Extending the sensitivity limits of VERA/KaVA using inverse phase referencing

Ross Burns

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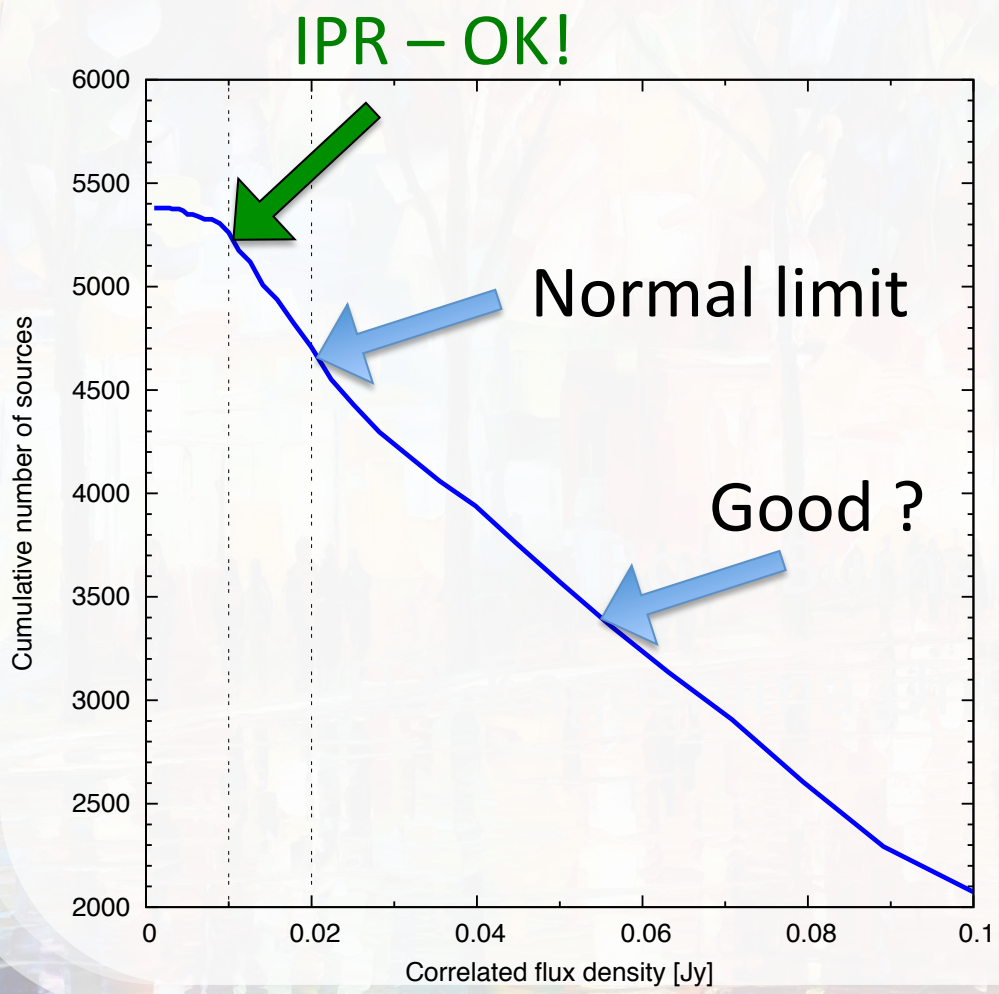
Why?

Known QSOs (X-band)



There are more weak QSOs on the sky.

IPR, use weak QSOs

More reference sources available.

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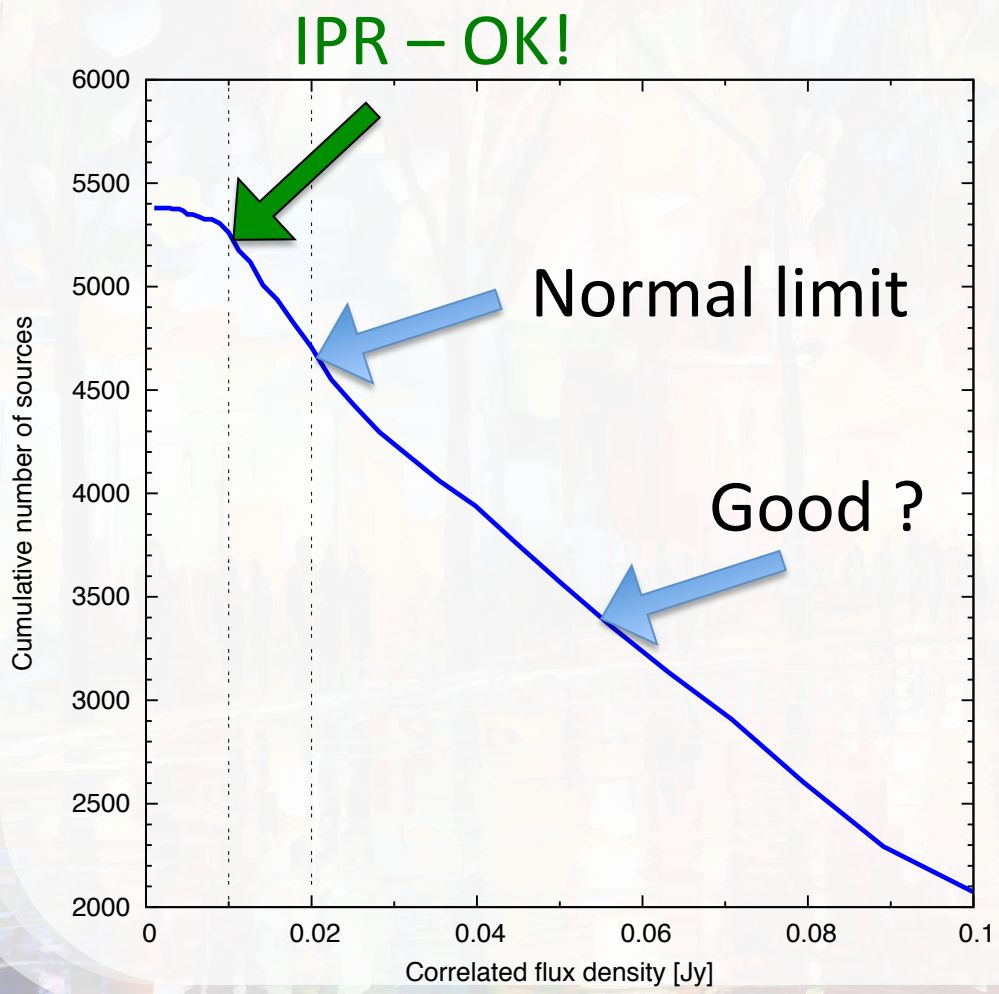
Known QSOs (X-band)



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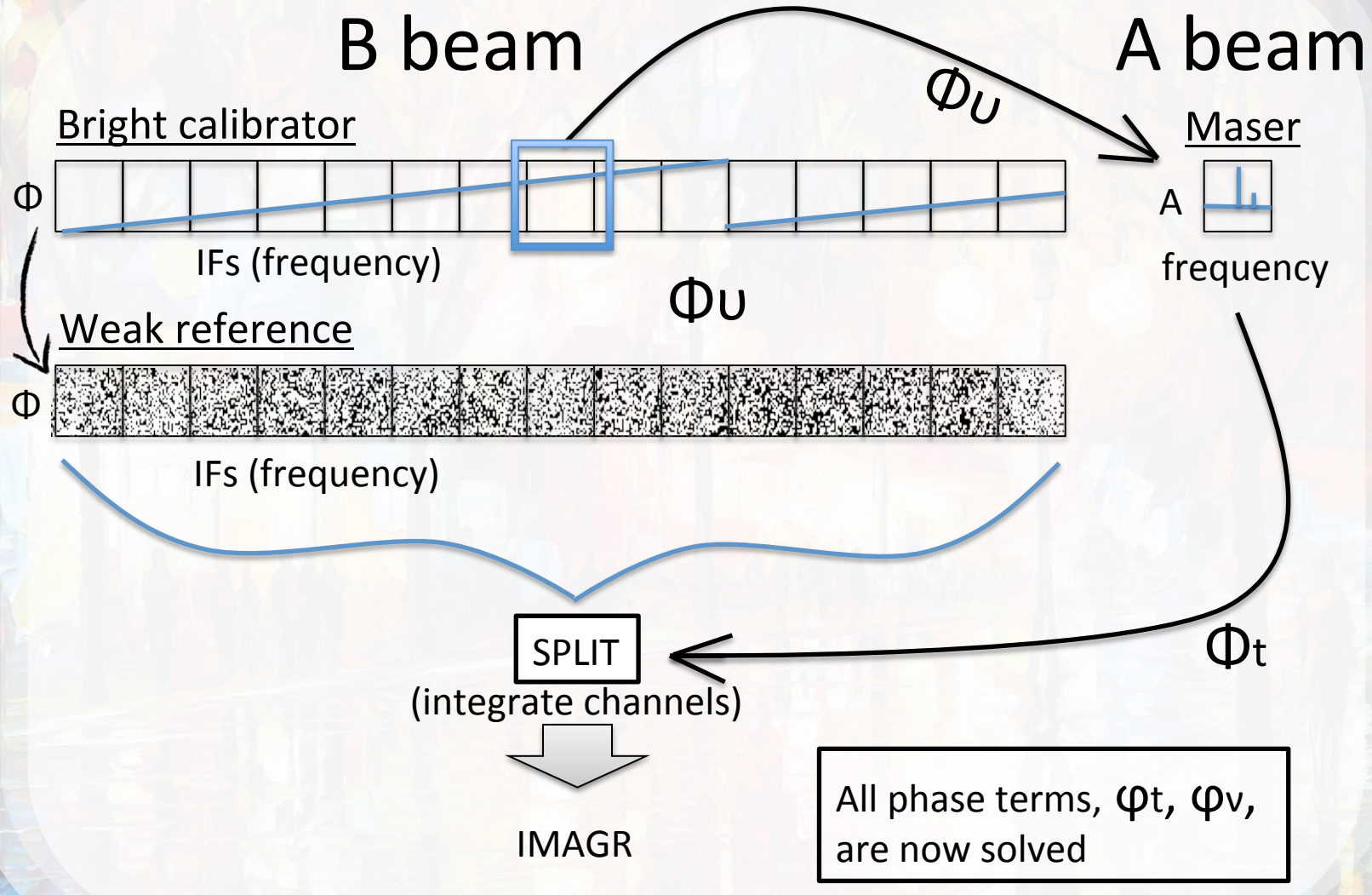
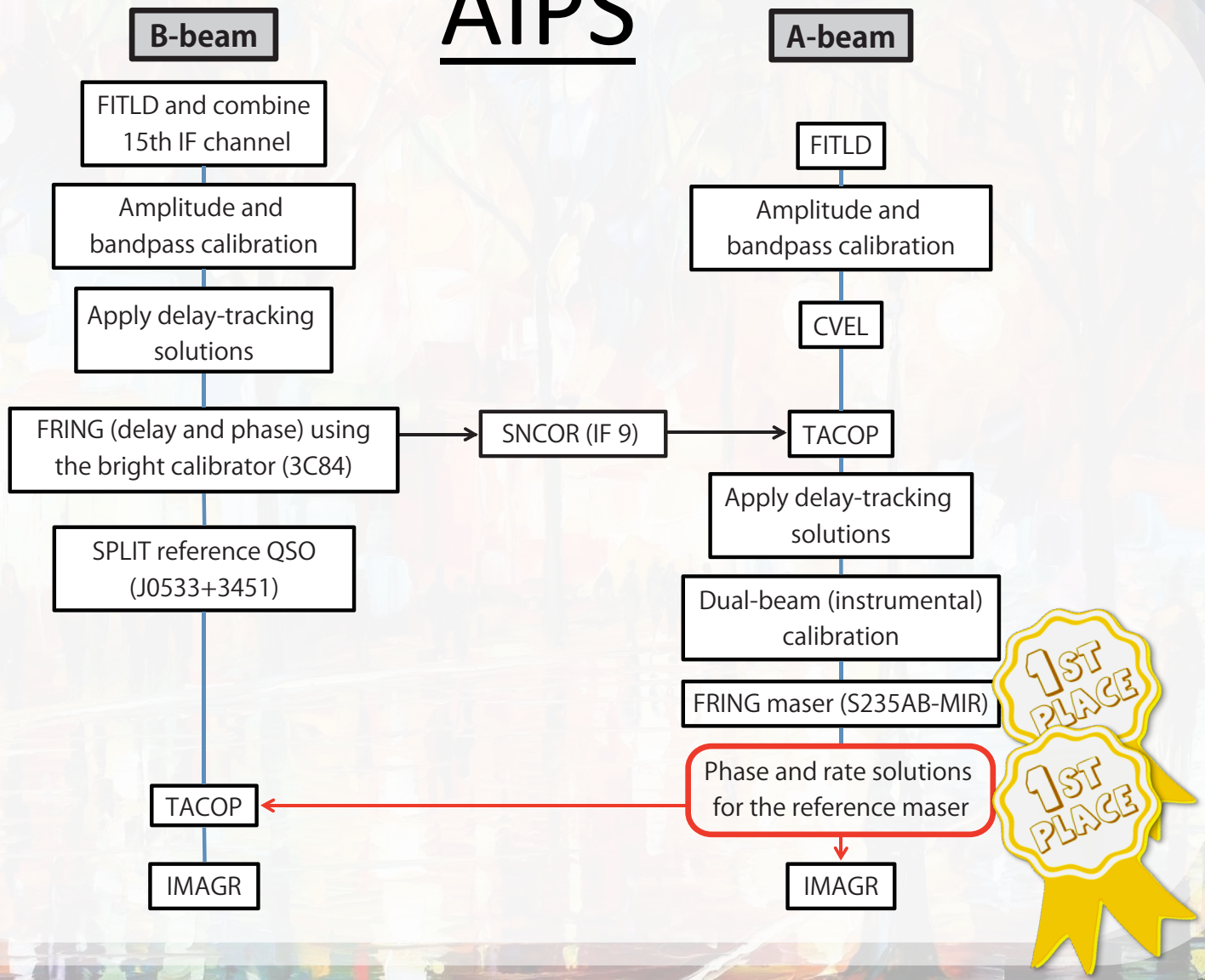
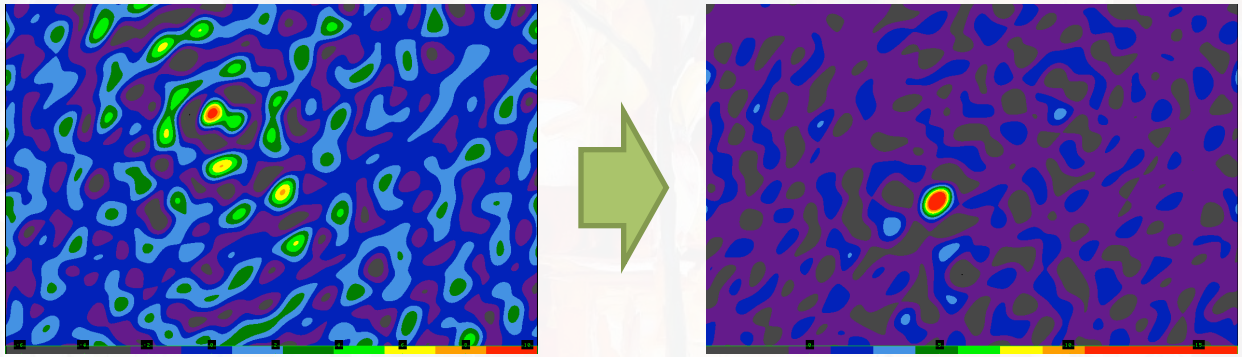

B beam
A beam
Φυ
Bright calibrator
Maser
Φ
A
IFs (frequency)
frequency
Φυ
Weak reference
Φ
IFs (frequency)
SPLIT
(integrate channels)
Φt
IMAGR
All phase terms, φt, φv, are now solved

AIPS


B-beam
FITLD and combine 15th IF channel
Amplitude and bandpass calibration
Apply delay-tracking solutions
FRING (delay and phase) using the bright calibrator (3C84)
SPLIT reference QSO (J0533+3451)
TACOP
IMAGR
SNCOR (IF 9)
A-beam
FITLD
Amplitude and bandpass calibration
CVEL
TACOP
Apply delay-tracking solutions
Dual-beam (instrumental) calibration
FRING maser (S235AB-MIR)
Phase and rate solutions for the reference maser
IMAGR
1ST PLACE
1ST PLACE

Special points

- Maser must be near the phase tracking center



- Same IF bandwidth and freq. resolution in A and B beams

Merits of IPR

- Can use **weak quasars** (detection / non-detection)
  More available QSOs
  Some masers are ONLY near weak QSOs
  Effectively, VERA is more sensitive

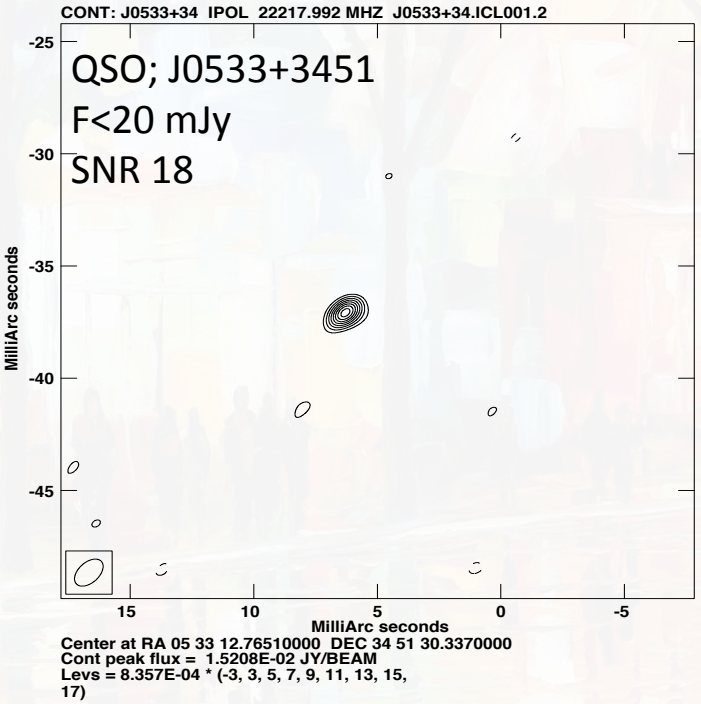
- Typically get **more masers** in final images
  Maser maps are effectively self-calibrated, without loosing absolute astrometry.
  (Also, don't lose masers due to coherence loss during phase referencing)

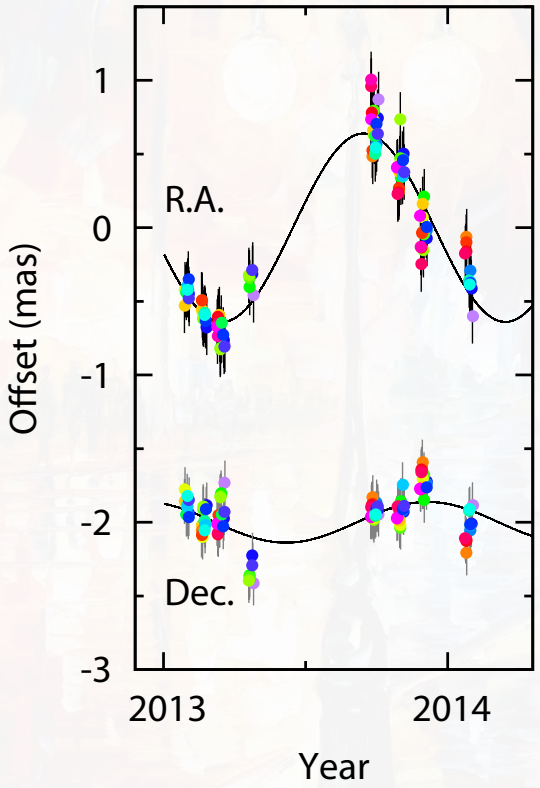
- Faster!! *
  Time for FRING is a few seconds

* After re-making "UVW tables"

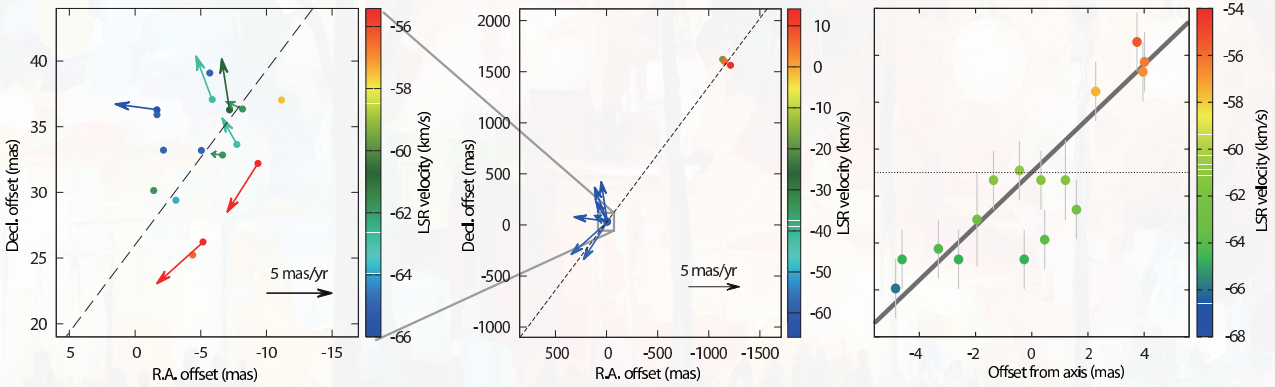
Recent results:

S235AB-MIR

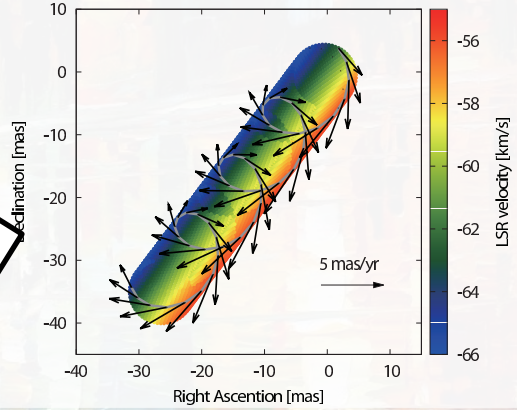


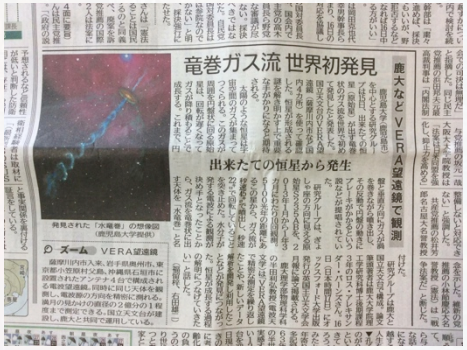


Recent results: S235AB-MIR



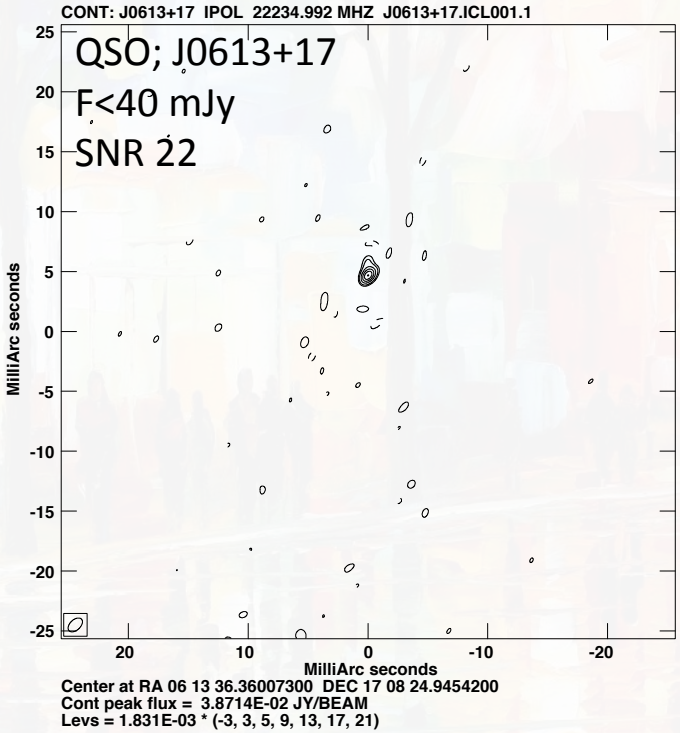
See poster!!

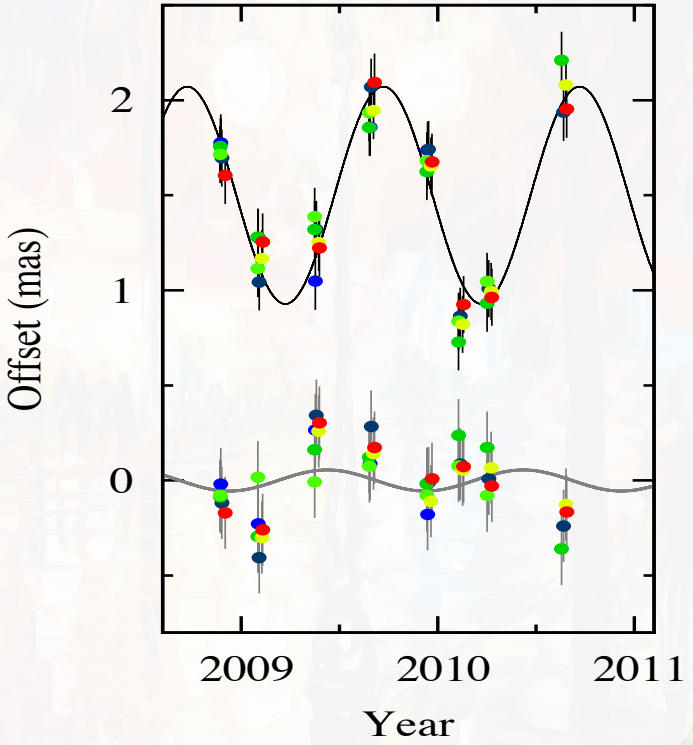



竜巻ガス流 世界初発見

出来たての恒星から発生

Recent results:
S255 (IC2162)





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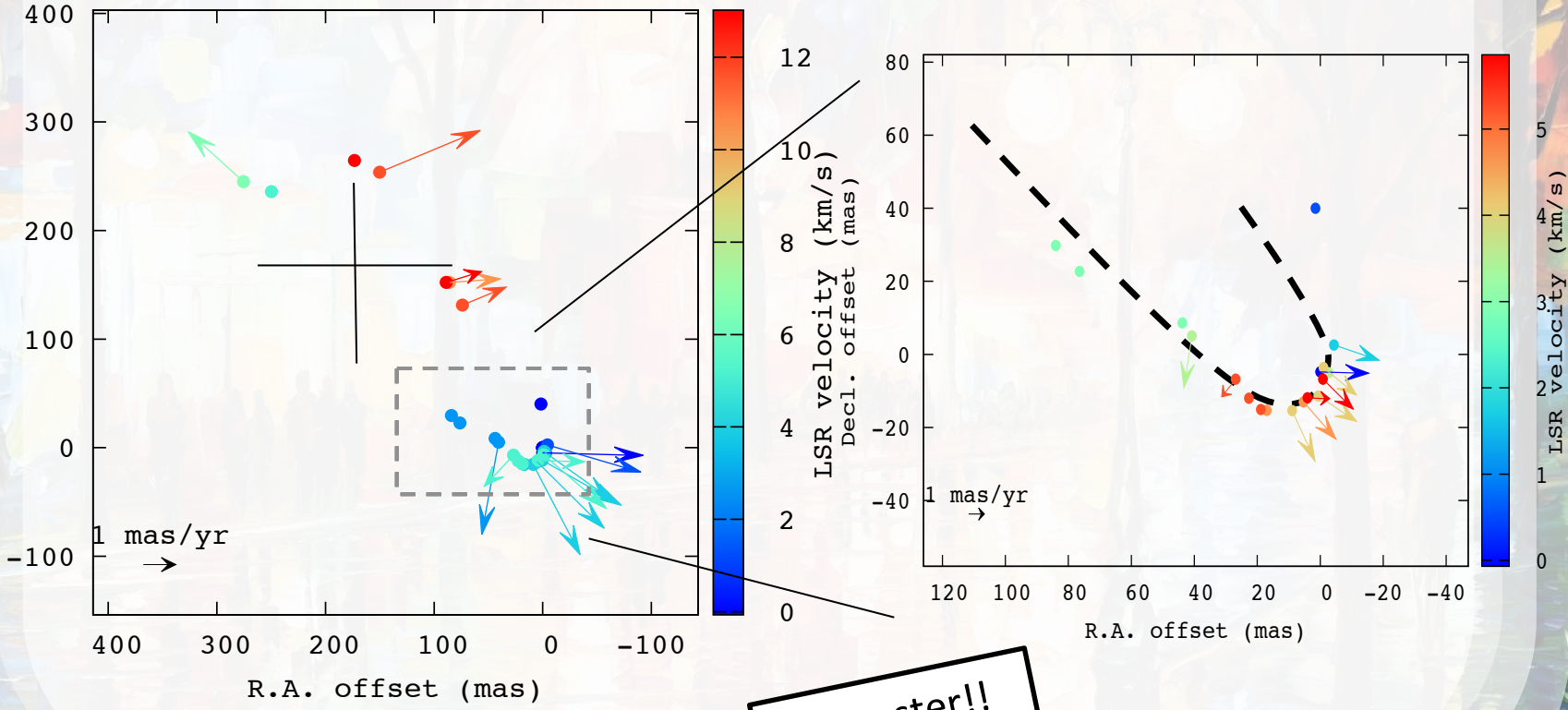
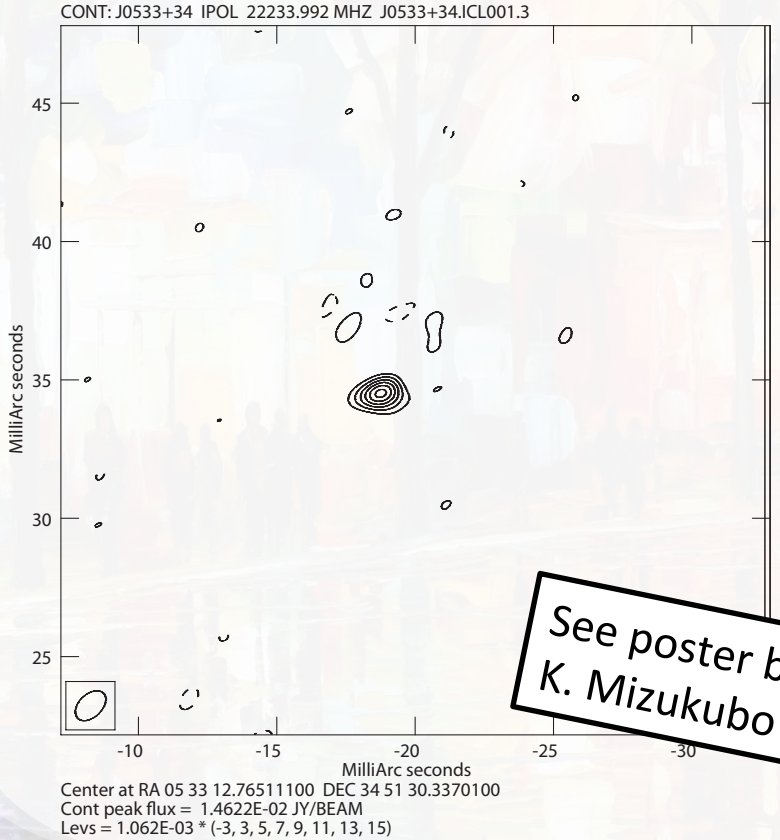


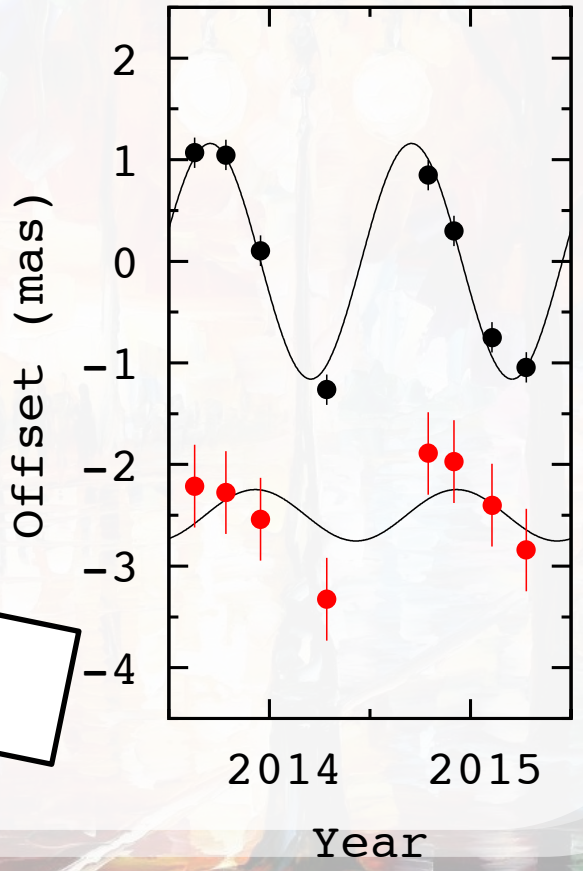
See poster!!

Recent results:

IRAS 05358 – by Mizukubo Kohei



See poster by K. Mizukubo !!



Inverse phase referencing AIPS POPS scripts

Full scripts are available on my website:

http://milkyway.sci.kagoshima-u.ac.jp/~rossburns88/Scripts.html

Thanks for listening !!