New idea of geomagnetic monitoring through ENA detection from the International Space Station: ENAMISS project

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Energetic Neutral Atom

ENAs are produced by charge-exchange of a magnetospheric ion with neutral atom of the geocorona. They can be remotely detected to obtain a real imaging of the generation region providing a global view of geomagnetic storm development Up-to-now ENA observations in the Earth's environment have been done mainly by dedicated spacecraft in polar orbits.
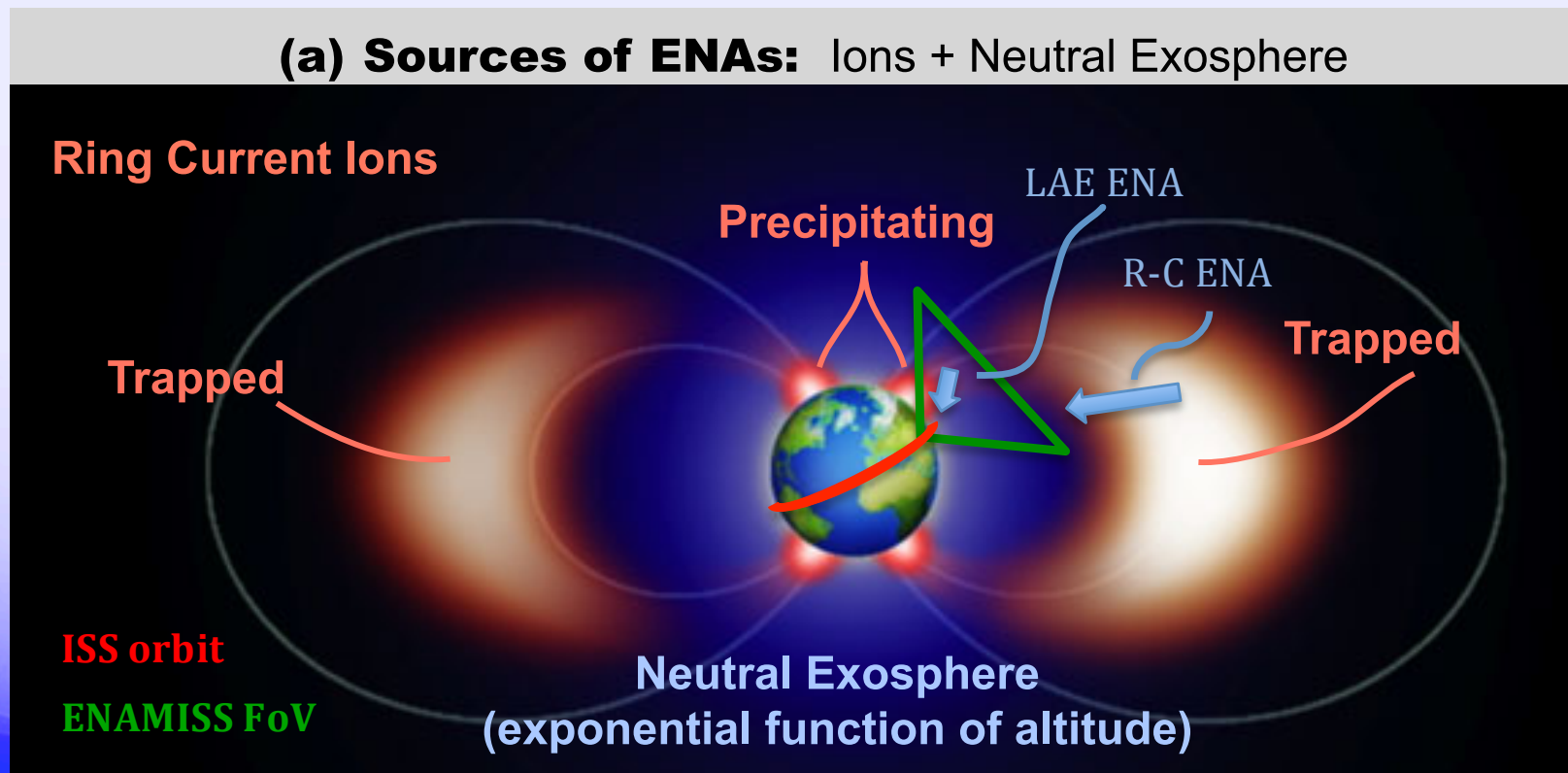
International Space Station
The International Space Station orbit is at an altitude of about 450 km and 52° inclination, below radiation belts and above dense atmosphere.
It is an ideal platform for continuous ENA monitoring.

Energetic Neutral Atoms Monitor on the International Space Station: **ENAMISS** project

ENAMISS project intends to develop an ENA imager and install it on the ISS for continuous monitoring of mainly two ENA populations: the ENA generated in the **ring current** (equatorial regions +- 45° magnetic latitudes at about 5 R_E) and ENA generated by the **high latitudes** (between 45° and 70° magnetic latitudes) precipitating ions (low altitudes about 550 km).

(a) Sources of ENAs: Ions + Neutral Exosphere

Ring Current Ions

Precipitating

LAE ENA

R-C ENA

Trapped

Trapped

ISS orbit

ENAMISS FoV

Neutral Exosphere
(exponential function of altitude)

ENAMISS web tool

The data products will be made available to scientists and to satellite operators and other potential users, by means of a web-based service.
The service will provide access to:
- ✓ near-real time (of the order of 30 minutes) **calibrated ENA data**;
- ✓ near-real time **ENA-based new geomagnetic indices**;
- ✓ deconvolved **ion distributions and spectra**;
- ✓ simulated **electron distributions** derived by ion distributions and models;
- ✓ near-real time (of the order of 1 hour) **ion / electron spectral distribution at specific spacecraft locations** (e.g. GOES, Galileo);
- ✓ **radiation dose** models;
- ✓ specific data products tailored to user needs.