

# IHDEA-2020 [October 21st (day 3)]

## Solarsoft (J Ireland)

Baptiste is introducing Jack Ireland who is briefly presenting SolarSoft and related news.

Solarsoft is developed by Lockheed Martin funded by NASA  
NASA dropped anonymous FTP => Solarsoft is updated for access methods

A Roberts: prep routines as part of a webservice?

J Ireland: there was experimental version sometime ago... not sure this is still developed. That would remove need of having local version of Solarsoft.

## SPEDAS (J Lewis)

SPEDAS interoperability and metadata tools

Example workflow: use THEMIS FGM data + solar wind parameter + geomagnetic indices, models => plot and compare. Few IDL lines for this. Can we add extra dataset (not in hardcoded in SPEDAS)?

"Load data from" interfaces: HAPI, CDAWeb...

Magnetic field model: input parameters can be set (upstream SW)

Data analysis toolbox: coord transform, filtering...

HAPI, CDAweb data selectors. Comparison show gaps in HAPI (on CDAWeb...)

Metadata Handling comparison:

- Non-ISTP attributes are very useful. E.g. COORDINATE\_SYSTEM is optional, but usually required to understand data.
- Missing extra attributes within HAPI?
- Das2: arbitrary attributes look seem acceptable

=> missing coordinate system metadata

Coordinate systems: need standardisation / recommendations?

Example = GSM (IGRF-12 vs IGRF-13)

(T. King): SPASE takes definition from publish literature. => consolidation needed, share common definitions

(B Ceconi): VESPA is working on a solar system reference frames

(L Bargatze): Subtree under GSM needed. Information not always in CDF attributes.

(J. Vandegriff): there are a lot of frames

(B. Ceconi): Use SPICE ? CDP/3Dview team has produced SPICE kernels for Sun-Earth missions

## CDPP tools (N. André)

CDPP started in 1998. Many collaborations and space mission support. Education and Outreach  
<http://www.cdpp.eu>

AMDA

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Data from several datacentres, interoperable connexion (CDAweb, simulation). Internal format is NetCDF. Webservices. Private space for embargoed data.

- Data tree: local and remote data (and uploaded). Timetables, catalogues
- Data analysis capabilities.
- New data: Heliospheric datasets, old mission from Earth magnetosphere.
- Machine learning capabilities.
- HAPI interface

3Dview

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Inspired by NASA VISBARD

Access to several database with 3D representation of data and models

Propagation Tool

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Solar wind propagation to space probes

Connections with other databases and tools: APIS, MEDOC...

Transplanet

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Run on request Ionospheric model at planets

Heliopropa

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Predict SW status at planets and comets. Several inputs for refined prediction. Virtual space monitor, for global context SW/planet interaction. part of ESA SSA (Space Situational Awareness)

Community infrastructure. User committee reviewing activities. 10-15 publications per year

(V Genot): HAPI is no longer a prototype

(A Masson): Remark on solar orbiter: some data are not public (e.g., PAS data)

(M Kuznetsova): CCMC type capabilities. Good opportunity to establish working group. Build network of modeling center.

(N Andre): Europlanet network also aims at this.

(M Kuznetsova): IHDEA is the place to build this network.

## Autoplot (J Faden)

More detailed introduction available online

Autoplot uses data sources (URI).

Scripting language: Jython

Aggregation URL of files

CDF Improvement:

- scatterplot made easy now.
- memory limitation (dropped support 32bit machines)

Waveform format recommended by CDAWeb Voltage [Time, Time-Offset]

Support for IDL Save files

Drag and drop jupyter script

ASCII-CSV support

URI Template

HAPI client has been extracted from Autoplot if needed

(J vandeGriff): separated library is on Github?

(B Cecconi): same as tsds.org specification? yes

For tomorrow: items for the idea website

## PyHC (Julie Barnum)

Formed in 2018. reduce replication of development, increase interoperability

Standard set of libraries. best practices, code standards, publicize code. support teams to get funding

5 core packages:

- Heliopy, plasmaPy, pysat, SpacePy, SunPy

PyHC standards: see website

- based on astropy, selected by consensus

PyHC fall meeting, starts next week

- <https://heliopython.org/meetings/fall2020/>

Main PyHC website

- <https://heliopython.org/>

(A Masson): size of the community?

(J Barnum): usually 20-30 persons weekly. Mailing list > 100

(B Cecconi): self evaluation for new package into PyHC. Tutorials showcase was planned.

(J Faden): is C wrapper with python ok? => probably yes

(A Masson): how to measure usage of tools?

(J Faden): there is this request header "agent" capability that can be used

(B Martinez): could also be an extra http request parameter (origin=library\_name)

(A Roberts): survey of tools used

(L Hayes): <https://ui.adsabs.harvard.edu/abs/2020SoPh..295...57B/abstract>

## SunPy (L Hayes)

Sunpy open source package for solar physics

using mature and maintained code (e.g. astropy)

Core and affiliated packages (e.g. AIAPy)

Code standards (open source, testing, version control, documentation..)

Contribution welcome (the more contributors/users the better code quality)

## Highlights 2.0:

- clean up of code
- download capabilities improved
- coordinate transforms
- astropy times
- logging system

Fido: unified API to search and download data

Main data containers: TimeSeries and Map

Coordinate package (based on astropy.coordinate)

Roadmap:

- extend NDCube to Ndimensional
- standardized metadata approach
- affiliated packages

(A Roberts): feature tracking, fourier transform... guide for packages to do this?

(L Hayes): SunPY will do the data loading, and the rest of the python ecosystem would be use. Not sure about feature tracking.

(J Ireland): for specific question: there is something in based on sunpy. but better to use existing other libraries (scikit-image).

(Veronique Delouille) : you mentioned standardized approach to metadata. What does this imply?

(L Hayes): standardised metadata container (shared between data containers). Currently metadata is mapped with FITS metadata. NetCDF reader under development.

(J Vandegriff): coordination between SunPy/SpacePy/NDCube for translation between models

(L Bargatze): need aggreting information spread in the community

(V Delouille): use the UCD (Unified Content Descriptors fro IVOA). Could be a first step?

Link for UCD1+ controlled vocabulary <https://ivoa.net/documents/UCD1+/20200212/index.html>

(T King): Data DOI could be used for mapping, with type of metadata.

(L Bargatze): check and compare with SPASE MeasurementType, Qualifier, various Quantifiers, CoordinateSystemName, CoordinateSystemRepresentation, etc.

(B. Cecconi): Lee: an assessment was done some time ago: <https://doi.org/10.5281/zenodo.3479164>  
Check appendix 1

## PySPEDAS (E Grimes):

PySPEDAS can use data loaded by IDL SPEDAS. same system variables.

Many datasets supported

unittest IDL / Python

jupyter notebook for examples

## Kamodo (D De Zeeuw)

Nasa open source project. CCMC codes

Kamodofication: import objects into Kamodo; requires some Komodo-specific coding my modelers (for interpolation between model output point, for example); currently all is done in Python on CCMC

servers, although after this is shown to work, there may be discussion about a possibly generic server interface to model data (others were interested in participating in that server interface development)  
Nice plotting capabilities!