Panel D / Chapter 5

Conclusions

25 January 2007

Inputs from the community (1)

- Through web site (a few)
- E-mails to the panel chairs
- 11 oral contributions during Parallel Session
- Open discussion (all)

Inputs from the community (2)
Oral presentations

- R. Harrison, L. Klein, N. Vilmer, J.-L. Bougeret (Heliosphere, solar wind, magnetosphere)
- M. Haberreiter (Total Solar Irrandiance)
- L. Damé (High-resolution solar observations)
- A. Stepanov (Solar flares)
- V. Gudukova (Ground-based monitoring)
- J. Souchay (Solar system dynamics)
- J. Davies (Small bodies)
- T. Appourchaux (Gravity waves in the Sun)

Main comments and changes

- Heliosphere, solar wind and magnetosphere have not been properly covered
  - Proposal to change Question 1 into: “What can the Sun and the Solar system tell us about astrophysical processes?”
  - Discuss in more detail solar wind, plasma physics, particles and space weather
  - Contributions to § 5.1, 5.2 and 5.3 will be coordinated by Richard Harrison

- Introduction will be reformulated to address common issues in solar-system sciences:
  - Data volume and archives
  - Need for long-term synoptic observations

1. What can the Sun and the Solar System tell us about fundamental astrophysical processes?

- Need to go beyond traditional MHD
- Essential role of microscopic plasma physics
- Role of the solar wind in carving planetary environments and in driving magnetospheric engine
- Importance of radio diagnostics and in situ diagnostics
- Internal structure of the Sun: Need to search for gravity waves
- Discuss solar abundances (presently in § 5.2)

2. What drives solar variability on all scales?

- Comment: the discussion on solar abundances is not in proper location
  - Proposition: Add this discussion in § 5.1

- Comment for § 5.2.2: The total luminosity must be better determined
  - Need for long-term monitoring

3. What is the impact of solar activity on life on Earth?

- Comment: Space weather activity needs to be better emphasized (very strong activity in Europe)
  - To be mentioned in the general introduction
  - Need for long-term monitoring of the space environments of the planets

4. What is the dynamical history of the solar system?

- Reference systems must be mentioned (cf Gaia - building of a new reference system)
  - Needed for solar-system dynamics
- Formation of the Kuiper belt
  - Need for 4-8m optical telescopes + ELT for TNOs
- Reference should be made on migration dynamical models (in Background and Key questions)

5. What can we learn from solar-system exploration?

- Comment: The Solar-system section is too much fragmented
  - Proposition: Rewrite the introduction of Chapter 5 in enhancing the specificities of Sun and Solar-system observations:
    - Large data volume, need for archives (cf VO)
    - Need for long-term synoptic observations

- Small bodies: need for surveys (NEA, KBO)

6. Where can we look for life in the Solar System?

- Comment: Mention the possible role of asteroid and cometary impacts in the apparition of life on Earth

Recommendations
Requirements for principal facilities (1)

- Large-aperture (3-5m) solar telescope with adaptive optics
- Solar Orbiter
- Meter class UV space mission with X-ray capabilities
- Access to Radio spectral Imaging Capability in cm – m band

Recommendations
Requirements for principal facilities (2)

- Mars sample return mission
- To be considered in the frame of Cosmic Vision:
  - Exploration of Jupiter's and/or Saturn's systems, with special emphasis to Europa, Titan, and Enceladus
  - Mission toward a Near-Earth asteroid
  - Saturn probe mission
  - Mission to Venus
  - 3D Multiscale magnetosphere solar wind analysis

Recommendations

Requirements for supporting facilities(1)

- Network of ground-based, synoptic solar instruments
- Radio-telescopes arrays, sub-mm and meter (ALMA, LOFAR)
- Continuous Total Solar Irradiance monitoring
- Continuous study of ionospheric convection
- High-resolution multi-objects spectrographs at 4-8m class telescopes

Recommendations
Requirements for supporting facilities (2)

- Access to optical facilities: ELT, JWST
- Access to sub-millimeter facilities: ALMA, Herschel
- Continued operation of smaller telescopes
- Laboratory studies
- Numerical simulations and theory

In conclusion…

- Thanks to all Panel D participants!
- Rewriting of § 5.1, 5.2, 5.3 concerning space plasma will be coordinated by Richard. Please send your inputs to Richard and Oskar
- Please send all your other suggestions (including editorial changes) by E-mail to Oskar and Therese