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Report on Missions under study and development
and science highlights of missions in operation

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Ulysses: A paper published in ApJ (667:1262-1266, 2007) by M. Neugebauer et al. describes the recent encounter of Ulysses with the ion tail of Comet McNaught. Because of the record-breaking duration of the encounter (5 days), the data are unusually comprehensive. O^{3+} ions were detected for the first time in a comet tail, coexisting with singly charged molecular ions with masses in the range 28-35 amu. The presence of magnetic turbulence and of ions with energies up to ~200 keV indicate that at a distance of ~1.6 AU from the comet nucleus, the ion tail of comet McNaught had not yet reached equilibrium with the surrounding solar wind.

Ulysses' brief sojourn in the variable low-latitude solar wind during its perihelion passage ended in early October, when the spacecraft, then at ~40 deg north solar latitude, once again became fully immersed in steady, high-speed flow, this time from the northern polar coronal hole. This transition occurred at significantly higher latitude than during the previous solar minimum perihelion pass in 1995. At that time, the fast solar wind from the northern polar coronal hole extended down to ~20 deg solar latitude. This behaviour is in keeping with recent solar observations that show the Sun's magnetic dipole axis to have a higher inclination than expected given the proximity to solar minimum.

SOHO: Key discussion items in the SOHO SWT are the preparations for the upcoming NASA Senior Review and the transition to the final "Bonus" or "Bogart" phase of the mission in 2009. There have been publications on NASA News about a small patch of reversed polarity magnetic field on the north-east Solar limb in SOHO data, which has extensively been discussed at AGU as it might indicate the birth of the new Solar Cycle.

Cluster: A paper published in Sept. 2007 by Eastwood et al., showed that the Lorentz force ($\mathbf{J} \times \mathbf{B}$) accounts for the major part of the electric field observed at the Earth's bow shock. This electric field is very important since it decelerates the ions crossing the shock and sometimes even reflects part of these ions.

A Chinese and European team has published a study with Cluster data, in J. Geophys. Res., showing for the first time that electromagnetic waves appear about 30 s before magnetic reconnection is observed. The question how reconnection is initiated is still unanswered and this study implies for the first time that electromagnetic waves indeed play a key role.

Two Web stories were published in November. One on the evaluation of a new element of the generalised Ohm's law, a fundamental law in plasma physics, and the other one on the CME interaction with the magnetosphere accelerating solar wind plasma by about 70% due to a "magnetic slingshot" effect.

DSP: A very successful DSP science workshop has been held in Shanghai from October 15-19, 2007. After the very surprising recent recovery of the TC-2 satellite we are now

waiting for instrument switch on. Depending on the success of such activities we might have to revive the discussion about and formulate a science case for an ESA participation in a low cost further continuation of science operations within the Cluster project.

Mars Express: The European Mars Science and Exploration Conference took place on 12-16 November at ESTEC attracting more than 300 participants.

Most recent Mars Express papers have been published by the Journal of Geophysical Research on a special issue concerning OMEGA results (vol.112, no. E8_2007). An article on MARSIS data is in press in GRL (Safaeinili et al., Estimation of the Total Electron Content of the Martian Ionosphere Using Radar Sounder Surface Echoes). This is the first time that Total Electron Content (TEC) is being measured at Mars, which opens new horizons in this field of research. The first article on the neutral atmosphere derived from MEX radio-occultation is in press (Hinson et al., Radio-occultation measurements of diurnal and semidiurnal Kelvin waves on Mars, Icarus). At the Fall AGU meeting the radio-science team presented evidence of ionopause features in the Martian ionosphere, which is a discovery of prime importance in this field of research. Following the delivery by all PI Teams of materials for the M-Ex ESA-SP, editing of the volume is proceeding again. A paper on the PSA archive will also be included.

The Mars Express **Orbit 5000** has occurred in the second half of November and a limited celebration took place during the Mars conference at ESTEC.

Scientific support will be given to the NASA Phoenix Mission, which will be landing on May 25, 2008. It is planned to characterize the landing site before and after landing with MEX instruments, to use MEX/PFS to measure atmospheric parameters above the landing site before the probe entry, and also to attempt to observe the entry emission of Phoenix by some of the MEX remote sensing instruments. The distance Phoenix-MEX will be ~2200-1600 km.

Venus Express: A very successful press conference has been held in Paris on 28 November, announcing the results obtained so far during the mission and to draw attention to the journal Nature which carried nine papers with results from Venus Express in the 29 Nov issue. The event has received very wide and positive press coverage, and the mission teams have received numerous congratulations for the outstanding results.

The SOIR team recently announced the detection of a new unknown line of CO² due to an Oxygen isotope. Many media have subsequently reported on these news and in particular quoted the SOIR discovery (but often misquoted it as the discovery of a new molecule).

An educational film about Venus and planetary evolution has been produced by one of the VEX CoIs in collaboration with RSSD. This movie is now available online at <http://www.esa.int/venus> or http://www.esa.int/esaSC/SEM8F1NJCAF_index_0.html. On request (but primarily for teachers) this movie will also be available on DVD.

Rosetta: The Asteroid Workshop (Athens, 23-25 Oct. 2007) was a great success. The scientific case for the flyby at asteroid Stein in September 2008 has been prepared and the science operations requirements were discussed. Very few conflicts were identified. The results of the workshop were presented and discussed at the 23rd SWT meeting, which took place at ESOC, 27-29 November 2007. Also the first results of the scientific

observations during the 2nd Earth swing-by were presented there.

A large number of Rosetta related reports have appeared on the ESA web-page in November 2007. Most of them dealt with the successful second Earth swing-by.

Hinode: A special Hinode issue with 9 papers appeared in the 7 December issue of Science (Vol. 318, No. 5856, p. 1571-1599 + cover image).

Another special issue comprising 43 papers with initial results from Hinode was published in the 30 November issue of PASJ (Vol. 59, No. SP3).

Cassini-Huygens:

The Huygens radio receivers on board Cassini will be re-activated on 4th November for about one hour. The objective of the test, driven by the Orbiter radio science team, is to evaluate the usage of the Huygens radio science receivers for augmenting the capabilities of the Orbiter radio science investigation during the 2-year Cassini extended mission.

The Vol 1 of the two-volume Special PSS issue on Huygens latest news of Titan « Titan as seen from Huygens » appeared in November. Furthermore, 13 papers have been accepted for Vol. 2 that is expected in mid-2008. This set of articles highlights the great synergy provided by laboratory experiments and theoretical modeling, which very efficiently complement the observational data of the Cassini-Huygens mission. It also demonstrates once more the multidisciplinary aspects of the science, which can be carried out on Titan.

An article on the correlation of the effects of the Solar Wind modulation of Saturn's radio clock appeared in the November issue of Nature (Zarka et al.).

It is presently unclear how ESA can scientifically support the further science exploitation of the Cassini part of the collaborative ESA/NASA Cassini/Huygens mission after the formal end of the Huygens part.

Chandrayaan-1:

D. Koschny, in his role as new Chandrayan Project Scientist following Olivier Witasse, has attended recent Chandrayaan meetings and is presently preparing an anticipated Smart-1, Selene, Chang'e 1 data analysis workshop in early 2008

Discussions about the mission ground segment are ongoing and several training sessions have been held with the Indian colleagues. It is still unclear what support for science operation will be needed, as the Indian efforts have not yet been properly defined.

Chang-e 1: After the successful launch and Lunar orbit insertion of China's first Lunar mission, we are now waiting for the first scientific data in exchange for ESA ground support efforts. Such data will be used in combination with Smart-1, Chandrayaan, and Selene data in a coordinated European/Asian Lunar data analysis effort.

Bepi-Colombo:

Payload support issues with Strophio (NASA) and PICAM (Belgium) funding have been resolved. The situation for MSA on MMO is worse, and new solutions are being discussed.

J. Benkhoff's appointment as PS for B/C has finally been accomplished and he has taken up duty as PS for B/C on January 1, 2008.

The instrument teams started work on the papers for the special issue of Planetary Space Science (PSS). Title of the issue will be: 'Comprehensive Science Investigations of Mercury - The scientific goals of the joint ESA-JAXA mission BepiColombo'.

Solar Orbiter:

In close coordination with NASA the Solar Orbiter AO has been released on October 18, immediately after presentation of the Draft Science Management Plan (SMP) to SSAC on Oct 17. In parallel NASA has issued both a general SMEX AO, which is open for minor US payload participation in Solar Orbiter, and a further dedicated SMEX AO for major US payload contributions (FOSO – Focussed Opportunity Solar Orbiter). A common timetable on how to assess the expected input for these three AO's and how to arrive at a coordinated payload selection has been worked out between ESA and NASA.

At its 120th meeting on 12-13 Nov, SPC gave the green light to proceed with phase B1 of the mission. The draft Solar Orbiter Science Management Plan was discussed at the same meeting, and following written input from the French, Italian and Belgian delegation the draft Solar Orbiter Science Management Plan has been updated, in particular concerning formulations about a "Letter of Commitment" for instrument proposal from national agencies, and the exact definition of a PI "proprietary" period for scientific data.

Just before Christmas it has been widely announced on the ESA web-pages as a new applicable document to the Solar Orbiter AO.

New Cosmic Vision missions under study: Following the SSAC selection and SPC confirmation of initial studies for 4 mission in the Solar System realm the respective Study Science Teams have been formed under the chairmanship of RSSD Study Scientists and all have begun their work.

Marco Polo The members of the Science Definition Team (SDT) have been selected and appointed. The first meeting of the SDT took place at ESTEC on 22 Nov 2007. D. Koschny is the RSSD Study scientist, and A. Barucci was nominated as Co-Chair of the SDT. A successful 5 party telecon (3 parties on video) has been held on Dec 5, also involving JAXA. The formal kick-off meeting including the Japanese Study Science team is planned on February 6 in Tokyo.

Cross Scale: The first meeting of the Cross Scale SDT has been held on Nov 21 in ESTEC. P. Escoubet is Study Scientist and S. Schwartz will be the Co-chair of the SDT. Both Japan and NASA will in the future send two members each to the SDT meetings. M. Fujimoto has already attended this first meeting and as future NASA members S. Bale and M. Kessel have been nominated. Cross scale has as first new CV study completed its CDF activities on Dec 19. The final CDF report will become public soon.

Laplace/Tandem: First discussions about the Laplace/Tandem Joint SDT with JAXA and NASA have been held in Paris on Nov 12 with both principal proposers M. Blanc (Laplace) and A. Coustenis (Tandem), MC, Sci-Sm and the L/T study scientist J.P. Lebreton. While a first meeting with NASA and JAXA is considered as very urgent by all parties, it has not been possible to arrange such a meeting during 2007. Following discussions with J. Green (NASA), Kawaguchi and Fujimoto (JAXA) a first meeting of the respective European Study Science team is now planned for Jan 10/11 at ESTEC.