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Prediction of the effect of an extreme solar event on the Martian environment using a 3-D, self consistent hybrid model supplemented by test particle simulations.

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Energetic particle data recorded by the SLED and LET instruments aboard the Phobos-2 spacecraft while in circular orbit about Mars showed the presence from 6 > 26 March, 1989, in association with an extreme solar event, of intense ambient particle radiation (> 30 MeV) punctuated by traveling interplanetary shocks. The response of the Martian environment to the March 1989 solar disturbances is modeled using a 3-D, self-consistent, hybrid model (HYB-Mars) supplemented by test particle simulations. In HYB-Mars ions are modeled as particles while electrons form a massless, charge neutralizing, fluid. The magnetic and electric fields present during the March 1989 activity are each derived from HYB- Mars while the high energy ion populations are analyzed using test particle simulations. Finally, the predictions of the model are validated by comparing the simulated properties of the disturbed Martian environment with the in situ observations.