



ENA emission from global Martian upper atmosphere

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The Neutral Particle Detector (NPD) on board Mars Express has confirmed the existence of energetic neutral atoms (ENAs) from a broad region on the dayside of the Martian upper atmosphere. We show one such example for which the observation was conducted at an altitude of 570 km, just above the Induced Magnetosphere Boundary (IMB). The time of flight (TOF) spectra of these ENAs show that they had energies of 0.2-2 keV/amu, with an average energy of ~ 1.1 keV/amu. Because the TOF spectra are consistent with theories of the backscattering of the precipitation of the solar wind ENAs (sometimes this mechanism is called “the ENA albedo mechanism”), these ENAs are most likely the backscattered ENAs generated at the exobase. However, the observed flux was 3-4 times higher than the expected value. One possible explanation is that there exist contributions of direct precipitation of the solar wind proton to the exobase.

We made a global map of the flux of the ENA at the height of the exobase. This map was made by an inversion method with a two-month long data recorded by the NPD instruments. Since the ENA generation is considered to be proportional to the precipitation of the solar wind protons/ENAs, the map can fundamentally be converted to the flux of the precipitating particle map. The map exhibits clear solar zenith angle dependence in the backscattered ENA generations. This result is also consistent with the theories of ENA albedo mechanism.