The space weather forecast for Proxima Centauri B
3 April 2017

M dwarf stars pose a particular hazard to their planets: A large proportion of their radiation, much more than in Sun-like stars, is in the form of UV, extreme UV, and X-rays. This radiation can evaporate a planet's atmosphere, especially when those planets orbit nearby in the habitable zone. Indeed, the question astronomers ask is whether planets like Proxima Cen b can retain any atmosphere at all, at least over a long enough time for the planet to be "habitable" from any practical point-of-view. An additional danger is posed by the star's magnetic activity, which is not only responsible for the corrosive radiation but which also drives stellar winds and coronal mass ejections that could be even more perilous to atmospheric survival.

The photoevaporation of planetary atmospheres due to stellar radiation has been studied in limited situations, but not much effort has been devoted to the case of active M-dwarf stars and their magnetic activity. CfA astronomers Cecilia Garraffo, Jeremy Drake and Ofer Cohen have begun a program to model the stellar winds and magnetic field for active M-dwarf stars, and to investigate the impact on the atmospheres of planets in habitable zones. Proxima Cen is their first specific example. They found that the pressure of the stellar wind at the exoplanet was a thousand to ten thousand times higher than the solar wind pressure at Earth. Moreover, the pressure is highly nonuniform, and Proxima b will pass through these extreme pressure variations twice each orbit leading to the compression and expansion of its atmosphere by factors of up to 3 every day. The atmosphere of Proxima Cen b is also likely to experience supersonic wind conditions. All these phenomena will have a significant negative effect on any atmosphere that might exist on Proxima b. The extent to which similar hostile conditions prevail on other M-dwarf exoplanets is a subject of further studies.

More information: "The Space Weather of

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