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Effect of energetic particles on the atmosphere of terrestrial exoplanets

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M-dwarf stars have been preferred targets of exoplanet search due to the favourable parameters of the system for remote characterisation. However, planets in the habitable zones of these stars are expecting to experience intense radiation.

We present the INCREASE project (INfluence of strong stellar particle Events and galactic Cosmic Rays on Exoplanetary AtmoSpherEs), aiming at modelling the effect of energetic particles on the atmosphere of terrestrial exoplanets. The INCREASE model suite is an almost self-consistent simulation chain coupling the state-of-the-art magnetospheric and atmospheric propagation and interaction models PLANETOCOSMICS (Desorgher et al. 2006) and AtRIS (Banjac57 et al. 2019) with the atmospheric chemistry and climate models 1D-TERRA (e.g., Wunderlich et al. 2020) and ExoTIC. Finally, spectral characterisation is done using the GARLIC line by line radiative transfer model.

By combining these models, we are able to constrain the habitability of such planets, the stability of their atmosphere as well as simulating observational features.