Status of LOFAR

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On behalf of the LOFAR team

ASTRON is part of the Netherlands Organisation for Scientific Research (NWO)

June 12 2010: the opening of LOFAR

LOFAR: LOw Frequency ARray

- LBA: 10/30 – 80 MHz; HBA: 120 – 240 MHz
- 48 MHz BW
- AA Stations
  - Core: 24 stations (including 6 in superterp), B ~ 3 km,
    48 LBA dipoles (2 sets) + 2 x 24 HBA tiles
  - NL Remote: + 16 stations, B ~ 80 km,
    48 LBA dipoles (2 sets) + 48 HBA tiles
  - EU Remote: + 8 stations , B ~ 1000 km,
    96 LBA dipoles + 96 HBA tiles

  - Currently: 18 CS + 6 RS + 2 EU
  - Expected in October: 24 CS + 8 RS + 3 EU

LOFAR Super Terp

LOFAR Core Station

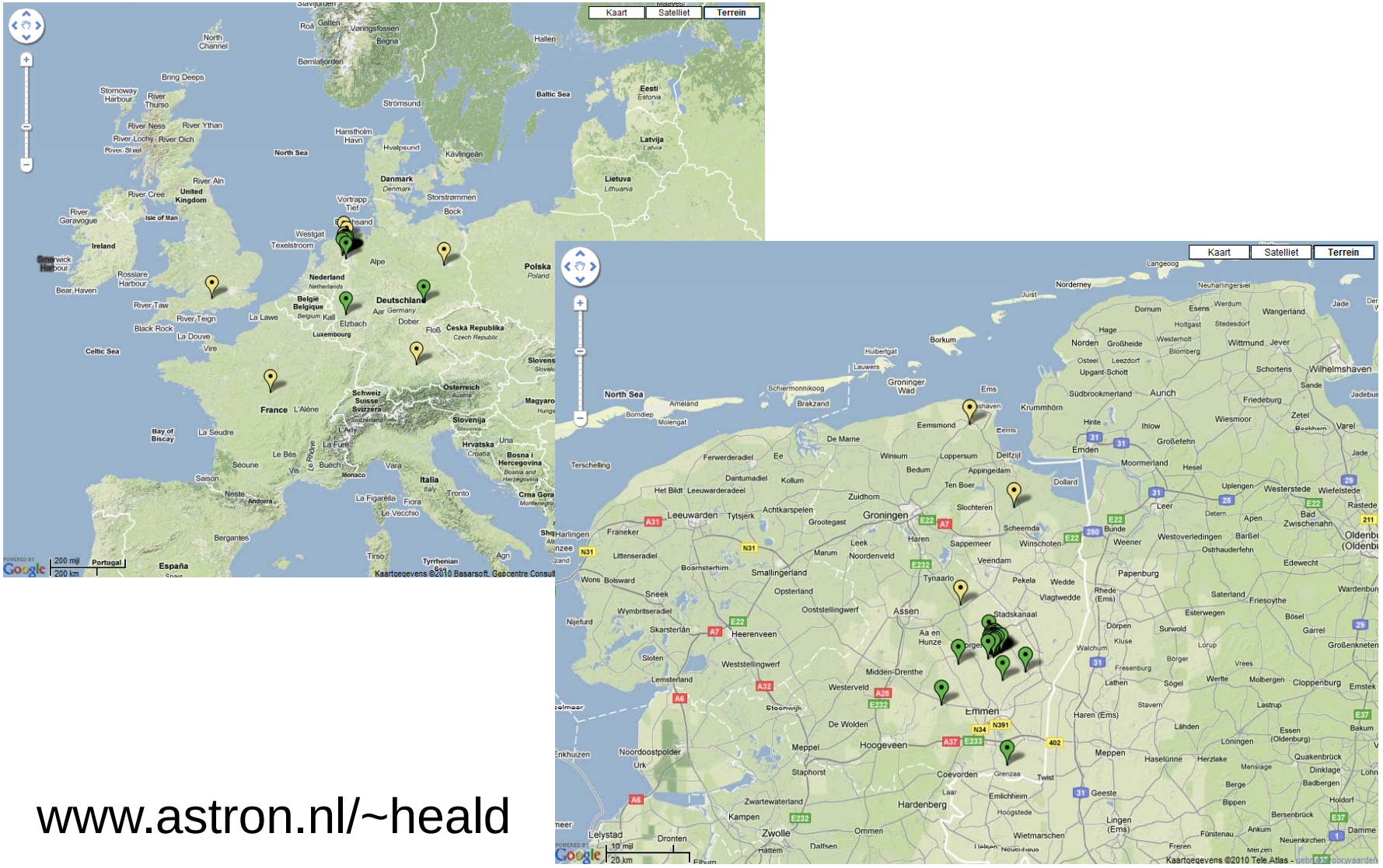
International Stations

Tautenburg

Chilbolton

Effelsberg

LOFAR on the map



www.astron.nl/~heald

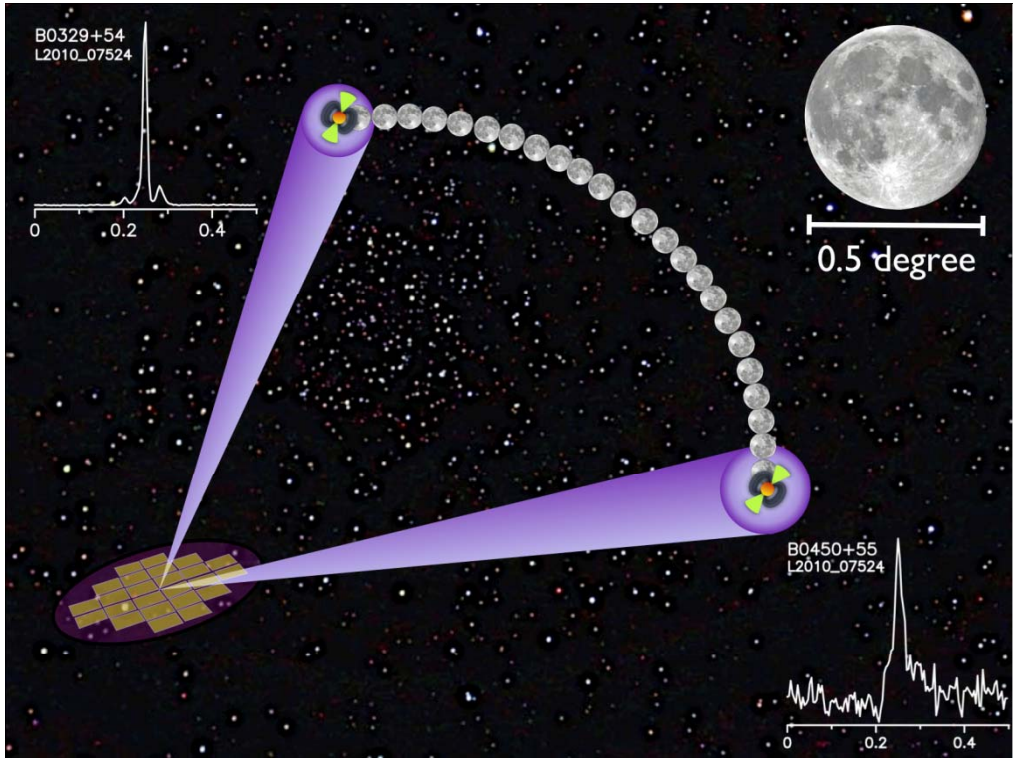
Groningen: CEntral Processing

- Phase 1 Cluster:
  - 72 compute nodes
    - 2 CPUs per node
    - 4 cores per CPU
    - 16 Gbyte per node
    - Total ~ 5 TFlop/s
  - 24 storage nodes
    - ~ 480 TByte
  - 8 data switches
  - 2 front end nodes

- Phase 2 Cluster:
  - Expected end 2010 / early 2011
  - ~ 4 times larger

Pipelines

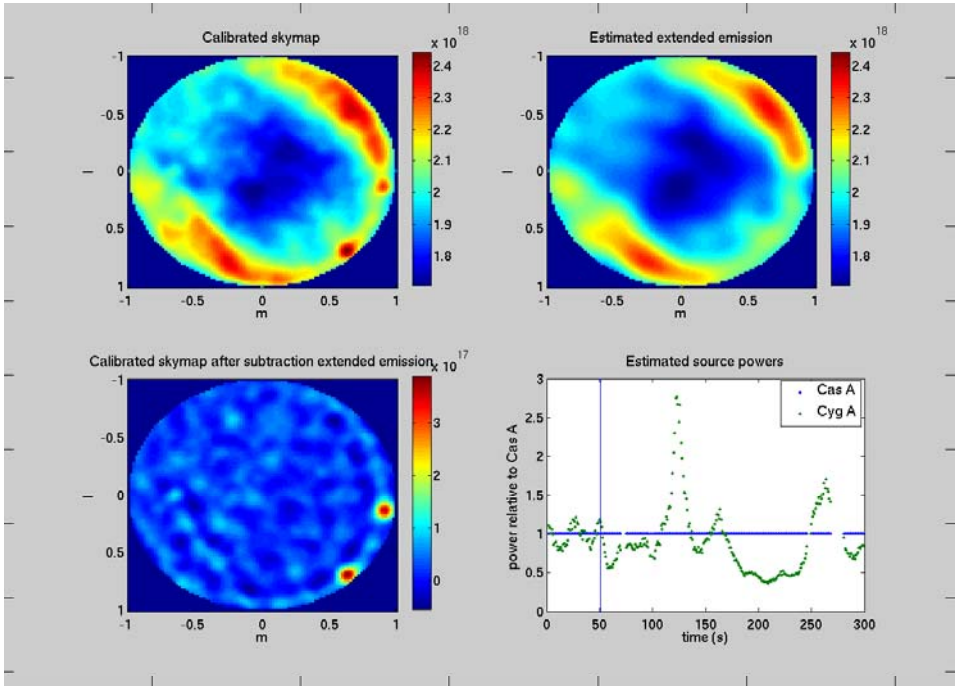
- Imaging Pipelines
  - Surveys
  - Transients
  - EoR
- Pulsar Pipelines
  - Coherent mode
  - Incoherent mode
- Cosmic Ray Pipelines
  - HECR, VHECR, UHEP, …



- Multi-beam observations
- Piggy back observations

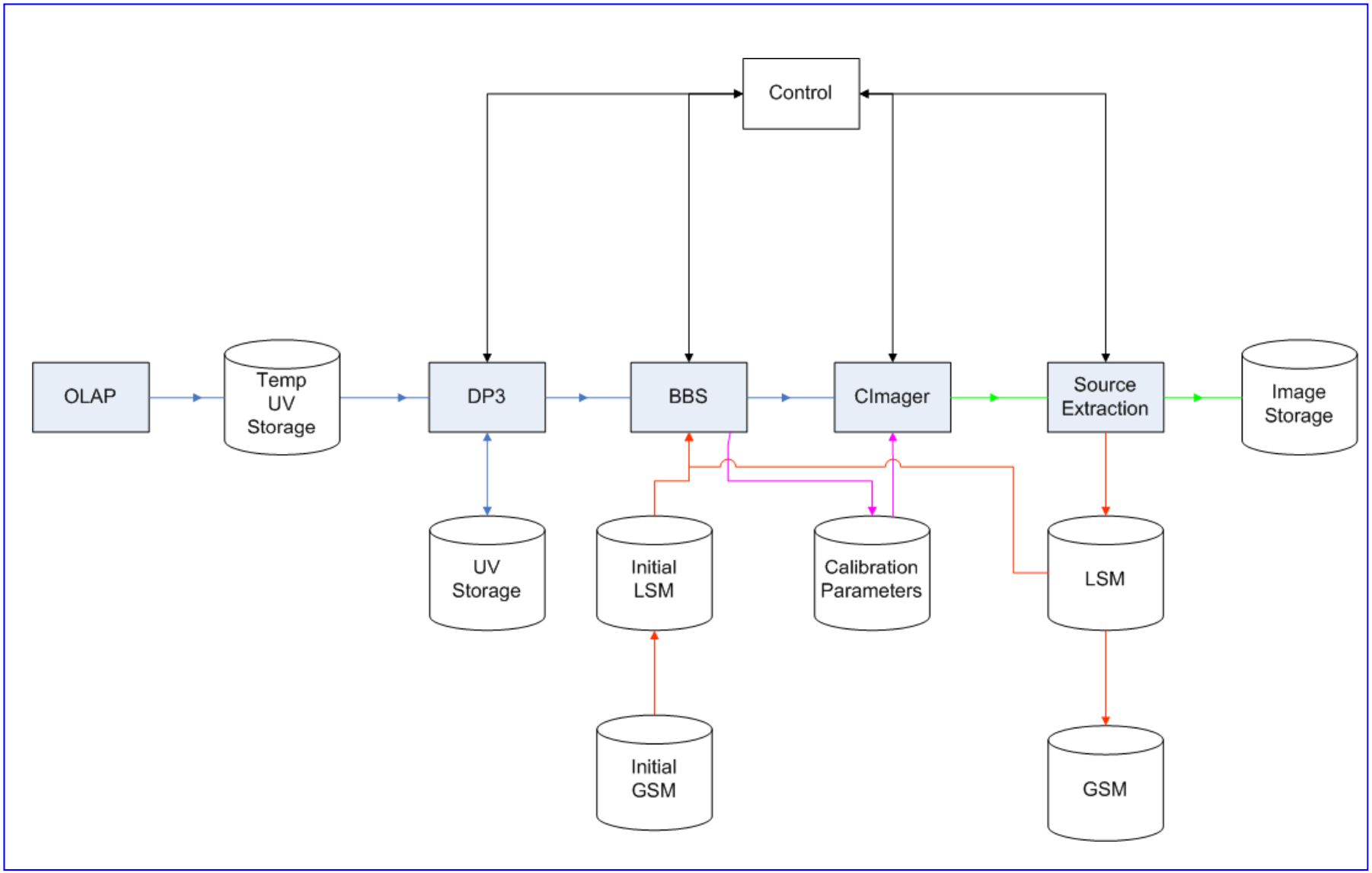
Station Calibration

- LBA
  - Being tested and rolled out now
  - All sky calibration and imaging
  - Solve for sky, instrument and noise parameter
- HBA
  - Under development
  - Calibration and imaging within tile FoV
  - Option of redundancy calibration under investigation



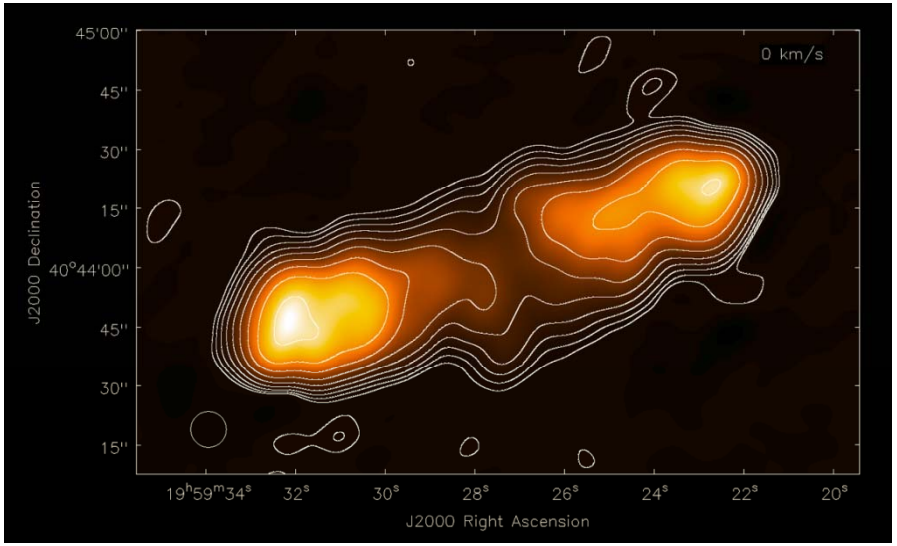
Stefan Wijnholds, Parisa Noorishad

Standard Imaging Pipeline



Standard Imaging Pipeline

- DPPP
  - Flagging
  - A-team removal
  - Data compression
- BBS
  - DI calibration
    - Station gains & clock phases
  - DD Calibration
    - Ionosphere
    - Station beams
  - Source subtraction
- Imager
  - DD Correction
    - Ionosphere
    - Station beams
  - Deconvolution
- Source Finding



CygA; McKean, Ker

See presentation George Heald

Immediate issues (1)

- Strong sources contaminating through PB sidelobes
- Making PB & ionosphere corrected images
  - Calibration
    - Ionospheric calibration
      - Phase
      - Faraday rotation
    - PB
  - Making corrected images
    - Facets?
    - AProjection?
    - Full pol needed; time dependent corrections
  - Deconvolution
    - Subtract sources from uv-data: how deep?
    - Deconvolve in image domain: how to deal with DD PSF?

Immediate issues (2)

- Handling of large data volumes
  - Automatic processing (in observatory style)
  - Data inspection
  - Data format (standardisation, common tools, I/O performance)
- How will we be limited by processing power?

Conclusions

- LOFAR hardware roll-out is nearing completion
- LOFAR software
  - Operates the on-line chain from station to correlation / beamforming
  - Data processing pipelines are under development
- Initial imaging pipeline can be used for automatic production of narrow field images
- Wide field calibration and imaging is on the way