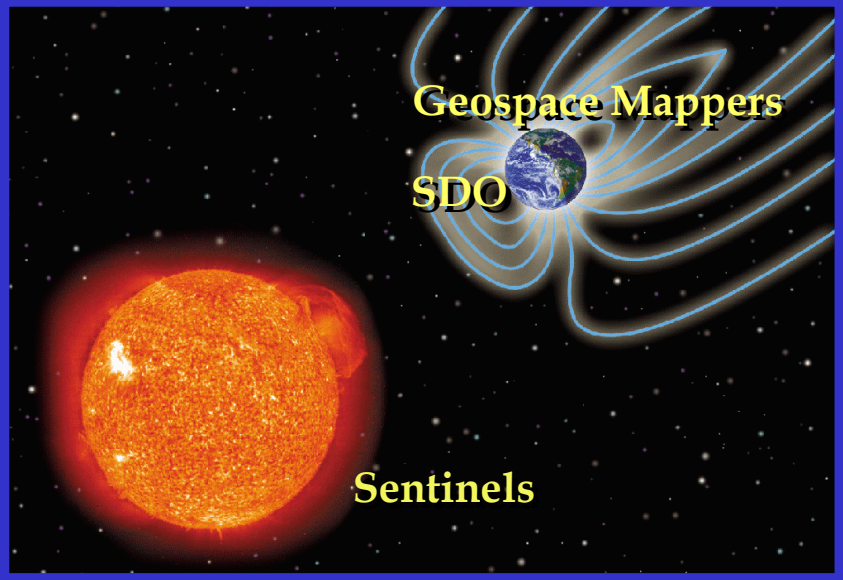
LWS: Sailing in Endeavor's Wake

CCMC Workshop
30 Oct – 1 Nov 2001
Maui, Hawaii

R. Fisher
NASA-GSFC
Laboratory for Astronomy
And Solar Physics

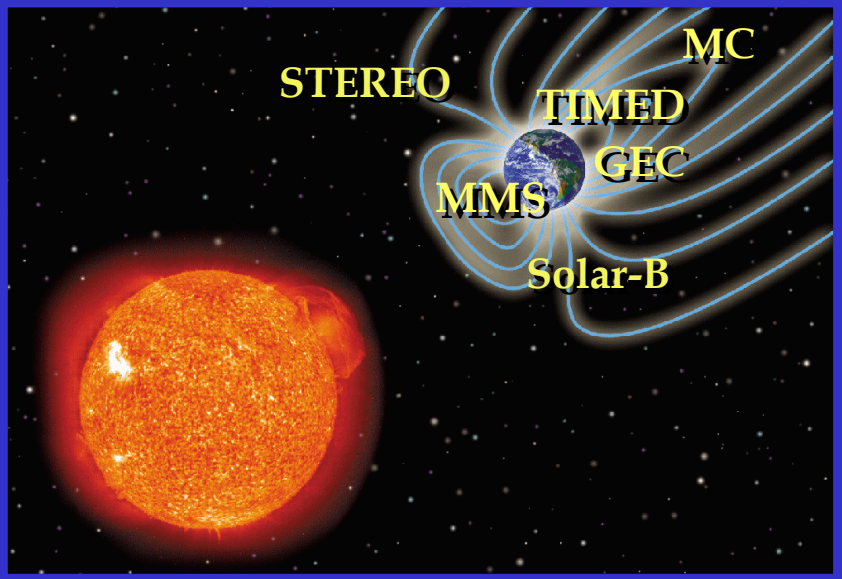
SEC Programs



Current LWS Missions

- **Living With a Star (LWS)**
  - **Missions to establish the space weather research network for characterization of the Sun-Earth System behavior and identification of the critical physics that link parts of the system**

- **Solar Terrestrial Probes (STP) Program**
- **- Missions launched every 20 months with focused investigations to explore specific scientific research questions**

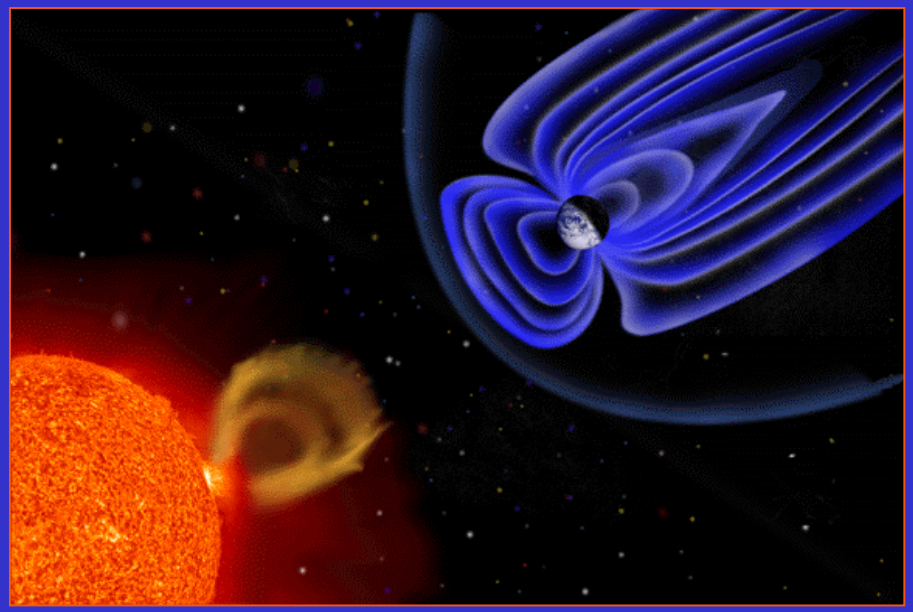


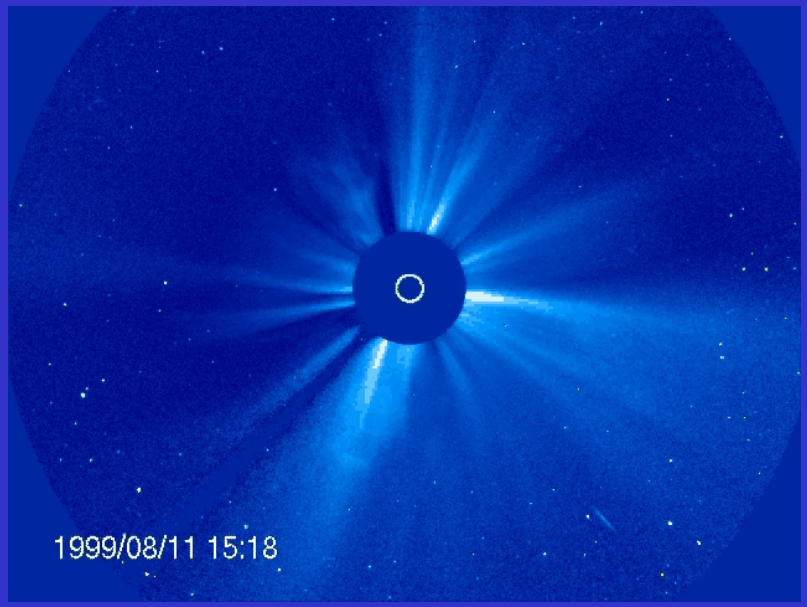
Present STP Missions

STP Missions Goal

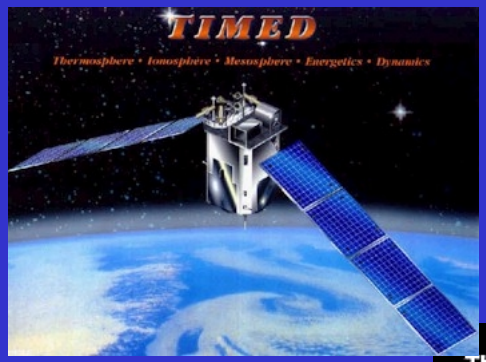
- **Develop the understanding of the behavior of the Sun-Earth system and identify the critical physical processes**

- **Develop focused scientific missions aimed at discovering new knowledge concerning physical conditions and physical processes in the Solar System**

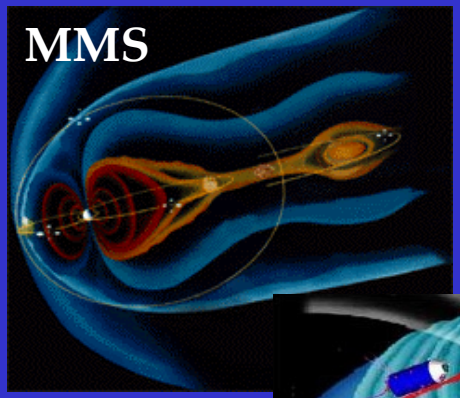




Solar Terrestrial Probes (STP)

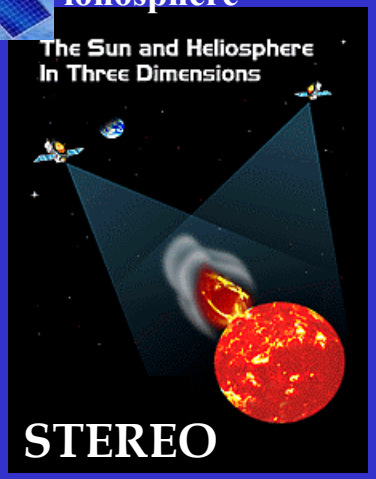


Determine basic structure and understand energy balance of mesosphere, lower thermosphere, ionosphere

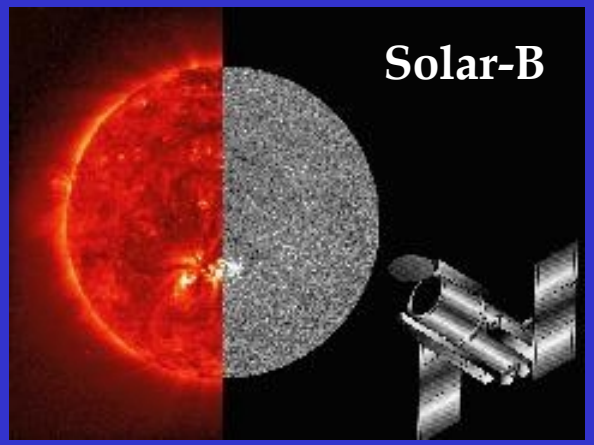


Understand fundamental plasma processes of reconnection, acceleration and turbulence

Understand creation and destruction of solar magnetic field

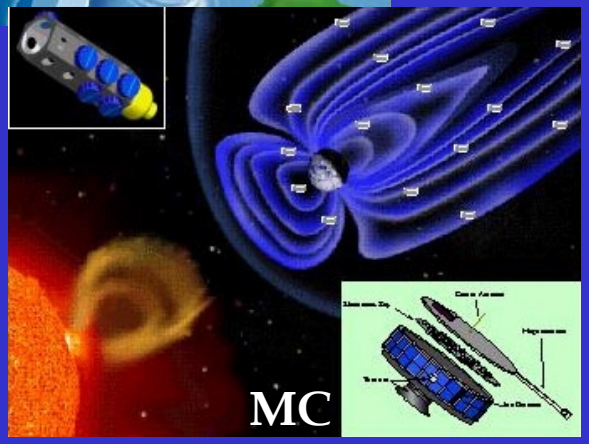


Understand plasma interactions with the atmosphere



Understand origin, evolution, and propagation of CME's

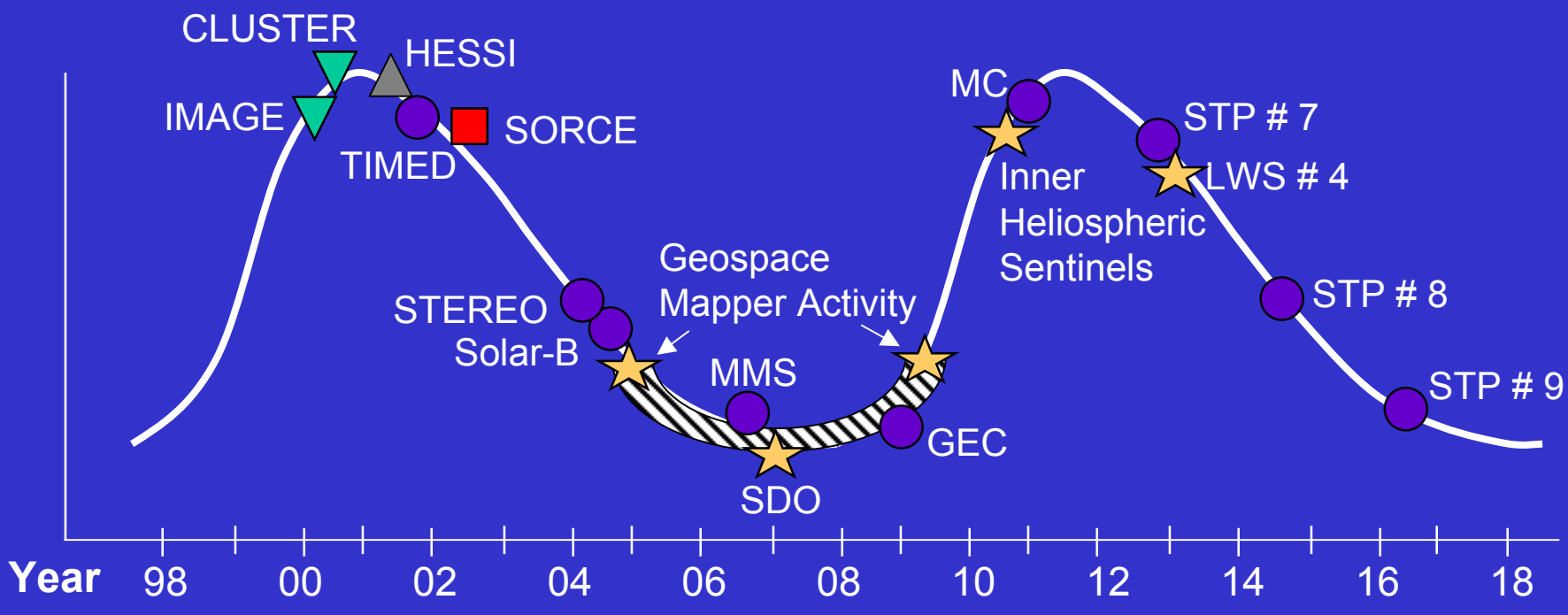
Understand processes that control the dynamic state and energy flow of the magnetosphere



LWS Missions Goal

- Develop the scientific understanding necessary to effectively address those aspects of the connected Sun-Earth system that directly affect life and society.

SEC Schedule



Notes: Symbol definitions are listed below.

- STP Missions
- Earth Science Missions
- Small Explorer Mission
- Medium Explorer Mission
- LWS Missions
- Geospace Mapper Activity

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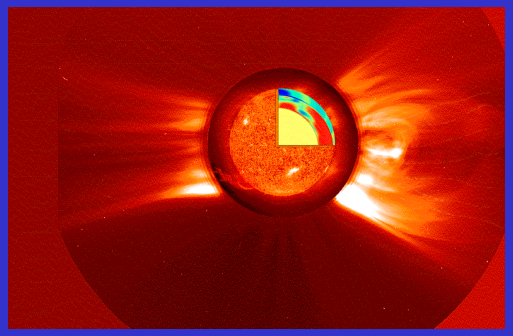
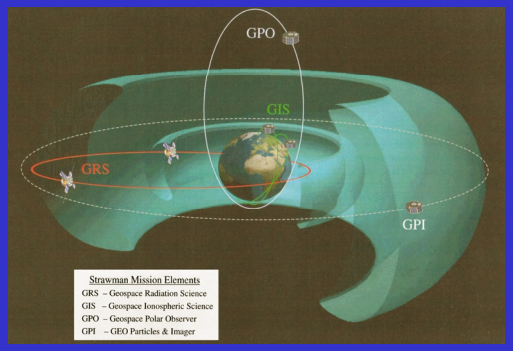
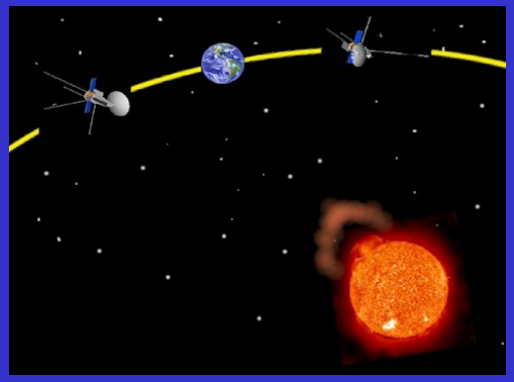
Selected Mission Issues





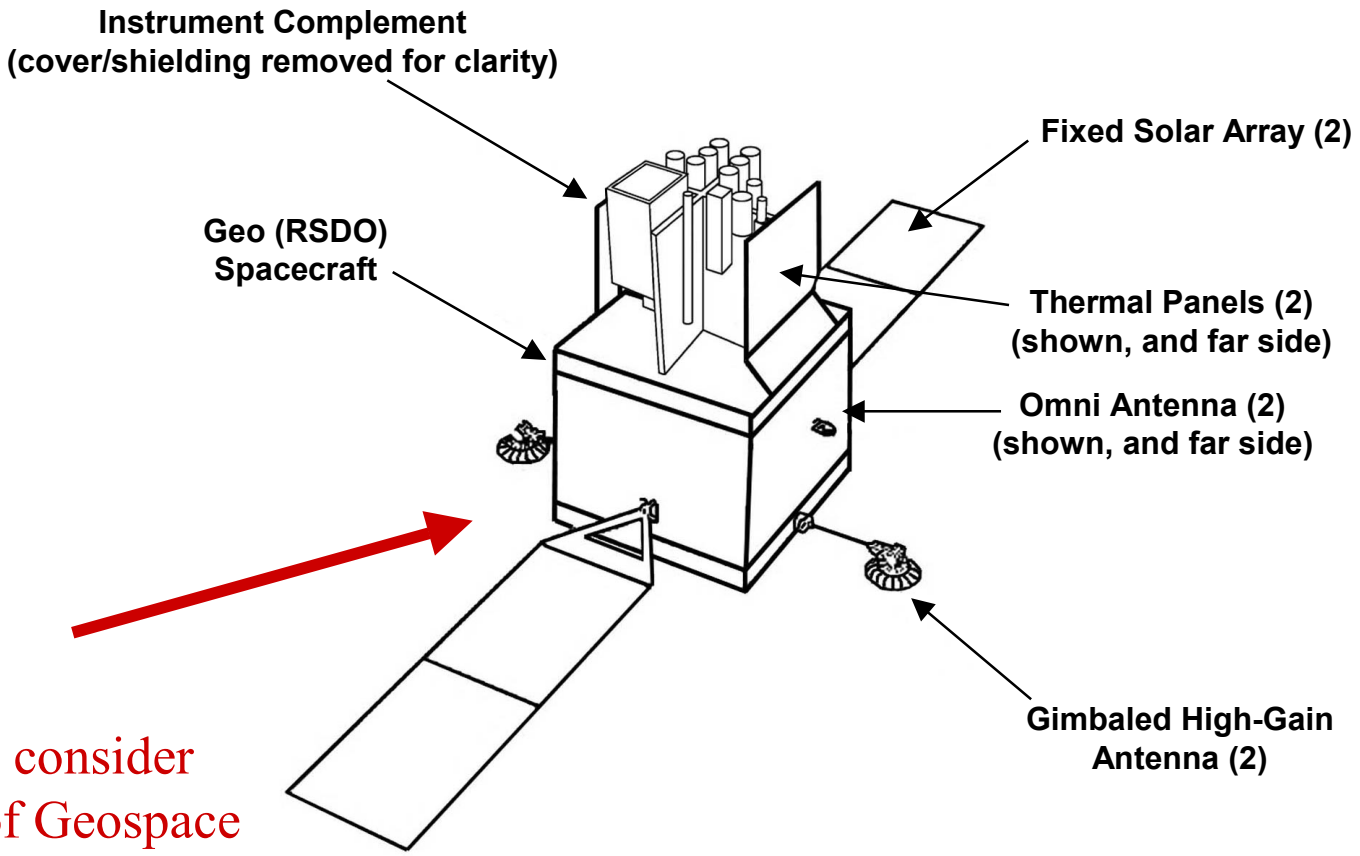


- LWS
  - •SDO
    GEOSPACE INSTRUMENT
  - •GEOSPACE
    GMDT IN-WORK
- STP
  - •STEREO
    SPACE WEATHER DATA

SDO Potential Instrument Complement

- Magnetograph / Helioseismograph capable of delivering a magnetic data product every 20 seconds, a vector magnetogram every 5 minutes, and a complete helioseismology data set every 45 seconds
- A suite of EUV/UV/Visible Telescopes to image the Sun simultaneously every 10 seconds, 4096x4096 CCD (.5 arcsec pixels)
- Coronagraphs capable of making polarization measurements from <1.2 to 18 Solar radii every 30 seconds, 4096x4096 CCD
- A complement of irradiance instruments to study
  the drivers of irradiance variations and
  the impact on climate and geospace

SDO Concept S/C



GMDT to consider addition of Geospace instruments to SDO payload

GMDT: Magnetosphere/Radiation Belt priorities (report by Reeves)

Priority I goal: differentiate among competing processes of acceleration & transport of outer zone

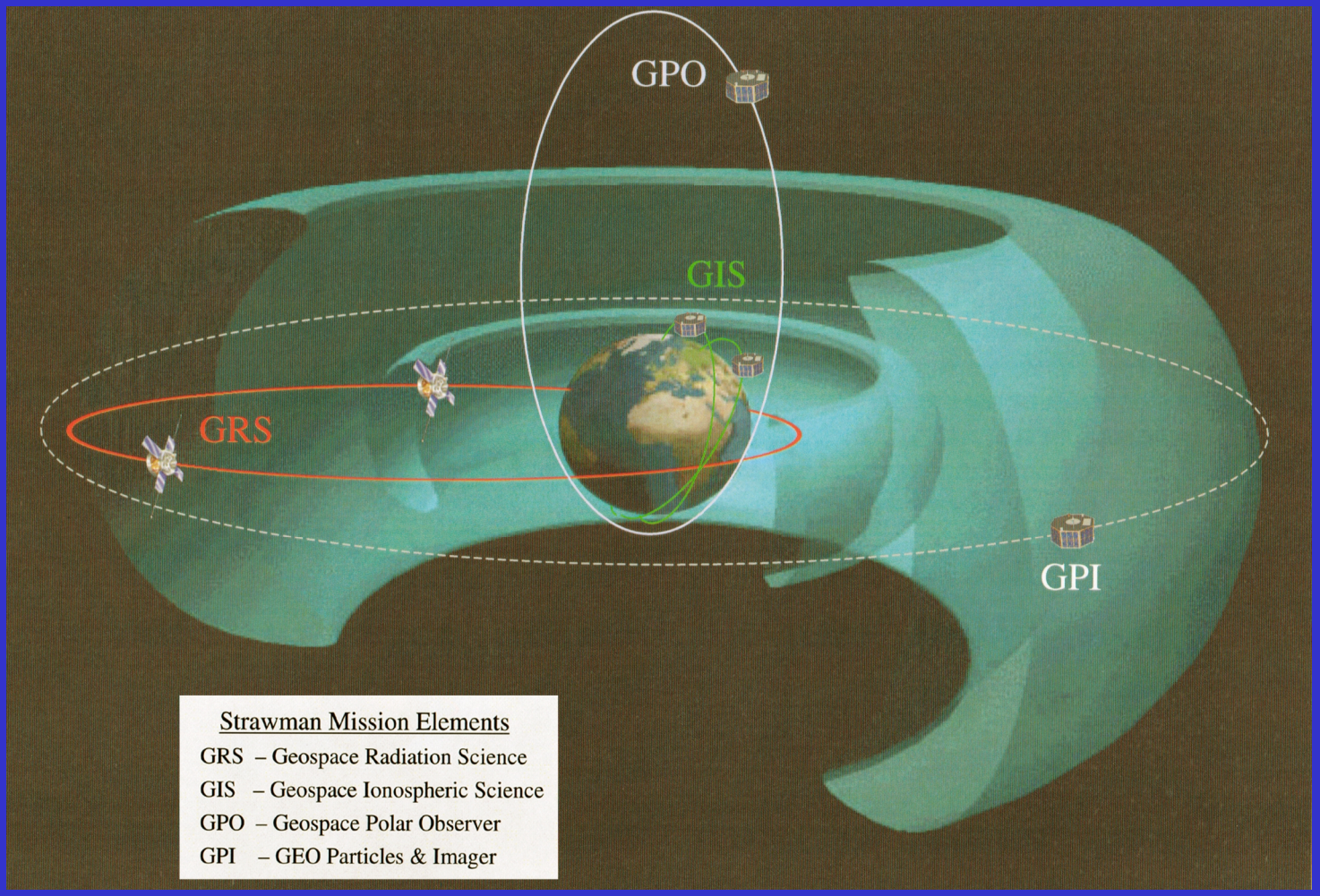
Priority II goal: differentiate among competing processes for loss

Priority II goal: understand sudden creation of new electron belts

Priority II goal: develop & validate physics-based specification models of outer zone

Defined measurements to extent possible, orbits include at least 2 equatorial component (GTO or nested orbits) plus at least 1 LEO

Geospace Straw Missions

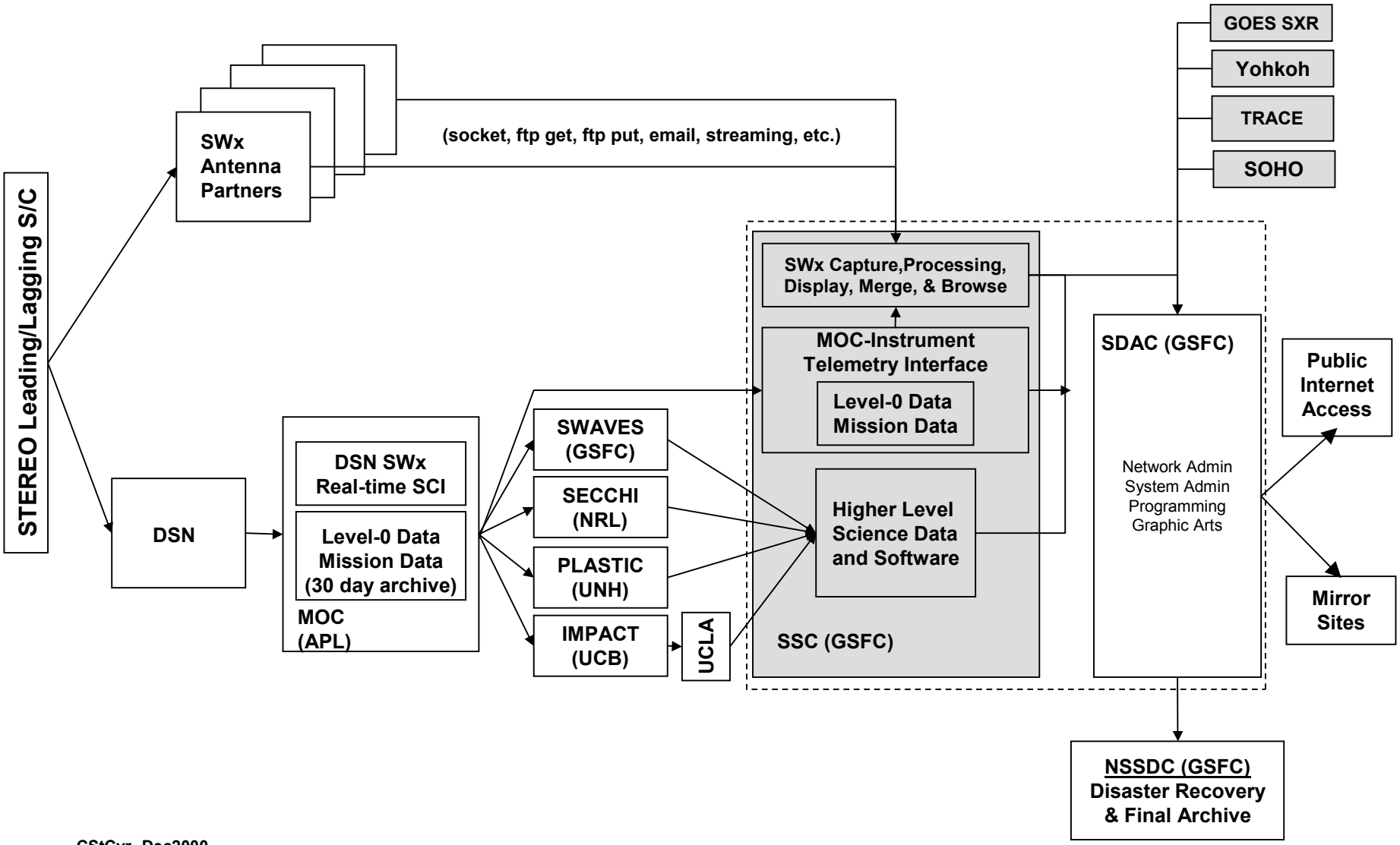


STEREO Space Weather Broadcast Goal

- **In support of LWS synergy, "Space Weather" data from each instrument will be sampled in support of a space weather broadcast mode similar to that employed by the ACE mission.**

- **The spacecraft will provide continuous downlink of 500bps of spaceweather data.**

STEREO Telemetry Flow, Data Distribution, and Archive



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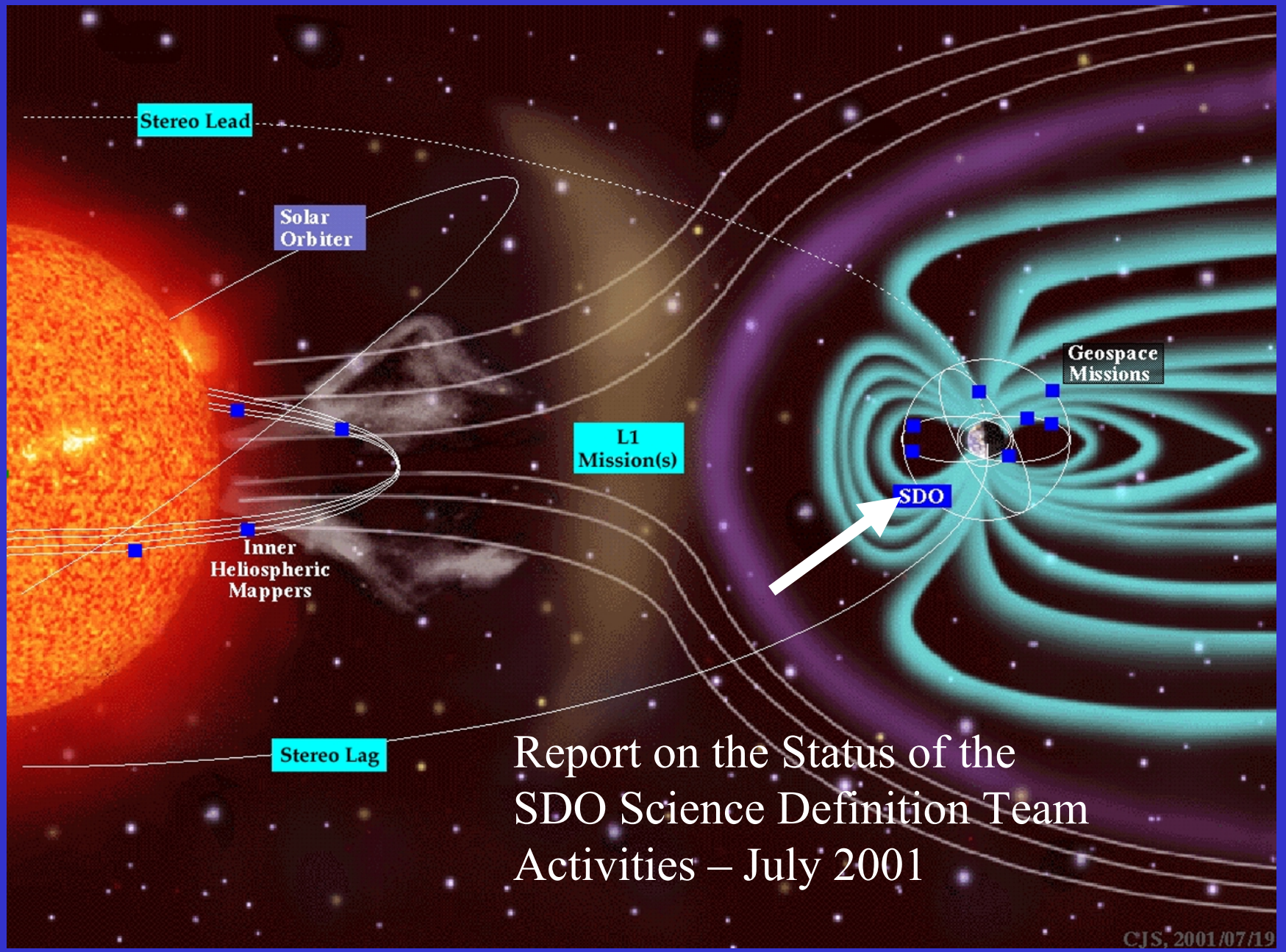
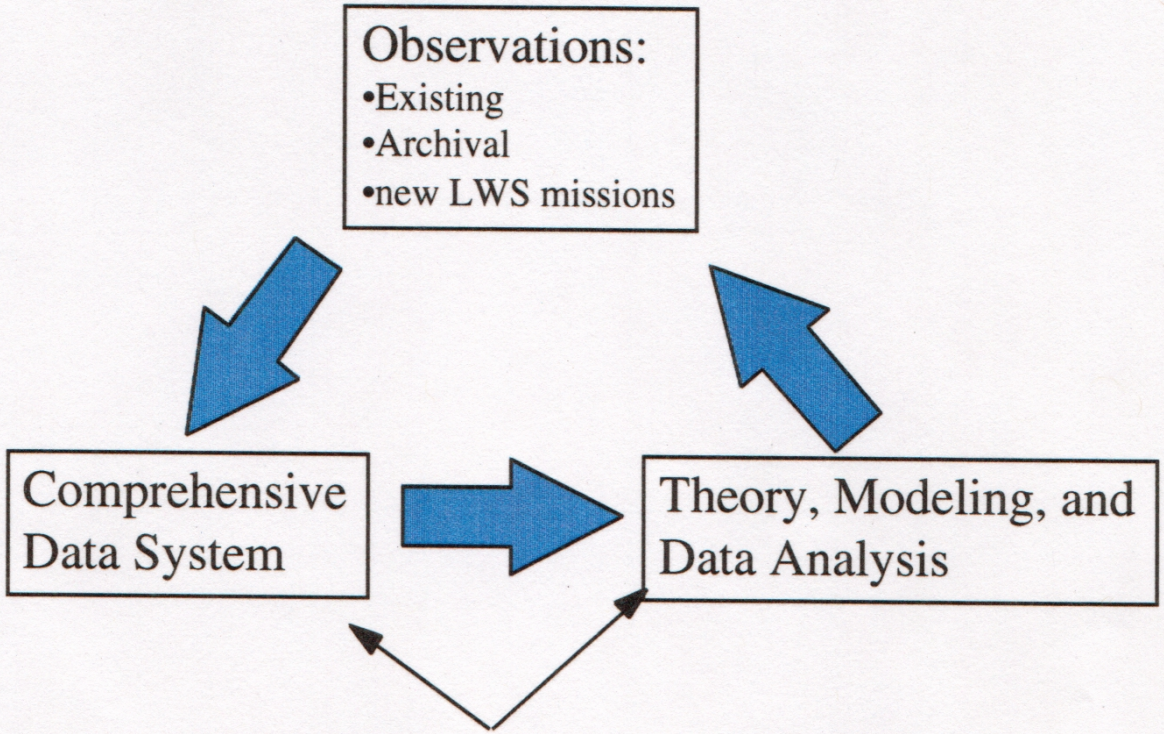

Stereo Lead
Solar Orbiter
L1 Mission(s)
Geospace Missions
SDO
Inner Heliospheric Mappers
Stereo Lag
Report on the Status of the SDO Science Definition Team Activities – July 2001
CJS, 2001/07/19

LWS SAT picture



LWS DATA ISSUES

- The Missions are Urgent – the Data Base is Vital
- Data must speak to the issues of the models
- LWS Data Base needs to be as inclusive as possible -multiple national sources
- Consideration for the NVO (NVSO)
- Optimal utilization of existing assets

Spatial Region	LWS Supporting Missions
Outer Heliosphere	Voyager, Ulysses
Solar (remote)	SOHO, HESSI, TRACE, Solar-B
Inner Heliosphere	SOLO, Messenger, Beppi-Columbo, Solar Probe
Heliosphere at 1 AU	STEREO, IMP, Geostorm,
L1	ACE, Wind, Triana
Magnetosphere	MagCon, GEC, TWINS, Polar, Cluster, GOES, LANL-GEO, GPS,
Low Earth Orbit	SORCE, TIMED, DMSP, TIROS, NPOESS, SAMPEX, C/NOFS

Theory and Modeling Issues for LWS

- Getting Started: What theories? Which models?
- The next ROSS NRA and partnerships . . .
- How best to utilize the existing CCMC arrangement ?

What Does NASA Want (from the CCMC, anyway)?

- Goal:

Enable the research community to make a production-ready high performance computational applications that model, analyze, or interpret NASA SEC observational mission data and. . .

(1) **B**etter characterize the Sun-Earth System behavior

(2) Identify the critical physical processes that link parts of the system

Sun-Earth Connections