PRIMARY RIFTING AND OCEANOGENESIS IN THE
EARTH’S HISTORY, COMPARISON WITH MARS AND
GANYMEDE.
E.E. Milanovsky and A.M. Nikishin, Geological Faculty,
Moscow State University, II7234, Moscow, USSR.

Geological data testify for the occurrence during the Early Archean (3.5 to 3.0 b.y. ago) within recent oratons of the irregular sialic plates, characterized by abundant basalt volcanism (recent granite-greenstone provinces) and mobile linear belts with basalt and graywacke content (recent granulite belts)(fig.). Numerous geological data indicate very ancient age of the Pacific basin probably existed in the Early Archean. The Archean geological setting beyond the most ancient oratons and areas of the Pacific, where we can suppose the existence of the hypothetic depression with oceanic crust, are unknown. To study the early tectonics of the Earth one should have the complex data on oraton geology and comparative planetology.

Comparison of the Earth’s tectonics with that of Mars and Ganymede revealed that the norther planetary Mars’ depression is similar to the Pacific depression by the structural situation and, probably, by the origin and age, while the system of mobile belts of Ganymede is similar in plan to system of the Early Archean granulite belts of the Earth. This resemblance seems to reflect a certain coincidence in the early tectonic evolution of the Earth, Mars, and Ganymede.

At Mars, within its northern hemisphere, an ocean-like depression with basalt cover was formed after the period of formation of generally spread primary crust under conditions of the thin lithosphere about 4.0 to 3.5 b.y. ago. Within its southern hemisphere, an areal basalt volcanism occurred at that time (2,4). It can be explained by a relatively greater extension of the northern hemisphere contrast to the southern one at the general slight extension of Mars as whole. Ganymede, after the formation of the primary icy lithosphere about 100 km thick, experienced general extension that resulted in the break up of its lithosphere into more stable icy blocks, polygonal in plan, and mobile rift-like belts with water "magmatism" and complicated deformations (3).

Reconstruction of the principal pattern of the early tectonics of the Earth can be deduced from the comparison of data on the tectonics of the Archean Earth, early tectonics of Mars and Ganymede. We can suppose that after the period of general (?) formation of the ancient "gray gneiss" crust began some extension of the Earth, manifested asymmetrically at the surface. Simultaneously an ocean-like depression of the Pacific Ocean was formed in one hemisphere under conditions of relatively more strong areal extension of the crust, whereas in the other hemisphere, under conditions of relatively less intensive extension, the ancient "gray gneiss" crust was splitted into a number of more stable sialic plates, polygonal in plan, separated by a planetary net of rift mobile belts (prototype of recent granulite belts). Within plates, under conditions of thin lithosphere,
PRIMARY RIPTING AND OCEANOGENESIS.

E.E. Milanovsky and A.M. Nikishin

Figure. Real and hypothetic Early Archean granulite belts on ancient platforms (1, and other data). 1 - granulite belts, 2 - Archean gneiss basement and greenstone provinces, 3 - modern margins of ancient platforms.

a strong intraplate magmatism was concentrated in subsiding basins, elliptical and isometric in plan. Their further complicated evolution led to the formation of granite-greenstone provinces.

References