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Fortuitous Plasma Observations During the Mars Atmospheric "Plume" Event of March-April 2012

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We present initial analysis and conclusions from plasma observations made during the reported ‘Mars Dust plume event’ of March - April 2012.During this period, multiple independent amateur observers detected a localized, high-altitude feature over the Martian terminator [Sanchez-Lavega et al., Nature, 2015, doi:10.1038/nature14162], the explanation for which remains incomplete. The brightness of the feature in visible light is too extreme for auroral emissions to explain, despite its occurrence at a location where these have been previously reported. Likewise, the (projected) altitude of the feature is significantly too high to allow for the local formation of clouds. Fortuitously, the orbit of ESA’s Mars Express allowed the measurement of ionospheric plasma density and solar wind parameters over the precise location of the plume sighting at multiple points during this interval. Based on these observations, we tentatively conclude that the formation and/or transport of this plume to the altitudes where it was observed was in part the result of a large Coronal Mass Ejection encountering the Martian system. However, while measurements of ionospheric plasma density at the corresponding altitudes indicate a disturbed structure, this is not a-typical of this location over Mars. Finally, we briefly discuss some possible mechanisms that may lead to the formation of this plume.