



## Atmospheric Escape Processes and Planetary Atmospheric Evolution: from misconceptions to challenges

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The recent discoveries of telluric exoplanets in the habitable zone of different stars have led to questioning the nature of their atmosphere, which is required to determine their habitability. Atmospheric escape is one of the challenging problems to be solved: simply adapting what is currently observed in the solar system is doomed to fail due to the large variations in the conditions encountered around other stars. A better strategy is to review the different processes that shaped planetary atmospheres and to evaluate their importance depending upon the stellar conditions. This approach allowed us to show that processes like ion-pickup were a more important way to lose atmosphere at Mars in the past.

We reviewed the different escape mechanisms and their magnitude in function of the different conditions. This led us to discover discrepancies in the current literature concerning problems such as the Xenon paradox or the importance of a magnetic field in protecting an atmosphere.

This shows that one should be very careful before claiming the presence of an atmosphere on planets in the habitable zone of their M-dwarfs: new criteria such as the Alfvén surface location with respect to the planet should be taken into account a-priori.

Overall, the habitability of a planet should not be claimed only on by its location in the habitable zone but also after careful analysis of the interaction between its atmosphere and its parent star [Gronoff et al. 2020].

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