

Latest results

from



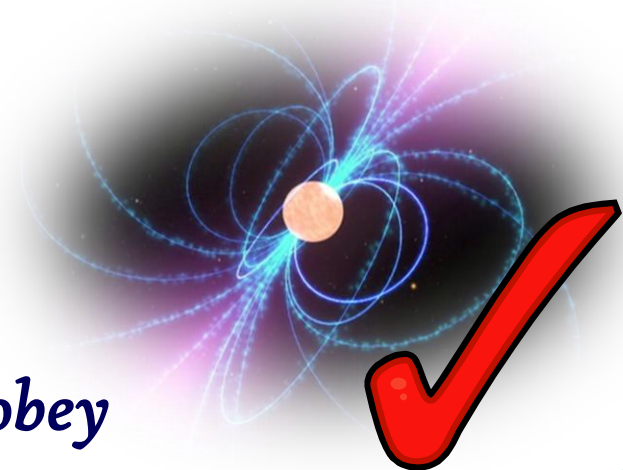
LOFAR observations

of

polarised pulsars



Charlotte Sobey



Dr. Aris Noutsos & Prof. Michael Kramer

Max-Planck-Institut
für
Radioastronomie



MAX-PLANCK-GESELLSCHAFT

Charlotte Sobey

Max-Planck-Institut für Radioastronomie

Latest pulsar polarisation results with LOFAR

Thursday 24th November 2011

Outline

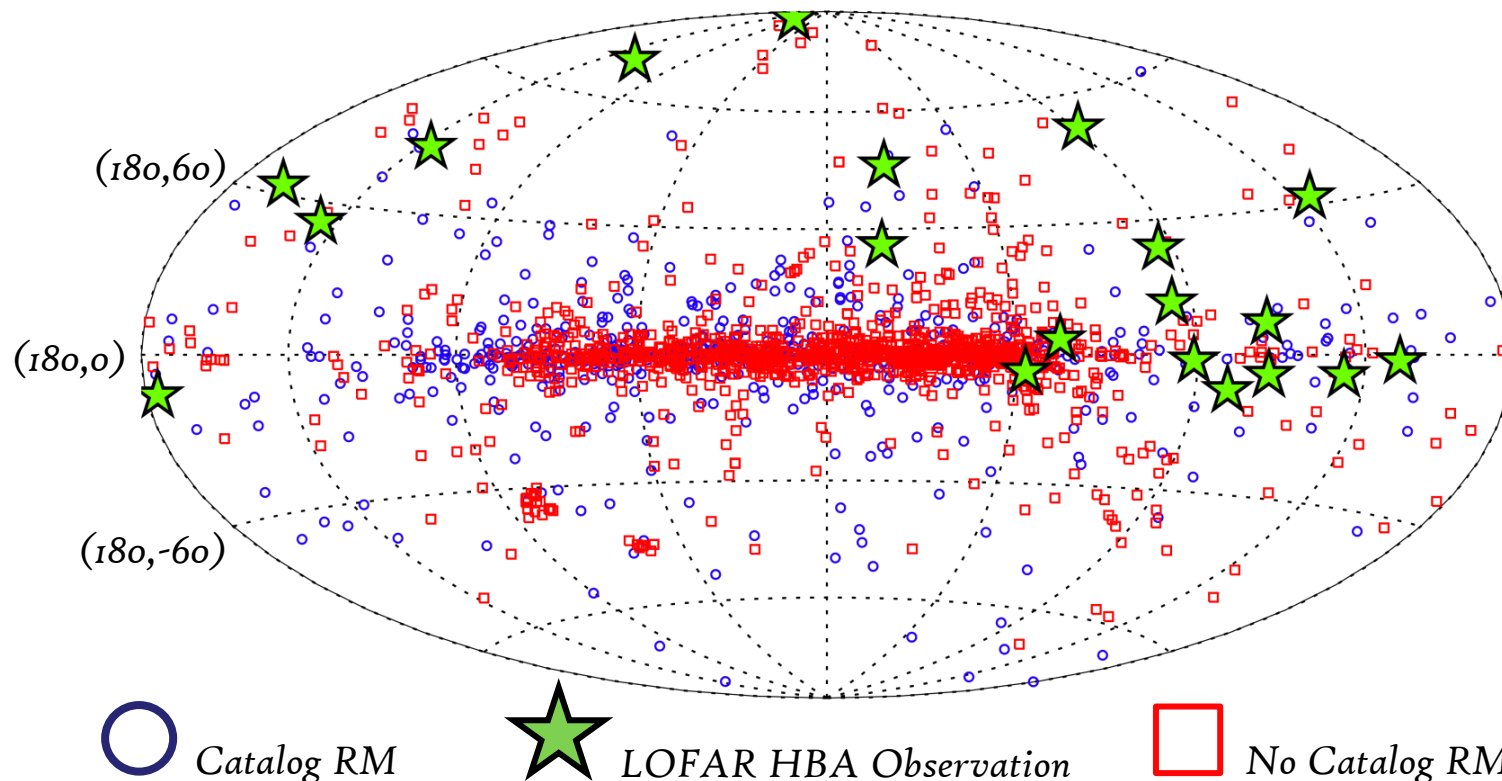
- ⌚ New(ish) observations and results from:...
- ⌚ RM synthesis on polarised pulsars
- ⌚ RM tracks of Ionospheric variations
- ⌚ Almost-simultaneous beam-formed/imaging obs
- ⌚ Giant pulses from the Crab pulsar
- ⌚ Future prospects for observations etc...

In collaboration with the MKSP & Pulsar Working Group (TKSP)

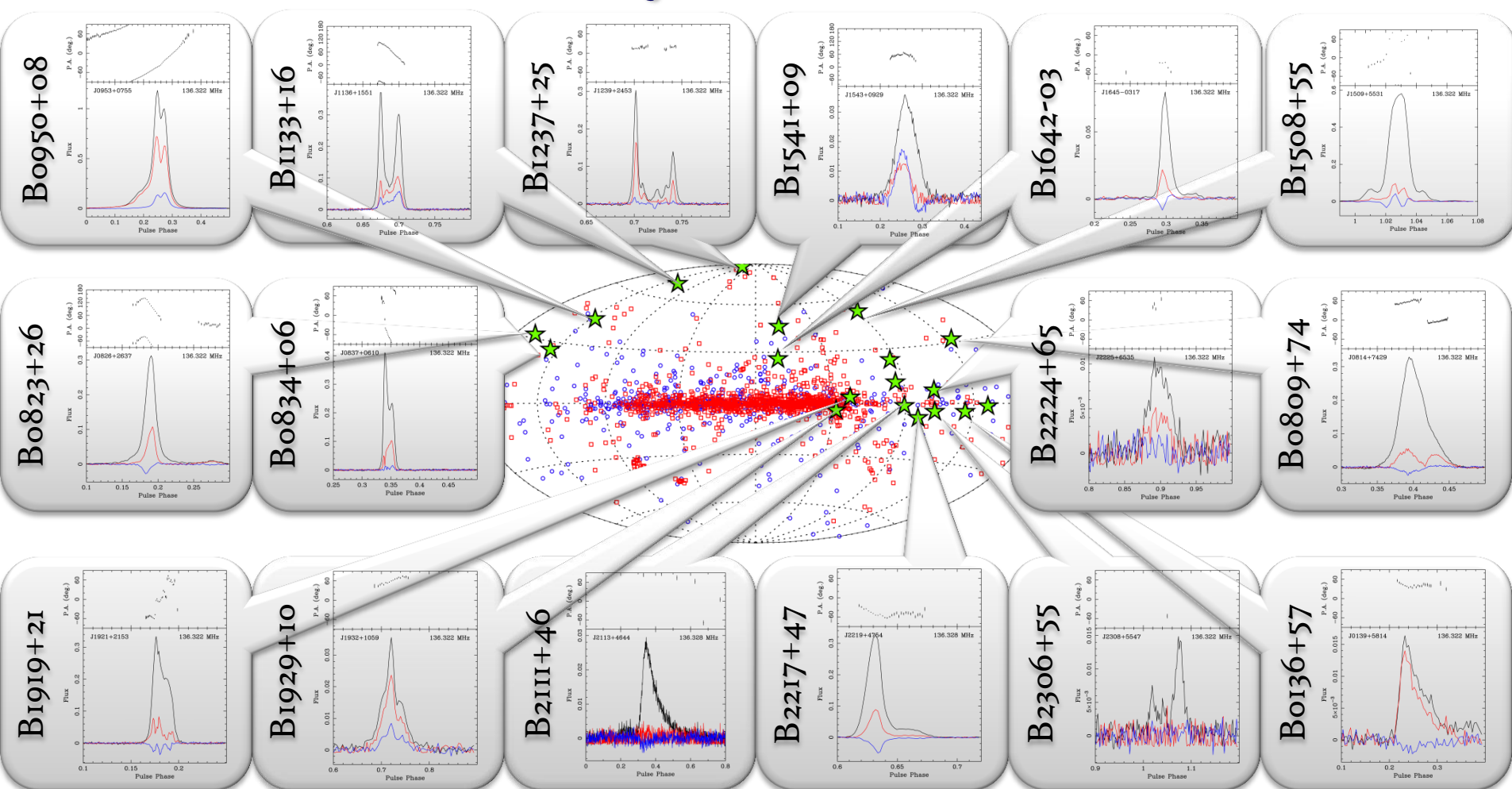
Previously... March 2011

10 mins, Superterp stations, coherently summed, raw voltages

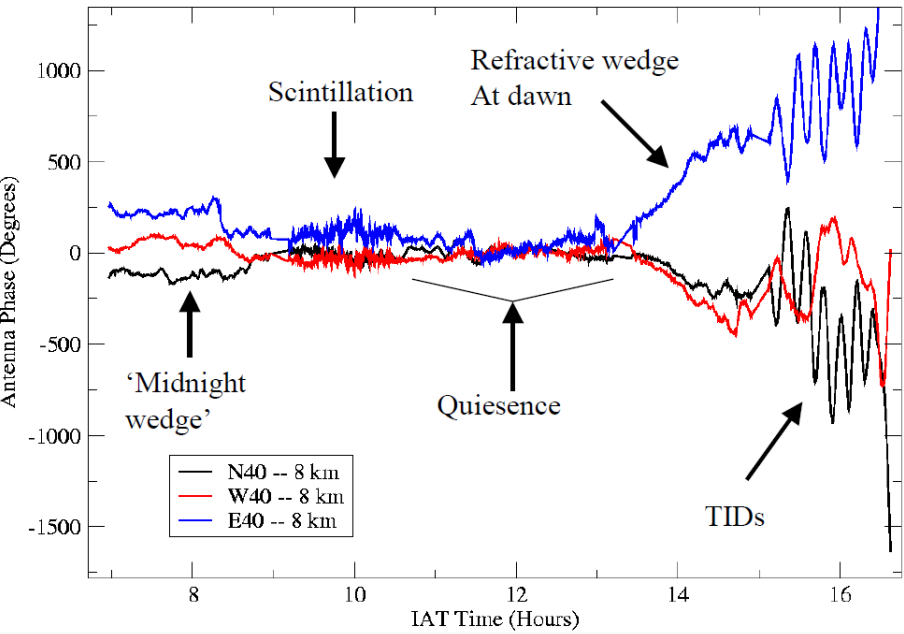
Freq = 136.322 MHz BW = 6.25 MHz



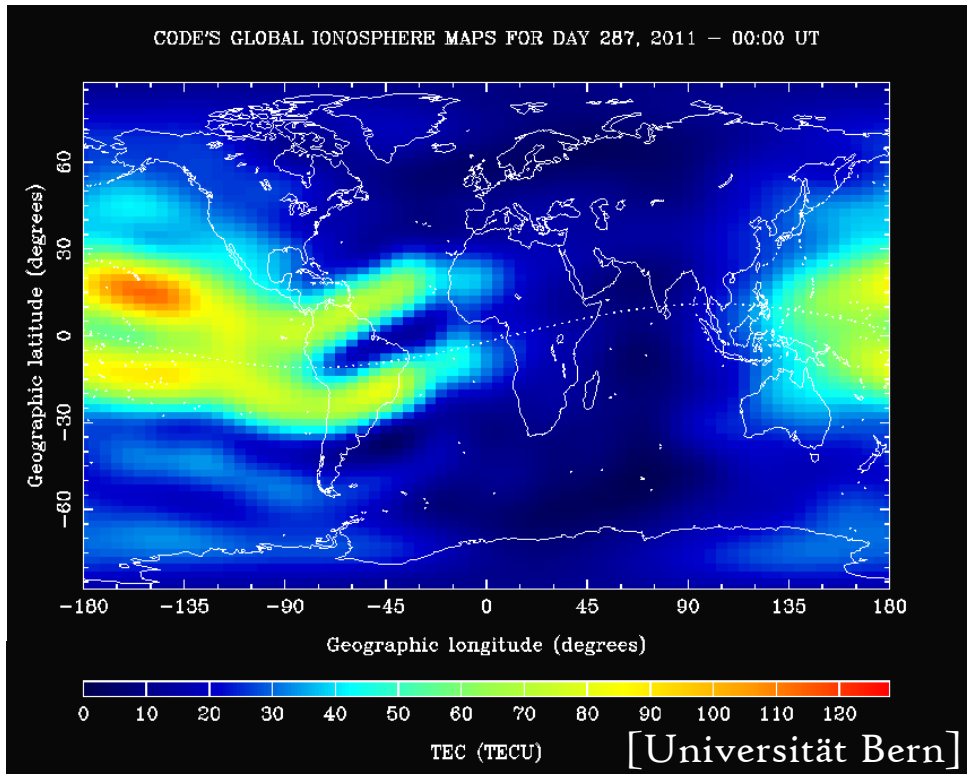
Previously... March 2011



So... The Ionosphere...



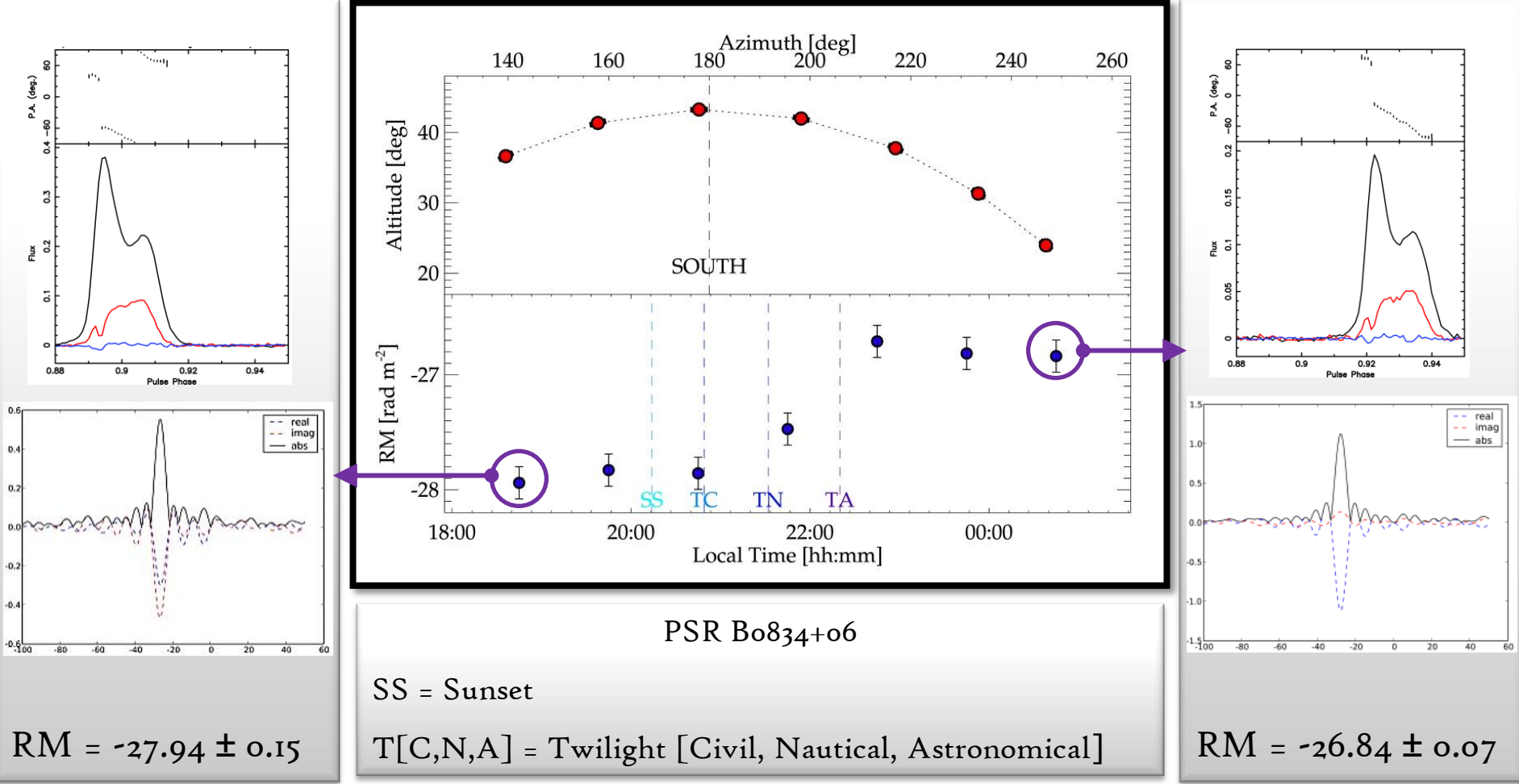
Relative antenna phase over 8 hr VLA obs
Vir A at 78 MHz
Kassim et al. 2007



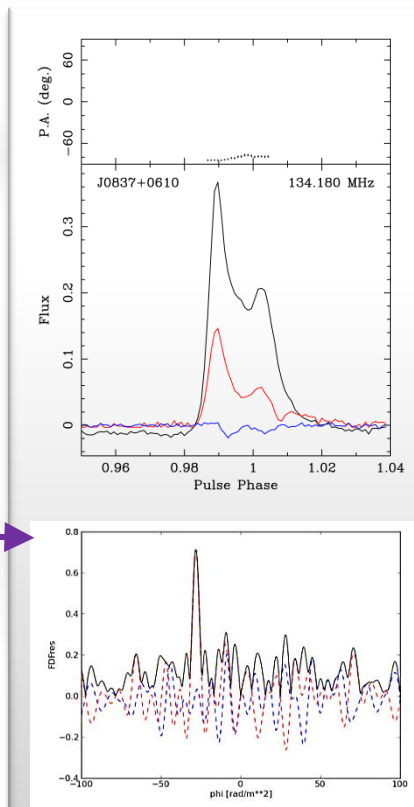
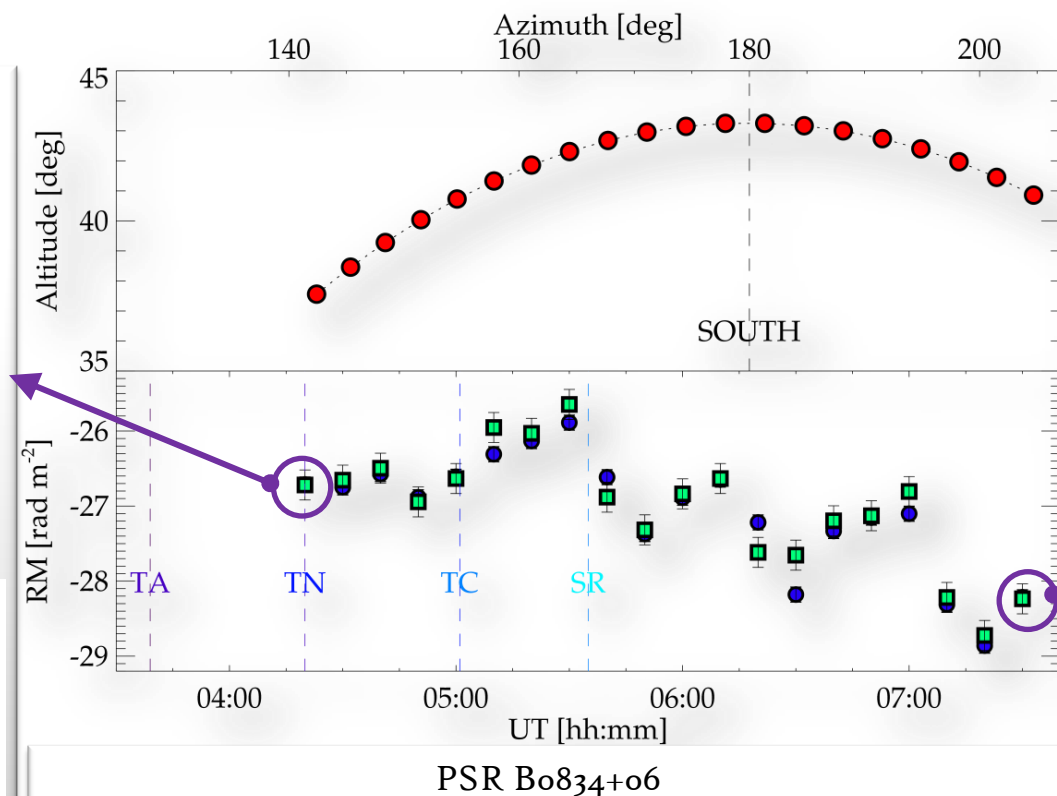
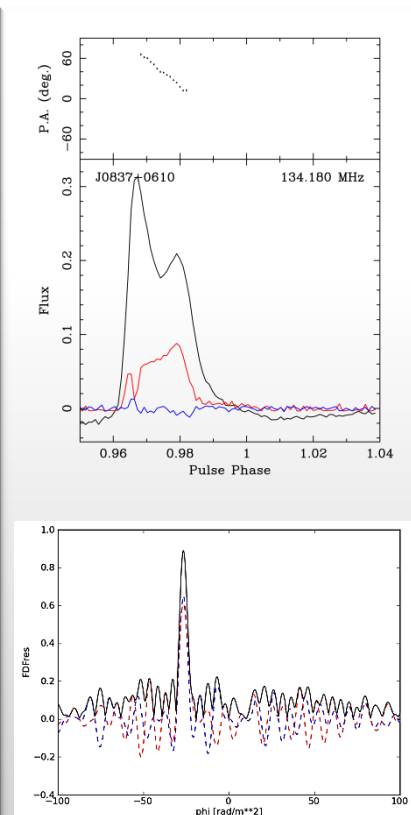
An Ionospheric Journey...

- ⌚ First observations: 11th April 2011 (sunset)
 - ⌚ 10 minute observations every hour over 6 hrs incl.
 - ⌚ Superterp raw voltage Freq = 122.65 MHz BW = 6.25 MHz
- ⌚ Further investigation: 20th October 2011 (sunrise)
 - ⌚ 3 minute observations every 10 minutes over 3 hrs incl.
 - ⌚ Superterp raw voltage Freq = 134.18 MHz BW = 9.155 MHz

Initial results at sunset...



Further results at sunrise...



RM = -26.7 ± 0.2

SR = Sunrise

T[C,N,A] = Twilight [Civil, Nautical, Astronomical]

N.B.: For true RM of pulsar multiply by -1

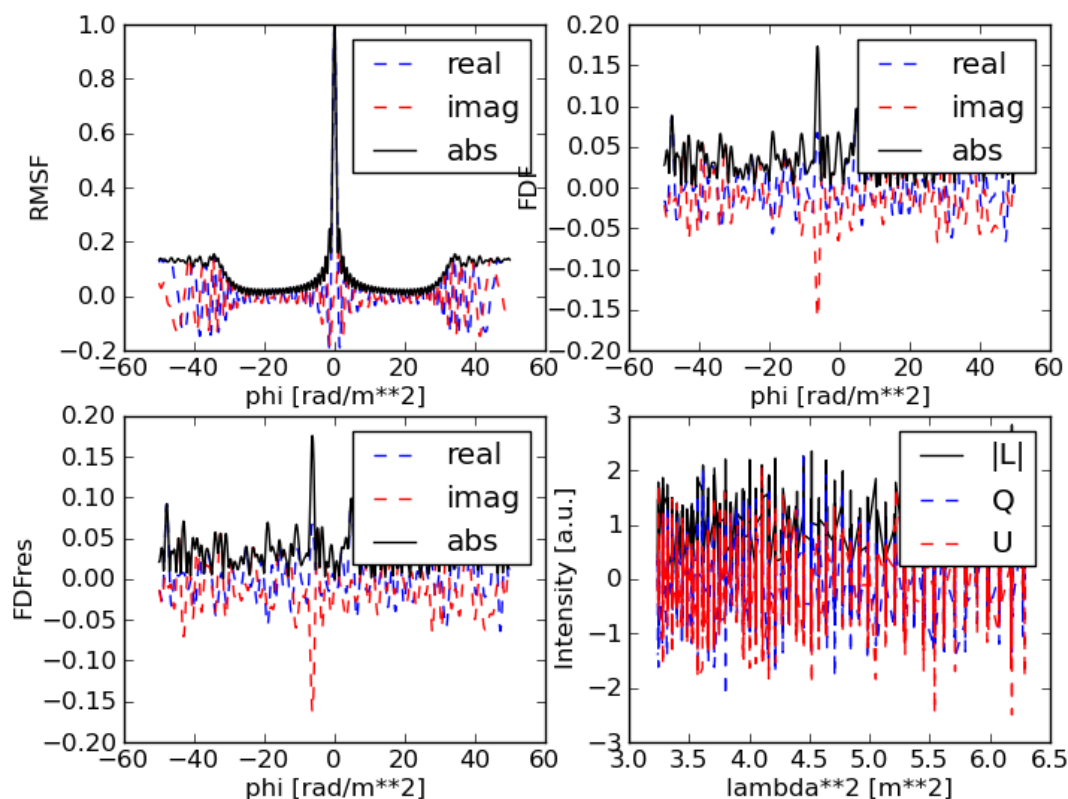
RM = -28.2 ± 0.2

Another attempt... with imaging!

- ⌚ New observation with 'simultaneous' BF and IM modes:
 - ⌚ 3 mins beam-formed tied array with Superterp PSR B0823+26
 - ⌚ New aspect: non-continuous sub-band numbers
 - ⌚ 15 mins imaging mode with 19 CS & 9 RS PSR B0823+26
 - ⌚ 1 min calibrator field 3C 123
 - ⌚ See Mike Bell's presentation?!?!
 - ⌚ 1 min gaps between each...
- ⌚ BF: 13th – 14th November 2011, 3 min obs every 19 mins over 9 hrs

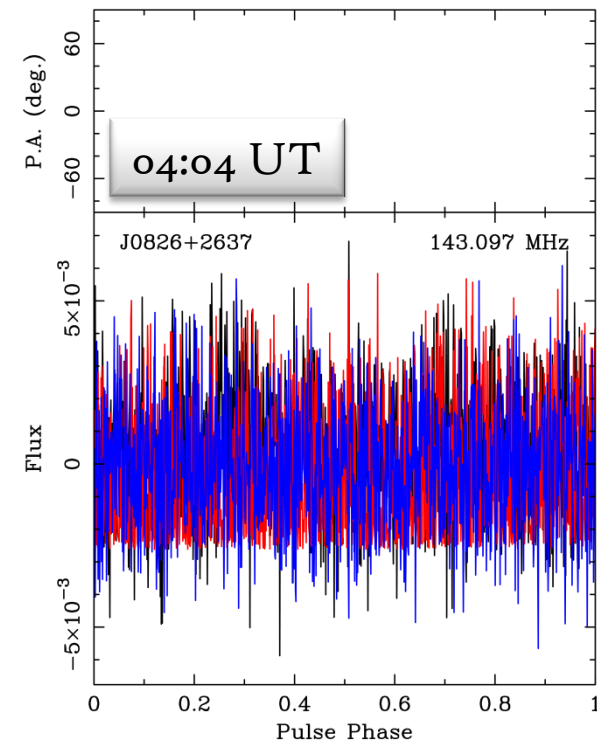
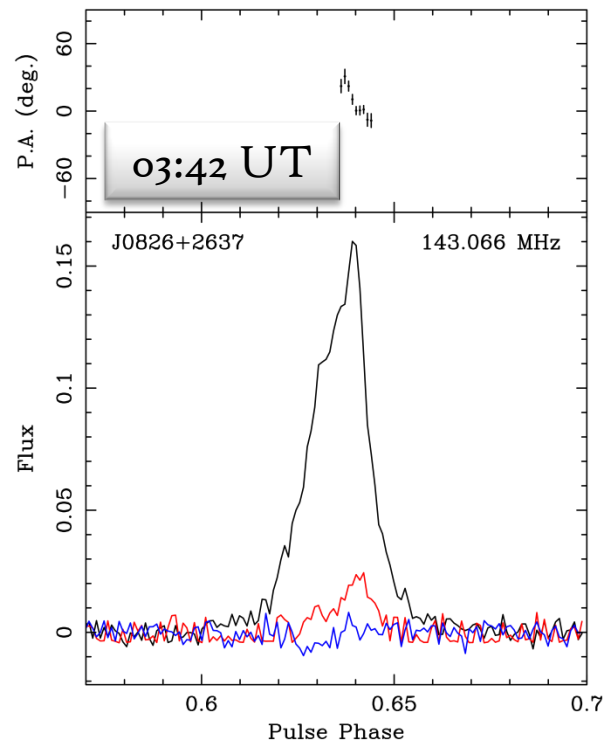
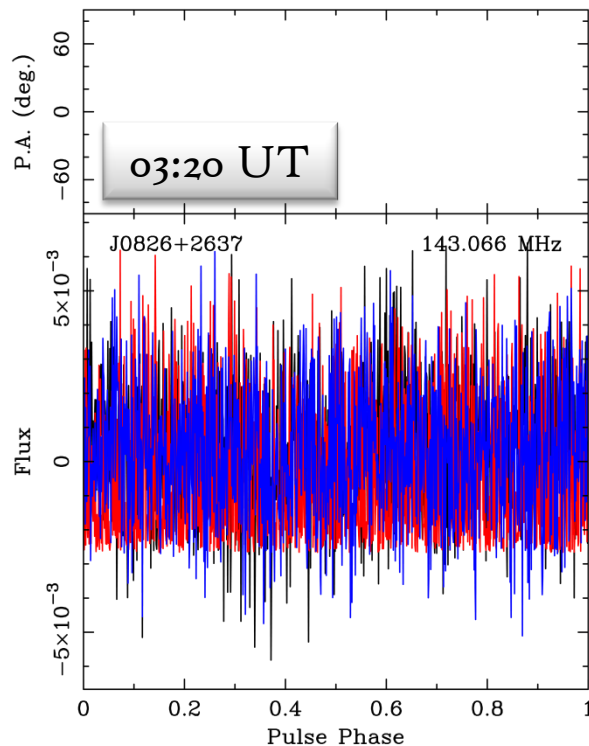
Good news...

- RM synthesis FWHM = 1.25 rad m^{-2} ... best to date...
< 1.5 min integration, $\text{SNR}_{|L|} \sim 20$, $\text{RM} = -6.17 \pm 0.06 \text{ rad m}^{-2}$



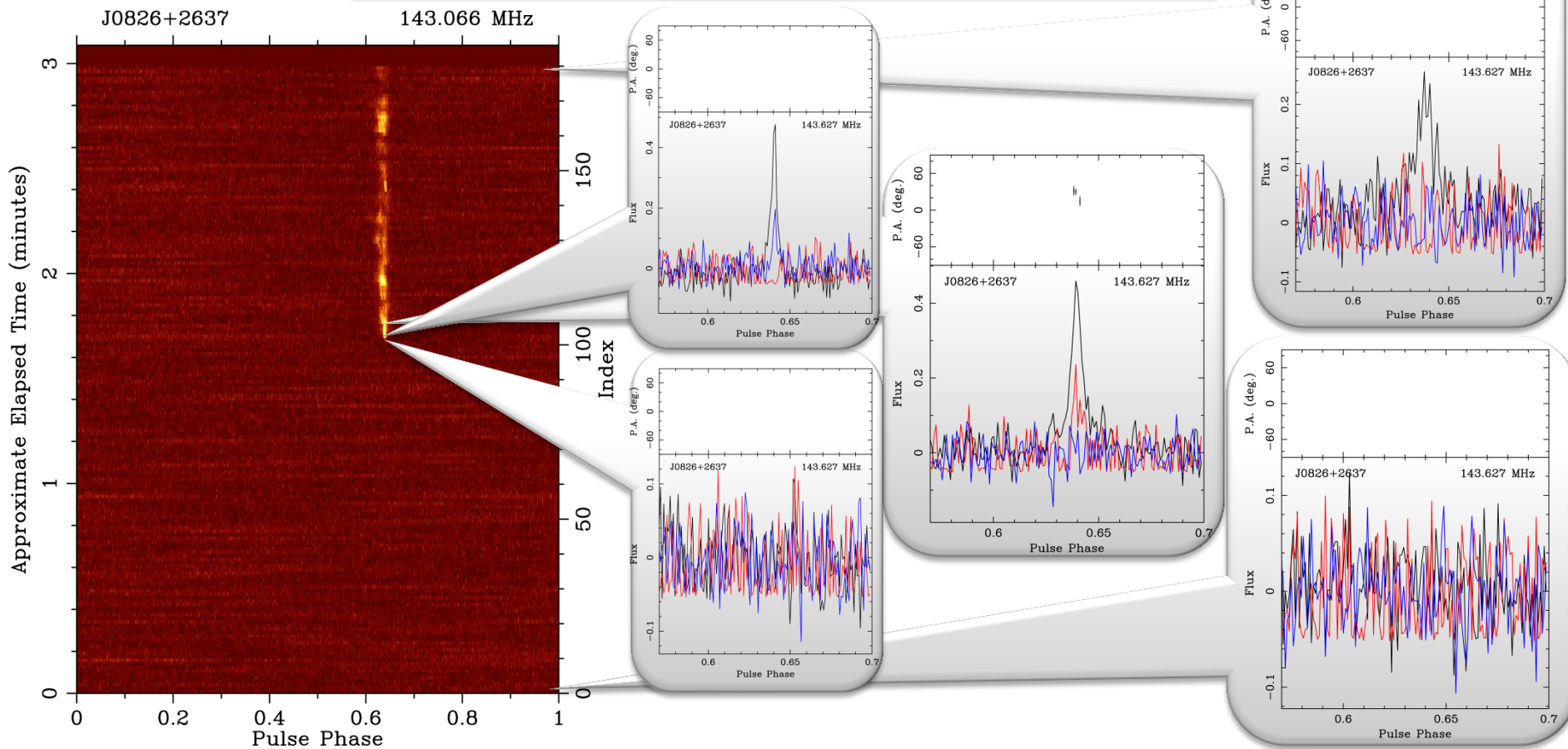
'Bad' news...

- ⊙ It turns out that Bo823+26 is a nulling pulsar.... Oooops!
- ⊙ Not the best for tracking RM or calibration... BUT



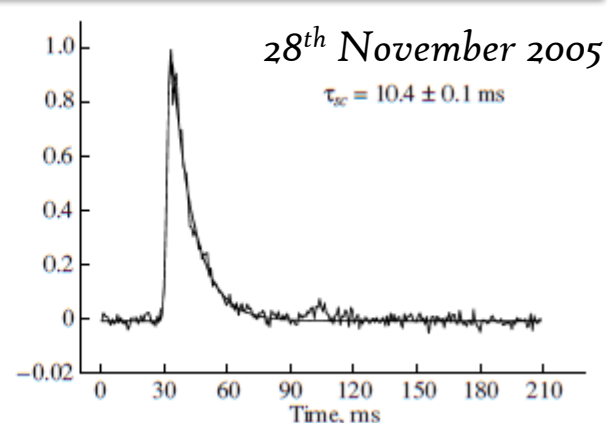
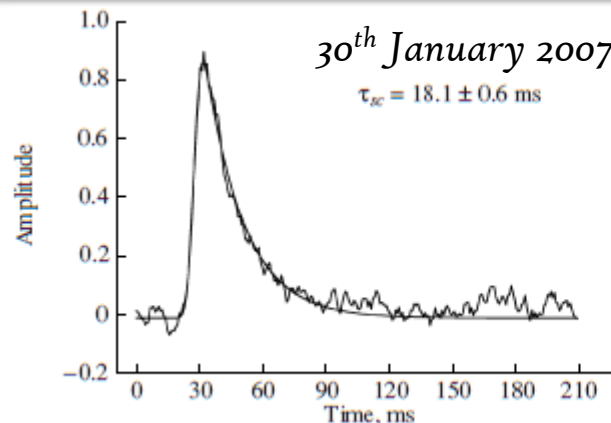
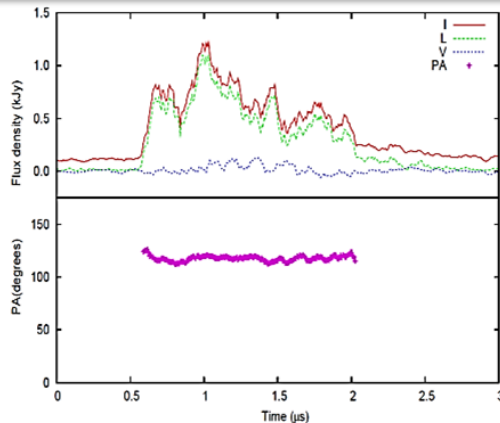
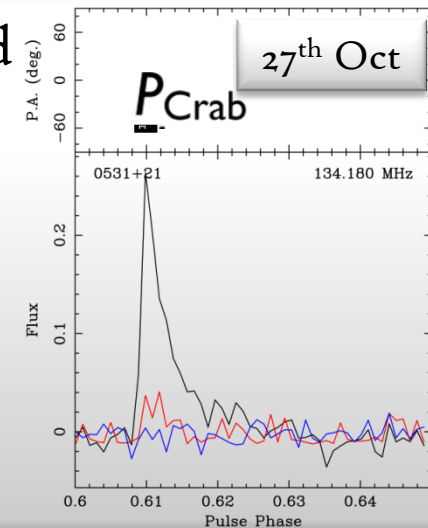
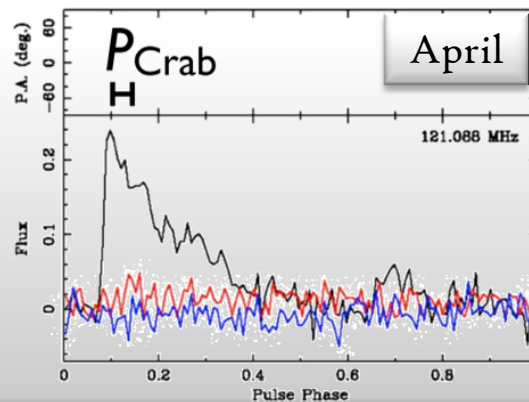
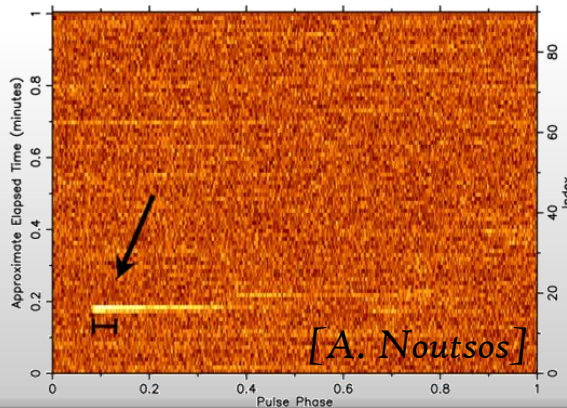
On the bright side...

Very interesting in other ways...



Crab giant pulses...

@ Work in progress... 30 min obs, 27 detected



15.1 GHz at Effelsberg [Jessner et al. 2010]

111.88 MHz at LPA [Smirnova & Logvinenko 2008]

Charlotte Sobey

Max-Planck-Institut für Radioastronomie

Latest pulsar polarisation results with LOFAR

Thursday 24th November 2011

The future looks bright...



- ⌚ Past obs have proven interesting in many ways...
 - ⌚ RM can be achieved with high precision - Ionosphere
 - ⌚ Looking at consistency with imaging data with view to calib
 - ⌚ Plus some interesting things on the way: o823 and the Crab
- ⌚ Near -future observations:
 - ⌚ Repeat of BF-IM obs with o834 (not nulling – as we know!)
 - ⌚ More ionospheric studies... i.e. > 4 pulsars over various l.o.s.

$$E = mc^2$$



[German Wings in-flight magazine Oct/Nov 2011]

Thank you for listening!