

Theme 4: SPACE CLIMATOLOGY

Co-Chaired by Claus Fröhlich and Jan Sojka

General

- We understand our theme as to provide the data necessary to study the “Climatology of the Sun-Earth System”.
- This allows to distinguish our tasks from those of the other themes which will eventually use our data sets.
- As we are dealing with Climatology we are concentrating on long-term effects, certainly longer than several weeks (e.g. longer than the solar rotation period).
- Our emphasis is on both a critical review of the original observations and their interpretations.

Theme 4: WORKING GROUPS

WG 4.1: Solar Irradiance Variability

Co-chaired by Judit Pap and Gerard Thuillier

WG 4.2: Heliosphere Near Earth

Chaired by Leif Svalgaard

WG 4.3: Radiation Belt Climatology

Chaired by Takahiro Obara

WG 4.4: Ionospheric and Upper-Atmospheric Variations

Co-chaired by Martin Jarvis and John Emmert

Theme 4: STATUS

- Each working group has been formed.
- Membership in the working groups is being actively pursued, three are fully formed and working.
- Workshops have already occurred, and other are being planned.
- Special Theme 4 Working Group Sessions at national and international meetings have occurred and more are being organized.
- Working groups will provide a detailed status report.

Theme 4: ORGANIZATION OBJECTIVES

- In order to achieve the integrated space climatology objectives the theme needs effective interaction between the working groups.
- This is achieved by a committee consisting of the theme co-chairs and the working group chairs with responsibility to identify areas of overlaps and mutually relevant topics and to ensure these are pursued. (Still to be enacted.)
- A measure of the success of this cooperation is a CAWSES Theme 4 data base that encompasses all four working groups.
- A CAWSES product will be a “CD” of this data base intended for non-specialists as well as being useful to non-disciple specialists. *(This aspect will serve as outreach, even public outreach)*

CAWSES Theme 4, Working Group 1

2004-2005 1-Year Report

Judit M. Pap and Gerard Thuillier

Solar Irradiance Variability

1. SCIENCE

- 1.1. CAWSES Theme 4 WG1's organization is complete, WG1 is divided into five subgroups: long-term solar variability effects on solar irradiance; reference spectrum; predictions/irradiance models; theory; data distribution
- 1.2. Peter Fox was elected as WG1 science coordinator
- 1.3. Science Plan includes: improvement of irradiance composites, reference spectra including new measurements, improve irradiance models with new data and images, study the energy balance of active regions, understand the physics of irradiance variations (magnetic field evolution, temperature changes, radius changes)
- 1.4. The PICARD mission was approved within the last year. PICARD will measure solar diameter, total and spectral irradiance, and will be launched in 2008.

2. MEETINGS

- 2.1. First Working Group 1 meeting: July 23, 2004, Paris, COSPAR 36th General Assembly
- 2.2. AGU 2004 Fall Meeting, San Francisco, CA, December 2004. Joint meeting with Theme 2.
- 2.3. Solar Variability and Earth's Climate, Villa Mondragone, Italy, June 27 - July 1, 2005, special session on July 1.
- 2.4. SORCE Science meeting, September 12-16, 2005, Durango, CO, special session

3. FUTURE PLANS/CONCERNS:

- 3.1. Continue research as outlined above
- 3.2. Collaboration with CAWSES Theme 1
- 3.3. CAWSES Theme 4 WG1 website
- 3.4. Develop collaborative research between PICARD and SDO within the umbrella of ILWS
- 3.5. Lack of UV and spectral irradiance measurements overlapping with NPOESS after the SORCE experiment, what can we do about it?

CAWSES Meeting on 23 July 2005 in Toulouse, France

CAWSES Theme 4, Working Group 2
2004-2005 1-Year Report
Leif Svalgaard
Heliosphere Near Earth

At the time of writing Leif has not been able to provide a summary.

- I have met with him on at least 2 occasions at scientific meetings.
- He has made several visits to international destinations that could potentially be archives of undocumented geomagnetic records.
- His emphasis is to bring to light such records not only to extend and complete the climatological magnetic field record, but also to provide “simultaneous” coverage from different global locations.

- A major effort in this work is calibration of these records.
- These records provide the longest “man-made” climatological observational data set.
- They also provide climatology information from:
 - Sun (large flare activity)
 - Heliosphere (solar wind interaction with magnetosphere)
 - Magnetosphere-ionosphere (geomagnetic storms - substorms)
- Coupling between CAWSES themes and working groups of Theme 4.

CAWSES Theme 4, Working Group 3

2004-2005 1-Year Report

Takahiro Obara

Radiation Belt Climatology

1. SCIENCE

- 1.1 Synergize and clarify our knowledge of the climatology and extremes of the radiation belt.
- 1.2 Promote making a long-term database over 40 years for the purpose of scientific understandings and applications.
- 1.3 Make next generation radiation belt models based on the knowledge of the long-term behavior.

2. ORGANIZATION

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3. OBJECTIVES

- 3.1 To make a long term radiation belt data base by compiling data from Europe, Russia, Japan and the United States and use it to:
 - Study solar activity control of radiation particle environment
 - Study variability of radiation belt with/without magnetic storms
- 3.2 To “consider” the next generation radiation belt model that will contain:
 - Dependence upon solar activity phase (solar max, declining, solar min, and increasing).
 - Interactions with other plasma regimes in the magnetosphere (also ionosphere and plasmasphere).
- 3.3 To clarify the long term variation of the radiation belt together with understanding the basic physics of these variations.

CAWSES Theme 4, Working Group 4
2004-2005 1-Year Report
Martin Jarvis and John Emmert
Ionospheric and Upper Atmospheric Variations

1. SCIENCE

- Assess the current state of climatological (especially empirical models) and trend estimates, particularly with respect to the relative reliability of the estimates (objectives 1, 3, 5).
- Identify critical issues for understanding upper atmosphere climatological variation and variability. Assess which areas need special focus. Publicize these and encourage the peer community to focus on them (objective 1).
- Institute an endorsement procedure for investigators proposing work that furthers the issues identified by the WG.

2. OBJECTIVES

- 2.1 Focus the scientific activities of the community on key climatological issues.
- 2.2 Promote the preservation and dissemination of long-term data sets.
- 2.3 Advocate for new measurements to fill gaps in the climatological record, and for continued collection of data from existing instruments.
- 2.4 Assess and document the quality of long-term data sets.
- 2.5 Establish a set of standardized procedures for producing climatologies and calculating long-term trends, in order to promote meaningful comparison of results from different data sets.

3. ORGANIZATION

Rashid Akmaev (Also a member of WG 3.2, IAGA/ICMA Working Group II-F)

Gufran Beig (Co-Chair, IAGA/ICMA Working Groups II-F)

Gary Burns

Jorge Chau (Also a member of WG 3.3)

Alexei Danilov (Also a member of IAGA/ICMA Working Group II-F)

Jan Lastovicka (Chair, IAGA/ICMA Working Group II-F)

Rick Niciejewski

Henry Rishbeth (Specialist Consultant)

Thomas Ulich

4. INTERACTIONS

4.1 CAWSES Theme 1: Solar Influences on Climate

- Consult on methods for calculating long-term trends.
- Collaborate to establish whole-atmosphere picture of trends.

4.2 CAWSES Theme 2: Space Weather: Science and Applications

- Consult on climatological parameters (I.e. indices of energy input) important for ionosphere and upper atmosphere processes.
- Provide assistance with baseline climatologies, from which storm effects can be interpreted.

4.3 CAWSES Theme 3: Atmospheric Coupling Processes

- Collaborate on the interpretation of climatological features and trends.
- Collaborate to establish whole-atmosphere picture of trends.

4.4 CAWSES Working Group 4.1: Solar Irradiance Variability

- Consult on solar irradiance indices

4.5 CAWSES Working Group 4.2: Heliosphere Near Earth

- Consult on geomagnetic activity indices
- Consult on changes in the magnetic field and implications for ionospheric climatology

4.6 CAWSES Working Group 4.3: Radiation Belt Climatology

- Collaborate on interactions between the two regions

4.7 IAGA, ICMA, and other scientific organizations

- Coordinate efforts to ensure a minimum of duplication. Coordination is ensured by personal overlap - four out of five leaders of the IAGA/ICMA Trends Working Group are panel members.

Theme 4: conclusions

The first data sets for the CAWSES

Theme 4 CD data base will be 100

Year long magnetometer measurements.

Theme 4: WG PRESENTATIONS

WG 4.1: Solar Irradiance Variability

Presented by **Judit Pap** and Gerard Thuillier

WG 4.2: Heliosphere Near Earth

Presented by **Leif Svalgaard**

WG 4.3: Radiation Belt Climatology

Presented by **Takahiro Obara**

WG 4.4: Ionospheric and Upper-Atmospheric Variations

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CAWSES Meeting on 23 July 2005 in Toulouse, France