

The Living with a Star (LWS) Heliophysics Summer School (HSS)

Jan J. Sojka

Dean of the HSS

Center for Atmospheric and Space Sciences
Utah State University, Logan, Utah

The perspectives given and developed in this talk have not been sanctioned by the owner, the originators, nor my fellow Deans of HSS. I have not requested their permission, but I do expect their forgiveness for what I'm about to say.

- NASA's Living With a Star program has taken on the challenge of integrating our knowledge, exploration, and students of three autonomous space science disciplines

Solar – Solar Wind Science

Magnetospheric Science

Ionospheric Science

- All three disciplines are known to us by a variety of labels and contain regional labels that form our “baggage”.
- One of the successes of LWS is the idea that educating our most advanced students in the broadest cross-disciplinary way would generate a replacement generation with a working understanding of the SUN-EARTH system.

Hence the Heliophysics Summer School

- HSS players:

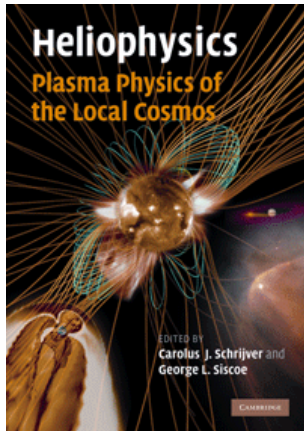
Deans: Amitava Bhattacharjee, Dana Longcope, and Jan Sojka

Inventors: George Siscoe and Karl Schrijver

PI: Margaret Austin (Meg), UCAR

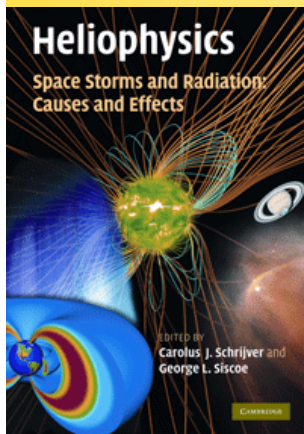
LWS Visionary: “Lika” Madhulika Guhathakurta, NASA

- Offer a summer school in LWS at the advanced graduate/post-doc level once per year.
- Lectures will be given by leaders in the field who can communicate the state-of-the-art science, its problems, and where the field is headed.
- Over the first three years each lecturer provides a chapter to a book generated from that years’ summer school.
- I credit Professor Siscoe with the development of an overarching title “Heliophysics” and a theme that threads its way through all three disciplines, “magnetic fields and currents”.
- Lecturers will also generate homework assignments and develop laboratory “hands-on” materials.



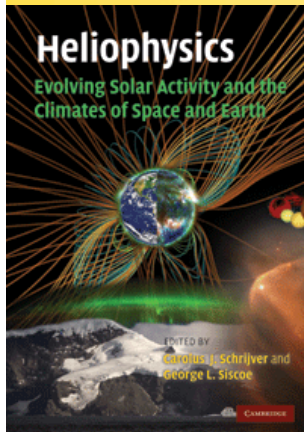
Book 1

Heliophysics: Plasma Physics of the Local Cosmos



Book 2

Heliophysics: Space Storms and Radiation Causes and Effects



Book 3

Heliophysics: Evolving Solar Activity and the Climates of Space and Earth

Heliophysics Text Books

Solar-Heliosphere

Magnetosphere

Ionosphere-Thermosphere

Expert lecturers from our disciplines

Advanced level space physics

Date of HSS

Overarching Theme

1. July 30 - Aug. 7, 2007
Plasma Physics of the Local Cosmos
2. July 23 - 30, 2008
Space Storms and Radiation:
Causes and Effects
3. July 22 - 29, 2009
Evolving Solar Activity and the
Climates of Space and Earth
4. July 28 - Aug. 4, 2010
Space Storms
5. July 27 - Aug. 3, 2011
Long-Term Solar Activity and the
Climates of Space and Earth
6. May 31 - June 7, 2012
Heliophysics Exploration

Participants at HSS

<u>Year</u>	<u>Teachers</u>	<u>Students (Total)</u>	<u>Students (International)</u>
2007	21	38	16
2008	15	30	13
2009	13	29	14
2010	17	35	14
2011	12	33	14
Totals:	<u>78</u>	<u>165</u>	<u>71</u>
Average:	<u>15ish</u>	<u>33</u>	<u>14ish (42%)</u>
Repeats:	~30%	≤5%	

Structure of HSS Meeting

<u>Year</u>	<u>Days</u>	<u>Lectures</u>	<u>Laboratories</u>	<u>Discussion/Homework</u>
2007	8	20	8	8
2008	7	15	9	4
2009	7	15	4	9
2010	7	14	5	5
2011	7	13	5	6

Typical lecture is 1.5 hours.

Typical laboratory is 2 hours.

Typical discussion/homework is 1.5 hours.

Five Year Lecture Distribution

	Theory	Modeling/Analysis	Instrumentation
Sun - Heliosphere	18.6	3.5	1.8
Magnetosphere	11.6	3	1.3
Ionosphere & Thermosphere	5.6	4	0.3
Plasma	13	0	0
Outside These Disciplines	8	4	2

Summary of What We Did

	Theory	Modeling/Analysis	Instrumentation	
Sun to Heliosphere	18.6	3.5	1.8	= 24
Magnetosphere	11.6	3	1.3	= 16
Ionosphere & Thermosphere	5.6	4	0.3	= 10
	= 36	= 10.5	= 3.5	

Plus 31 lab sessions = 41.5

The laboratory sessions were devoted to modeling and uniformly distributed over heliophysics

Reflections on the Five Years

- Lectures emphasized theory and solar-heliosphere physics.
- The laboratory sessions provide the modeling-analysis balance, however a lack of observation/instrument balance. A significant number of the students were closely involve with instrument PI groups!
- Originally lecturers were responsible for a laboratory session, now they are responsible for the homework.
- A major selection consideration is whether or not an applicant has taken courses in E & M (“Jackson”) and Plasma (“Chen”).

CCMC Role as Laboratory Provider

The reference to “labs” over the 5 HHS has evolved over time.

Originally individual lectures provided a tailored lab for their lecture which could be over a range of techniques: empirical, data handling, modeling, etc.

As the CCMC capability became more comprehensive George Siscoe’s idea of end-to-end heliophysics modeling could be a student laboratory spanning the LWS system.

In the fifth HSS all laboratories were CCMC products.

The CCMC Student Laboratory

As the capability of CCMC to support student learning evolved a number of joint CCMC-HSS developments took place. These have generated a CCMC product that can provide the heliophysics community both educational and research access via “PRIMERS” to CCMC models.

Maria Kuznetsova (Masha) and her CCMC team has provided modeling support to all five HSS.

During meeting at various locations held between HSS Masha and her team have refined and developed interfaces to the CCMC models for educational products.

Specifically the PRIMERS are a product that from a researchers viewpoint is as necessary as a textbook is to the student.

Accessing the “HSS” Primer

Directions for HSS

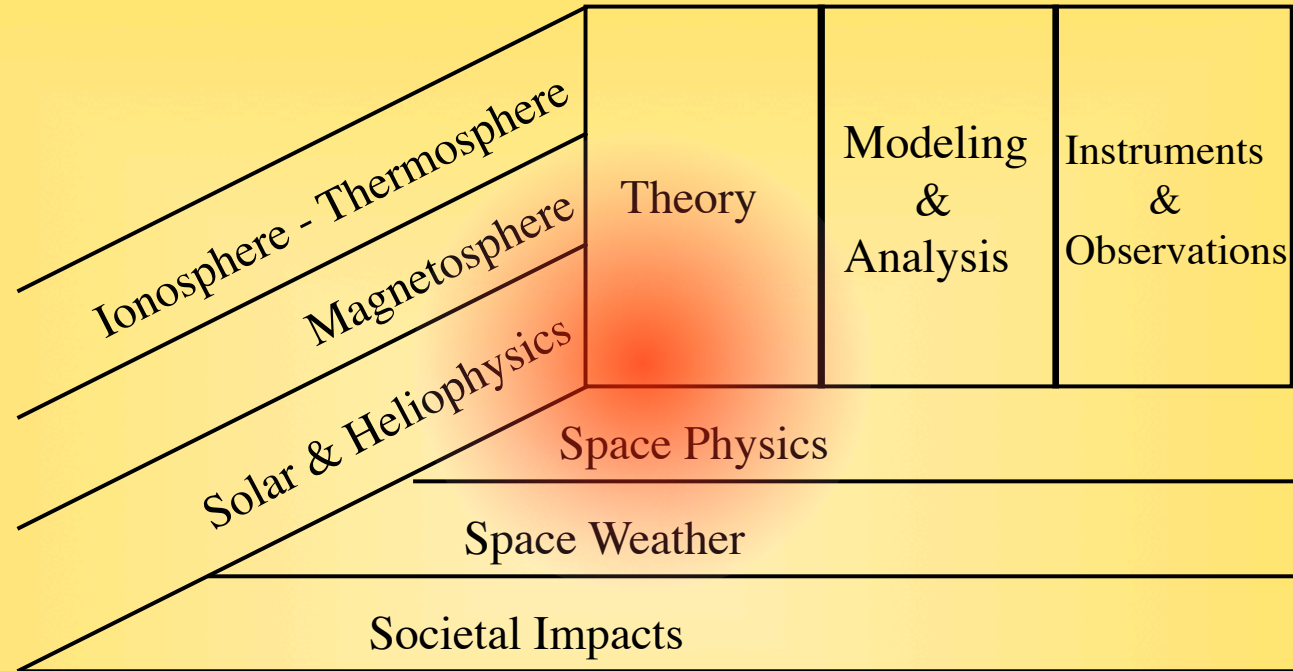
The first five, and soon to be held sixth summer schools have very definitely achieved the program goals:

- Almost 200 graduate students/post docs.
- 3 text books published.
- On-line homeworks in final development.
- CCMC modeling laboratory.
- PRIMERS for introduction to CCMC heliophysics model use.

Going forward there are a few adjustments that should be considered

- Excessively “heavy” on theory.
- Somewhat solar centric.
- Devoid of instrumentation - observations.
- Who cares!

The HSS Matrix Goes 3-D



- Space weather works well to cross our disciplines.
- Societal impacts are an independent challenge crossing other disciplines and only partly associated with space weather.

—————> Sputnik was a societal impact <—————

