seems to be a downgrading factor, at least for parts of the basin explored.

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Origin of Regional Pre–Middle Devonian Dolomitization in Williston Basin

Lower Paleozoic limestones in the Williston basin are only preserved from complete dolomitization where they are overlain by an argillaceous member of the Ordovician Stony Mountain Formation. This umbrellalike relation was originally interpreted as indicating that dolomitization resulted from the actions of descending brines. Basin-wide dolomitization of overlying strata (including the Middle Devonian Winnipegosis Formation) and an absence of Upper Devonian and higher regional dolomitization suggest that dolomitization was also a Middle Devonian event, which occurred during deposition of the overlying Prairie Evaporite.

Winnipegosis–Prairie Evaporite relations in Saskatchewan, however, indicate that a different genetic link existed between evaporite deposition and the regional dolomitization of subjacent carbonate rocks. It is believed that the Prairie evaporites were precipitated largely from groundwaters that entered the basin by means of carbonate buildups in the Winnipegosis Formation. Groundwater seepage first deposited travertine, "vadose" pisolites, and carbonate muds on mound tops and flanks, then caused massive precipitation and growth of interstitial, sediment-replacing and sediment-displacing gypsum in the mound-flanking beds. Concentration and processing of brines during their downward migration allowed final precipitation of chevron halite in salt flats on the basin floor. Groundwater movements also caused regional dolomitization of pre–Prairie Evaporite carbonate rocks which lay along flow paths. Groundwaters beneath the relatively impermeable Stony Mountain shale were stagnant and, consequently, did not cause dolomitization of their carbonate hosts.

Dolomitization of lower Winnipegosis blanket ("platform") limestones occurred concurrently with early compaction. This timing is consistent with the suggested dolomitization model.

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Late Cenozoic Calcareous Microfossil Biostratigraphy, Paleo-oceanography, and Biogeography—Poles to Tropics

Deep-sea drilling has provided a set of marine sedimentary sequences for global Cenozoic paleo-oceanographic studies. The CENOP (Cenozoic Paleo-oceanography) program is conducting paleo-oceanographic studies of the late Cenozoic from tropics to poles within the framework of plate tectonism and polar-glacial evolution. This requires detailed correlations between high- and low-latitude regions using different approaches.

Quantitative planktonic foraminiferal investigations have been conducted on late Cenozoic sequences in the South Pacific ranging from temperate to warm subtropical latitudes (41 to 26°S). Previous nonquantitative biostratigraphic studies have enabled the establishment of biostratigraphic schemes and correlation between the sequences which differ markedly in faunal characteristics as a result of the latitudinal range. Species frequency, diversity, faunal groupings (principal component and factor analyses), and coiling directions of *Neogloboquadrina pachyderma* have been determined for each sequence. Oxygen- and carbon-isotopic stratigraphy also has aided in intersite correlation.

During the Cenozoic, major changes have occurred in planktonic microfossil biogeography as reflected in the biostratigraphic sequences. These changes have been created largely in response to evolution of the Southern Ocean circulation system as obstructing landmasses moved apart. Included in these changes are the development of the Antarctic and Subantarctic water masses and the Antarctic Convergence and the evolution of cold, high-latitude climates. Nearly all evolution of calcareous planktonic microfossils has occurred outside of the Antarctic-Subantarctic, in subtropical-tropical areas, followed by limited migration into high latitudes. Virtually no endemism occurs among calcareous microfossils at high latitudes, but it is marked in late Cenozoic siliceous forms.

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Potential Resources of Natural Gas in United States—Case History of Potential Gas Committee

Since the early 1960s the Potential Gas Committee (PGC) has been preparing periodic estimates of potential resources of natural gas in the United States. The committee operates independently from any other group, either industry or government, and its published estimates represent the consensus of the working members who are organized into committees, one for each major producing area of the United States. Over the years, many different people have participated. The total U.S. natural gas resource consists of cumulative past production plus present proved reserves plus undiscovered potential resources. The work of the PGC involves the estimation of the potential resources only. With time the various components of the total recoverable resource should reflect a gradual shift from the potential category through proved reserves into production. Indeed, as the cumulative production in the United States has increased and the proved reserves have gradually decreased in recent years, the potential estimated independently by the PGC has changed gradually and the estimate of the total recoverable resource has remained remarkably consistent. Within individual areas the estimate of the undiscovered potential has shifted rather markedly, but the overall picture for the entire country has varied within close limits. Variations in the estimate of potential for the individual areas can be attributed to the progress of exploration and the exploration philosophy of the members of the committee.

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