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N86-31150

ON THE DIFFERENCES IN CONTINENTAL RIFTING AT THE EARTH,MARS AND VENUS.

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During the process of continental rifting at the Earth the lower ductile crust stretches forming a neck,while the upper brittle crust is broken in blocks by faults,and the blocks sink down the thinned lower crust (I,2); if the stretching continued, the neck may break and a newly originated oceanic crust is formed at this place. The figure displays some types of rifting. The rift system structure depends on the depth of the boundary surface between the brittle crust and the ductile crust,the litospheric thickness and a form of asthenospheric diapir,the tension value,ets..

The depth of the boundary surface between the brittle crust and the ductile crust is determined by PT-conditions,the stress value,the rock composition,ets.. It ranges from 5 to I5 km for the Earth's rift zones. At the Mars' Valles Marineris rift system the depth of the boundary surface between the brittle and the ductile crust during rifting was situated 2-4 times deeper then at the Earth (4),since the lithosphere was thicker and the heat flow was lower in comparison to that at the Earth (4,5), and since the lithostatic adverse pressure gradient was smaller owing to smaller gravitation. Therefore,when a belt-like area of the Valles Marineris rift system had expanded by several percents,only the deepest layers of the lithosphere experienced the plastic stretching. The thick brittle part of the lithosphere over the zones of plastic stretching of the lower part of the lithosphere underwent breaking and it's blocks sank down for I-IO km. The form and the relative position of the troughs was governed by stress field and by the distribution of heterogeneities in the lithosphere.

At the Venus the rift-like structures are discovered in Aphrodite Terra,Beta Regio and in other areas (3). They are wider and shallower than the Earth's continental rifts. The temperature at the Venus' surface is about 475°C. At the Earth such temperature exists near the boundary surface between the brittle crust and the ductile crust. Therefore the Venus' lithosphere is considerably more plastic than that of the Earth. Hence,the ductile type of rifting must be characteristic of the Venus. With the plastic Venus' type of rifting the tension does not cause the breaking of its lithosphere,in consequence of this,the structures like the Earth's contemporary oceans are not characteristic of the Venus.

Therefore,the rigid brittle rifting when narrow "necks" in the lower crust form,is characteristic of the contemporary Earth; at the Mars the brittle rifting with large subsidence was characteristic of the Tharsis upland formation epoch; the ductile rifting is typical of the Venus. The difference of the rheologic features of the lithospheres of different planets causes the variation in types of rifting.

RIFTING AT THE PLANETS

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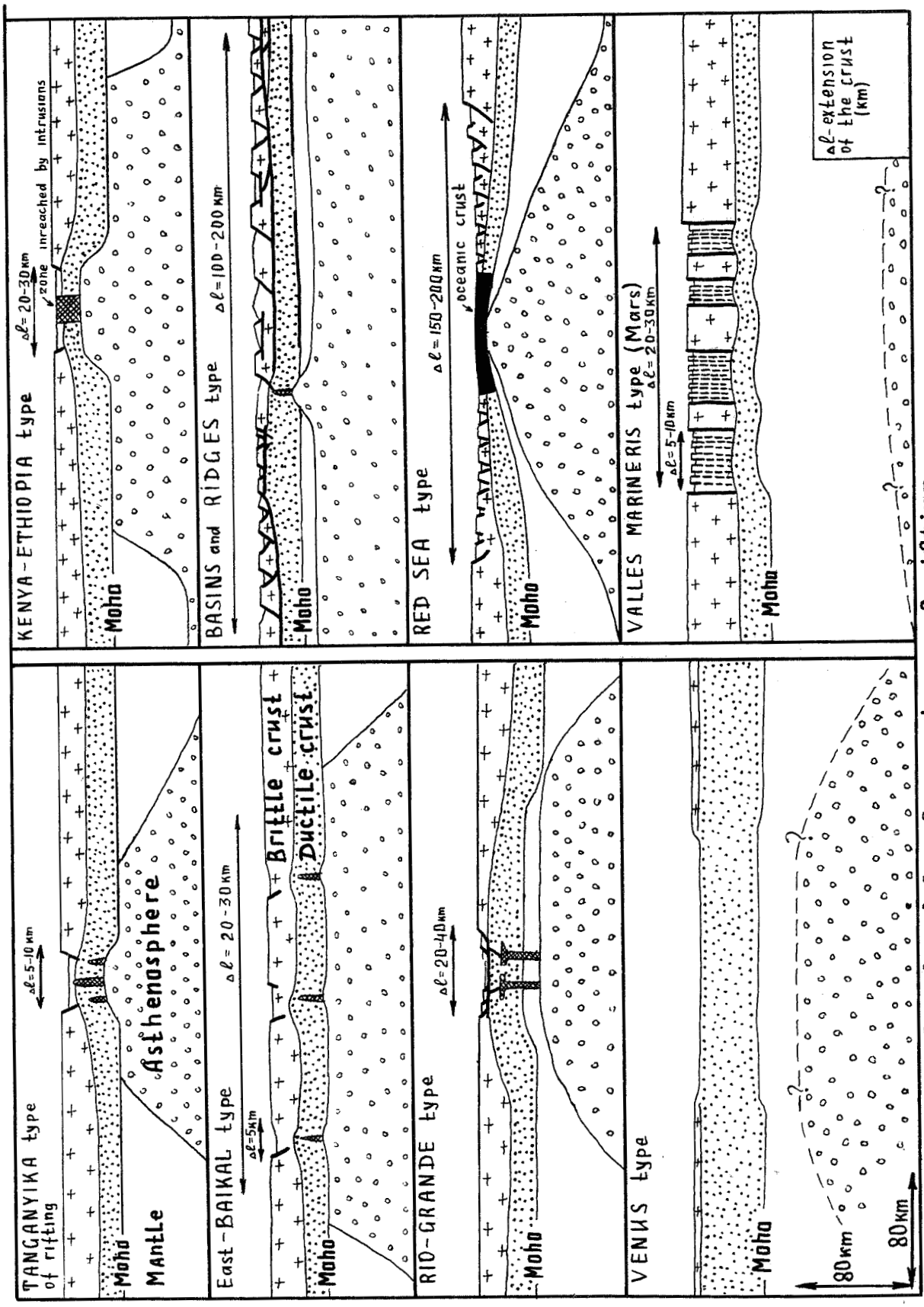

Fig.I. Idealized models of some types of rifting.

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