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ULTRAVIOLET PHOTOABSORPTION OF SO ISOTOPOLOGUES AND THE $B\,^3\Sigma^-$ AND $C\,^3\Pi$ STATES

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The sulphur-monoxide $B\,^3\Sigma^-(v \geq 4)$ levels are known to be strongly affected by vibrationally-dependent predissociation and local energy perturbations (Liu et al. 2006 JMS 238:213). The isotope-dependence of this predissociation and the SO photodissociation cross section is a candidate atmospheric-source for explaining the anomalous ^{32}S/^{33}S/^{34}S/^{36}S isotopic fractionation found in 2.5Ga old sedimentary material (Ono 2017 Annu. Rev. Earth Pl. Sc. 45:301).

We have recorded new photoabsorption spectra between 195 and 230 nm to determine spectroscopic constants, predissociation linewidths, and transition strengths for the excited $B\,^3\Sigma^-(v = 4-17)$ levels of ^{32}S^{16}O, ^{33}S^{16}O, and ^{34}S^{16}O. The $C\,^3\Pi$ state is also observed and perturbs $B\,^3\Sigma^-(v = 4 - 17)$ through spin-orbit interaction. $B\,^3\Sigma^-$ and $C\,^3\Pi$ potential-energy curves, electronic transition moments, and a global spin-orbit interaction are deduced from the new data so that it may be extrapolated to the rare ^{36}S^{16}O isotopologue.

We use the new cross sections to explore the potential for isotope-dependent photodissociation of SO in the ancient-Earth atmosphere due to structured solar UV radiation and atmospheric opacity.

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