A NONEQUILIBRIUM THERMODINAMICAL APPROACH TO SPACE-PLASMA AVALANCHING SYSTEMS

Giuseppe Consolini

Istituto di Fisica dello Spazio Interplanetario, INAF, 00133 Roma, Italy

Many natural systems display an avalanching dynamics in response to small external disturbances that manifests in scale-free distributions of many observable quantities. A very well known example is provided by earthquakes for which the Gutenberg-Richter law is a manifestation of such a scale-invariance. In the last decacde, it has been suggested that also many space-plasma systems could show an an analogous avalanching dynamics. For example, scale free distribution functions have been observed in solar activity (solar flares), as well as, in magnetospheric dynamics.

Here, discussing to the dynamics of such space-plasma avalanching systems in terms of *constrained* thermodynamics and following the approach proposed by Lavenda and his cohautors (1995, 2000), a generalized equation of state is drawn for such plasma systems. An interpretation of the results in terms of a stress field associated to magnetic field topological complexity is proposed.

References

[1] B.H. Lavenda, *Thermodynamics of Extremes*, Albion Publishing Limited, 1995

[2] B.H. Lavenda and E. Cipollone, Extremes value statistics and thermodynamics of earthquake: large earthquakes, *Annali di Geofisica*, **43**, 469, 2000