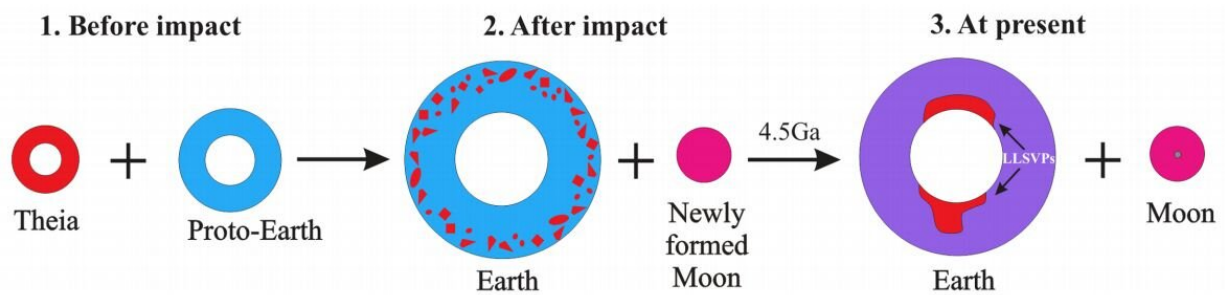


# New theory suggests large blobs of material in Earth's mantle are remnants of protoplanet Theia

March 26 2021, by Bob Yirka



The Giant Impact hypothesis for the origin of the LLSVPs. Credit: Li et al.

A team of scientists at Arizona State University has proposed that the large blobs of material in Earth's mantle (the large low-shear velocity provinces, LLSVPs) may be left over pieces of Theia, a protoplanet theorized to have struck Earth, resulting in the creation of the moon. The group argued their case at this year's Lunar and Planetary Science Conference and are awaiting publication in *Geophysical Research Letters*.

Most space scientists have come to believe that the [moon](#) was created when another planet (now called Theia) collided with a very early Earth—pieces of Earth, Theia or both that were flung into space during the collision eventually coalesced into the moon. Theories regarding

what happened to the rest of Theia are still being argued. In this new effort, the team in Arizona suggests that much of Theia's [mantle](#) wound up in Earth's mantle, forming what are now called the large low-shear-velocity provinces, LLSVPs—one beneath parts of the African continent and one beneath the Pacific Ocean.

Scientists have been studying the LLSVPs for many years—their existence has been confirmed by studying seismic readings around the globe. When seismic waves run into the LLSVPs, they slow down, suggesting the material they are made of is denser than the rest of the mantle. The LLSVPs are very large and rest on the rim of the outer core. The team at ASU note that if Theia's mantle was denser than Earth's, any of it that made its way to the mantle would eventually work its way to the core.

To back up their ideas, the team at ASU built a model depicting Earth as it was approximately 4.5 billion years ago and then showing what could have happened if there were a collision with a planet the size of Mars, or even larger. The model also assumed that the mantle of the theorized planet Theia was rich in iron, making it extremely dense. In their model, Theia winds up mostly destroyed, with pieces flung into space to create the moon, and much of its mantle breaking into fragments, which make it all the way into Earth's mantle. Over billions of years, the fragments merge, forming the LLSVPs.

The researchers note that the idea of Theian fragments making up the LLSVPs has been expressed before by others in the field, but suggest their work is the most comprehensive to date.

**More information:** 52nd Lunar and Planetary Science Conference 2021 (LPI Contrib. No. 2548)

[www.hou.usra.edu/meetings/lpsc2021/pdf/1980.pdf](http://www.hou.usra.edu/meetings/lpsc2021/pdf/1980.pdf)

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