EPSC Abstracts
Vol. 7 EPSC2012-633 2012
European Planetary Science Congress 2012
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The magnetic anomalies significantrly reduce the Martian ionospheric escape rate

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Abstract

Looking forward to the MAVEN mission, it seems very useful to return to Mars Express data to refresh an important problem of Martian atmosphere escape: what role the crustal magnetic field may play in this process? There are several publications on this topic with completely opposite conclusions. The last hybrid simulations show that the magnetic anomalies significantly reduce the ion loss rate during solar minimum. We are trying to use a new approach to Mars Express IMA data analysis to check how it is possible. On the base of a statistical study of the ion distributions in the Martian magnetotail we show that the characteristic accelerated ions are not associated with the magnetic anomalies but only with interplanetary magnetic field clock angle. Moreover the magnetic anomalies screen and deviate the escaping flow leading to reducing of the total loss rate. We have calculated a "quasi-experimental" escaping rate in an assumption of the total absence of the magnetic anomalies. We are comparing this value with a real measured escape rate.