO_3$ (mostly foraminifera) ranges episodically from 2 to 25%. Phosphate occurs as fish-debris-rich laminae or rare, soft, centimeter-size pellets. Diagenetic dissolution of silica is recorded at Site 479 on the slope where finely laminated hard muds occurring below an unconformity at 380 m subbottom are now devoid of frustules, except those cemented in dolomite beds. Paradoxically, porcellanites were not encountered, although traces of clinoptilolite suggest that some silica reactions are presently active. Chert only occurs in proximity to basaltic intrusions. Dolomite precipitation occurs at shallow subbottom depths in zones of high alkalinity and methanogenesis, gradually forming decimeter-thick hard layers by slow vertical accretion. These layers commonly preserve primary fabrics. Petrologic and heavy carbon isotope evidence suggest that ions for dolomite precipitation are mainly derived from interstitial waters.

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Amorphous and Crystalline Ferromanganese Deposits from Seamounts in Gulf of Alaska

Both amorphous and crystalline ferromanganese deposits have been dredged from depths between 1,400 and 2,250 m on the flanks of Welker, Miller, Murray, and Patton Seamounts in the Gulf of Alaska (53-55°N, 140-150°W). Prominent 1 to 11-cm thick massive crusts, consisting largely of black amorphous oxide and poorly crystalline δMnO_2, occur as rounded multishelled coatings on the surfaces of alkali-basalt pillows and volcanic breccia. These crusts are characterized by a simple internal stratification constructed from isotropic oxide microlaminations in alternating colloform and columnar aggregates. Detrital fragments of quartz, plagioclase, palagonite, and mafic volcanic rock are concentrated along cusps or channels within crenulated oxide layers. Bulk-chemical analyses of the massive amorphous crusts yield Mn/Fe ratios of 1.5 to 2.5 and relatively high Ni (0.26 to 0.65%), Co (0.23 to 0.66%), and Cu (0.03 to 0.12%). The occurrence and composition of these amorphous crusts suggest that they are authigenic deposits with a growth mechanism similar to that for the top surfaces of Pacific deep-sea manganese nodules.

Thin (1 to 10 mm) subparallel crusts, interconnecting veinlets, and nodular infillings associated with friable tuffaceous sediment are composed of well-crystallized todorokite and cryptomelane; δMnO_2 and birnessite(?) are minor constituents. Complex textural variations are characteristic, but broad colloform bands of variably anistropic radiating oxide fibers, and massive zones of very coarse grained (as much as 1 mm long) strongly anisotropic acicular todorokite or cryptomelane crystals, are common. These massive anisotropic oxide zones contain abundant recrystallized radiolarian tests. Ferromanganese samples from Patton Seamount have a third association: undulating bands of columnar or nodular todorokite-rich oxide and volcanic detritus (mostly palagonite) occurring in a matrix of microcrystalline phosphorite (carbonate-apatite). Crystalline ferromanganese oxide deposits have bulk-chemical compositions similar to those of the amorphous oxides but with somewhat higher Mn/Fe ratios, higher Ni, and lower Co. In contrast to the amorphous crusts, crystalline ferromanganese accumulations on Gulf of Alaska seamounts are analogous to the bottoms of deep-sea nodules; that is, the formation of these accumulations is closely related to diagenetic modification of the associated sedimentary substrate.

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Evolution of Late Holocene Beach Accretion Plain on Pacific Coast: Grayland, Southwestern Washington

An extensive (140 km+) beach-accretion plain and lagoon-barrier coast has evolved over the last thousand years in southwestern Washington and northern Oregon. Before 1,100 years, a highly indented shoreline with a steep straight wave-cut cliff and terrace faced the Pacific much like the remainder of the American west coast. In the Grayland area, the first beach-accretion ridge formed at distances varying up to 7 to 10 km seaward from the former sea cliff, followed by two additional beach-accretion ridges with a maximum 2.5 km width of the plain at its southern end. A boring in the bog between the first ridge and older wave-cut cliff included a 1.2-m thick peat underlain by beach sands. Bog pollen is dominated by *Picea* and *Tsuga heterophylla,* with significant *Pinus,* Cupressaceae, and *Alnus,* essentially a modern flora. A basal peat RC^{14} date indicates the earliest barrier formed approximately 1,100 years ago. South of the Grayland accretion plain between Cape