Toward a Virtual Observatory for Solar System Plasmas: an exceptional scientific opportunity

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During the coming years, the "Solar System Plasma" environment will be explored by an exceptional set of observatories : RHESSI, SOHO, STEREO, SOLAR-B and ground based observatories will all provide continuous observations of the Sun and its corona. In situ plasma and field measurements will be obtained at and near Mercury (MESSENGER), Venus (VEX), Earth (ACE, WIND, GEOTAIL, CLUSTER, THEMIS), Mars (MEX, MGS) and Saturn (CASSINI), and inside the heliosphere (STEREO, ULYSSES, VOYAGER). These data will be complemented by UV and radio astronomical observations of Jovian, Saturnian and terrestrial auroral activity. This wealth of data will offer previously unequalled opportunities to study (i) global and multi-scale phenomena of the inner heliosphere (ii) the propagation of the solar perturbations and space meteorology, (iii) local interplanetary conditions around planets and (iv) the comparison of the ionised environments of various planets. However, the exploitation of all these data is a major technical challenge, as it requires accessing heterogeneous data from diverse origins to perform an integrated study using software tools appropriate for analysis of the phenomena observed. Moreover, the huge amount of data to manage coming from future space and ground based instruments requires extraction that could no more be done by hand, but automatically. This challenge is unlikely to be met by instrument teams or laboratories working individually ; it requires collaboration of the whole international community through a Virtual Observatory. The Europlanet/IDIS prototype will give a foretaste of what will be achievable by a Virtual Observatory for planetology. The overlap in functionality between a "Planetary VO" and a "Solar System Plasma VO" remains to be defined, but both are undoubtedly essential and complimentary components of any Solar System VO. In this paper, we present potential science cases in Space Plasma, which we then use to identify requirements for the access and analysis tools needed to exploit the promised exceptional harvest of solar and in situ plasma data.