**Planetary Plasma Acceleration and Escape Processes – Cosmic Analogies**

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Acceleration and mass loss/escape from the inner planets in our solar system is a consequence of *external forcing* by primarily solar EUV and the solar wind. Conversely, the acceleration and loss of coronal matter from the Sun is a consequence of *internal forcing*. However, also the Heliosphere is subject to external forcing from interstellar space, an issue requiring further investigations. Regardless of cause, the effect has a universal impact - plasma acceleration, mass loss and escape. Plasma escape dominates over thermal (Jeans) escape in high-gravity environments, because electromagnetic forces can accelerate charged particles to high velocities well above escape velocity.

Electromagnetic fields, waves and electric currents are involved in the dynamical processes that characterize a magnetized plasma entity, such as the magnetosphere of the Sun, the planets, the satellites, and the comets in the solar system. Magnetosphere morphologies are organized by a quasi-static and/or induced magnetic field that self-consistently couples to the motion and pressure of the ambient plasma. By the same token, distant astrophysical objects with magnetosphere-like morphologies should be organized by magnetic fields and plasma dynamics similar to those studied by *in-situ* measurements in the solar system. The same applies to the mass-loss/escape from astrophysical objects – from individual stars, galaxies during various phases of their life, to exotic objects such as quasars.

Another implication of the quasi-static magnetic field is that it defines a volume of space within which plasma particles can be accelerated, the ultimate energy gain defined by the plasma forcing terms and the maximum magnetic field strength in that particular volume of space. For example, the maximum energy gain by Ponderomotive wave forcing in a magnetic dipole field is expected to be proportional to the maximum magnetic induction (B). Based on such a scaling law, acceleration to extreme energies (e.g. Cosmic ray energies) requires extreme magnetic field strength, such as those in pulsars and magnetars. The magnetic field scaling law is in general agreement with particle acceleration in the solar system.

Energy and momentum transfer, plasma acceleration, ion outflow and escape, as observed in the solar system, are the basis for Cosmic analogies discussed in this presentation, specifically observations made regarding solar forcing of the Earth, Mars and Venus. The combined internal and external forcing of Jupiter and Saturn, both planets applying external forcing on their satellites, are discussed in terms of the analogy of a small-scale solar systems (*hetegony*, Alfvén 1976).