

# Dark matter annihilation and the termination of the Martian geodynamo

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In this work we derive limits on the WIMP-nucleon scattering cross-section by comparing the potential heat flow within the Earth from Dark Matter capture and subsequent annihilation to the observational value. This effect has been argued previously in the literature to provide a potential link to mass extinction phenomena on Earth. However, we focus on whether additional heat-flux from dark matter annihilations within the Martian core could have affected the decay of its geodynamo, and thus precipitated its magnetic field loss. We determine that Xenon1T limits on the WIMP nucleon cross-sections do not allow sufficient heating to significantly affect either Earth or Mars. We then use this to determine the local dark matter density and the density of a dark matter sub-halo that would support a significant effect given these limits. In addition, we have extended previous work on this topic by including resonant collisional effects, considering the impact of Xenon1T limits, and by considering possible effects on the evolution of the Martian geodynamo. We have lastly presented the possibility of Mars coming into contact with such a sub-halo.

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