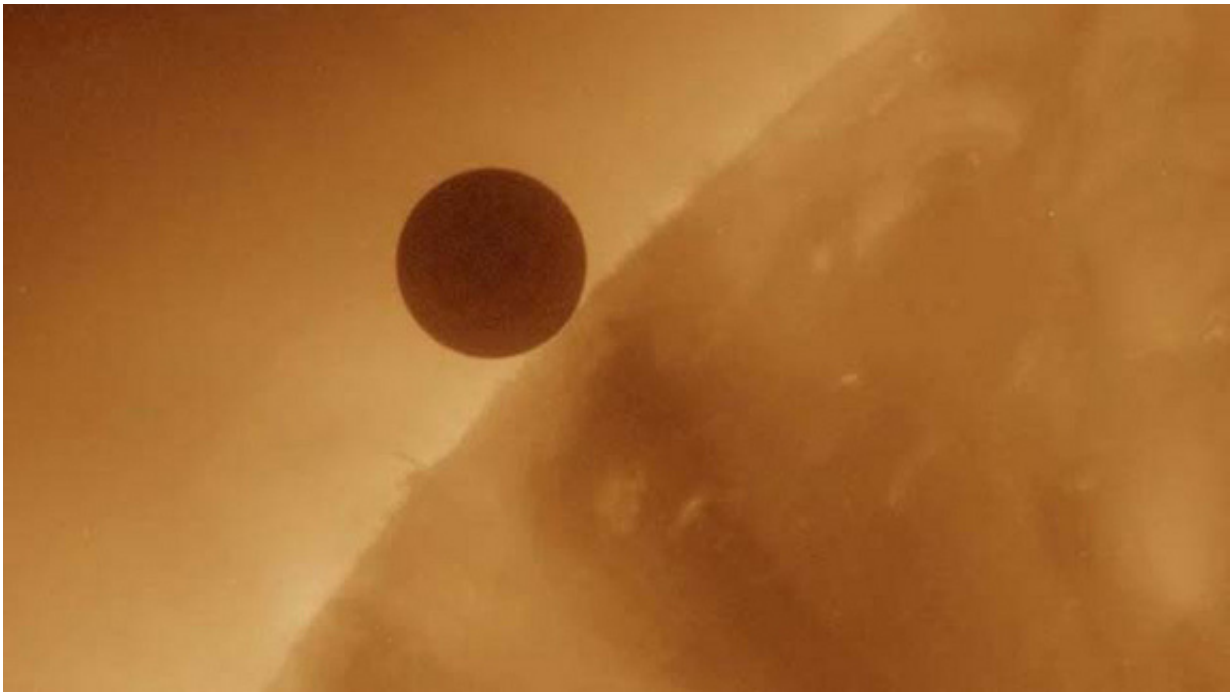


Simulations suggest Venus may have once been able to support life

August 9 2016, by Bob Yirka



Venus approaches the Sun in a 2012 transit visible from Earth. Credit: NASA

A team of researchers with NASA, Uppsala University, Columbia University and the Planetary Science Institute has created several simulations of conditions on Venus billions of years ago using Earth climate models and has found some instances that suggest the planet may at one time have been capable of harboring life. In their paper uploaded to the preprint server *arXiv*, the team describes their simulations and the

factors they used in creating them.

Venus is, by all accounts, an extremely hostile planet—at least from the perspective of humans. It is extraordinarily hot, volcanically active and has an atmosphere that is mostly carbon dioxide. But the simulations created by the research team suggest it may not have always been that way. They started with the idea that Venus and Earth were probably similar billions of years ago—a time when Earth's atmosphere was also mostly [carbon dioxide](#). From there, they created four possible scenarios for the future of Venus based on climate models developed for studying the history of Earth's climate. The models differed only slightly, with variances in energy received from the sun, or the length of days. They also considered conditions with shallow oceans. They let the models run, creating simulations of the planet as it evolved for approximately two billion years.

The team found that one simulation resulted in a planet with temperatures low enough to support life—one with clouds and sometimes snowfall—and it persisted until 715 million years ago—a period during which life was already present on Earth.

But if such simulations are accurate, what caused the conditions that exist today? The simulations did not advance that far, but the researchers note that the speed at which the planet spun on its axis might have had something to do with it—they noted that speeding up the rotation slightly resulted in rapidly rising temperatures as weather patterns that tended to keep the planet cool were disrupted. Today, it takes 243 Earth days for Venus to spin just once, which is actually longer than the amount of time it takes to circle the sun—225 days.

More information: arxiv.org/abs/1608.00706

Abstract

Present-day Venus is an inhospitable place with surface temperatures approaching 750K and an atmosphere over 90 times as thick as present day Earth's. Billions of years ago the picture may have been very different. We have created a suite of 3D climate simulations using topographic data from the Magellan mission, solar spectral irradiance estimates for 2.9 and 0.715 billion years ago, present day Venus orbital parameters, an ocean volume consistent with current theory and measurements, and an atmospheric composition estimated for early Venus. Using these parameters we find that such a world could have had moderate temperatures if Venus had a rotation period slower than about 16 Earth days, despite an incident solar flux 46-70% higher than modern Earth receives. At its current rotation period of 243 days, Venus's climate could have remained habitable until at least 715 million years ago if it hosted a shallow primordial ocean. These results demonstrate the vital role that rotation and topography play in understanding the climatic history of exoplanetary Venus-like worlds being discovered in the present epoch.

© 2016 Phys.org

Citation: Simulations suggest Venus may have once been able to support life (2016, August 9) retrieved 17 July 2024 from <https://phys.org/news/2016-08-simulations-venus-life.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--