and dissolved in the pore waters of the source rocks and are expelled to the reservoir rocks during dehydration of clays. Decarboxylation of these anions to the components of natural gas in the reservoir rocks provides a mechanism that does not require the primary migration of natural gas.

Evidence for the formation of natural gas from decarboxylation of these acid anions is provided by δC^{13} values of total bicarbonate and CH_4 and the correlation between the proportions of these anions in formation waters and their decarboxylated gases in the natural gas produced. Calculations show that most of the gas in these fields may have been generated from these anions.

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Depositional-Diagenetic History of Macaé Carbonate Reservoirs (Albian-Cenomanian), Campos Basin, Offshore Rio de Janeiro, Brazil

The Macaé platform sedimentary sequence consists of juxtaposed oncolitic calcarenite bars and intervening calcilutite bands extending parallel with depositional strike. The stacked oncolitic bars display a vertical evolution from infratidal to high intertidal. The depositional-diagenetic sequence of reservoir generation begins with development of geopetal internal sediment in a high-intertidal environment. This first stage of reorganization is followed by cavity-filling sparite cementation of beachrock, leaving some interparticle primary porosity. Subsequent vadose solution destroys large portions of the sparite, encroaches on the internal sediment and the framework, and generates secondary vuggy porosity. Preservation of the latter requires rapid burial, whereas any further emergence leads to complete obliteration of porosity by vadose blocky sparite.

The interbar calcilutites become increasingly restricted upward and are abnormally thick in comparison with contemporaneous oncolitic bars, a situation attributed to overproduction of micrite by calcareous green algae.

The juxtaposition of relatively heavier and thicker calcilutites with relatively lighter and thinner oncolitic calcarenites generated gravitational disequilibrium. After the sequence reached a critical thickness, halokinesis and related growth faulting occurred in underlying evaporites, thus accounting for the depositional evolution of the carbonate rocks.

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Role of Brines and Ferrous Iron in Formation of Dolostone

Dolomitization of geologically significant volumes of limestone by subsurface solutions requires: (1) a favorable thermodynamic drive, (2) an adequate supply of reacting solution, and (3) a reaction rate sufficient for dolomitization within a (geologically) reasonable length of time. The most important factors governing the thermodynamic drive, for a solution of specified composition, are (a) the temperature and (b) the composition and particle size of both the reactants and the products.

Data on the composition of calcite and dolomite coexisting with oil-field water of known composition and temperature provide an estimate of the equilibrium calcium-magnesium activity ratios in aqueous solutions in the presence of the common varieties of calcite and dolomite. Mass-transfer calculations, based on such data, suggest that most dolostone probably formed from concentrated sea water and/or at elevated temperatures. Factors affecting reaction rates are numerous and complex. Experimental work suggests that the conversion of 1μm reagent calcite to dolomite at 150°C may involve the formation of magnesite and protodolomite ($Ca_{60}Mg_{40}$) as intermediate steps. Ferrous iron in limited amounts relative to magnesium accelerates this reaction. Larger amounts of ferrous iron retard the reaction because much of the magnesium becomes incorporated into a relatively inert, ferroan magnesite.

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Allochthonous Nature of Numidian Flysch Complex, Western Mogod Mountains, Northern Tunisia

The Numidian flysch complex of Oligocene-Miocene age forms the highest structural unit in the Mahgreb orogenic belt of north Africa. In the western Mogod Mountains the Numidian complex lies on limestone and calcareous shale of the Tellian shelf sequence. Structural evidence clearly indicates a detachment zone between the Numidian complex and Tellian sequence that commonly is marked by the presence of Triassic cargneule. Paleontologically established age ranges for the two sequences do not overlap, and the superposition of the two sequences is younger over older thus making the significance of the contact controversial.

New evidence suggests that the Numidian complex is allochthonous and has been thrust to the southeast a minimum of 15 km. Paleodepth data indicate shallowing in the Tellian sequence from depths greater than 1 km in Cretaceous rocks to less than 200 m in middle and upper Eocene rocks. The Numidian complex is interpreted as a deep-sea-fan complex deposited in water more than 2 km deep as indicated by the presence of the isobathyal foram *Melonis pompilioidies*. Additionally, a newly discovered sequence of glauconitic sandstone and conglomerate depositionally overlies upper Eocene rocks of the Tellian sequence, and may be a time equivalent of the older part of the Numidian complex. These data suggest that the Numidian complex was detached from its substratum in a continental-rise setting, and was thrust southeastward over the Tellian shelf sequence. Thrusting of continental-rise sequences over continental-shelf sequences is a common but difficult to explain feature within orogenic belts. In the Mogod Mountains, timing and mechanism of emplacement of the Numidian allochthon can be explained by the collision of the Sardinian continental fragment with the North African continental margin during middle Miocene time.