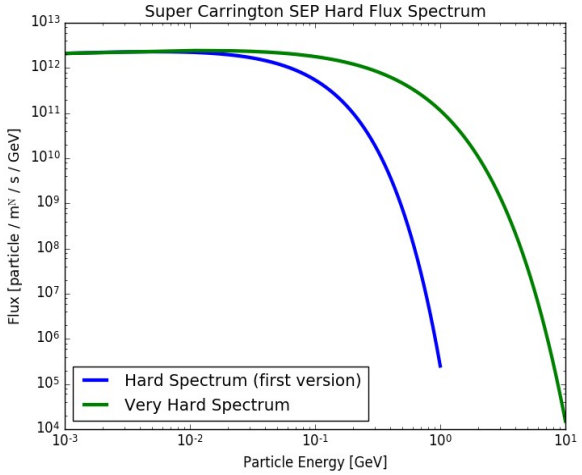
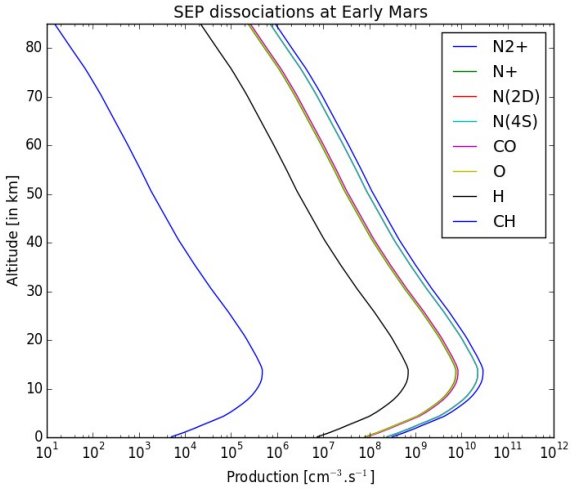
PREBIOTIC CHEMISTRY OF EARLY MARS: EFFECTS OF PALEO SPACE WEATHER. G. Gronoff[1],V. Airapetian[2], and E. Hebrard[3 1] SSAI/NASA LaRC (21 Langley Blvd Mail Stop 401B, Hampton Va 23681 USA, guillaume.p.gronoff@nasa.gov), [2]NASA GSFC. (vladimir.airapetian-1@nasa.gov), [3]Exeter University (E.Hebrard@exeter.ac.uk)

Introduction: The observation of Young Sun-like stars has shown that frequent and powerful mass ejection events, the so-called superflares, should have happened in the early ages of the solar system. These superflares were at the origin of hard solar energetic particle events (SEP). The magnitude, hardness, and frequency of these SEPs is interpolated from the observations, leading to the estimate of their average flux in two possible scenarios (Figure 1) . These SEPs in turn affected the atmosphere of the Earth [1] and Mars. The radiation is at the origin of the dissociation of N_2, CO_2, and CH_4 into different products (Figure 2) , and the radicals are at the origin of a complex chemistry that leads to the creation of HCN, NO_3, and N_2O, a powerful greenhouse gas. In this work, we show how such SEP precipitation affected the Early Mars atmosphere,



and the likely values of greenhouse gases created by this process. We used updated values for the hardness of the SEP events as an input to the Aeroplanet model to compute the creation of neutral species production. From that production, we used an updated photochemical model that takes into account photodissociation of the products to compute the densities of HCN and N_2O.



References:

[1] Airapetian et al., Nature Geoscience 9,452–455 doi:10.1038/ngeo2719