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Impact of uncertainties in CO₂, HCl, and H₂O cross sections on simulations of Venus atmospheric chemistry

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The atmospheres of Venus and Mars are primarily CO₂. CO₂ photolyses at wavelengths *less than* 200 nm to CO and O. Direct recombination via CO+O+M → CO₂+M is very slow so the rate of production of CO₂ to balance its loss via photolysis is controlled by the abundances of trace radicals that catalyse production of CO₂ (eg., Yung and DeMore, Icarus 51, 199, 1982). These trace radicals, such as OH and ClCO, are derived directly or indirectly from photolysis of H₂O and HCl. Previous large uncertainties in the rates of some of the key reactions that comprise these catalytic processes have been significantly reduced (eg., Mills and Allen, PSS 55, 2007; Marcq et al., Space Sci Rev 214, 10, 2018; Chao et al., AGU Fall Mtg Abst P11B-2985, 2024). In addition, several studies in the past 15 years have refined our understanding of the UV cross sections of CO₂ and H₂O (eg., Ranjan et al., Astrobio 17, 687, 2017; Schmidt et al., PNAS 110, 17691, 2013; Venot et al., A & A 609, A34, 2018; Archer et al., JQSRT 117, 88, 2013; Ranjan et al., Ap J 896, 148, 2020). Consequently, it is appropriate to examine again the impact on atmospheric simulations of the remaining uncertainties in the photolysis and extinction cross sections for CO₂ and H₂O. This poster will present the results from numerical simulations of the atmospheres of Venus and/or Mars conducted using the Caltech/JPL KINETICS photochemical model (eg., Allen et al., JGR 86, 3617, 1981).

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