

The formation of Earth's habitability the key role of Moon-forming giant impact

MAO TANG¹, QINGWEN ZHANG¹, YOU ZHOU² AND
YUN LIU¹

¹Institute of Geochemistry, CAS

²Chengdu University of Technology

Due to the Moon-forming giant impact, the earth gained at least dozens of times more heat than Venus, which forced the earth to choose a different way to get rid of so much heat in a short time in the early stage. It directly led to the earth chose the tectonic regime of the heat pipe, which is volcano-dominated tectonics and can be found on Jupiter's moon 'Io' right now. Heat-pipe can efficiently dissipate heat and extract a thick and cold mafic proto-crust from the early mantle. An intrusion-dominating regime could account for the subsequent formation of the felsic continents as Earth cools and heat pipe shut down. Then the heat-pipe tectonics will turn on again and destroy most of rocks formed during its shutdown period. Such episodic heat-pipe tectonics last for the whole Hadean era. The cool and hard rock layer formed due to the heat-pipe tectonics is essential for the formation of habitability of the earth. By this way, the required conditions by a habitable Earth, e.g., adequate surface temperature, aqueous sphere, and towering mountains, etc., would be appeared within a surprisingly short time. Therefore, the Moon-forming giant impact is the most important reason to make a habitable Earth. It not only brought tremendous heat into Earth and forced Earth to choose the volcanism-dominated heat-pipe tectonics but also completely destroyed the proto-atmosphere to avoid over-heated situations occurred like that of Venus at present. Only after the complete shutdown of heat pipe tectonics, igneous rocks can be eventually reserved and sampled in the present-day.