EPSC Abstracts
Vol. 11, EPSC2017-1020-1, 2017
European Planetary Science Congress 2017

Terrestrial planet evolution as constrained by element fractionation and atmospheric escape

H. Lammer (1) and **M. Scherf** (1)
(1) Austrian Academy of Sciences, Space Research Institute, Schmiedlstrasse 6, 8042 Graz, Austria (manuel.scherf@oeaw.ac.at)

Abstract

The evolution and habitability of a planet cannot be viewed without its host star. Among other things, the host star significantly influences the volatile and water inventory, as well as the long term evolution of the planetary atmosphere. Both are important factors for the habitability of a planet. However, not only the star itself, but also the mass and size of a planet, its orbit and formation history, magnetic field and geological activity play a crucial role for the evolution of a terrestrial planet.

Isotope and element fractionations, like $^{36}Ar/^{38}Ar$, $^{20}Ne/^{22}Ne$, or K/U can retrieve details on the formation history of a planet, as well as of the early radiation history of its host star. In addition, $^{14}N/^{15}N$ can give clues on the history of the evolution of a potentially nitrogen dominated atmosphere. However, to build up and maintain such an atmosphere, different key factors have to play together, such as the orbital location of the planet or the EUV flux of the young star. In addition, whether the planet evolved plate tectonics or not seem to be crucial factors to retrieve and maintain a nitrogen dominated atmosphere.

Via the examples of Earth, Venus, and Mars, these key factors will be discussed within this presentation. It will also discuss the importance of life for the maintenance of nitrogen dominated atmospheres, and what can be learned for the potential detection of exoplanetary biospheres. Finally, potential science cases for future space missions will be briefly addressed.