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OCEANIC STRUCTURES OF THE EARTH AND THE NORTH DEPRESSION OF MARS: A COMPARISON OF THE FORMATION MECHANISMS.

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The system of contemporary oceans of the Earth and the North Depression of the Mars are quasi-simmetrical in reference to the center of one of the hemisphere (fig.I). Both systems had been formed over the common megacycle of evolution of planets and their origin is likely to have similar features.

The formation of the Earth's oceanic system within the South Hemisphere seems to have proceeded in three stages: I) the formation of a network of passive rifts at the center of the Gondwana (fig.2a); 2) the formation of the system of active rifts at the zones of forthcoming spreading (fig.2b); 3) the spreading of the oceanic crust (fig.Ia). The fig.3 displays a hypothetic interpretation of the stages. The first stage is a warm-up of isometric area at the center of the Gondwana Hemisphere,followed by an areal tension and passive rifting which are caused by decrease of the upper mantle density owing to the plunging down of the phase boundaries in the peridotite. During the second stage a redistribution of the heat flow within the upper mantle of the South Hemisphere and its focusing along linear zones,simmetrical to the center of the hemisphere,took place; an active rifting took place within the belts over the mantle zones of increased heat flow. At the third stage a convection in the zones of increased warm-up of the upper mantle reached a steady state,the movement of plates and the spreading of magmatic crust had begun.

The formation of the Mar's North Depression seems to have proceeded in two stages; I) a formation of a dense network of grabens and faults at the center of the North Hemisphere over the upper mantle zone characterized by an anomalous warm-up and a density decrease; 2) a collapse of the ancient crust and it's overflowing by basalts. The first stage of the ocean formation at the Earth (fig.2a) and the Mars is similar. But there seem to have been a thinner lithosphere at the Mars and asthenosphere had been characterised by less density,therefore the dense areal rifting was immediately followed by a total collapse. At the Earth,when the Gondwana had started breaking,the mantle heat flow seem to have been areal first and then it concentrated along the linear warmed-up zones. The zones had caused an origination of asthenospheric diapirs and an active rifting first and then initiated a steady-state convection under the zones of the lithospheric tension and the spreading of the lithospheric plates. It was that process of the heat flow concentration in the mantle which the Mars lacked.

The Tharsis upland on the Mars,as well as the North Depression,occupies the most part of one of the hemisphere and had been developing during the common megacycle of the planetary evolution after the epoch of the North Depression' formation (4). The period of the formation of rift and graben belts wit-

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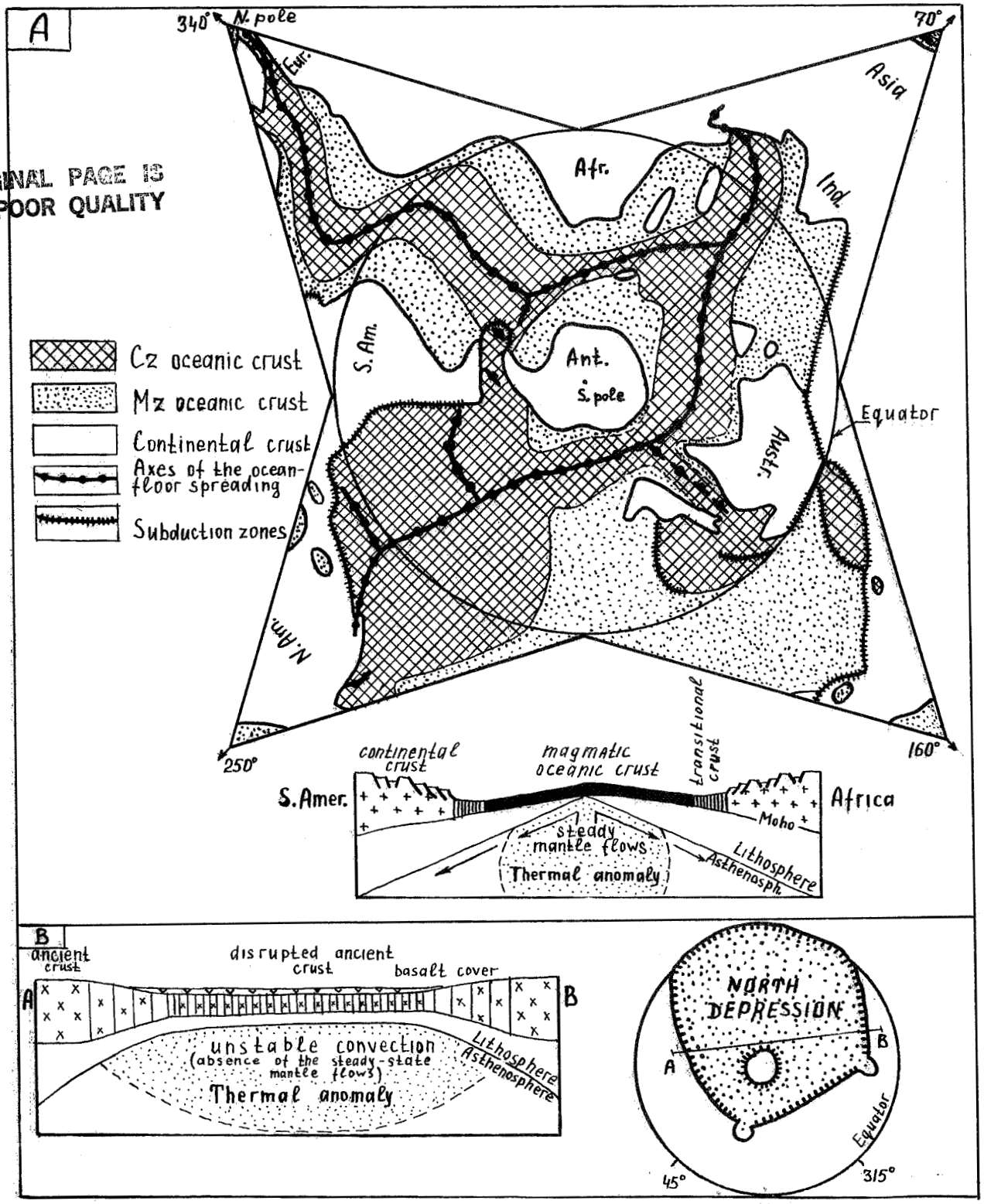
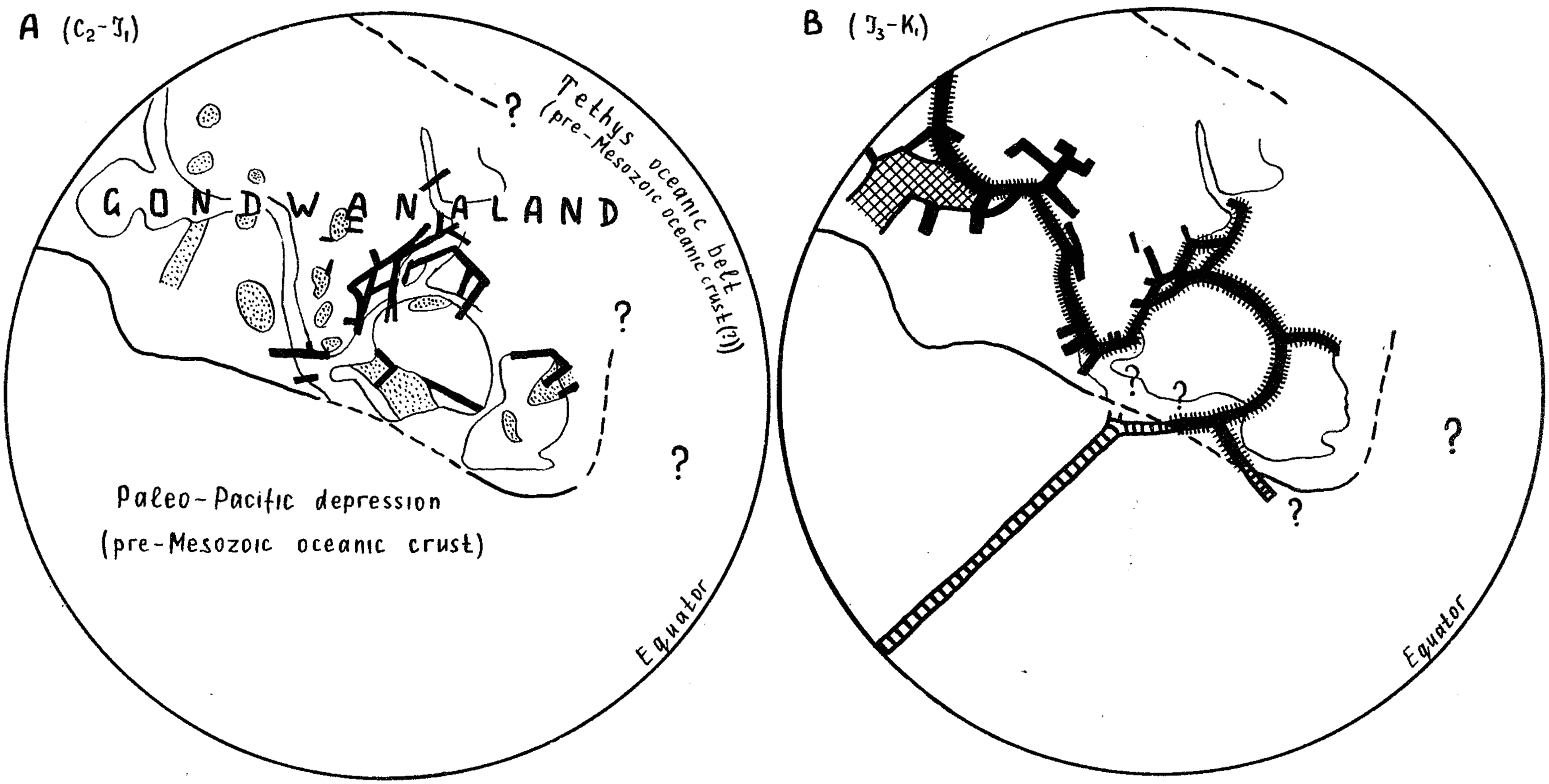


Fig.I. A - the system of the contemporary oceanic structures of the Earth; B - North Depression of Mars for the time of it's formation (adapted from (4)).



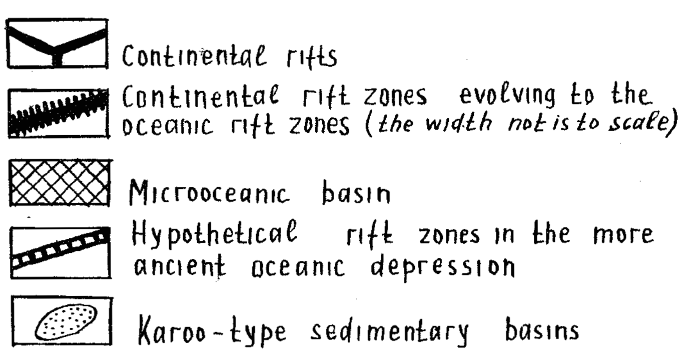


Fig.2. Gondwanaland for the Karoo time (A) and just before the splitting and the begining of sea-floor spreading (B). Paleogeographical reconstruction for "A" according to Zonenshine and Gorodnitsky (2) The paleogeographical reconstruction may be rather different. Rift pattern according to the data of (I,3).

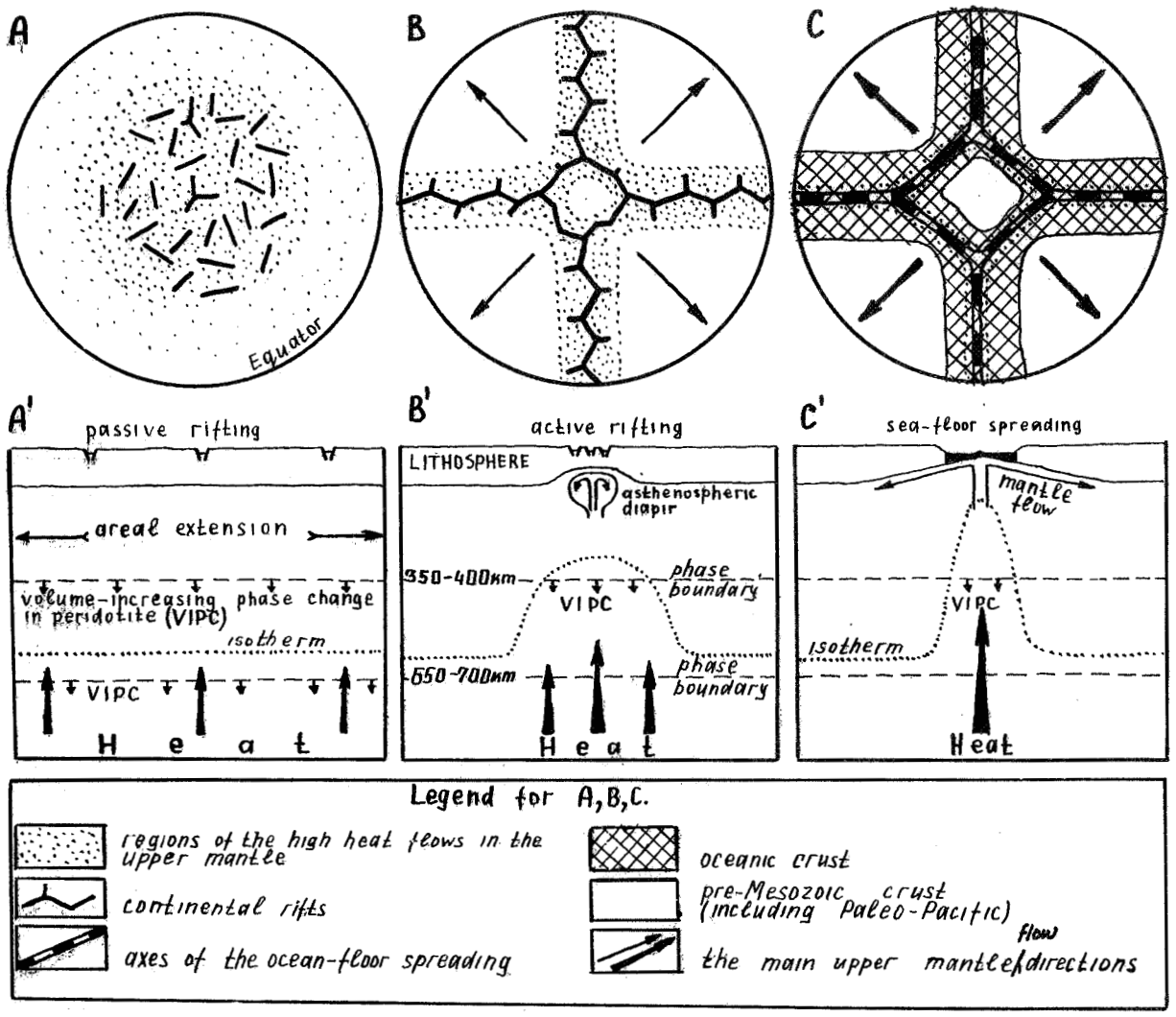


Fig.3. Idealized model of the ocean formation stages since the Late Paleozoic in the South hemisphere of the Earth.

hin the Tharsis upland is similar to the stage "2" of the Gondwana break (fig.2b). However the belts of lithospheric splitting and the zones of spreading of the magmatic crust had not been formed,becouse the Mar's lithosphere at the time of the formation of the Tharsis upland might have been thicker, then that of the Gondwana,and the convection under the Tharsis - weaker. The steady lateral flows within the upper mantle and the plate tectonics are characteristic features of the Earth,which are not observed at any other planets,where the "hot spots" tectonics seem prevail.

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