Recent developments of the Solar Imaging Pipeline

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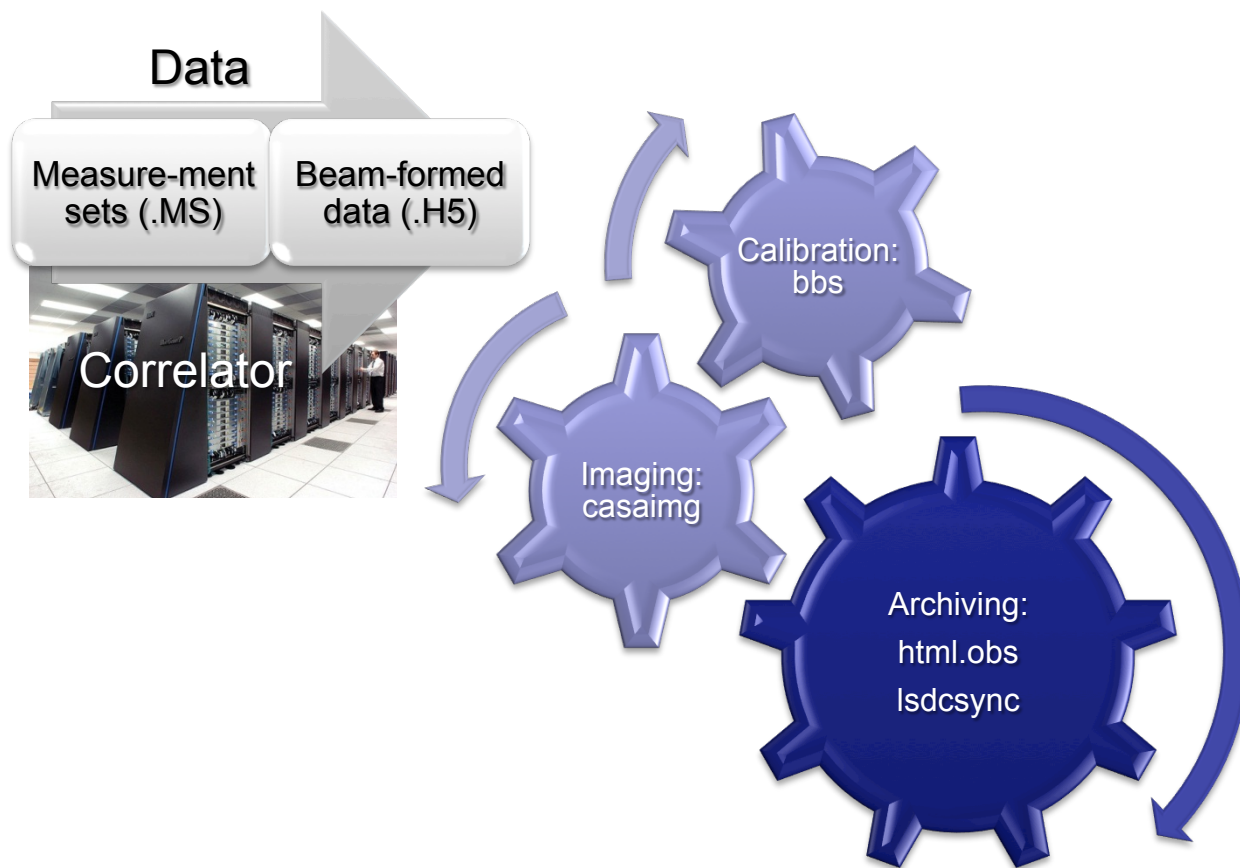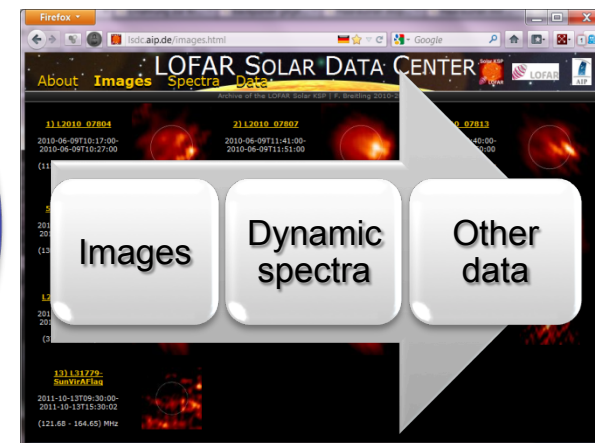Leibniz-Institut für Astrophysik Potsdam (AIP)

Outline

- overview of the Solar Imaging Pipeline
- improvements
- new features
- unsuccessful attempts
- work in progress
- ToDo List

The Solar Imaging Pipeline

Data

Measure-ment sets (.MS)

Beam-formed data (.H5)

Correlator

Calibration: bbs

Imaging: casaimg

Archiving:
html.obs
lsdcsync

Front end / Web interface

LOFAR SOLAR DATA CENTER

About **Images** Spectra Data

Images

Dynamic spectra

Other data

Main problems of solar imaging

- bursts on short times => no aperture synthesis => poor uv-coverage
- bursts very variable

  => no RFI flagging

  => no or poor sky models => no demixing
- extended object => calibration of long baselines more difficult
- intense object => disturbs calibrators => few useful calibrators
- more turbulent ionosphere => calibration more difficult

Main functions of the Solar Pipeline

- channel flagging (only for calibrator) and averaging
- calibration of calibrator beam
- solution transfer to solar beam
- multiscale clean
- selfcalibration
- simulation of Sun and A-team sources
- producing dynamic spectra
- collect data from GOES, SDO, NRH
- compilation of web page for the Solar Data Center

General improvements

About 50 revisions including

- calibrate => calibrate-stand-alone
- extension for calibration with higher time resolution (<1s)
- performance
- parallelization
- stability
- sourcefit.py for fitting source position and extension with Gaussian

Improvements to the Spectrummaker

- using percentile instead of median
- accelerated percentile calculation by only using every 1000th value
- preview plots for raw and flagged data (1D / 2D)
- flagging of channels with RFI
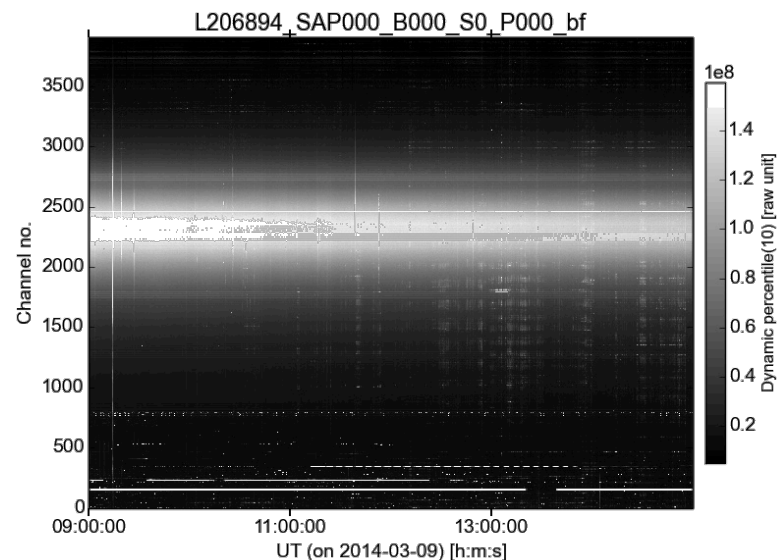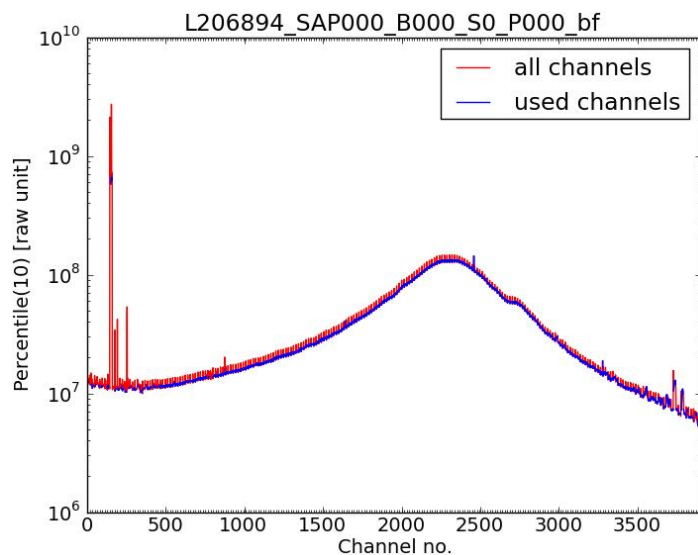
Improvements to the Spectrummaker

- sequential reading for processing large files (>32 GB)
- speedup through improved Numpy computations (percentile calculations, flagging, averaging, etc.)
- switched to HDF5 format for compressed data because of bug in the python "dump" command
- selected time range also in automatic mode
- automatically discard empty regions
- more verbosity
- better error handling
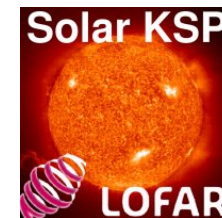- other important improvements

Improvements to the Solar Data Center

- faster creation of web pages
- processing of only certain time steps
- share the same spectra via links
- link to .info files with information regarding the processing

- include Cycle 0, 1

New features

- selfcalibration
- program for downloading and renaming from the LTA (LTArename)
- save magnetic field lines to VRML (Virtual Reality Modeling Language) files, and inspect it easily in 3D with other programs
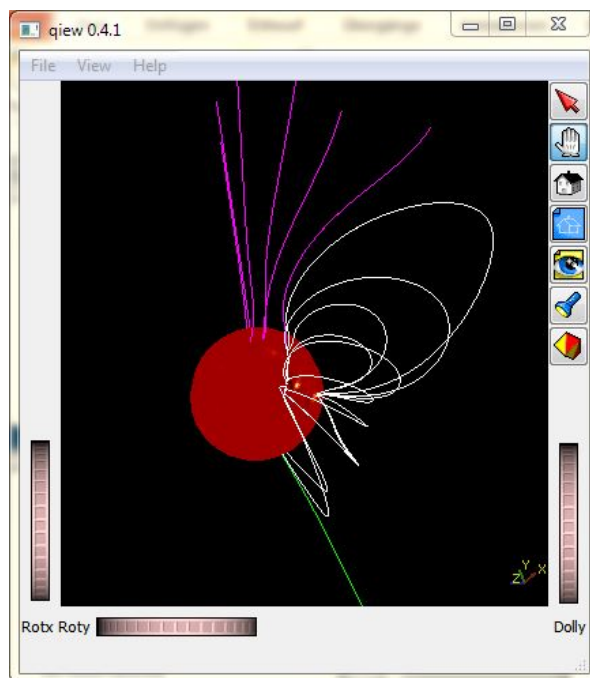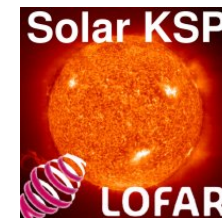
Unsuccessful attempts

- improve sky models with more than one calibrator
- subtract A-team sources
- direction dependent calibration didn't help

Work in progress:
Porting the Pipepline to CEP3

	CEP 1	CEP 2	CEP 3
Nodes	60	100	1 (of 20)
CPU	2 *Intel Xeon L5420 quad core*	24 *AMD Opteron 6172*	20 *Intel Xeon E5-2660 v2*
CPU PassMark	3512 x 60 x 2 = 0.42M	7784 x 100 x 24 = 19M	13659 x 20 = 0.27M
RAM	16 GB	64	128 GB
Storage	1 TB	20 TB	20 TB

- different hardware and storage
- new job management software SLURM

=> data and jobs need not be distributed but run on one node (lof001)

No access to CEP3 during network reconfiguration from May 18-29

ToDo List

- improve calibration
  - demixing
  - ionospheric corrections
  - polarization information?
- processing solar observations from cycle 2, 3, etc.
- reprocess certain interesting events
- documentation

Summary

- many changes on the Solar Imaging Pipeline
- and the Solar Data Center
- porting to CEP 3 in progress
- ToDo list is full

Thanks for your attention!