

Evidence of Crusty Impacts on Early Earth

Impact events during the first billion years of the solar system had long-lasting effects on the crust of early Earth, and evidence of these ancient impacts may still exist.

The Solar System was crowded with debris during first billion years, and Earth was probably struck very frequently. These collisions shaped the potential for life on worlds like Earth and Mars, by affecting terrains, changing the composition of the crust, altering the atmosphere and affecting the initial thermal conditions of the surface. A new study estimates how heat from the frequent impacts of the Late Heavy Bombardment (LHB) would have affected Earth surface.



The early Solar System was full of debris. It is likely that the early Earth was frequently hit by other celestial objects.

Results indicate that melted rocks, pooling in the depressions of the impact craters, covered >10% of surface to more than 1 kilometer thick, although only ~1% of the total crust down to 20 kilometers was melted at any given time. Also, during this period, impact ejecta and vaporized rock were tossed into air and rained down around the planet.

Although much of the evidence of ancient impacts on Earth are wiped away by weather and geology, this study used zircons – small crystals that act as clocks, measuring time since they were last heated above a particular temperature. Because impacts create heat, this study used zircons from rocks in the Jack Hills (formed ~3.9 billion years ago), as models of global zircons during this time and found that ~40% of these clocks had been at least partially reset.

This concentration of impactors suggest that any organisms living in the Earth's ocean during the LHB would be in significant peril.



The Jack Hills in Western Australia have some of the oldest rocks on Earth. These rocks may contain signatures of ancient impacts.

Abramov et al (2013) *Chemie der Erde – Geochemistry*