



Software Correlation at JIVE & Real-time e-VLBI in the EVN

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- PI Interaction and Operations
- EVN Software Correlation at JIVE (SFXC)
- Real-time e-EVN update
- Solar activity summary/prognosis

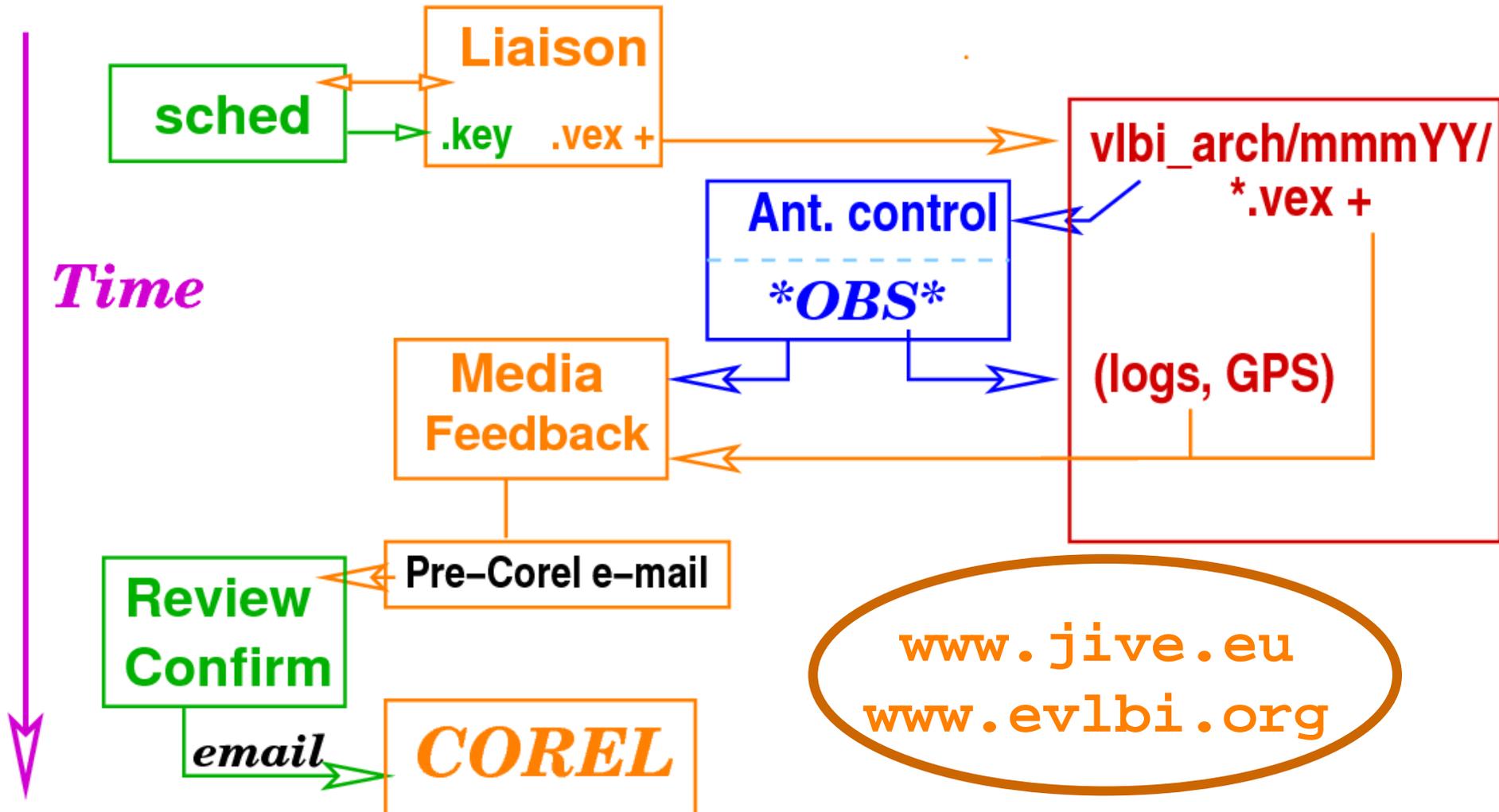
Ops Flowchart (≤ Correlation)

User/PI

JIVE

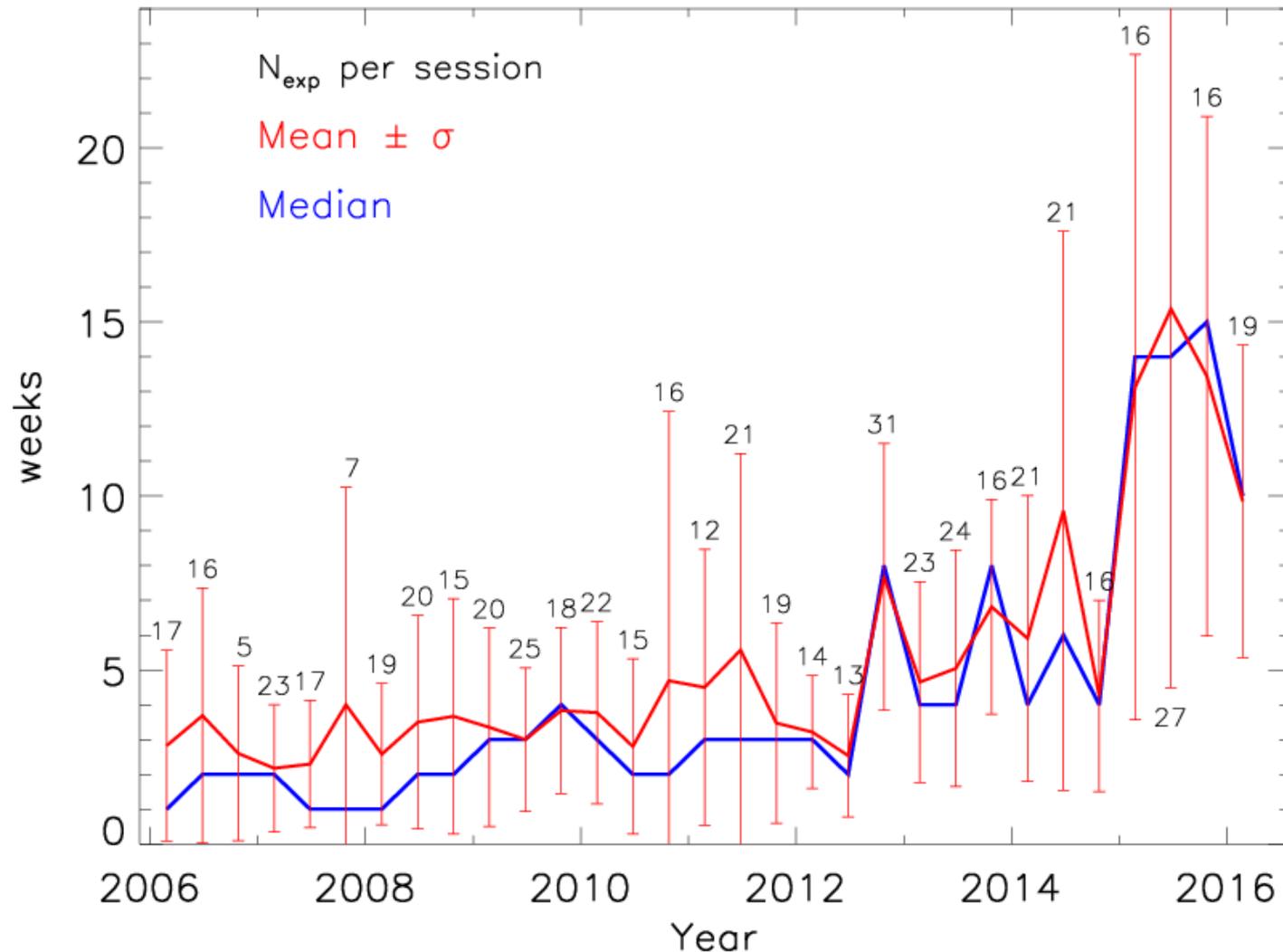
Stations

VLBEER



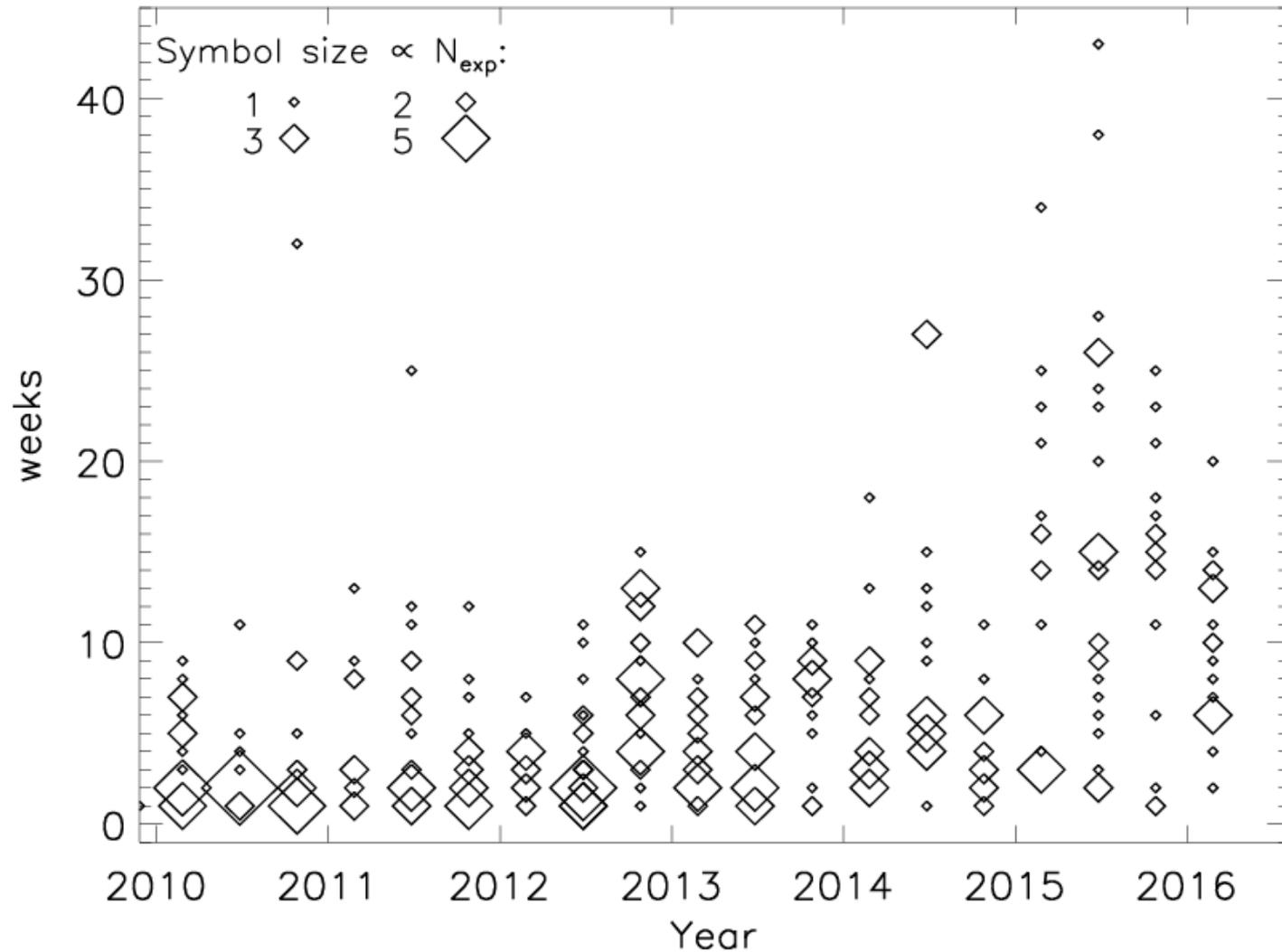
From Correlation to Distribution

time between corr & dist



From Correlation to Distribution

time between corr & dist



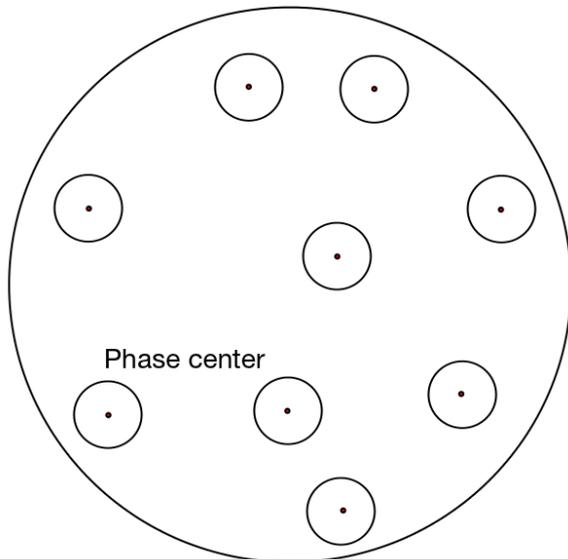
SFXC: Contemporary Capabilities

- Pulsar Gating/Binning
 - Both incoherent and (new) coherent de-dispersion
- Multiple output phase centers within a wider field
- Wide-field mapping (large N_ν , short t_{int})
 - Selectable spectral windowing (Hanning, Hamming, tophat, cosine)
 - Working on baseline-dependent averaging (t, ν)
- Mixed-bandwidth, mismatched-sideband correlation
 - enables inclusion of a wider set of heterogeneous back-ends
- “Phasing up” the EVN
- Space VLBI: near-field target, orbiting antenna

SFXC: Wide-Field Mapping

- Essentially unlimited $\max-N_{\text{frq}}$, $\min-t_{\text{int}} \rightarrow$ can map an area on the sky \sim single-dish beam w/ minimal smearing
 - Price = huge output data sets (record = 5.4 TB of FITS files)
- Multiple phase-center correlation: outputs only subsets of the full area (record = 699 phase centers)

Station Field of View

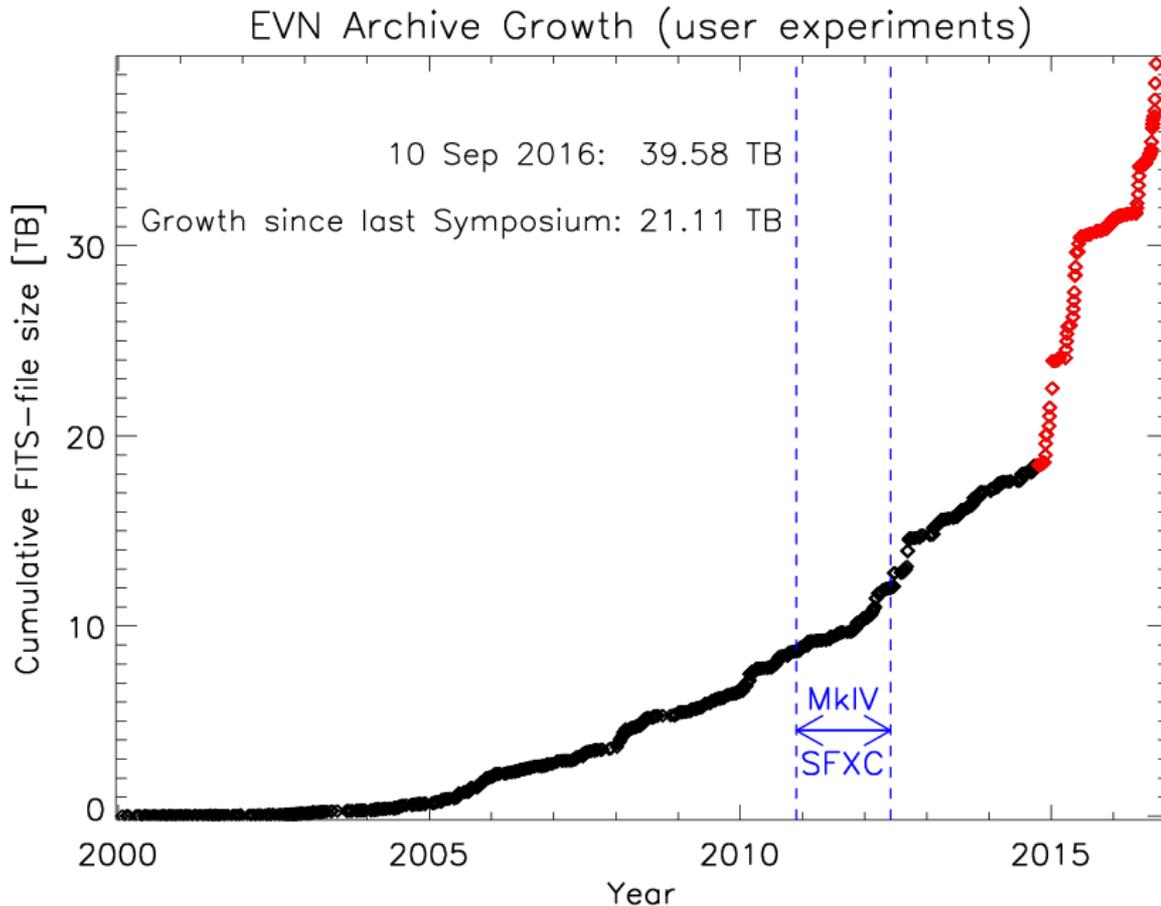


Typical "internal" correlation: $N_{\text{frq}} \sim 16\text{k}$; $t_{\text{int}} \sim 4\text{-}15\text{ ms}$

Correlation-time "penalty" factor small, $\sim 1.5\text{x}$ (for a reasonable number of phase centers) — multiplications much faster than Fourier transforms

("penalty" for 699 phase-centers, 13 stations $\sim 17\text{x}$)

WFM: Effect on the Archive



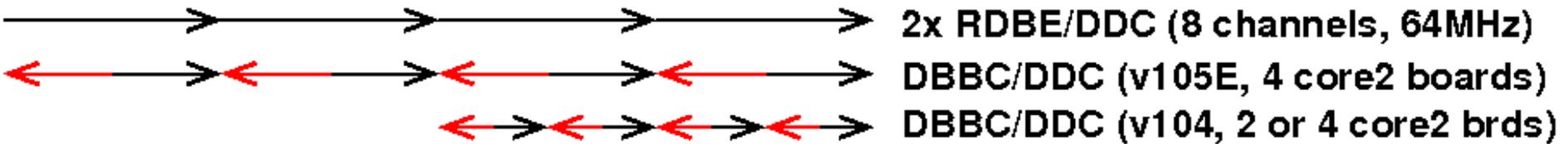
Transition period
MkIV→SFXC
annotated.

Exps. providing
3.7-4.7 TB more
"in the headlights"
(correlated or
observed).

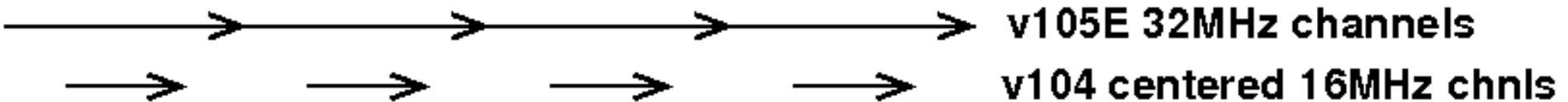
One proposal in
Feb'16 implied an
output = 85TB of
FITS files.

SFXC: Mixed-BW

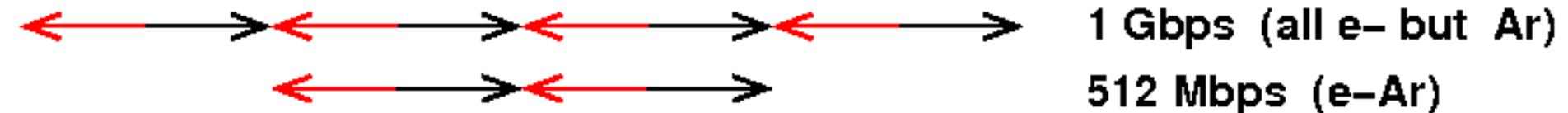
- K-band global obs: up to 6 different back-ends
- 2 Gbps global:



- Wide-band spectral line (e.g., HI absorption):



- e-EVN with Arecibo:

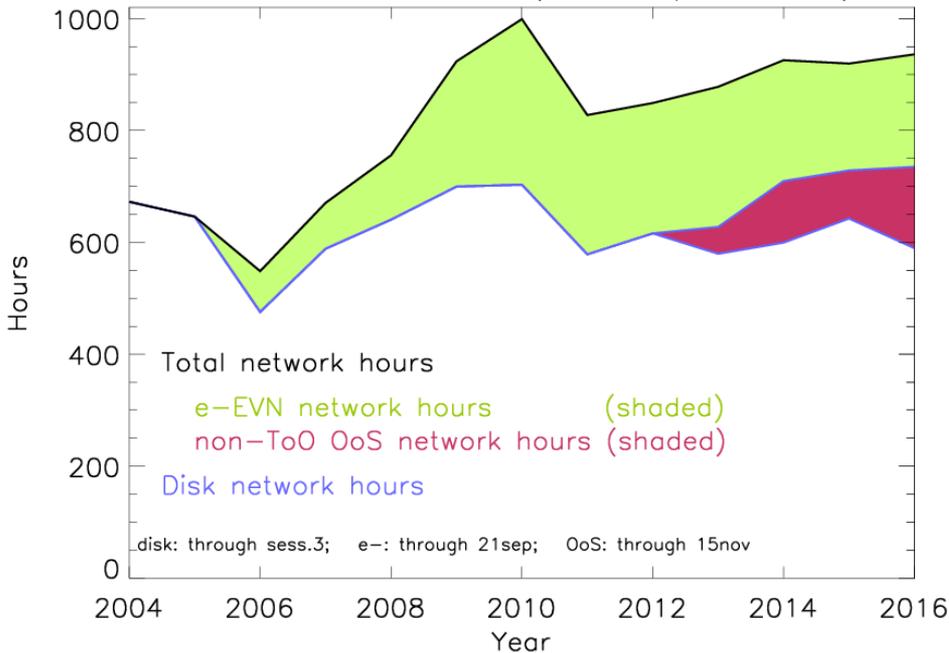


Real-time e-EVN Science

- Proposal-driven e-EVN science observations
 - Nowadays, a network of 10-11 stations at Gbps is routine
 - First 2Gbps e-EVN run in June (6 sta @ 2Gbps + 4 @ 1Gbps)
 - ~27% of EVN observing time since 2009 ('06-'08 = 13.7%)
 - 285 observations from 175 proposals; 71 different PIs
- Evolution of e-EVN procedures
 - ~monthly 24-hour runs (+4hr prelim. test) on fixed dates (10)
 - e-EVN also in ToO's & regular disk sessions (longer runs)
 - Proposals within standard proposal-submission cycles
 - Any EVN or GLOBAL proposal may contain e-VLBI observation(s)
 - Target of Opportunity Observations (69 obs; 43 props; 30 PIs)
 - Proposal Class for "triggered" observations (13 obs; 9 props)
 - New categories: generic trigger, automatic-override trigger

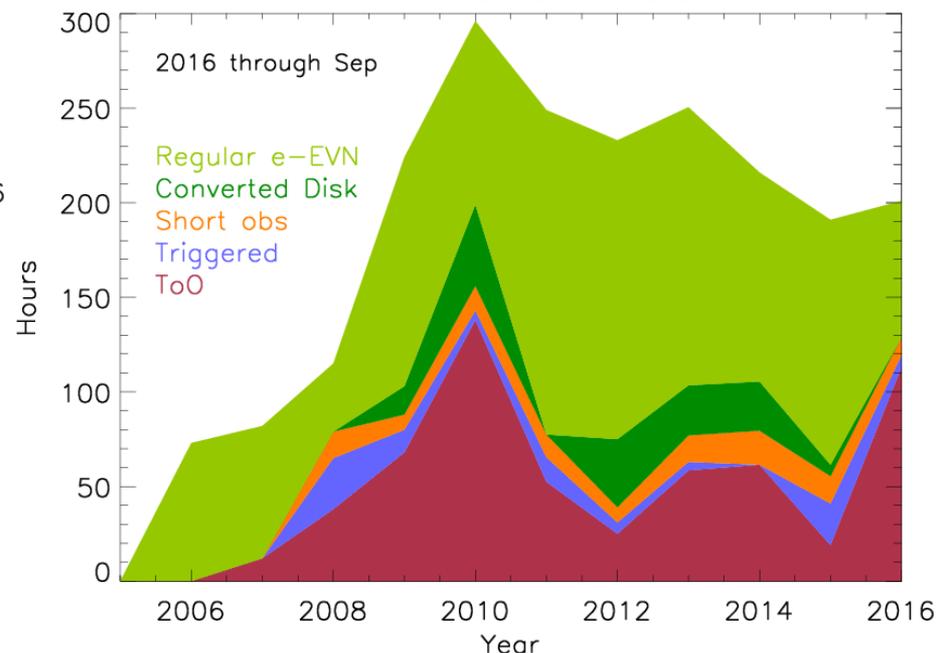
EVN / e-EVN Network Hours

EVN network hours (user experiments)



New category: non-ToO out-of-session: ≤ 12 blocks per yr; max 144 hr/yr (min. block size for accounting = 12hr)

e-EVN network hours



2016 so far: ToO = 113 hr
total = 201 hr
still 3 e-EVN days to come

e-EVN Operational Bandwidth

Station	Connection
Effelsberg	2048 Mbps
Westerbork	1024 Mbps
Jodrell Bank	1024 Mbps
Medicina	2048 Mbps
Noto	2048 Mbps
Onsala	2048 Mbps
Torun	1024 Mbps
Yebes	2048 Mbps
Sh / Tm65	1024 Mbps
HartRAO	2048 Mbps
Arecibo	512 Mbps
Metsahovi	1024 Mbps

LBA (At,Mp,Pa): 1 Gbps

KVAZAR (Zc,Bd): 512 Mbps in
clock-search portion of Jun'16

SRT expected soon

Robledo to start tests

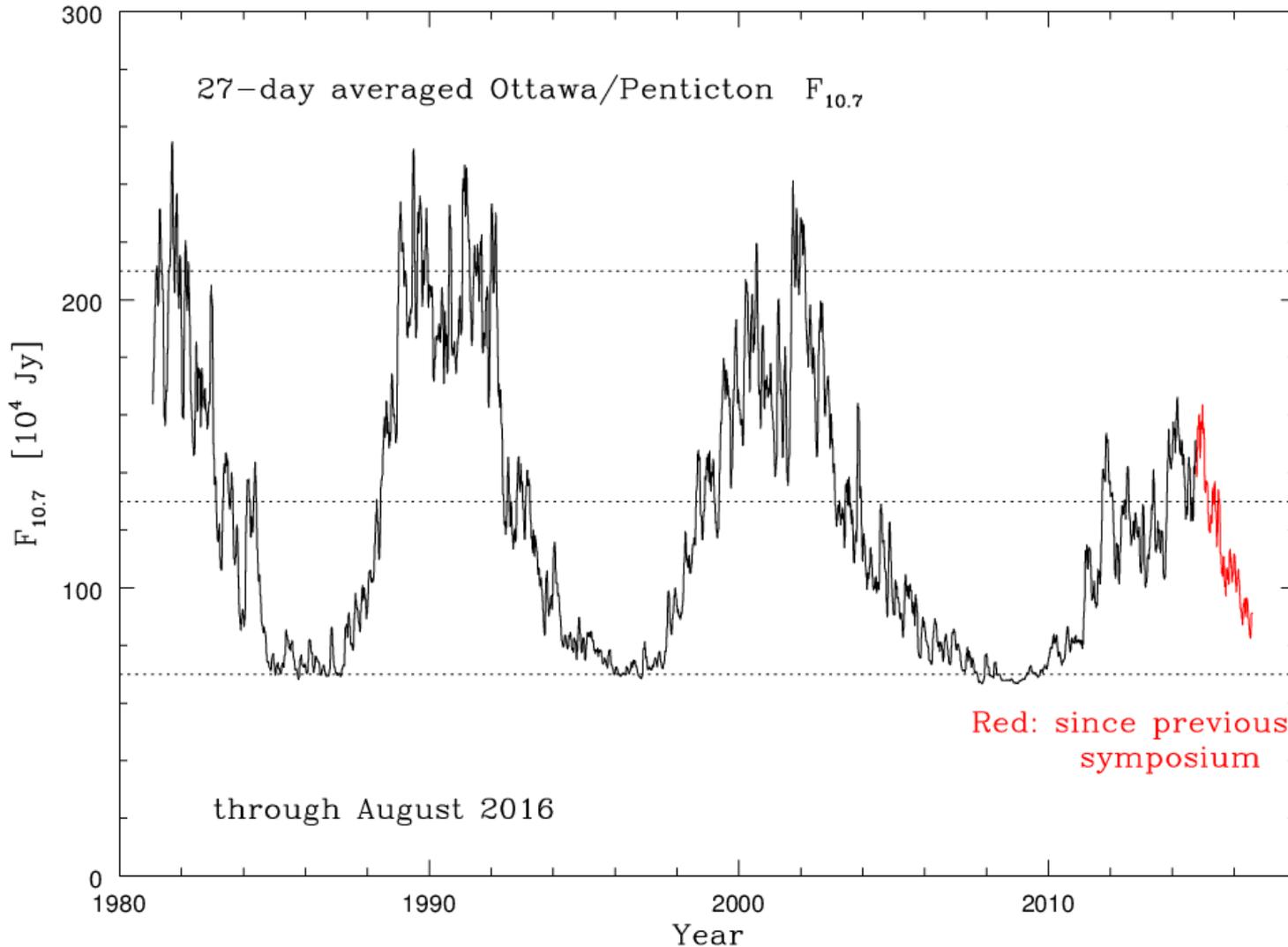
Irbene connection in place

e-EVN & Recording at JIVE

- Limitation: e-EVN had to be real-time correlation
 - No multiple-pass correlation, multiple phase-centers, *etc.*

- jive5ab → correlate real-time & record onto FlexBuff
 - Continuum-/Line-pass spectral-line observations
 - FRB obs: pulse search via auto-correlations or phasing-up; recorrelations of detected pulses with appropriate t_{int}, N_{ν}
 - → Today's target-of-opportunity observation: monitor the actual real-time fringes at:
services.jive.nl/sfxc/fringe.html
 - Torun remote-maser e-tests

Solar Activity

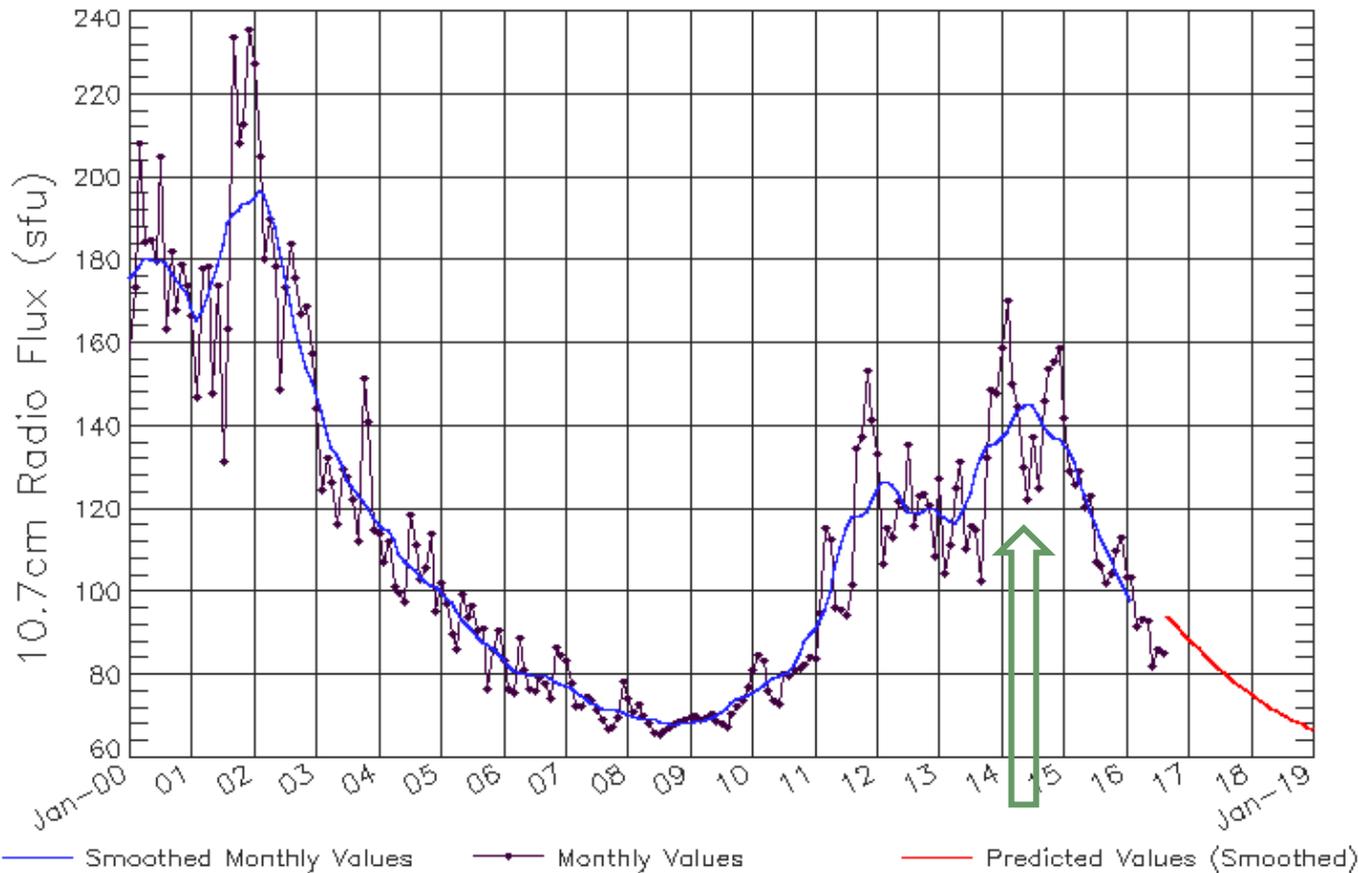


Transition towards solar-min from the weak peak of the current cycle seems truly underway.

L-band astrometry...

Predictions for this Solar Cycle

ISES Solar Cycle F10.7cm Radio Flux Progression
Observed data through Aug 2016



Sep'10 & '12 predictions:
solar max. in
mid-2013 at
140 sfu.

Follows Sep'14
prediction
fairly well

ref: Space
Weather
Prediction
Center, via

www.sec.noaa.gov

Updated 2016 Sep 5

NOAA/SWPC Boulder, CO USA