Long-baseline observations of the Crab

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Long-baseline observations of the Crab

- why?
- long baselines
- short baselines
- polarisation
- etc.

Why?

- crab pulsar at 100–150 MHz should be
  - ⋆ bright (~ 10 Jy)
  - ⋆ unresolved (~ 70 mas)
- bright source for commissioning
- calibration of amplitudes and phases
- use long-baseline calibration for short baselines?
- polarisation
- interstellar scattering

Observations

- 12 h on 13/14 Feb 2011 L2011_23410
- 115–160 MHz
- international stations: DE601, DE603, FR606
- NL stations: CS032, RS106,205,208,306,307,406,503
- problems
  - ⋆ DE601 failed
  - ⋆ 50 % of subbands bad in blocks of 30/31
    `https://proxy.lofar.eu/redmine/issues/80`
  - ⋆ significant ionospheric delays, differential Faraday rotation

Data reduction

- general diagnostic, disp/non-disp delay fits
- conversion to `uvfits` file
  - ⋆ flagging
  - ⋆ convert to circular polarisation
  - ⋆ average in time and frequency
- calibration in `AIPS` with point-source model using only long baselines
  - ⋆ fringe-fitting
  - ⋆ amplitude self-calibration
  - ⋆ works well
- imaging in `AIPS` and `difmap`
  - ⋆ either only long or only short baselines

Image of the pulsar: it is a point-source!

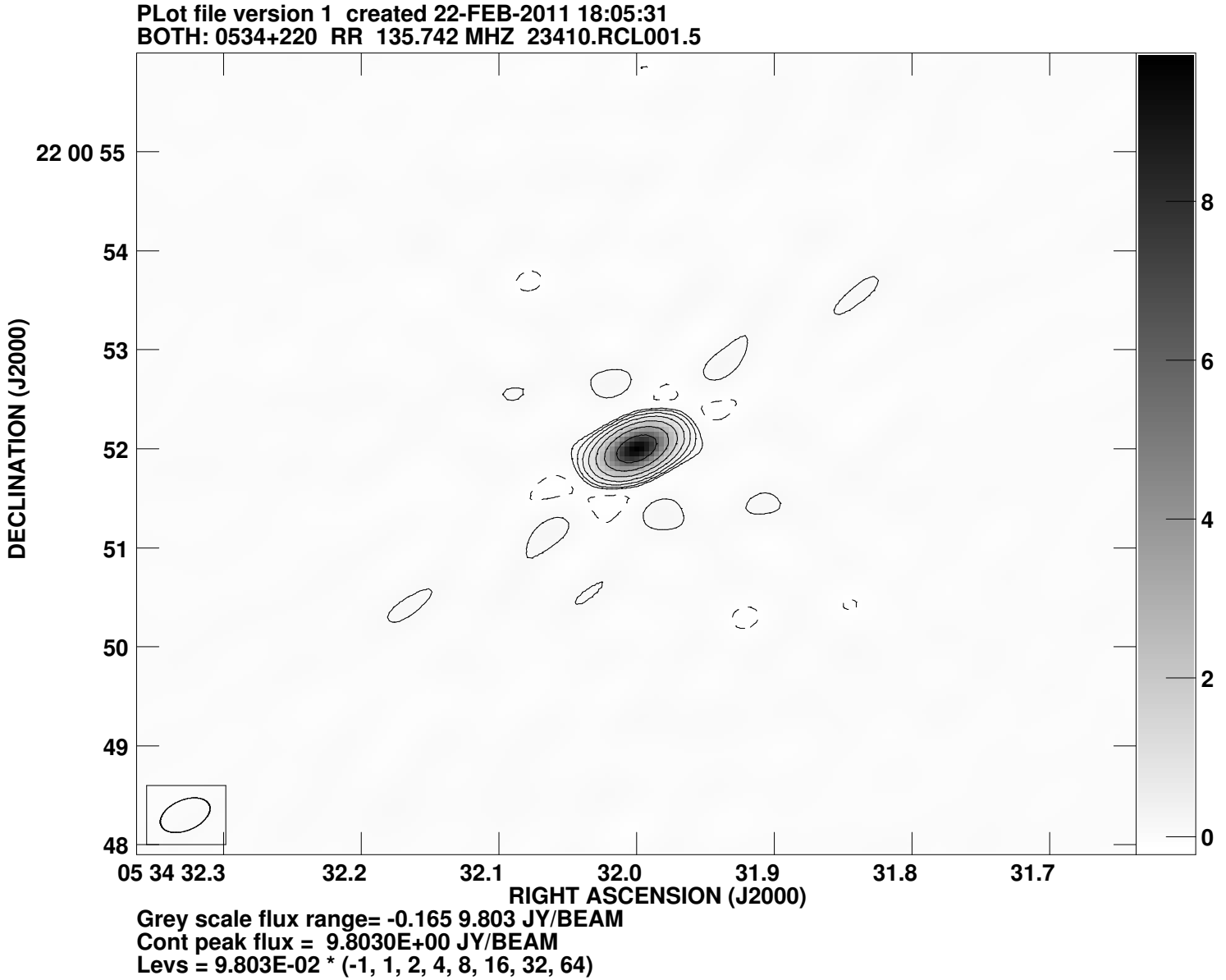
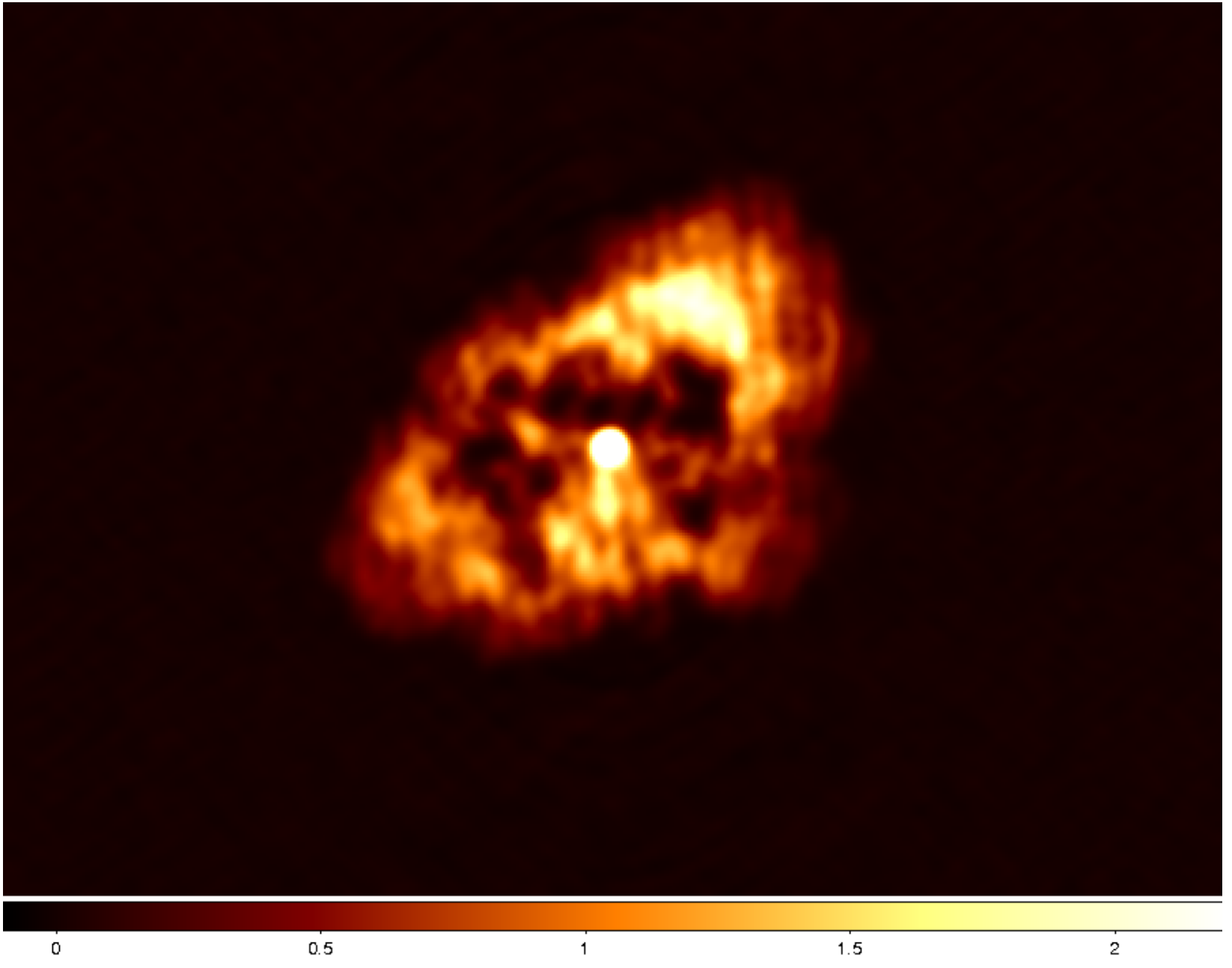
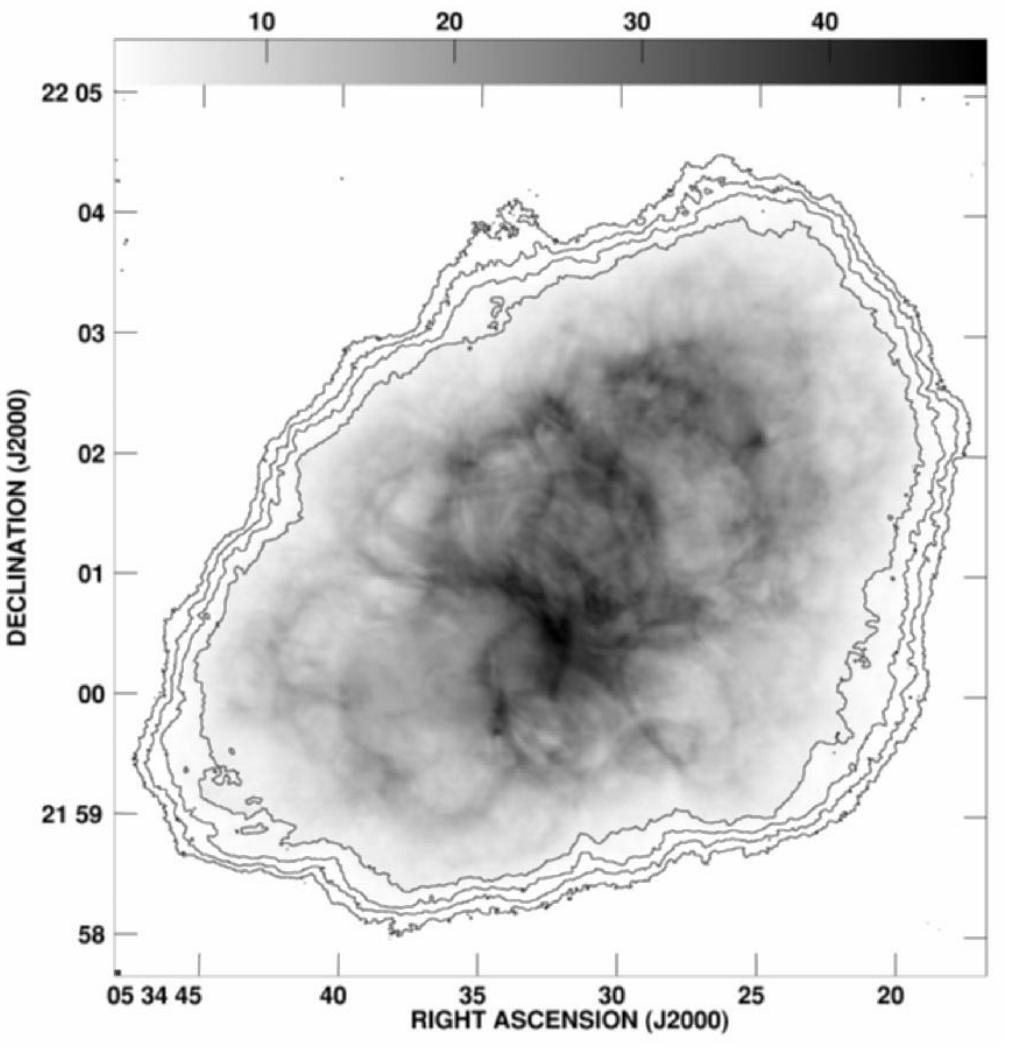


Image of the nebula: from crap to crab



The nebula with the VLA at 5 GHz



[Bietenholz (2004)]

Polarisation (if any)

- pulsar is (sometimes) linearly polarised
- up to 50 %, sometimes not
- RM$= 42\,\mathrm{rad/m^2}$
- see Ger de Bruyn, LSM 29 Oct 2008
- here: on long baselines
  - ⋆ no strong evidence for polarisation
  - ⋆ no hint of RM
- on short baselines: less clear, calibration is a problem

Conclusions

- crab is a great target for long-baseline commissioning
- long baselines can help the short baselines
  Otto is good for you!
- polarisation unclear, potentially great for calibration
- to do
  - ⋆ repeat with more stations, all subbands, more frequencies
  - ⋆ in parallel: time-resolved visibilities (abuse the coherent addition of station signals)
  - ⋆ studies of interstellar scattering
- use as calibrator for Sun when it passes
- Lunar occultations? (Sep 2011)

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