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Probing dark matter annihilation through planetary airglow and internal heat flow

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The annihilation of accumulated dark matter within planetary bodies could lead to observable signatures in the form of anomalous UV airglow and excess internal heat flow. We use existing UV and IR spectral data obtained by spaceprobe flybys of Solar System planets to constrain such effects. By comparing the measured spectra to potential dark matter-induced emissions, we place limits on scenarios where dark matter annihilation could contribute significantly to planetary emissions. We consider dark matter annihilating through both short- and long-lived mediators and account for the spatial distribution of dark matter within planetary interiors. Our results highlight planetary spectroscopy as a complementary approach for probing dark matter properties.

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