PROLONGED LIFETIME OF A TRANSIENT IONIZED LAYER IN THE MARTIAN ATMOSPHERE CAUSED BY COMET SIDING SPRING. Z. A. Luppen¹, Z. Girazian¹, D. D. Morgan¹, A. Kopf¹, F. Chu¹, J. S. Halekas¹ and D. A. Gurnett¹. ¹University of Iowa Department of Physics & Astronomy (zaluppen@iastate.edu).

Introduction: On October 19th, 2014, comet Siding Spring (C2013/A) flew within 40 Mars radii of the red planet. The comet deposited 82 (± 25) tons of dust, composed of Fe, Mg and other metals, into the upper atmosphere [1,2]. Due to the high impact velocities of the dust, much of this material was ionized upon entry, creating a transient layer of ionization below the main peak of the ionosphere [1,3-6]. The layer was observed for at least 2.5 days after closest approach [6].

We present new observations from the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) instrument on Mars Express that show the transient layer lasted several days after the flyby, much longer than previously reported (Figure 1). We postulate that a series of solar flares that erupted around October 25th, 2014 in sunspot region AR 12192 contributed to the longevity of the transient layer. The flares caused increased ionization and production of O₂⁺ ions which then charge-exchanged with cometary metals to produce long-lived metal ion species [1,7].

References:

(Figure 1) Top: Ionogram from Orbit 13710, showing the transient layer caused by the comet flyby. Bottom: Ionogram from Orbit 13731, showing the transient layer was observed five days after the flyby.