

# IMPACT Data Plans

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*STEREO*

**IMPACT**

UCB - NASA/GSFC- Caltech - U of MD - LANL - JPL - UCLA - SAIC - NOAA/SEC  
U of MI - JHU/APL - MPAe - U of Kiel - CESR/CNRS - ESA/ESTEC -  
DESPA/OBSPM - KFKI/RMKI

## IMPACT Team Member Institutions and Primary Roles

- University of California, Berkeley-Space Sciences Laboratory (IMPACT Management, SWEA, STE, IDPU)
- NASA Goddard Space Flight Center (MAG, SEP-LET, HET)
- California Institute of Technology (SEP-LET, HET)
- University of Maryland (SEP-SIT)
- *University of Kiel (SEP-SEPT)*
- *Centre d'Etude Spatiale des Rayonnements CESR (SWEA)*
- Los Alamos National Laboratory (Science Integration, SEP-SIT)
- *Max Planck Institut fur Aeronomie (SEP-SIT)*
- Jet Propulsion Laboratory (SEP-LET, HET)
- *ESTEC-European Space Agency (SEP-SEPT)*
- *DESPA Observatoire de Paris-Meudon (SWAVES/IMPACT coordination)*
- University of California, Los Angeles (MAG, IMPACT Data Web)
- SAIC-Science Applications International Corporation (IMPACT Modeling)
- NOAA Space Environment Center (IMPACT Modeling, Space Weather Applications)
- University of Michigan (IMPACT Modeling)
- *KFKI-Hungarian Research Institute for Particle and Nuclear Physics (SEP Modeling)*

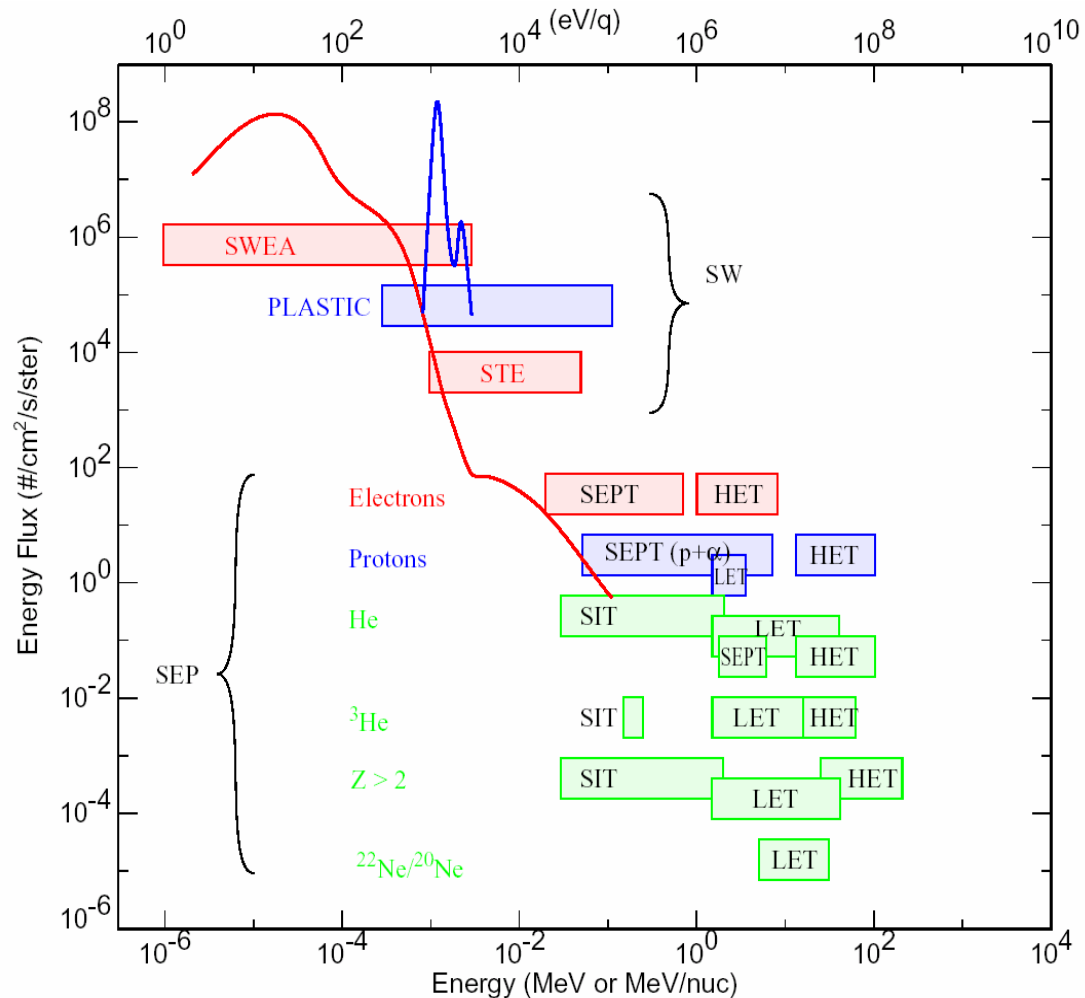
# What IMPACT contributes to the content of STEREO data

- **SECCHI (PI Russ Howard, NRL)**- Remote Sensing Package that will track Coronal Mass Ejections (CMEs) from the Sun to the Earth.
  - Two White Light Coronagraphs (**COR1, COR2**)- COR1 explores 1.4 – 4 Rsun. COR2 explores 2 – 15 Rsun
  - Extreme Ultra Violet Imager (**EUVI**)- Observes chromosphere and inner corona
  - Heliospheric Imager (**HI1, HI2**)- Observes Coronal Mass Ejections from the Sun to the Earth (12 – 300 Rsun)
- **IMPACT (PI Janet Luhmann, UCB)**- will sample the 3-D distribution of solar wind plasma electrons, the characteristics of the energetic particle ions and electrons, and the local magnetic field.
  - Solar Wind Experiment (**SWEA**)-Measures ~0-3 keV electrons with wide angle coverage
  - Suprathermal Electron Telescope (**STE**)-Measures electrons from 2-100 keV with wide angle coverage
  - Magnetometer Experiment (**MAG**)-Measures the vector magnetic field at 65,536 nT and 500 nT ranges
  - Solar Energetic Particle Experiment (**SEP**) Suite
    - Measures electrons from 0.02-6 MeV
    - Measures protons from 0.02 – 100 MeV
    - Measures helium ions from 0.03 – 100 MeV/nucleon
    - Measures heavier ions from 0.03 – 40 MeV/nucleon
- **PLASTIC (PI Toni Galvin, UNH)** - will provide the plasma characteristics of protons, alpha particles, and heavy ion. Provide composition measurements of heavy ions and characterizes the CME plasma
- **SWAVES (PI Jean-Louis Bougeret, Paris Obs.)**- in-situ as well as remote sensing instrument. Tracks CME Driven Shocks from the Corona to the Earth.

# Basic IMPACT Measurements

Experiment	Instrument	Measurement	Energy or Mag. field range	Time Res.	Beacon Time Res. (*)	Instrument provider
SW	STE	Electron flux and anisotropy	2-100 keV	16 s	2D x 3E, 60s	UCB (Lin)
	SWEA	3D electron distrib., core & halo density, temp. & anisotropy	~0-3 keV	3D=1 min 2D=8s Mom.=2s	Moments, 60s	CESR (Sauvaud) + UCB (Lin)
MAG	MAG	Vector field	$\pm 500$ nT, $\pm 65536$ nT	1/4 s	10s	GSFC (Acuna)
SEP	SIT	He to Fe ions	0.03-2 MeV/nuc	1 min	3S x 2E, 60s	U. of Md. (Mason) + MPAE (Korth) + GSFC (von Rosenvinge)
		<sup>3</sup> He	0.15-0.25 MeV/nuc	1 min	----	
	SEPT	Diff. electron flux	20-400 keV	1 min	3E, 60s	U. of Kiel (Mueller-Mellin) + ESTEC (Sanderson)
		Diff. proton flux	60-7000 keV	1 min	3E, 60s	
		Anisotropies of e,p	As above	15 min	----	
	LET	Ion mass numbers 2-28 & anisotropy	3-30 MeV/nuc	1-15 min.	2S x 2E, 60s	Caltech (Mewaldt) + GSFC (von Rosenvinge) + JPL (Wiedenbeck)
		<sup>3</sup> He ions flux & anisotropy	2-15 MeV/nuc	15 min.	1E, 60s	
		H ions flux & anisotropy	1.5-6 MeV	1-15 min.	1E, 60s	
	HET	Electrons flux	1-6 MeV	1-15 min.	1E, 60s	GSFC (von Rosenvinge) + Caltech (Mewaldt) + JPL (Wiedenbeck)
		H	13-100 MeV	1-15 min.	1E, 60s	
		He	13-100 MeV	1-15 min.	1E, 60s	
		<sup>3</sup> He	15-60 MeV/nuc	15 min	----	
	SEP Common	----	----	----	----	----
IMPACT Common	IDPU (+Mag Analog)	----	----	----	----	UCB (Curtis)

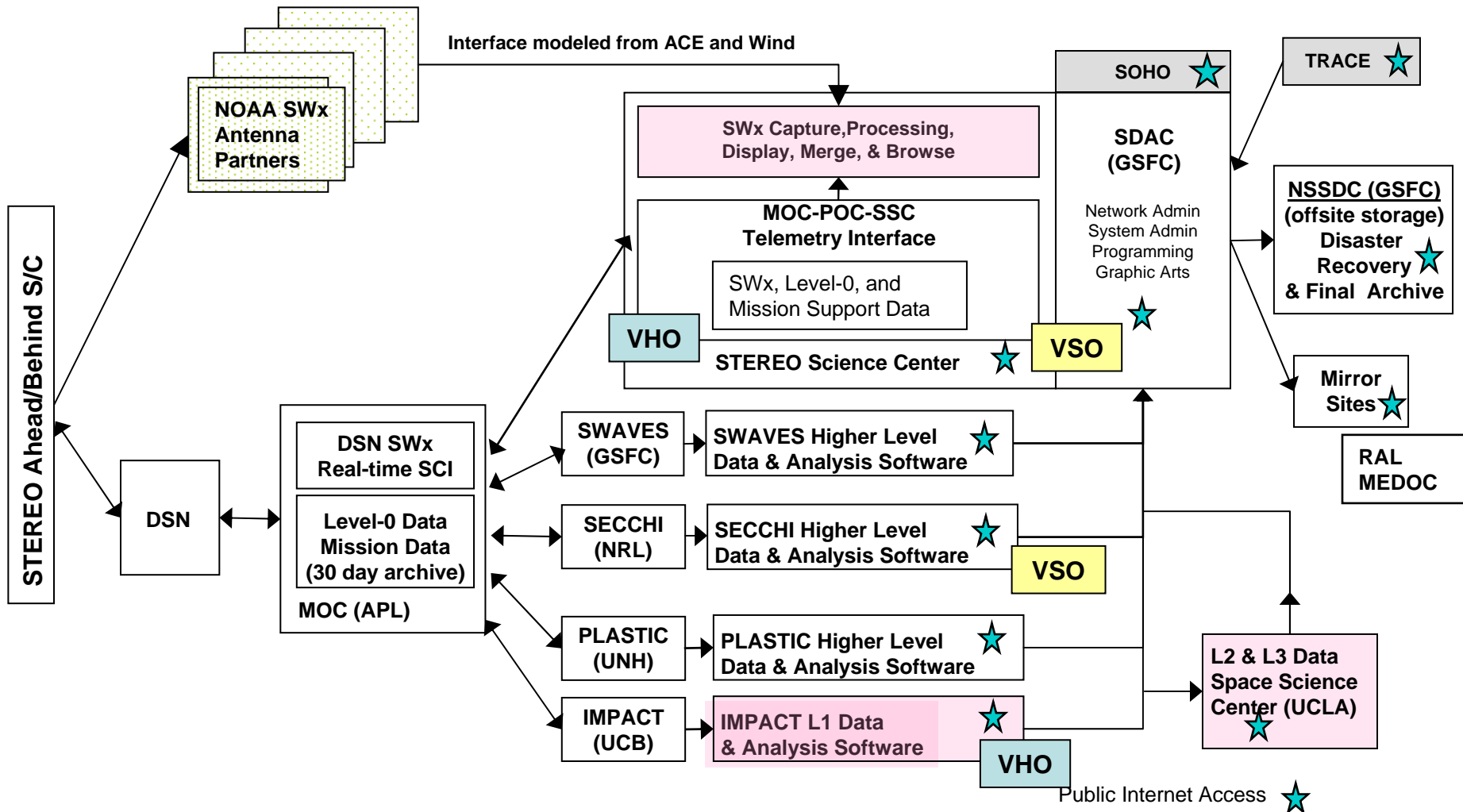
# IMPACT Particles Domain: Solar Wind, Suprathermal and SEP electrons, SEP ions



# IMPACT Data Products

- Beacon
  - Produced at SSC (GSFC)
  - Uses NOAA antenna partners for 24/7 space weather monitoring
- L1
  - Produced at UCB
  - Highest time resolution data in physical units of all measured quantities
  - Available in variety of formats (CDF, ASCII, FITS, ...)
  - Reside natively in ISTP-compliant CDF's
- L2
  - Produced at UCLA
  - Key parameter (1-minute cadence) data in physical units
  - Includes PLASTIC and SWAVES
  - Available in ASCII
- L3
  - Produced at UCLA
  - Higher level products such as event lists
  - ASCII

# Data Flow Block Diagram





# Beacon Data Processing Software Update

- IMPACT delivered first version of Beacon processing software to SSC in November
- Outstanding issues:
  - Need calibration data to finish conversion to physical units (SWEA and STE)
  - Not all status codes have been fully defined (SEP)
  - Still need to check-out MAG code
  - All instruments: Need to convert from instrument coordinates to STEREO HGRTN coordinates

# L1 Data Processing Software Update

- LET, SIT, SEPT, MAG, SWEA and STE have delivered software but all require further testing (and calibrations)
- Still need HET software (delivery expected very soon)
- Possibility of sharing pre-validated data with PLASTIC and S/WAVES
- Produced preliminary L1 science products during recent Mission Simulation

# L2 Data Processing Software Update

- Need to finalize quantities to include in L2
- First cut quantities = Beacon quantities
- Possibility of including derived quantities
- Need to continue working with PLASTIC and S/WAVES

# Building from CDAWeb

The header of the CDAWeb interface includes the NASA logo and the text "GODDARD SPACE FLIGHT CENTER Space Physics Data Facility". It features a search bar with "SEARCH NASA" and a "+ 60" button. Below the search bar are navigation tabs: "+ SPDF HOME", "+ DATA & ORBITS", "+ MODELS", "+ RESOURCES", "+ RESEARCH", and "+ EDUCATION". A secondary row contains "+ CDAWeb Home", "CDAWeb", and "+ FEEDBACK". A banner image with the text "Coordinated Data Analysis Web" is also present.

## CDAWeb Data Explorer

### Select start and stop times from which to GET or PLOT data:

Use pre-defined start/stop times

September 2005 Events 2005/09/07 00:00:00 2005/09/20 00:00:00

Use custom start/stop times

Start: 2005/10/30 00:00:00 (YYYY/MM/DD HH:MM:SS)

Stop: 2005/10/31 00:00:00 (YYYY/MM/DD HH:MM:SS)

### Select an activity:

Plot Data : select one or more variables from list below and press submit.

List Data (ASCII) : select one or more variables from list below and press submit. (Works best for <31 days)

Download original CDFs : press submit button to retrieve list of files. (Max. 200 days - use [FTP site](#) for larger requests)

Create CDFs for download: select one or more variables from the list below and press submit. **NEW**

Get [CDFX](#) - IDL GUI plotting/listing toolkit software. To be used with either the daily or "created" CDF files available above. **NEW**

### Plotting Options

Use coarse noise filtering to remove values outside 3 deviations from mean of all values in the plotted time interval.

Double the Y-axis height for time-series and spectrogram plots.

Combine all time-series and spectrogram plots, for all requested datasets, into one plot file. **NEW**

Submit Reset

### Variable parameters (required for Listing, Creating and Plotting data only)

#### WI\_PM\_3DP

Ion moments (computed on-board) @ 3 second (spin) resolution (version 3), PESA LOW, Wind 3DP - R. Lin (UC Berkeley)

Available dates: 1994/12/01 00:00:00 - 2005/10/30 23:59:36

(Continuous coverage not guaranteed - check the inventory graph for coverage)

- Proton number density
- Proton velocity vector (GSE)
- Residual Variance in Proton Velocity (6 components in instrument coords)
- Proton temperature
- Alpha number density
- Alpha velocity vector (GSE)
- Residual Variance in Alpha Velocity (6 components in instrument coords)
- Alpha temperature
- Energy range of moments computation
- Gap flag (0=no gap, 1=gap)
- Data quality flag (1=good, 0=bad)

[Wind 3DP [home page at UCB](#) (with plotting and digital data)]

Submit Reset

# CDAWeb+

- Primary access point for IMPACT Level 1 Data
- Ability to save previous plot layouts
- More flexibility with plot titles, axes, linestyles
- Export underlying CDF's to many other formats (ASCII, FITS, CDFML (XML))
- Tight integration with L1 spacecraft (ACE, WIND, etc.)
- Other possible functionalities? Do we want to include some derived quantities? Other plotting abilities not available in CDAWeb that would be appropriate for multi-spacecraft (time delays)? What about images? Mapping to solar images/movies?

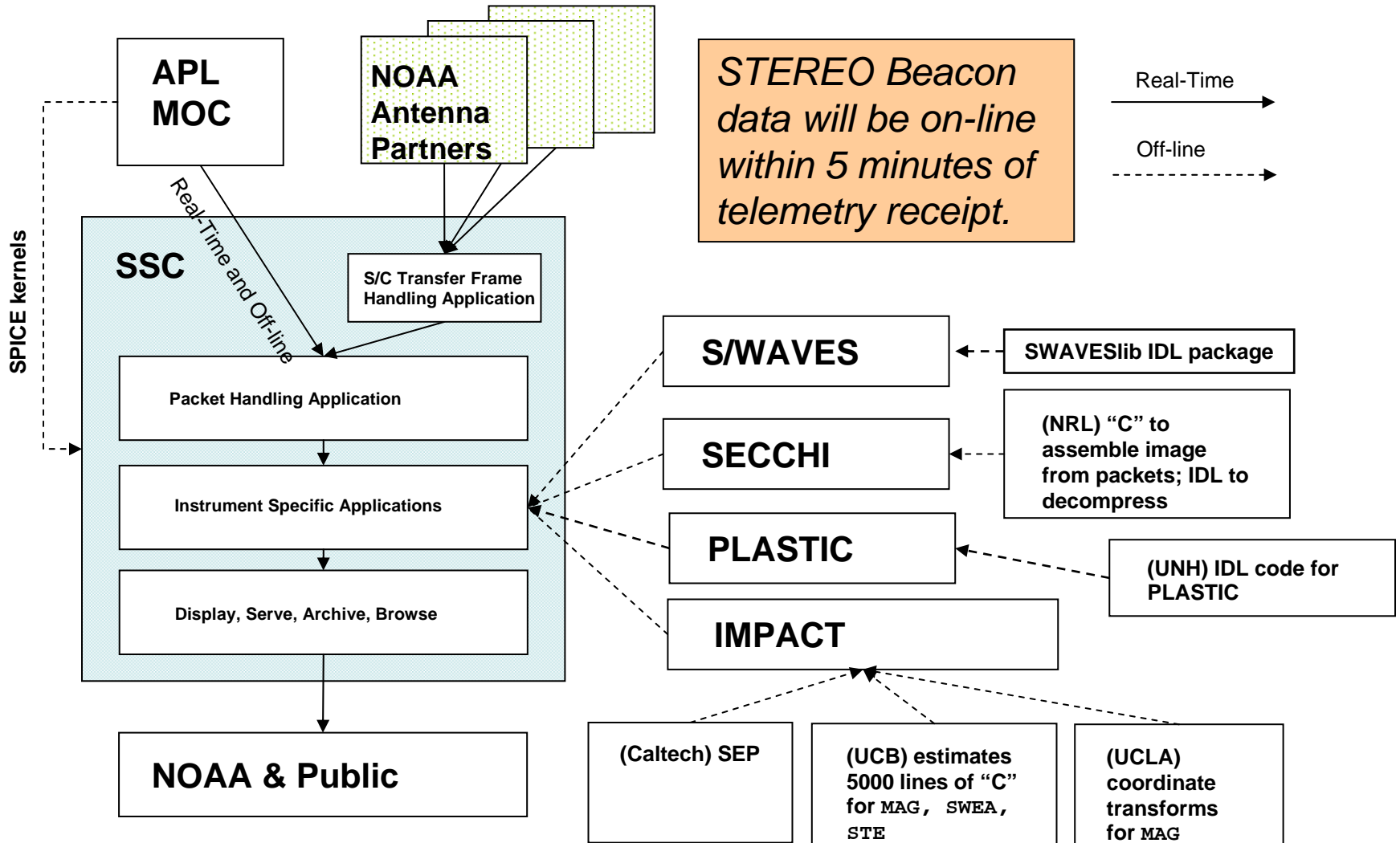
# SOAP Interface

- Simple Object Access Protocol is a web services messaging standard used increasingly by industry
- Allows local/custom applications to query and access data over the web
- Will conform to emerging VHO standard (which will interface with the VSO and other VxO's)
- Current model is the ACE Science Center using a modified version of the SPASE dictionary to define queries, but SPASE needs expanding to fit needs of particle data

# Berkeley Static Data Plots

- In addition to CDAWeb-like browser, Berkeley intends to make static plots at different time intervals (daily, 3- and/or 7-day, and Carrington Rotation)
- Primarily intended for internal diagnostic use but will provide interface for the larger community
- HELIOS/IMP-8/ISEE-3 browser as proxies for STEREO/ACE at:  
[http://sprg.ssl.berkeley.edu/impact/data\\_browser.html](http://sprg.ssl.berkeley.edu/impact/data_browser.html)
- Again, question of how best to utilize/visualize multi-spacecraft data

# Space Weather Beacon Processing





# Beacon Data Browser

- IMPACT responsible for “in situ-only” Beacon data browser (SSC will create an “integrated” browser as well)
- How best to display these data? Probably need input from NOAA and other end users.
- Do we make static or dynamic plots? If dynamic, should there be a standard default plot(s)? If so, what should it look like?
- Should we try to include ACE NRT data?

# STEREO Beacon Products

- [STEREO Science Operations Plan](#)