Update on the Solar Imaging Pipeline & Solar Calibrator Survey

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Solar Key Science Project

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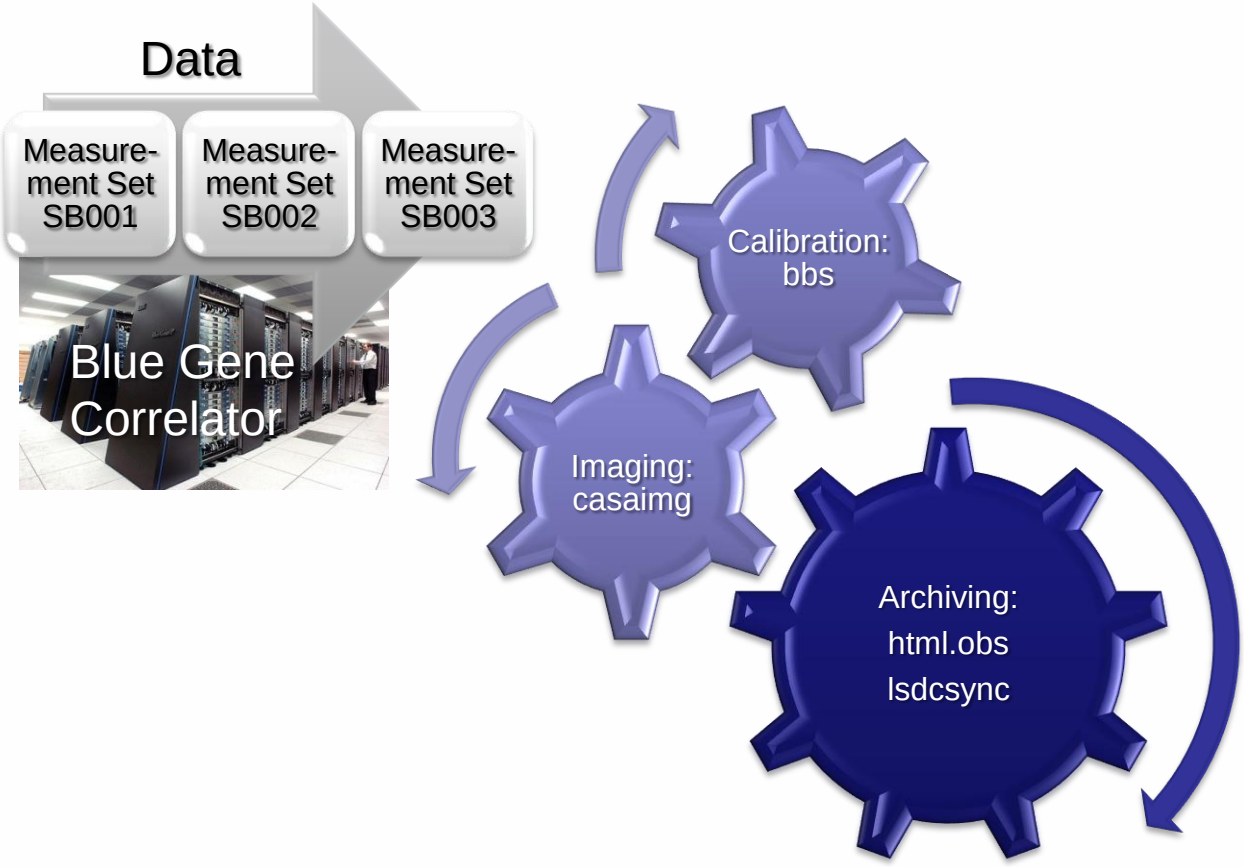
ASTRON (via EVO)

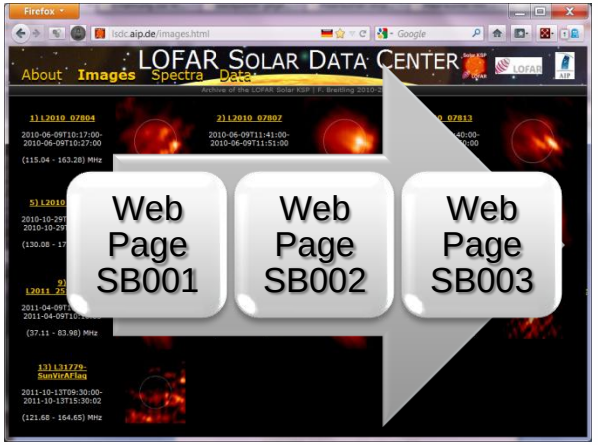
Overview

I. Progress of the Solar Imaging Pipeline
II. The Solar Calibrator Survey
   - Purpose
   - Results
   - Summary / Conclusion

I. Progress of the Solar Imaging Pipeline

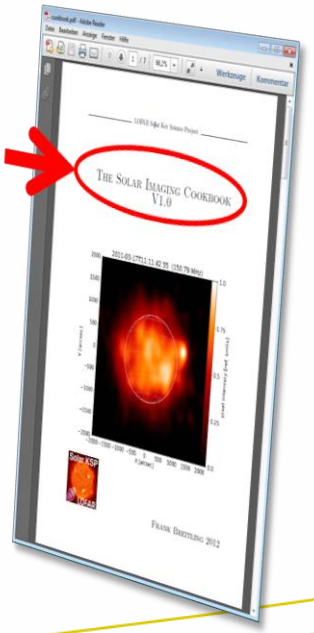


Front end / Web interface



Todo list from LSM July 11, 2012

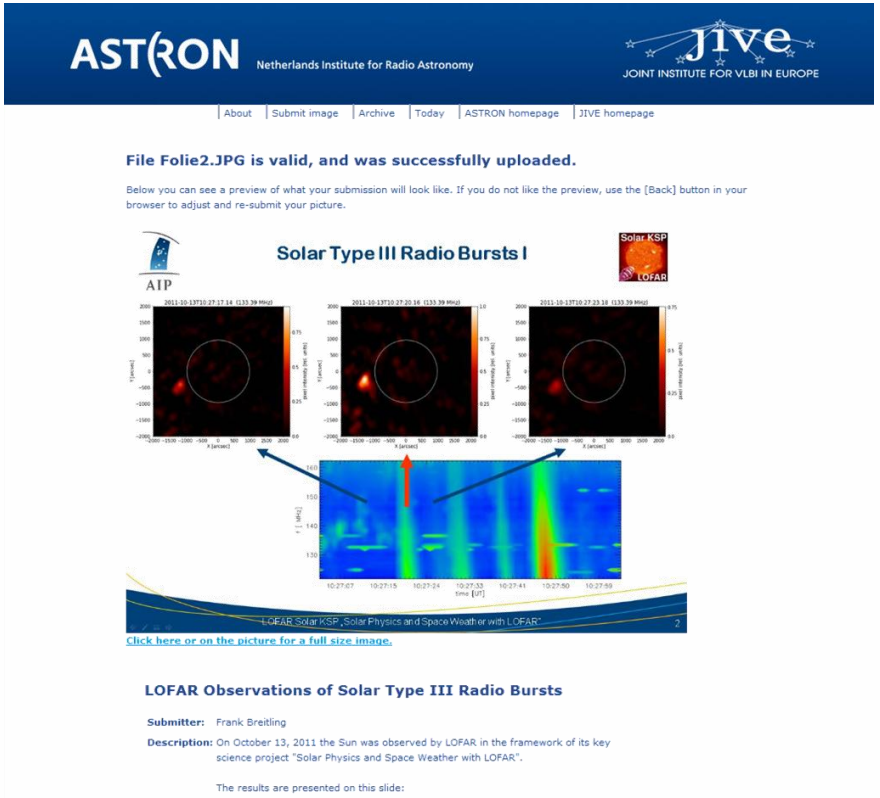
- Outstanding implementations
  - Verify absolute flux scale
  - Fix CASA imaging performance
  - Use AWImager: issue #3527
  - (Multiscale-) Clean
  - Ionospheric corrections
  - Calibration of tracking observations
  - Imaging synthesis now in CASA ✓
    - Ticket ID: IQZ-102668
  - Polarization
- Add
  - Spectra from LOFAR imaging data
  - High resolution spectra from single station / BF observations ✓
  - IPS data from R. Fallows et al.
  - Measurement Sets and FITS files
  - X-ray data from GOES satellite ✓
- Administration
  - Migrate the LSDC to its new server at the AIP ✓
  - Set up backup with the LOFAR Long Term Archive
  - Process the data from the first 48h campaign this fall
- Documentation
  - Solar Imaging Cookbook



- done ✓
- in progress
- progress stopped due to other problem !

Progress beyond the todo list

- First tests for demixing of solar data
- Solar Data Center: chronological order of data
- Submitted ASTRON Daily Image as suggested by Jan Noordam
- Solar calibrator survey (data analysis)



II. The Solar Calibrator Survey

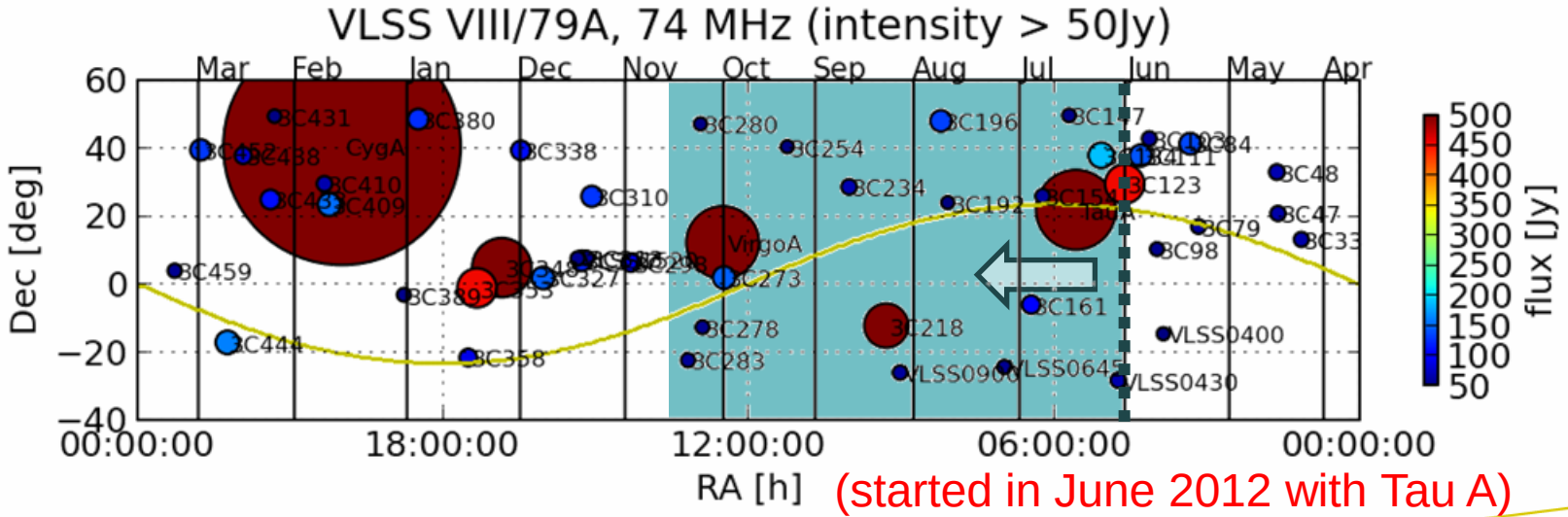
Goal: Find calibrators for the Sun / create a map of solar calibrators

Why an issue?: The Sun is a very strong and moving radio source

Requirements:

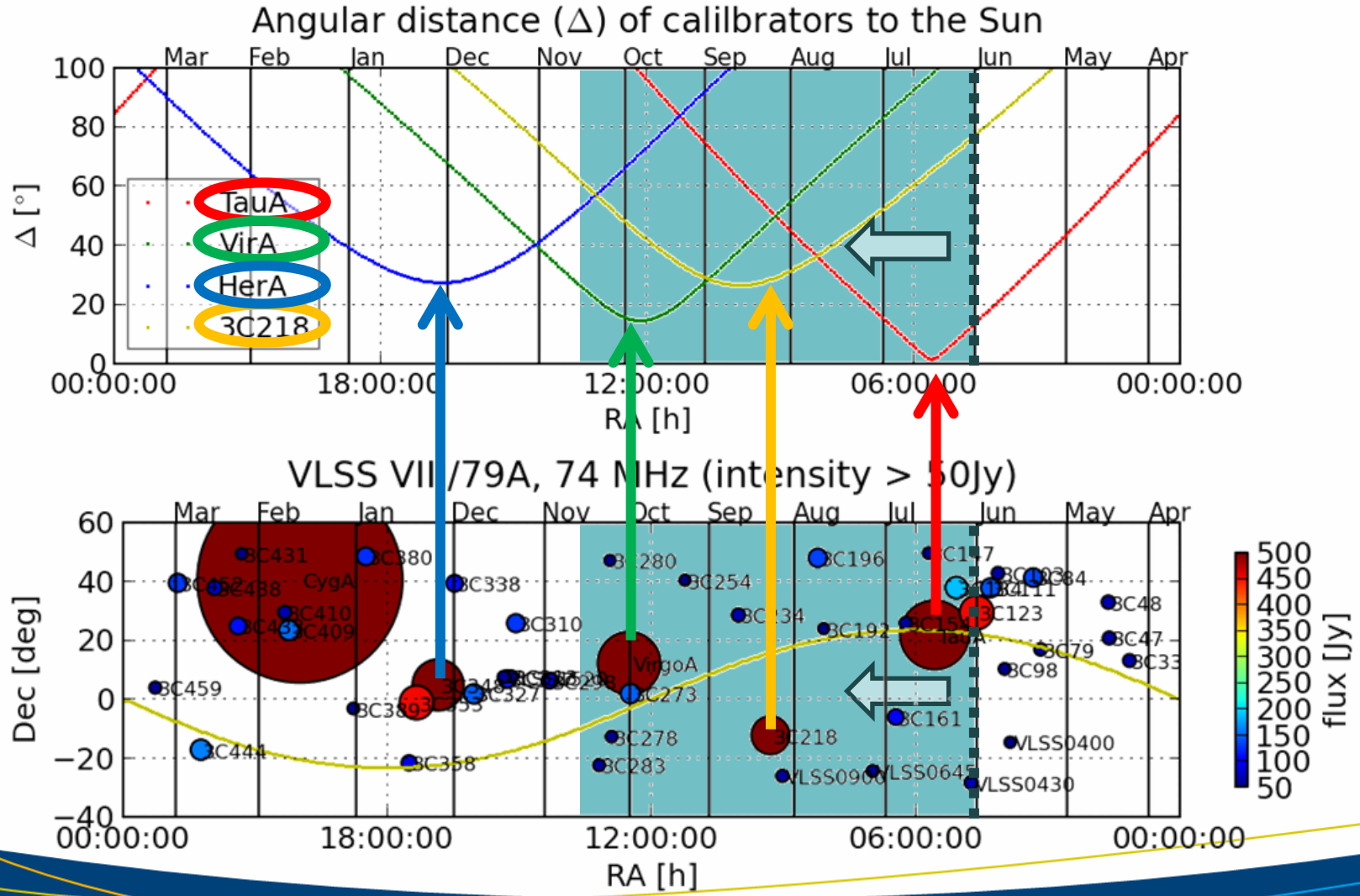
a) Calibrators
- strong (> 500 Jy?)
- point like (<1arcmin)
- close to the Sun

b) Observations
- few subbands
- short (<10 min)
- but frequent (every 2nd day)



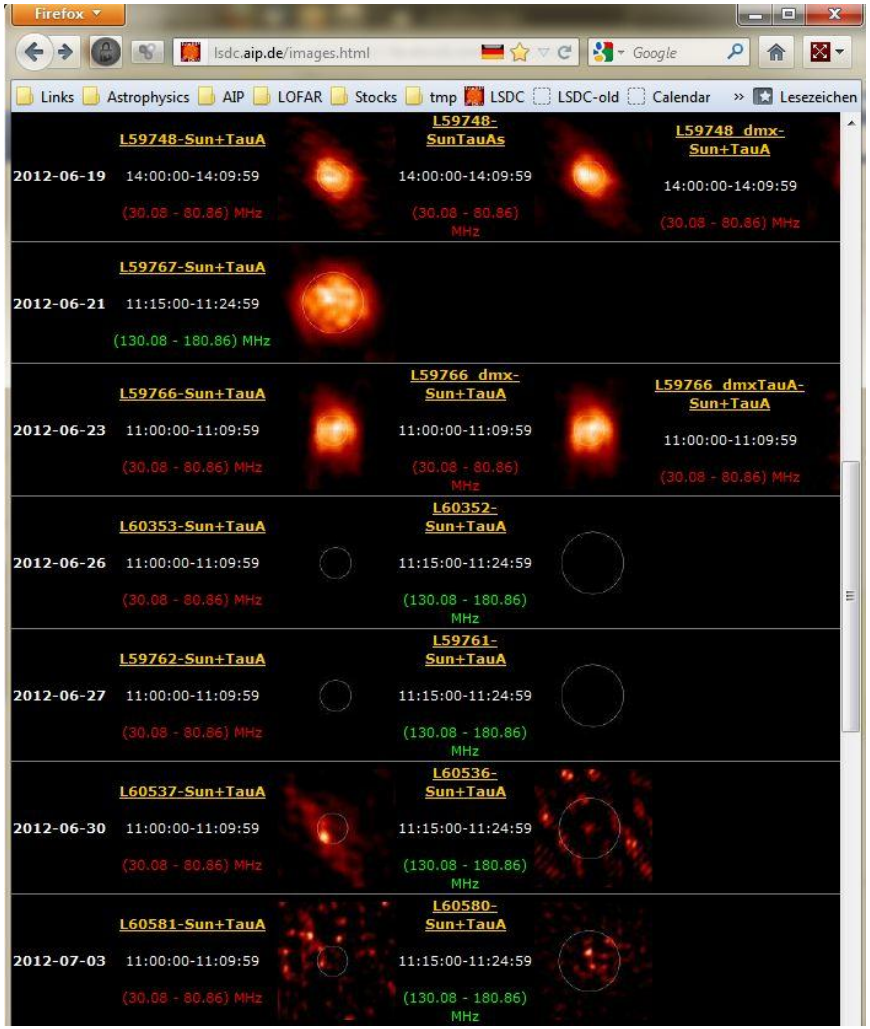
(started in June 2012 with Tau A)

Selection of 4 candidates

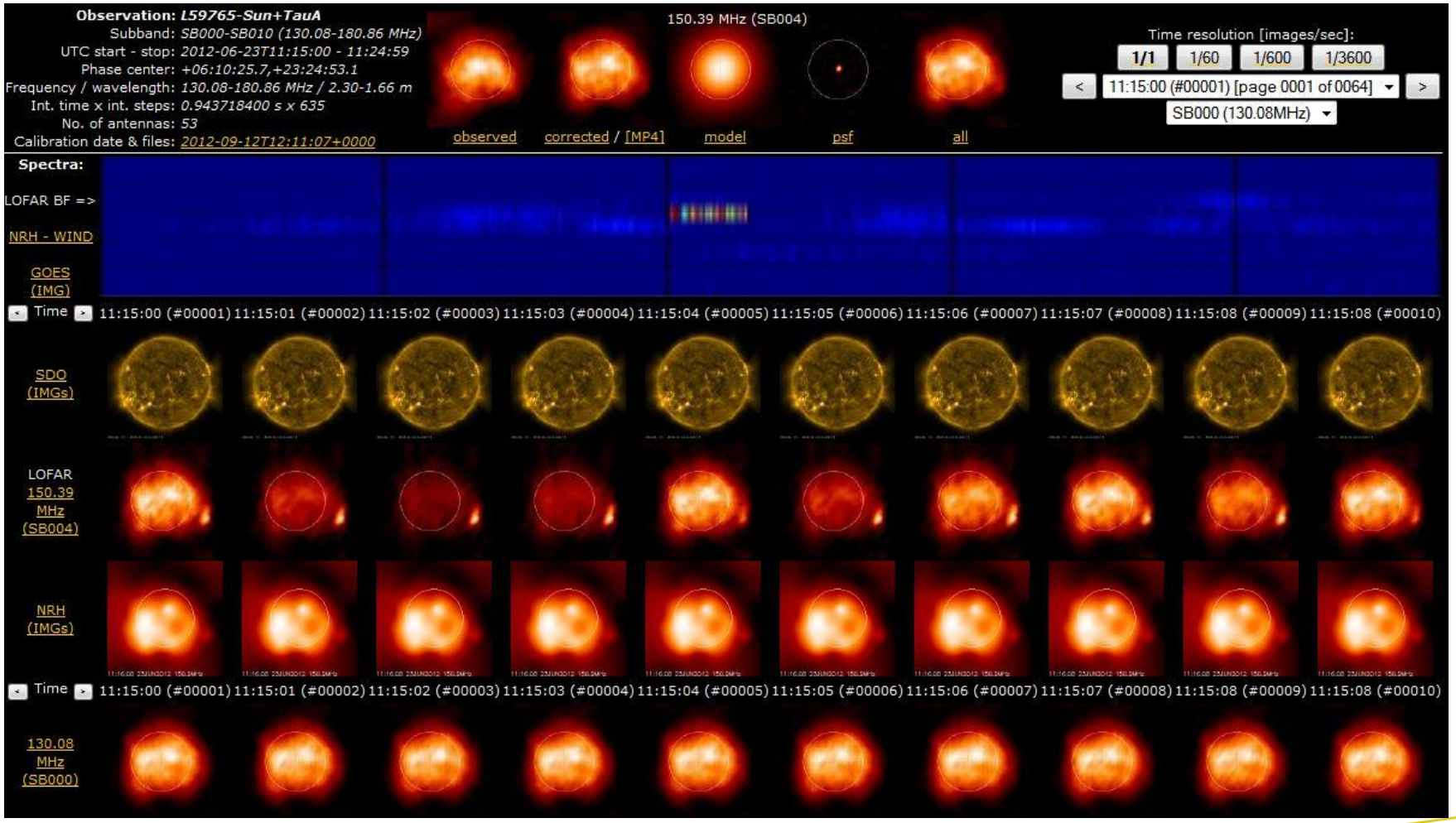


Images can be found at the LOFAR Solar Data Center

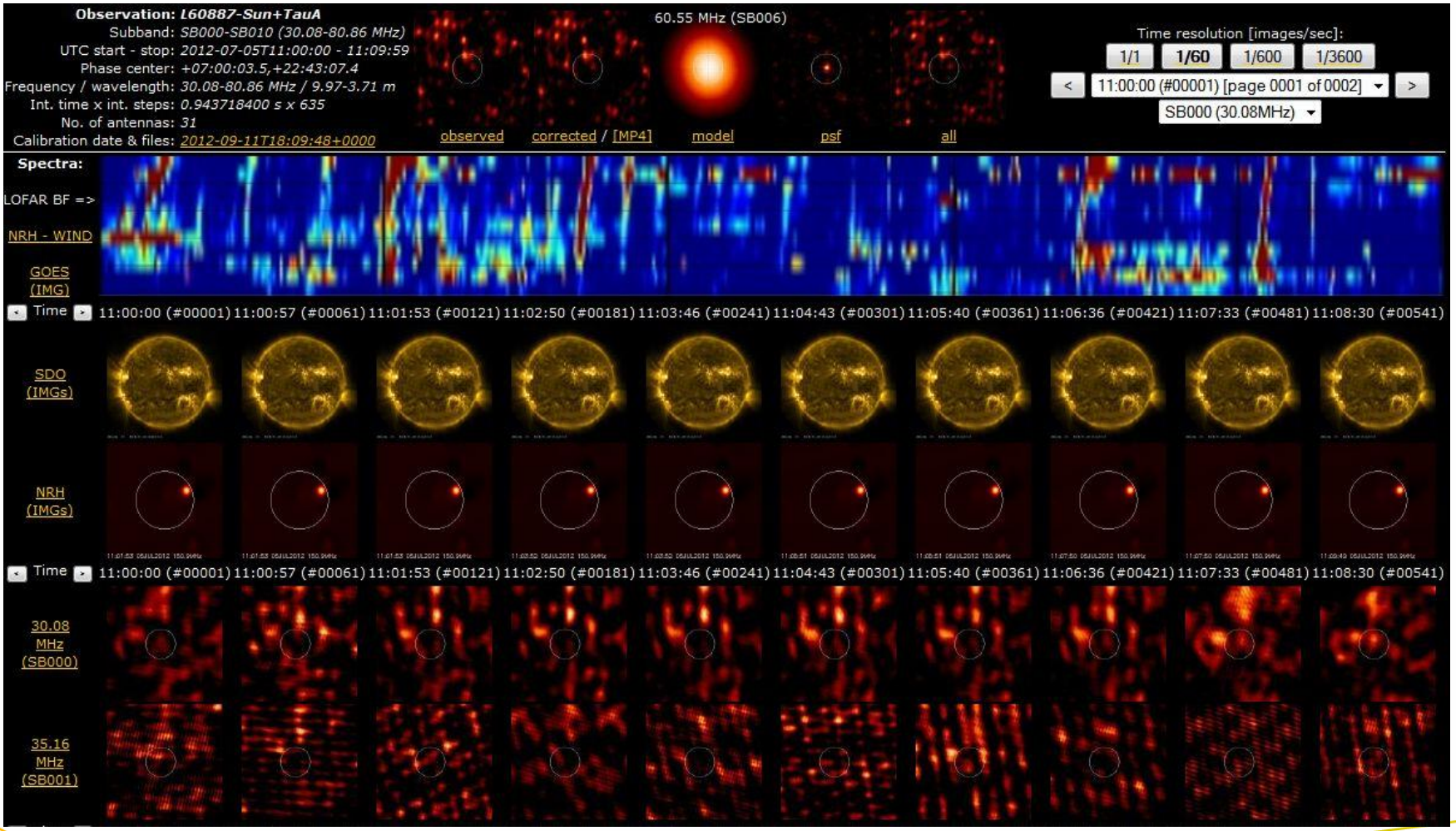
(http://lsdc.aip.de)



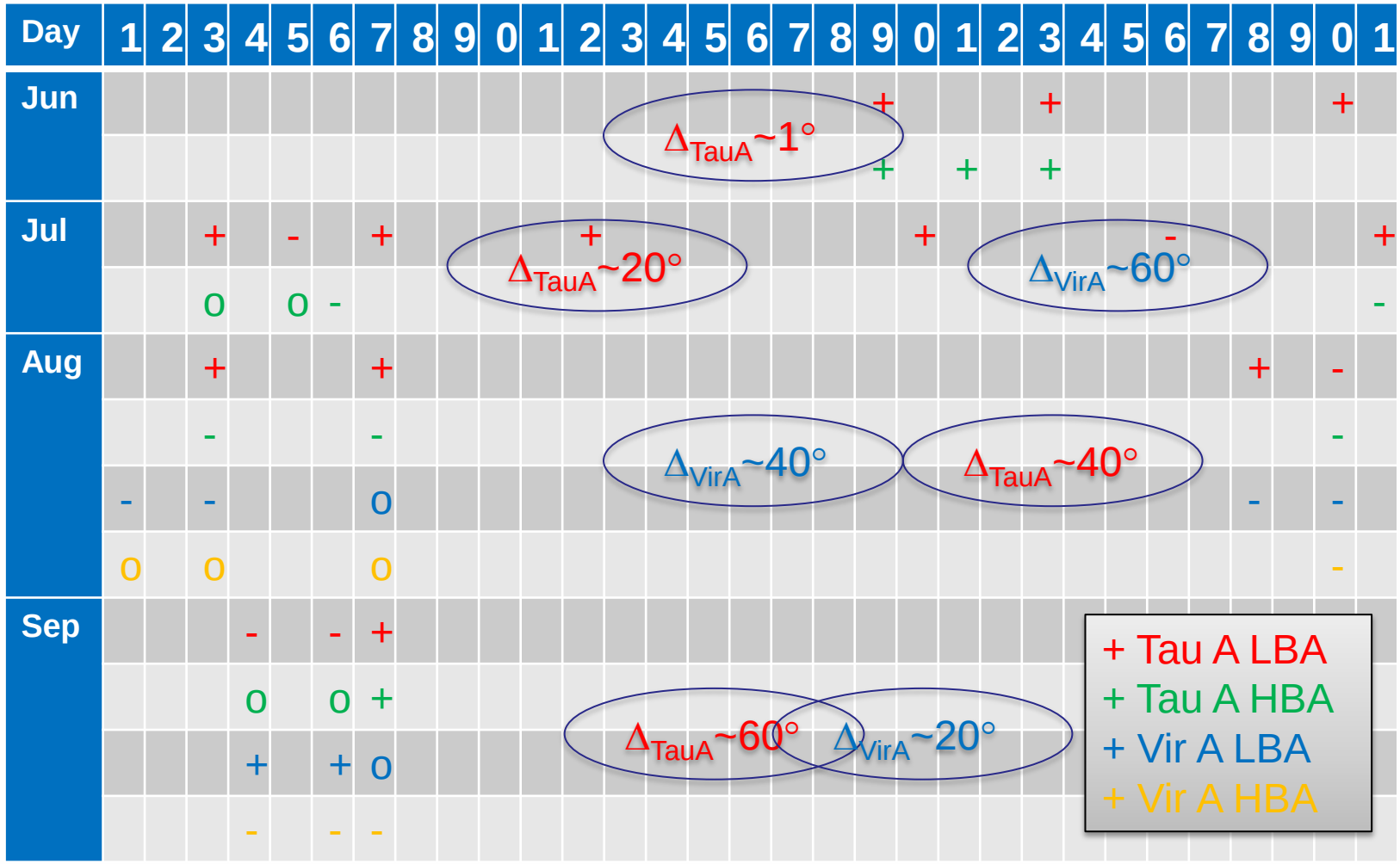
Example for good high-band calibration with Tau A (Δ_{TauA}~8°)



Example for bad low-band calibration with Tau A (Δ_{TauA}~20°)



Overview of image quality



Summary

- Taurus A (1900 Jy @ 80 MHz, 1300 @ 160 Mhz) very useful
  - even at a distances > 80 deg
  - even in high band
  - images quality sometimes increasing with distance

  ⇒ it is surprising for us and we would like to understand this better (side lobe effect?)

- Virgo A (1600 Jy @ 80 MHz, 570 Jy @160 MHz) less useful
  - no good results at large distance
  - now approaching smallest distance, latest observations look promising

Conclusions

- This data gives us first insights about calibrators for the Sun
- The data is still too sparse to study the variation of the image quality with distance of the calibrators in detail
  - ⇒ a better coverage would be needed
  - ⇒ observation proposal was updated, submitted and approved
  - ⇒ new observations have started (including new calibrators)
- Latest results can be found at the Solar Data Center at http://lsdc.aip.de/ .