An Extended View of Ozone and Chemistry in the Atmosphere of Mars

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We present an ongoing effort to characterize chemistry in Mars' atmosphere in multiple seasons on timescales longer than spaceflight missions through coordinated efforts by GSFC's HIPWAC spectrometer and *Mars Express* SPICAM, archival measurements, and tests/application of photochemical models. The trace species ozone (O_3) is an effective probe of Mars' atmospheric chemistry because it is destroyed by odd-hydrogen species (HO_X, from water vapor photolysis). Observed ozone is a critical test for specific predictions by 3-D photochemical models (spatial, diurnal, seasonal). Coordinated measurements by HIPWAC and SPICAM quantitatively linked mission data to the 23-year GSFC ozone data record and also revealed unanticipated inter-decadal variability of same-season ozone abundances, a possible indicator of changing cloud activity (heterogeneous sink for HO_X). A detailed study of long-term conditions is critical to characterizing the predictability of Mars' seasonal chemical behavior, particularly in light of the implications of and the lack of explanation for reported methane behavior.