Solar KSP User Experience

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Solar Key Science Project

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Overview

I. Difference of solar imaging from standard imaging

II. Experience with the LOFAR services

III. Issues

IV. Summary / Discussion

Solar Imaging = Dynamic Imaging Spectroscopy

Main Problems

- short int. times   => • poor uv-coverage   => • no RFI flagging
- poor calibrators   • poor sky models   • turbulent ionosphere

Data processing steps

- NDPPP channel flagging (only for calibrator) and averaging
- calibrate (BBS) of calibrator beam
- solution transfer to solar beam
- casapy multiscale clean
- Selfcalibration
- producing dynamic spectra + collecting data from GOES, SDO, NRH
- compilation of web page for LOFAR Solar Data Center

Pipeline Status

Imaging Pipeline	Standard	Solar
Demixing	-	-
Preprocessing	+	+
Calibration with calibrator	?	+
Imaging / Cleaning	?	+
Selfcalibration / Subtraction	-	-
Spectra	-	+
Solar Data Center	-	+

LOFAR services

- Science support was very helpful and responsive (Thank you!)
- Compute resources & software
  - \+ so far good availability of compute resources & LOFAR software (CEP 1)
  - \- no batch system required the development of own job management
  - \- migration to other clusters requires new adaption to batch systems (e.g. Juropa Cluster in Jülich)
  - \- closing of CEP 1 raises question: where can software and data processing be developed in the future?
- Issue tracker very useful
- LOFAR User Forum very useful, but closing it removes possibility of find solutions and discussing problems

LOFAR services (continued)

- Observation proposal submission
  - observation of solar activity requires monitoring of the Sun since one cannot predict what and when a certain feature can be studdied
  - conflicting with conventional observation proposals which address a specific scientific question => unusual work for solar physicist
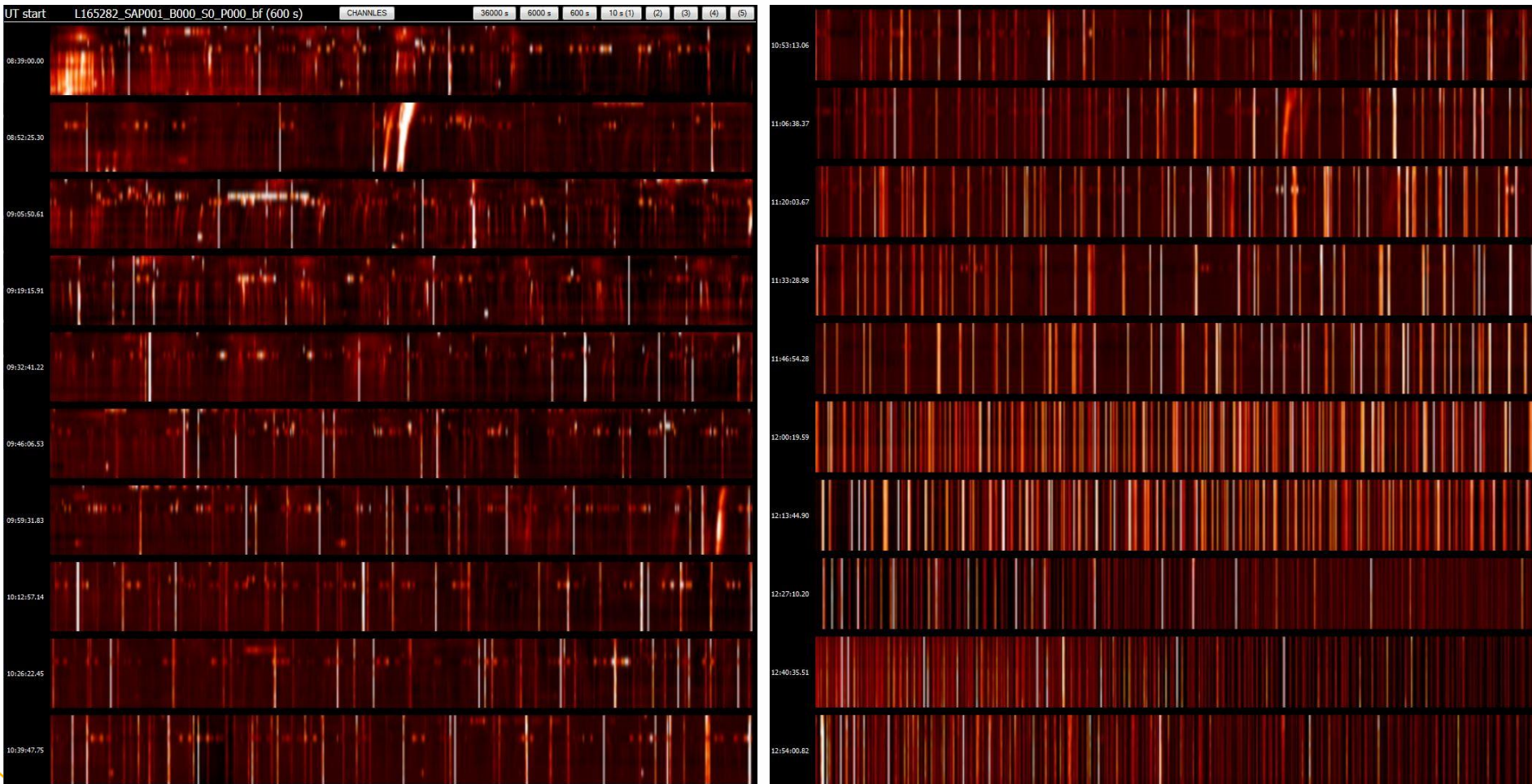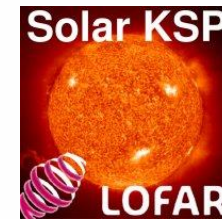 - some referee comments could have been resolved if there was the possibility to reply

Issues

Spectra sometimes stop recording
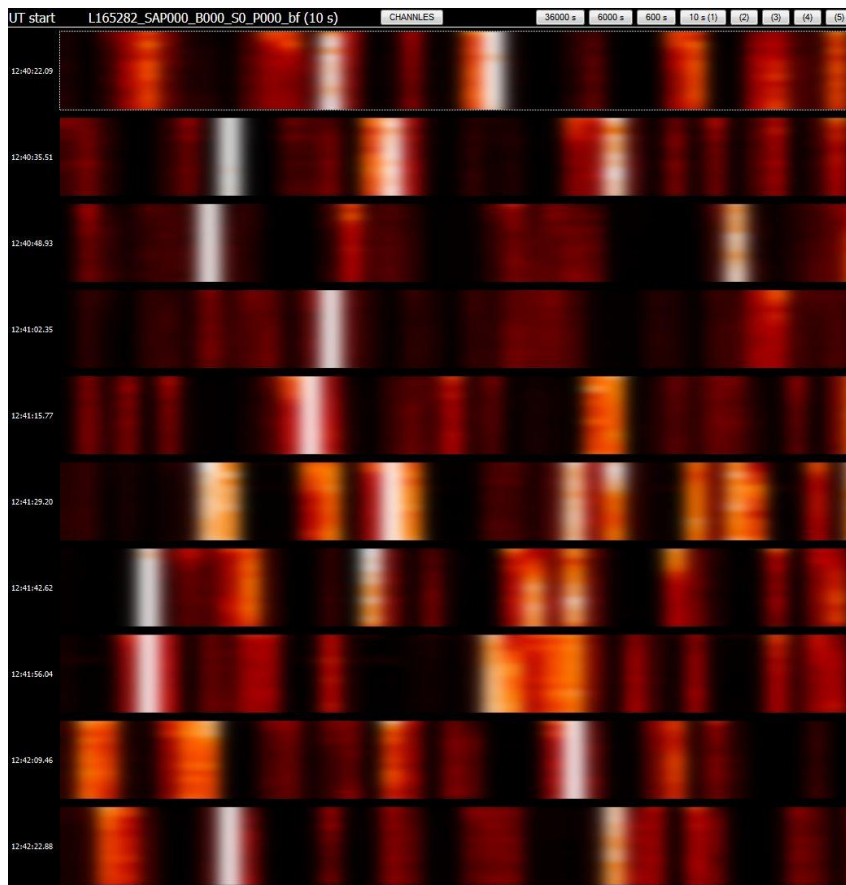
Sun, LBA, 2013-03-05, uncalibrated
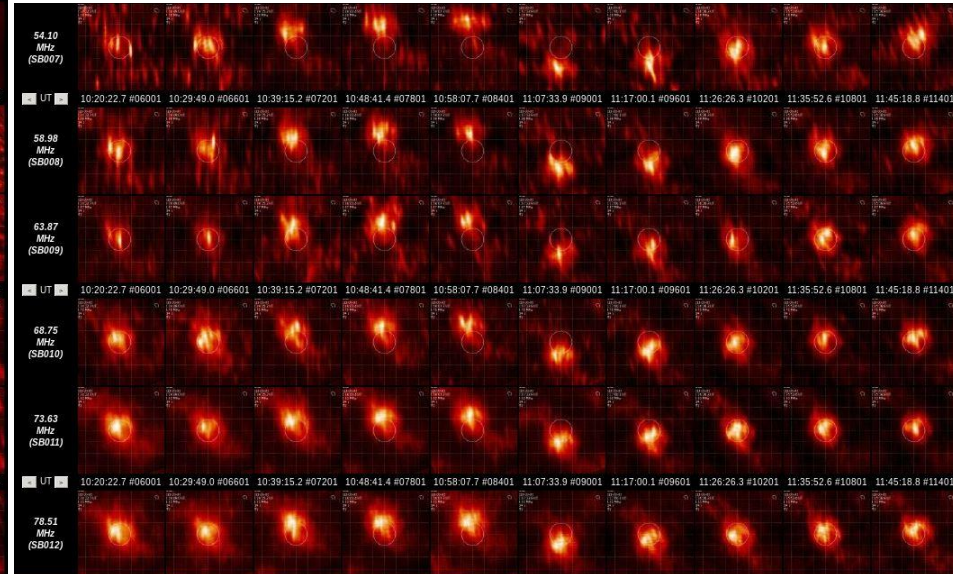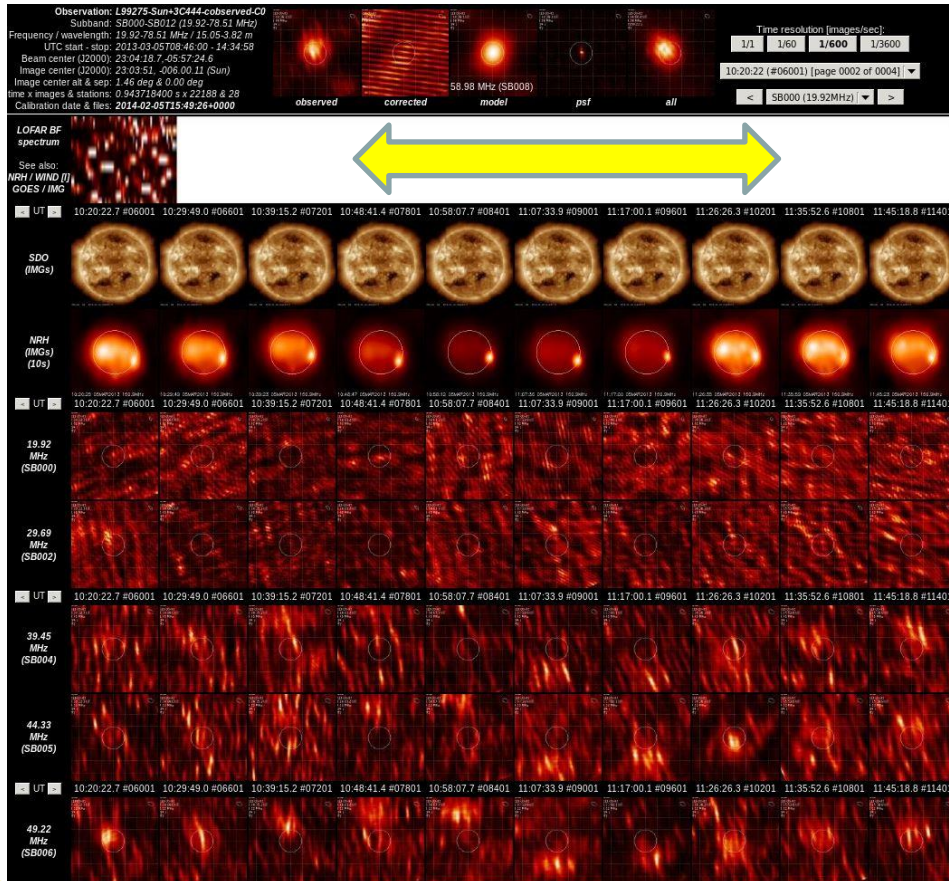
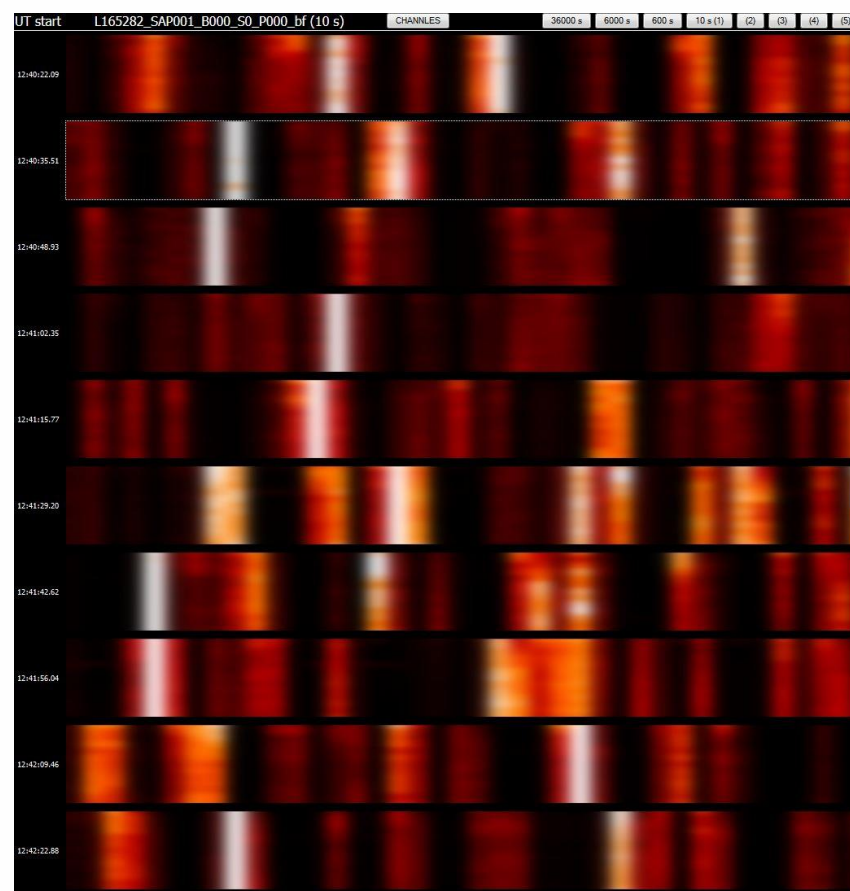# Broadband time dependent RFI
occurs with 50% of our observations

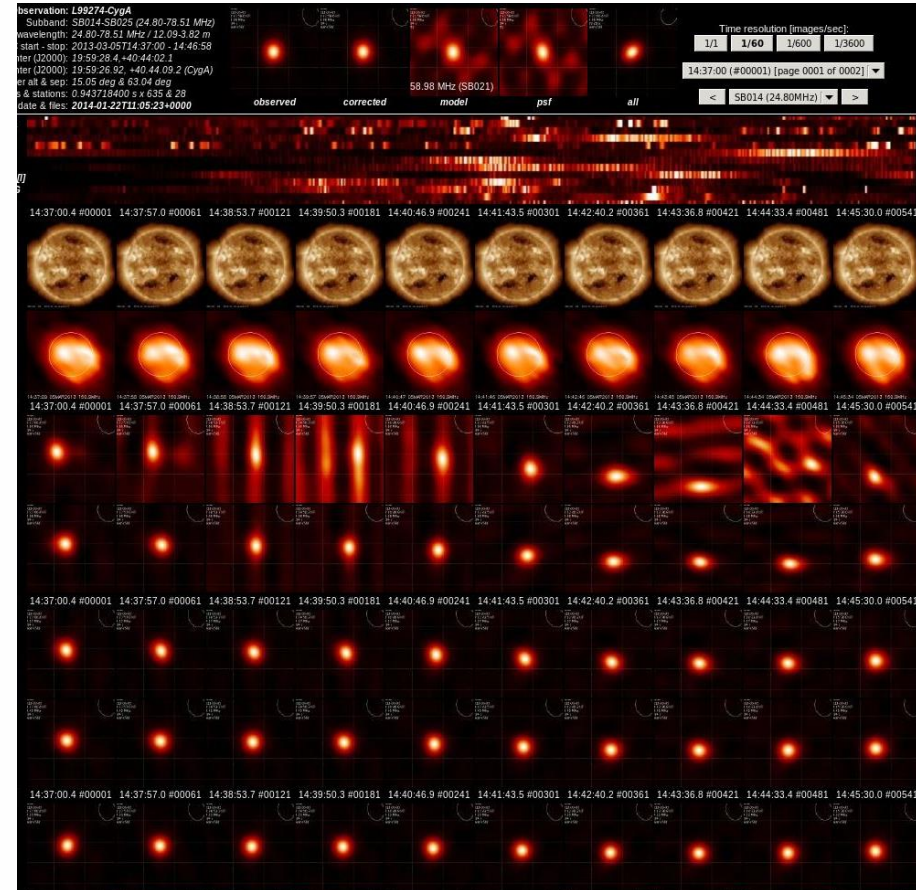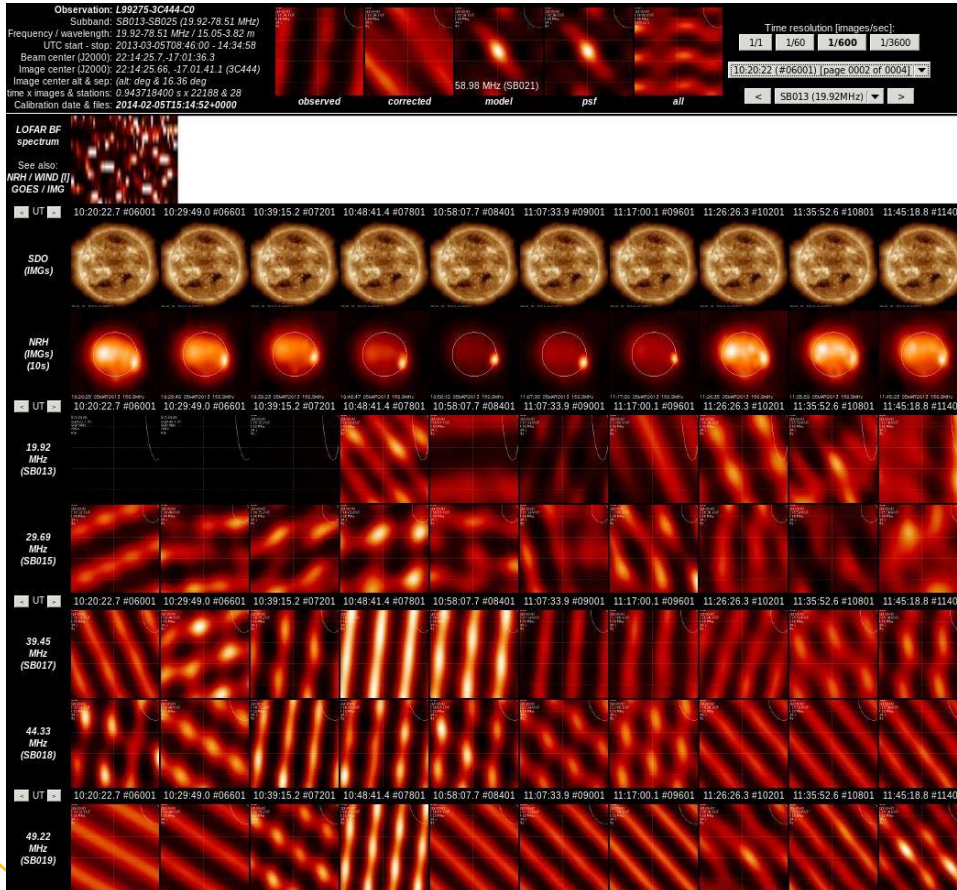# Comparison of beams ($\Delta_{\odot-TauA}=40°$)

Sun

Tau A

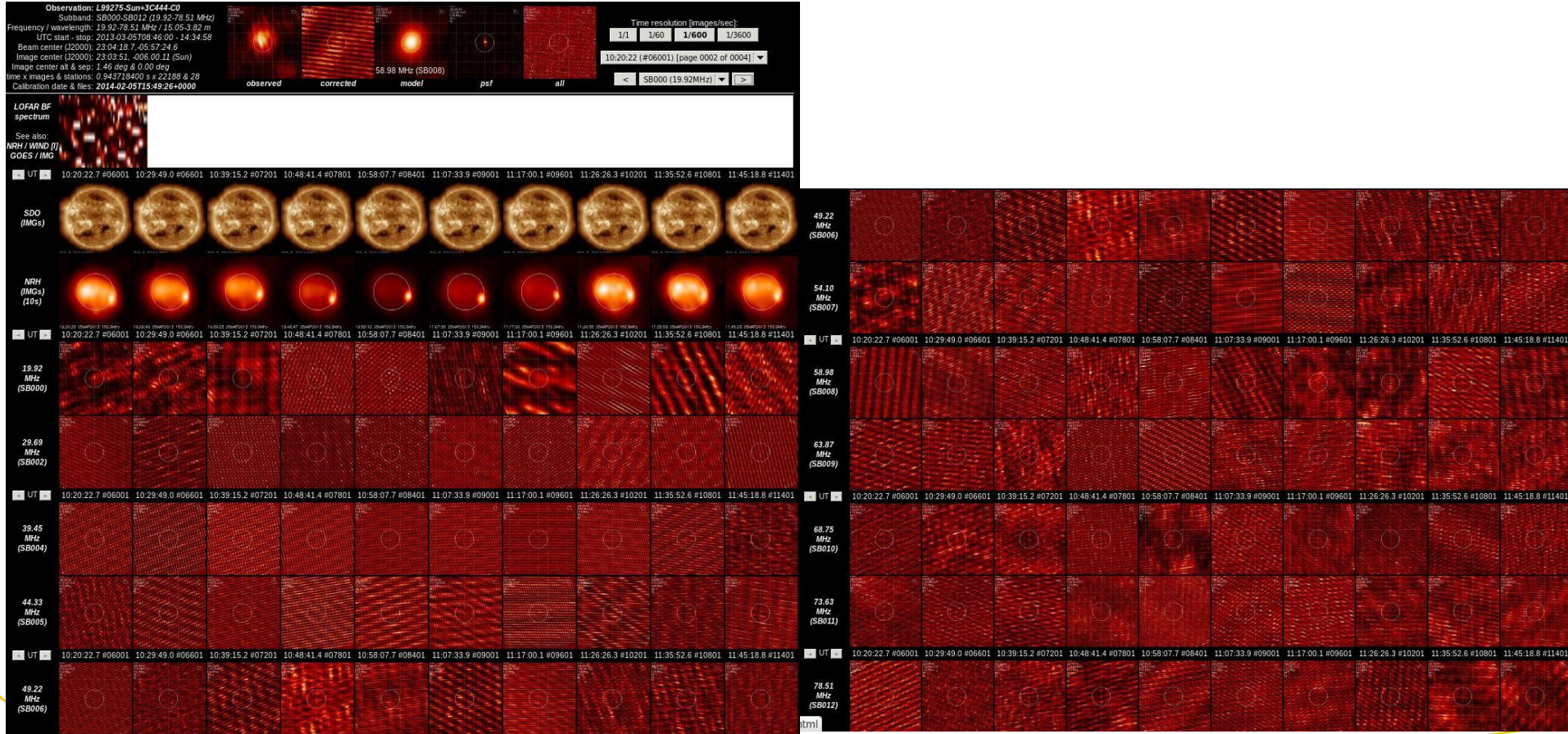# Good calibrators not always availab. (e.g. on 2013-03-05)

3C444 too weak
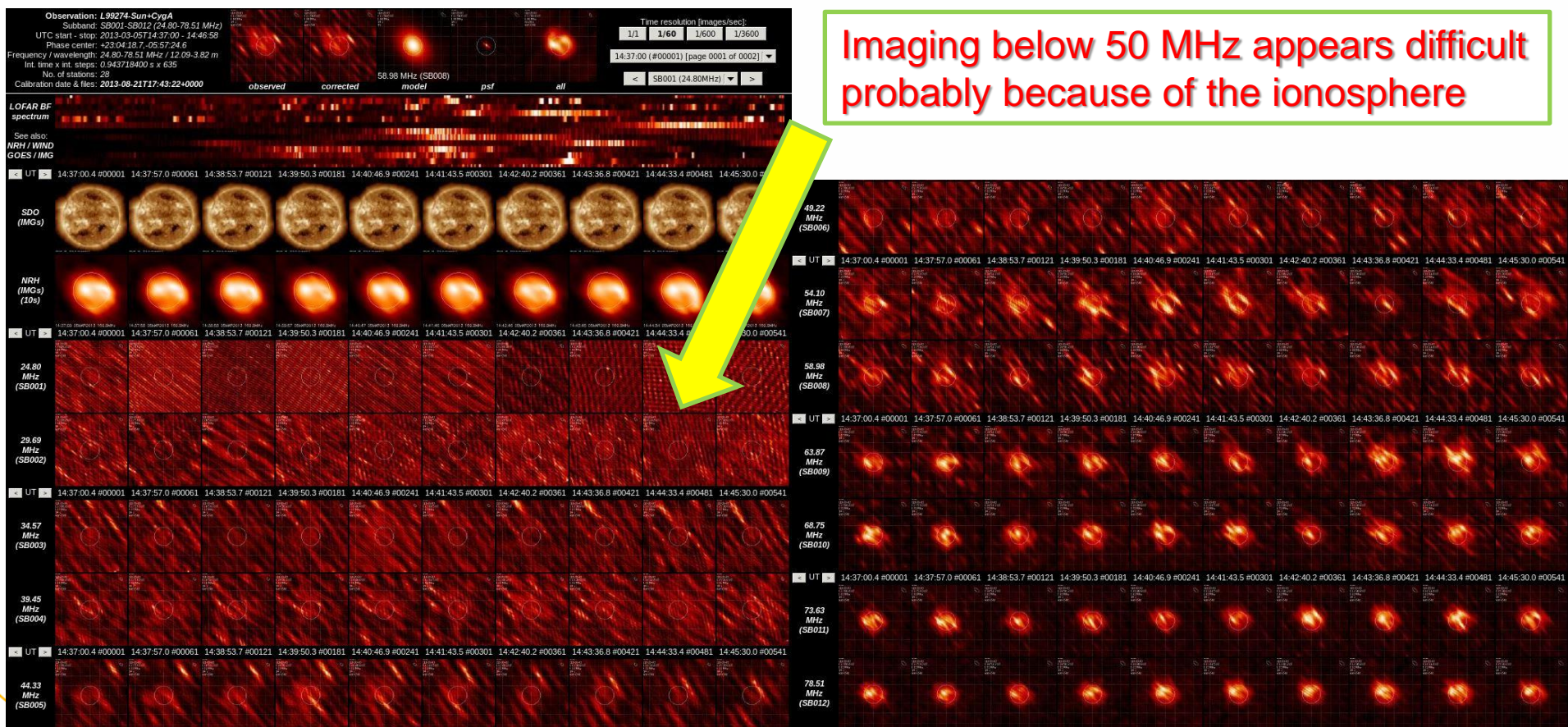
Cygnus A too far away
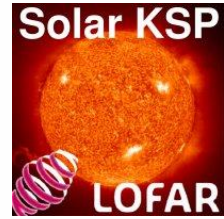
The Sun calibrated with 3C444

The Sun calibrated with Cygnus A

Imaging below 50 MHz appears difficult probably because of the ionosphere

Summary

- **Remaining problems**
  - RFI for at least 50% of our observations
  - calibrators are not always available
  - ionosphere complicates imaging, especially below 50 MHz
- **Possible solutions**
  - selfcalibration ?

    but very computationally expensive and difficult with low uv-coverage
  - demixing ?

    but very computationally expensive and difficult with without skymodel

    so far not successful with Gaussian for the Sun

Discussion

- who has experience with RFI or observed similar problems?
- where can the development of data processing happen in the future?
- no simultaneous spectra & imaging with COBALT is serious drawback
- we would also welcome retrieving the data directly from CEP 2

Solar imaging
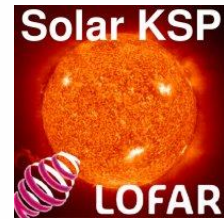
- uses intense and close by calibrators
- calibrators in cycle 0: Cyg A, Tau A, 3C444