

世界古地理と生命進化：その3 古生代 Global paleogeography and life evolution: 3. Paleozoic

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In modern oceans, there is no remaining information about past oceans older than 200Ma. For reconstructing paleo-plate motions with respect to collision-amalgamation of continents, on-land geology, in particular, orogenic belts that cemented older continents provide a sole source of information.

The onset of the Paleozoic is marked by the Gondwana semi-supercontinent formation at 540Ma around the South Pole. During the Paleozoic, Gondwana broken up, whereas Laurentia aggregated to form a real supercontinent by 430 Ma. Immediately after that, Gondwana began to be rifted, and its fragments and other blocks such as Baltica, Kazakhstan, Siberia, N China, South China, Indochina, and smaller pieces of Cimmeria, were dispersed; most of these were eventually amalgamated to form the northern half of Pangea, i.e., Laurasia.

The mode of mantle dynamics was represented by the high MORB production rate during 540-350Ma, almost the same as that in the Cretaceous, but it dropped after 350 Ma, probably by the activation of Pacific superplume. According to such continental assembly/ disassembly, sea-level changed remarkably as represented by the glaciation/deglaciation; the major Gondwana glaciations during the Carboniferous-Permian with 3 more minor episodes; the Paleozoic-Mesozoic transition interval might be close to the snowball Earth condition with extremely cold climate. The continent dispersion/amalgamation likely drove the development of remarkable floristic provincialism, e.g., Gondwana, North America, and Angara, that particularly reflected the formation of Laurentia. Not only the post-Ordovician land trees, this also controlled the diversification pattern of soil bacteria, moss, and land animals. Biodiversity changes including mass extinctions occurred in accordance with the secular change in seawater Sr isotope ratio; extremely high in the Cambrian with high bio-diversification, and the minimum at the G-L boundary (Permian) with onset of the greatest mass extinction.

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