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Model of the Crustal Magnetic Field in the Martian Aurora Zone

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Abstract

It is well known that aurorae are prominent on planets with a global magnetic field and occur where open magnetic field lines converge. The UV spectrometer used for investigating the characteristics of the atmosphere of Mars (SPICAM) on board the Mars Express made the first observation of auroral-type emission in the cusp region of the strong crustal magnetic field on Mars and found that the arc of the Martian aurora zone is very narrow in width, which obviously differs from that of other planets. Based on the observation, we put forward a model of a crustal magnetic field on the Martian aurora zone through the morphology of Martian aurorae. In the model, equivalent currents are proposed; the topology and magnitude of the magnetic field generated by these equivalent currents are consistent with that of the crustal magnetic field in the Martian aurora zone. The morphology of the Martian aurora zone generated through the model matches well with the observations made by the Mars Express orbiter.