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Numerical Simulation of Arsia Mons Cloud on Mars

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Arsia Mons is located on the Tharsis Plateau near Mars' equator and is the southernmost of the three major shield volcanoes. It features a large caldera at its summit and a gentle slope. Recent studies by Hernandez et al. (2021, 2022) have investigated the elongated clouds over Arsia Mons through long-term observations and mesoscale modeling. Their research supports the mechanisms described by Michaels et al. (2006), demonstrating how the mountain disturbs the atmosphere.

The formation of water-ice over Arsia Mons is a natural laboratory for understanding the distribution of water vapor and the lifecycle of water-ice clouds on Mars. Our study focuses on the Arsia Mons Elongated Cloud, beginning with the use of NASA's Global Climate Model (GCM) to understand the cloud's seasonal dynamics. Subsequent numerical simulations suggest that while the GCM may not fully represent Martian conditions, the clouds over Arsia Mons are the result of multiple factors interacting at different scales.