

Imaging the IYA09 VLBI Super-session

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General context

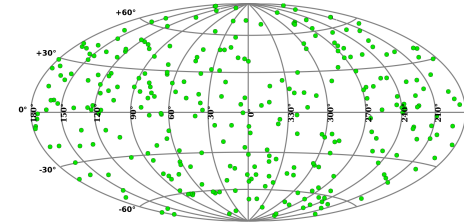
* 2009

International Year of Astronomy (IYA) initiated by the IAU and the UNESCO



* August 2009

Adoption by the IAU of the 2nd realization of the International Celestial Reference Frame (ICRF2)

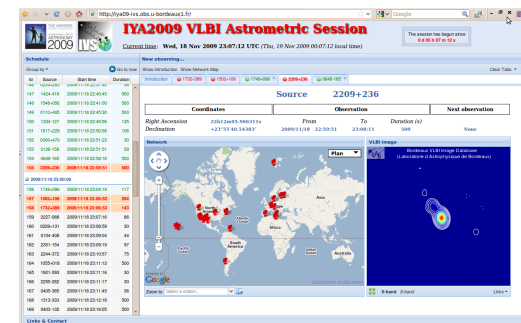


* IVS contribution to the IYA

A special astrometric session to observe as many as possible ICRF2 def. sources in a single session

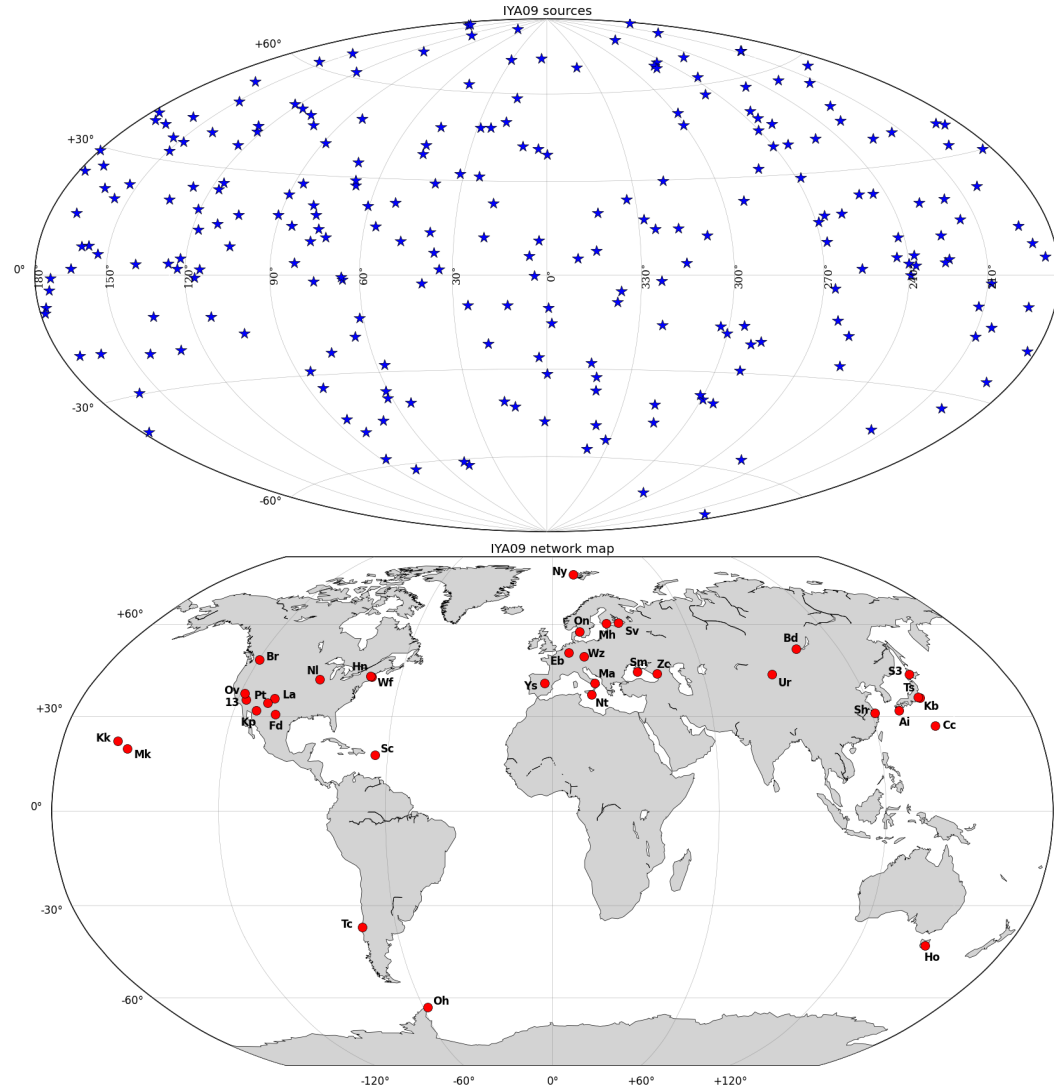


+ outreach activities (animations @ stations, Live web page, etc.)



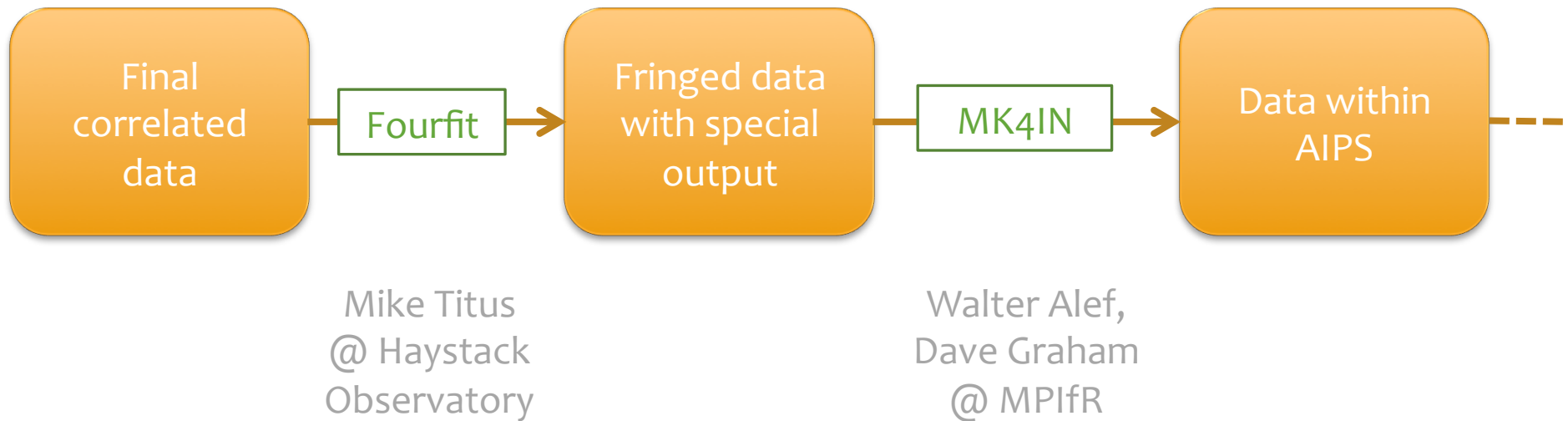
Session details

- * “Nickname”:
IYA09
- * Date:
November 18, 2009 (24h)
- * Frequency:
S/X – 2.3 / 8.6 GHz
- * **243** scheduled **sources**
(82% of ICRF2 def. sources)
- * **35** scheduled **stations**
(largest session ever)
Ø 3 - 100 m
➔ **33** observing stations



Data workflow

* Post-processing the data

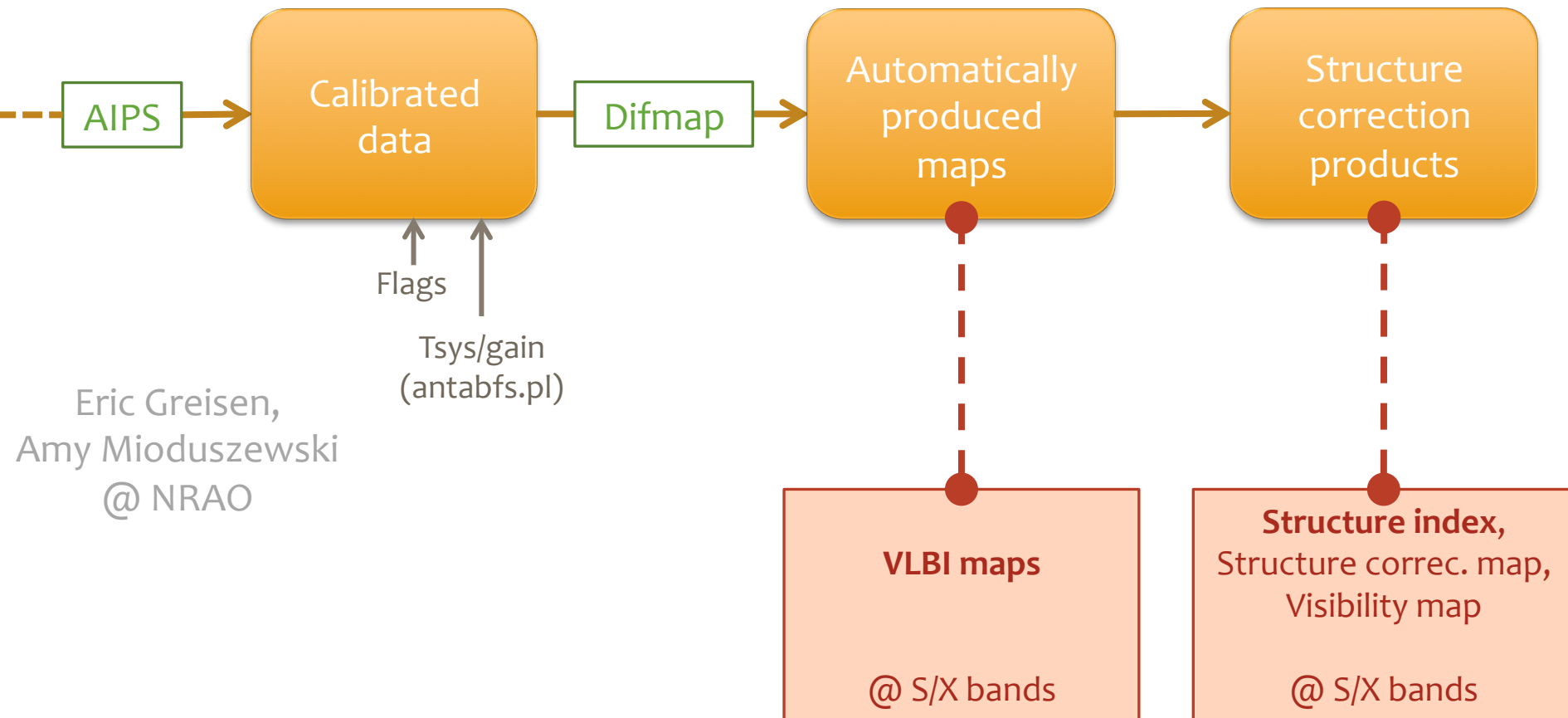


At the end of this step:

- ✓ 1 uvfits file per frequency band, each containing ~4.9 million visibilities
- ✓ Phases, residual delays and delay rate corrections from Fourfit

Data workflow

* Analysing the data



Eric Greisen,
Amy Mioduszewski
@ NRAO

Analysis remarks

- * **A very unique session** (33 stations, 243 sources)
 - Dealing with some software bugs/incompatibilities/limitations
- * Use of **Fourfit solutions** instead of AIPS ones
- * **Automatic data editing** using a self-developed Difmap command
- * **Automatic mapping** procedure similar to the one used to regularly process RDV sessions
- * Some systematic flagging (e.g. short and less sensitive intra-Japan baselines)

Mapping results

* $\left. \begin{array}{l} 228 \text{ X-band maps} = 94\% \\ 230 \text{ S-band maps} = 95\% \end{array} \right\}$ of the 243 observed sources

* No map for 14 low-declination sources ($< -40^\circ$)

* High angular resolution

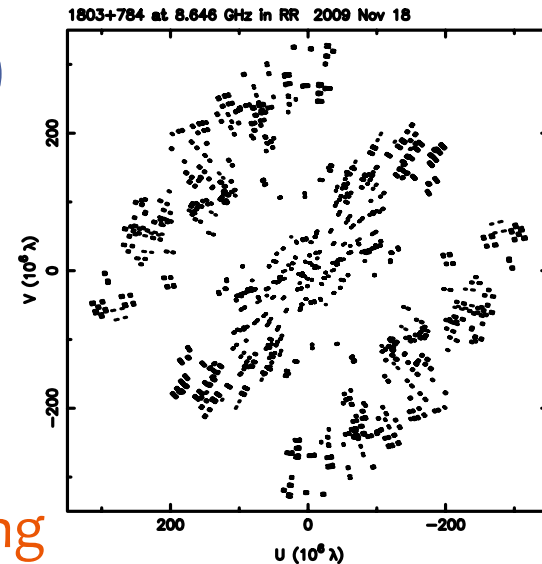
Median beam size of 0.5×1 mas @ X band

* Limitations for imaging

* Astrometric session \rightarrow not optimized for imaging

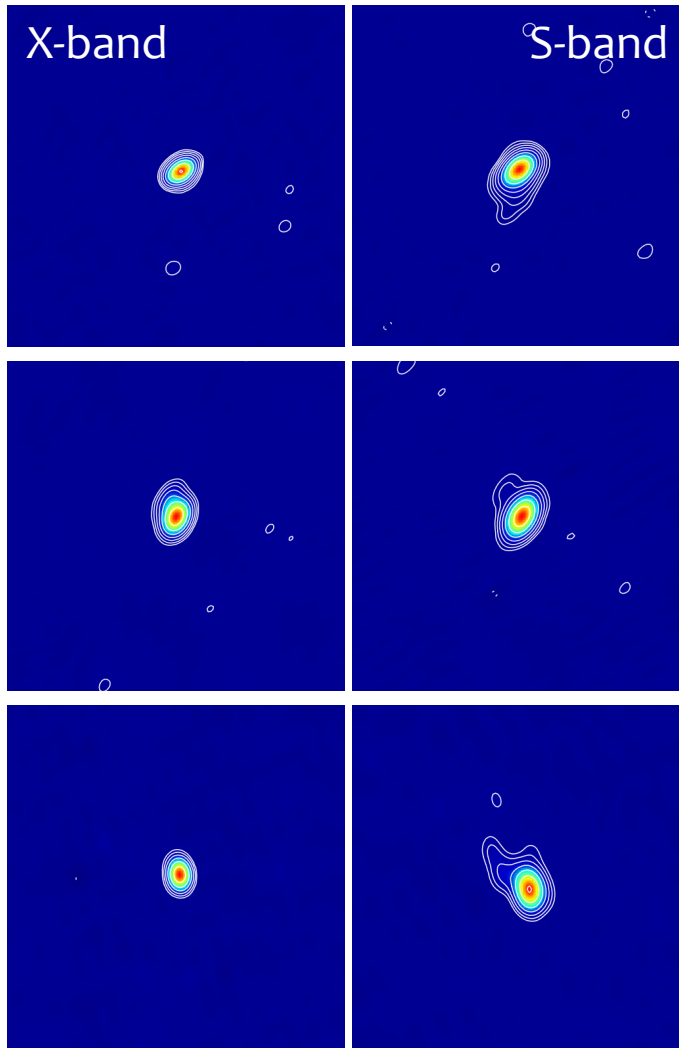
* Lots of sources (i.e. fewer scans) \rightarrow “limited” dynamic range

1st contour median value of 0.75% of the peak @ X band

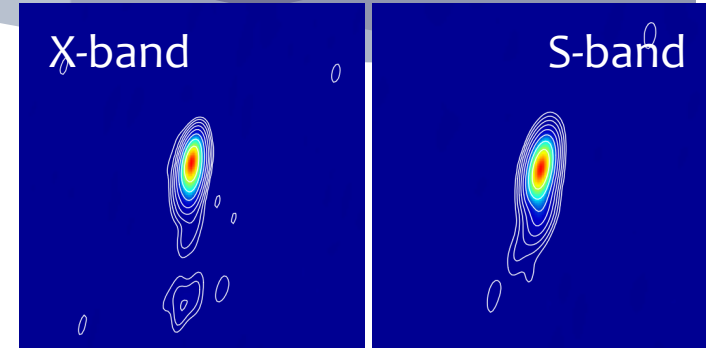


Some VLBI maps

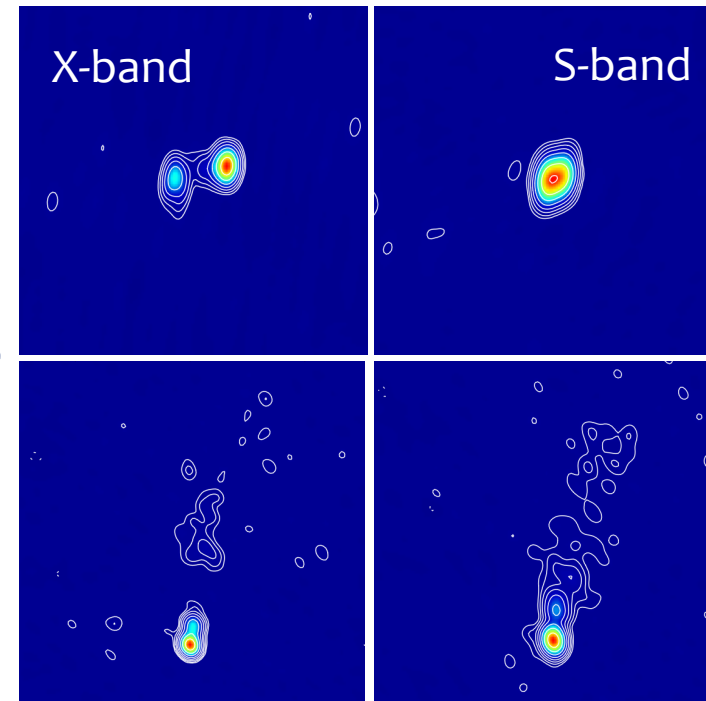
Point-like ($\sim 70\%$)



Some structure ($\sim 20\%$)

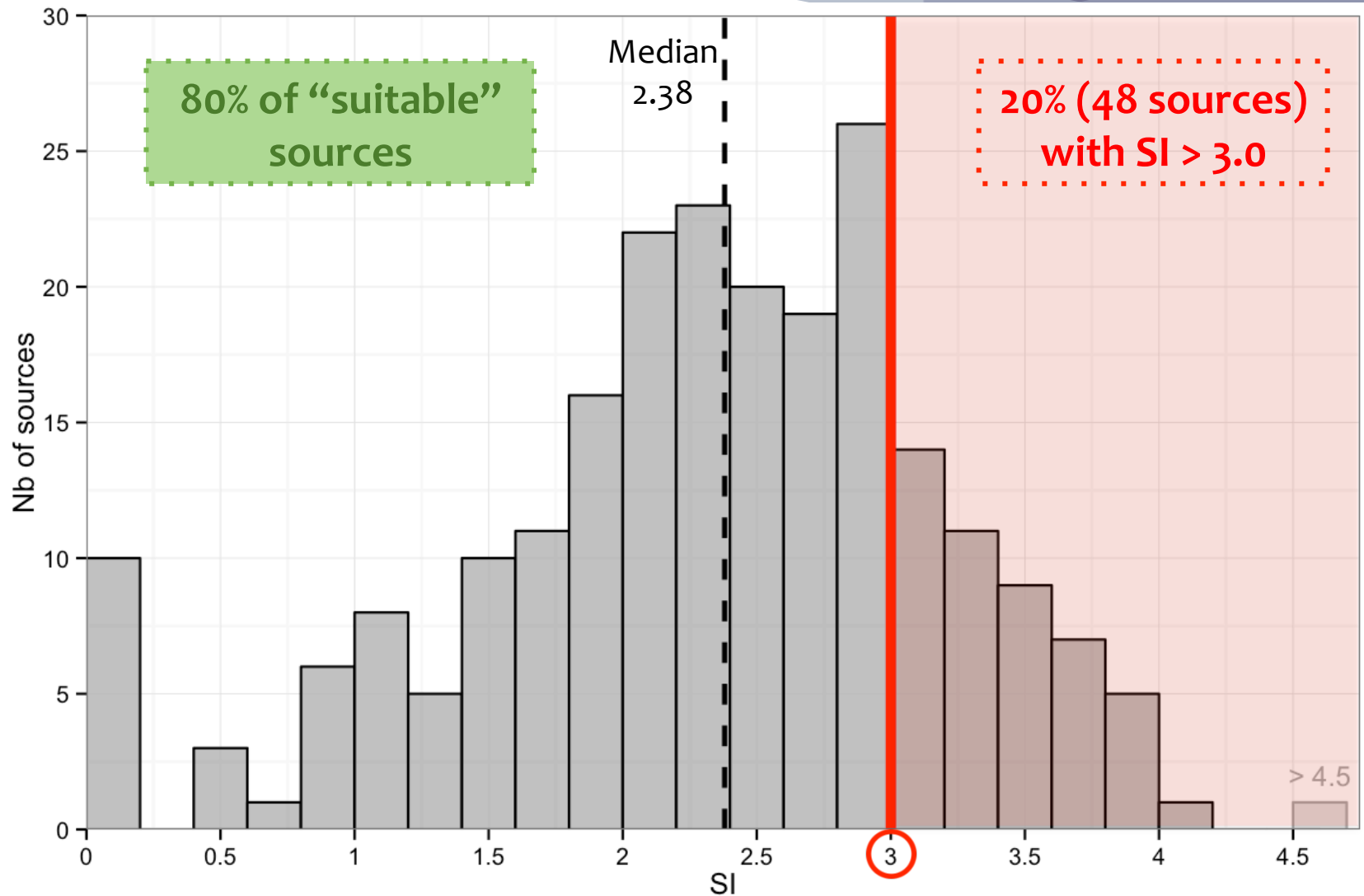


More structure ($\sim 10\%$)

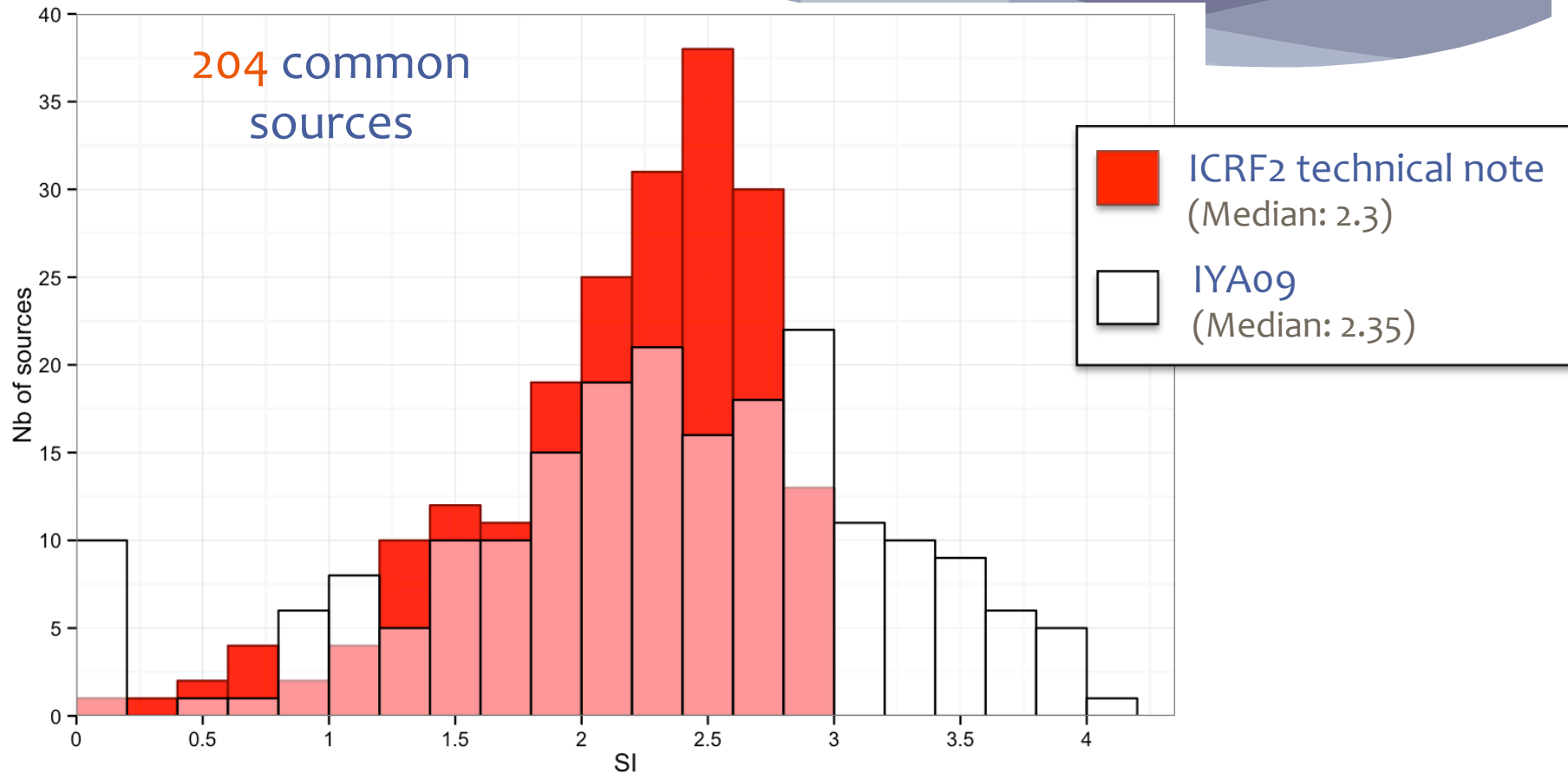


Structure indices

For X band



IYA09 vs. ICRF2 indices



* 24 sources not in ICRF2 technical note → No SI value available at that time (not necessarily southern sources)

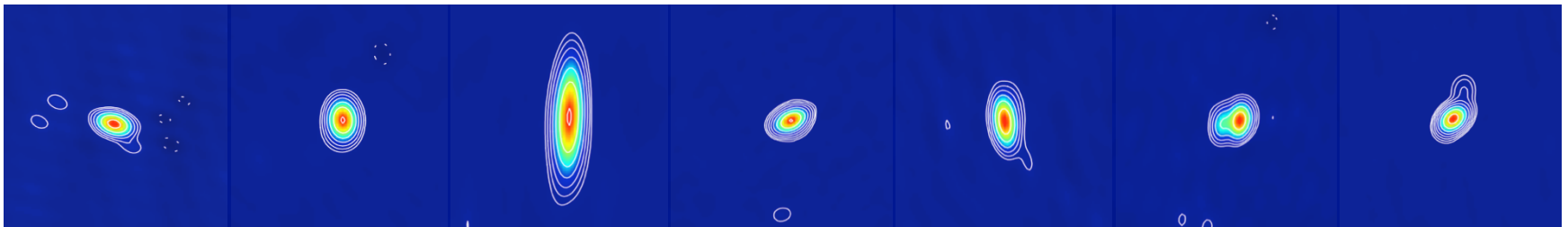
Conclusion

- * IYA09

- **largest VLBI session ever conducted**
(**33** stations, **243** sources observed)

- * Concerning the imaging

- * Around **95%** of sources mapped
 - * More than **80%** of them may be considered as ICRF2 “suitable” sources using the structure index criteria
 - * Structure indices for **24** additional sources in comparison to the ICRF2 Technical Note



Thank you!

Acknowledgments:

Mike Titus (@ Haystack Observatory)
Walter Alef, Dave Graham (@ MPIFR)
Eric Greisen, Amy Mioduszewski (@ NRAO)

A few links...

<http://ivscc.gsfc.nasa.gov/program/iya09/>

<http://iya09-ivs.obs.u-bordeaux1.fr> and/or

<http://ivslive.obs.u-bordeaux1.fr/index.php?session=iya09>



Data soon available within Bordeaux VLBI Image Database

<http://www.obs.u-bordeaux1.fr/BVID>

Further details to come in Collioud et al., A&A (In prep.)