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Effects of impacts on atmospheric mass evolution and climate of Mars

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Early in its history, Mars probably had a denser atmosphere with sufficient greenhouse gases to sustain the presence of stable liquid water at the surface. Previous studies have showed that impacts by asteroids and comets could affect the atmospheric evolution not only by causing atmospheric erosion but also by delivering material and volatiles to the planet.
Here, we investigate the atmospheric loss and the delivery of volatiles during a period of intense bombardment of meteorites, with the help of a simplified semi-analytic model that takes into account the impact simulation results. This model is an improved version from the one published in Pham et al (2011). In order to assess the atmospheric mass evolution scenarii, we consider the climate of early Mars, as well as the contribution of additional factors such as the outgassing and non-thermal escape processes (i.e sputtering, ion pick-up, etc).