Splashed hadean seawater hypothesis

H. GENDA[1*], Y. UENO[1], J. FORIEL[1], T. USUI[1], S. UETA[1], H. BAO[2] AND T. SUN[3]

[1]Tokyo Institute of Technology, Tokyo 152-8551, Japan (*correspondance: genda@elsi.jp)
[2]Louisiana State University
[3]Johnson Space Center, NASA

We propose a new hypothesis that the information about the Hadean Earth's seawater was recorded on the Moon's surface. Understanding of the Hadean Earth's environment is a key to reveal the origin of life on the Earth. However, the information about the Hadean Earth's environment is very limited, because there is no geological rock record on the present Earth. On the other hand, some parts of the lunar surface have very old rock records during Hadean time (4.5–4.0 Ga), and we already have lunar samples via Apollo missions and lunar meteorites. Therefore, we focus on the Moon.

Hadean Earth has been thought to have experienced a lot of asteroid and/or comet bombardments [e.g.,1], and Hadean Earth had oceans, which is supported by oxygen isotopic composition of Hadean zircon minerals [2,3]. Therefore some amount of Hadean seawater would be splashed into the space by such an intense meteor bombardment. If this is correct, some fraction of salt dissolved in Hadean seawater must have spreaded over the Moon's surface. We may get the information about Hadean Earth's seawater from lunar samples.

According to our preliminary estimate, about 20% of Hadean seawater would be splashed out during Hadean time, if the volume of the Hadean ocean is the same as that of the present Earth's ocean. Since the Moon orbited much closer to the Earth in Hadean time, significant amount of salt that was dissolved in the Hadean seawater is carried to the Moon's surface (~ 1 cm salt layer globally on the lunar surface).

We have investigated the feasibility of this hypothesis by using numerical simulations of meteor impacts on the Earth covered with oceans, and will discuss how to test this hypothesis.

[1] Chyba (1999) Nature 343, 129–133. [2] Wilde et al. (2001) *Nature* **409**, 175–178. [3] Mojzsis et al. (2001) *Nature* **409**, 178–181.