VGOS Intensives

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2017-May-15
EVGA Meeting
Chalmers University
Gothenburg, Sweden

Preview

Question:
How do ‘VGOS’ Intensives compare to standard S/X intensives?

Look at 2 networks:
Kokee-Wettzell (S/X)
Kokee12M-Wettzell13S (VGOS)

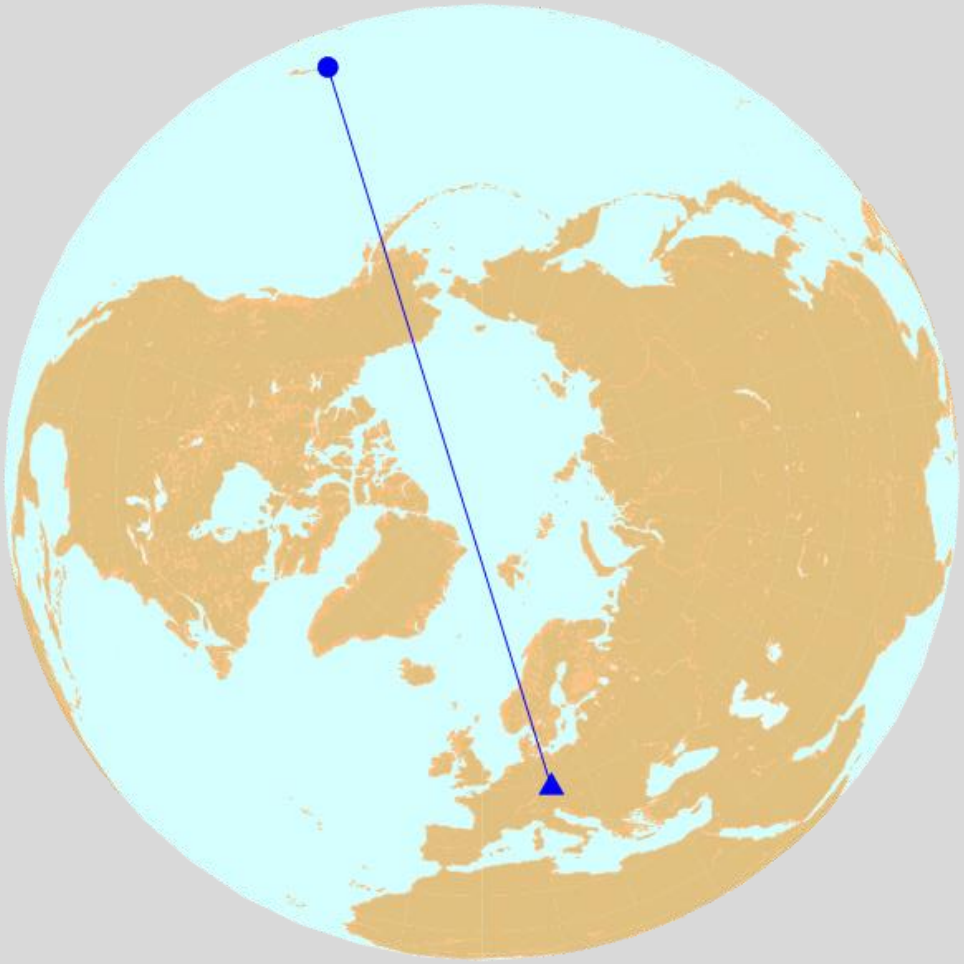
For each network generate 26 schedules spaced 2-weeks apart
→This samples the sky at different times of the year.

Repeat this using 12 different flux catalogs
→ Observations depend on fluxes of sources, and this can change

Compare schedules using several metrics

The Baseline

Intensives require long E-W baselines to measure UT1.



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Our Metrics

UT1 Formal Error. Uses UT1 formal error from solve simulation. This assumes all observations were successful, and the sigma calculated from sked is correct.

Atmospheric Turbulence. Looked at RMS change in UT1 from 300 runs where we stimulated effect of atmospheric turbulence. Uses sked sigmas.

Sensitivity to Source Loss. For each schedule we calculated the RMS change in UT1 estimates caused by a single source failing. This might happen if the flux model is outdated.

Also look at schedule characteristics:

- Number of Sources Scheduled
- Number of Observations

Team One: Grizzled Veterans

Kokee

Wettzell

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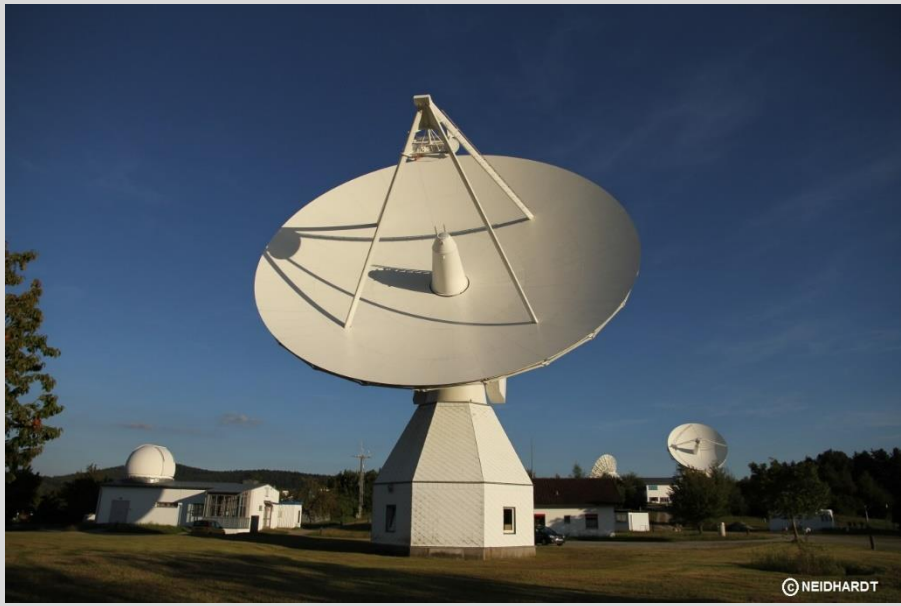
Team Two: The New Kids

Kokee12M



Wettzell13M

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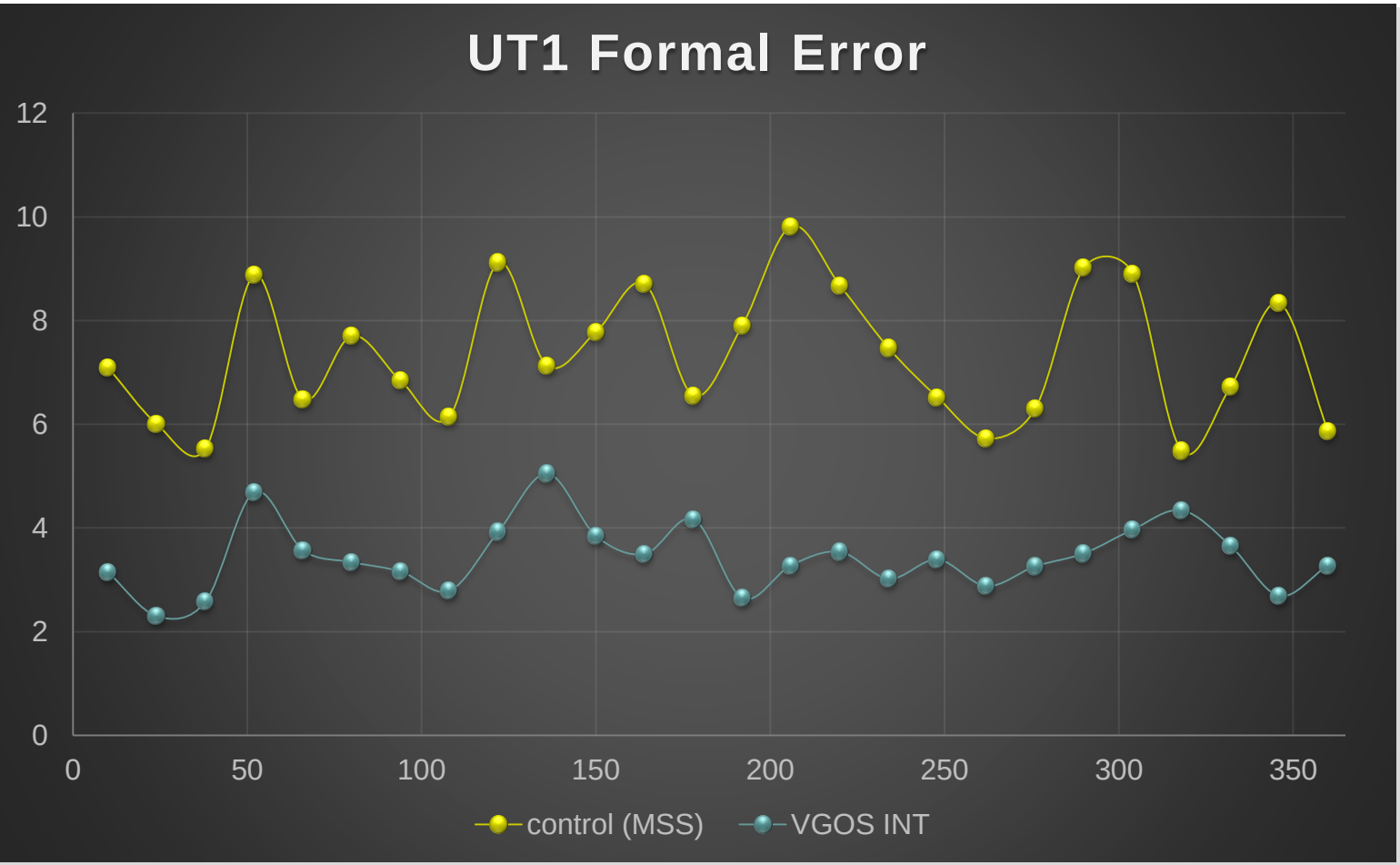
Comparison

	Kokee	Wettzell	Kokee12M	Wettzell13M
Size	20M	20M	12M	13M
SEFD	2000 750	750 1115	3000 3000	1400 1050
Band	S/X	S/X	Broadband	Broadband
Mbps	128		8192	
Az slew (deg/sec)	2	3	5	12
El slew (deg/sec)	2	1.5	1.1	6

Formal Errors



	MSS	VGOS
Avg	7.34	3.44
STD	1.25	0.64
STD/Avg	17%	19%

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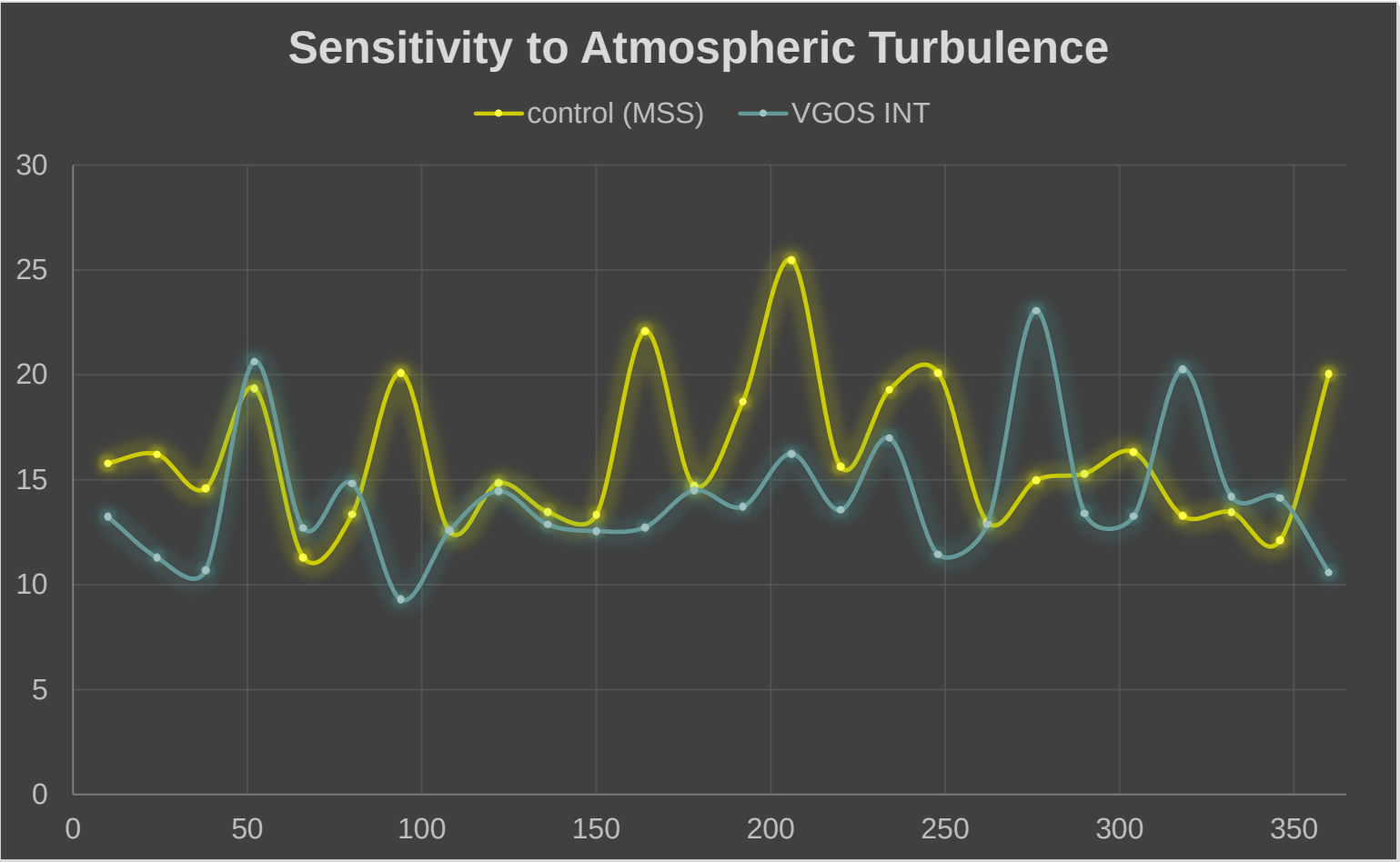
Sensitivity to Atmospheric Turbulence



	MSS	VGOS
Avg	16.13	14.08
STD	3.43	3.11
STD/Avg	21%	22%

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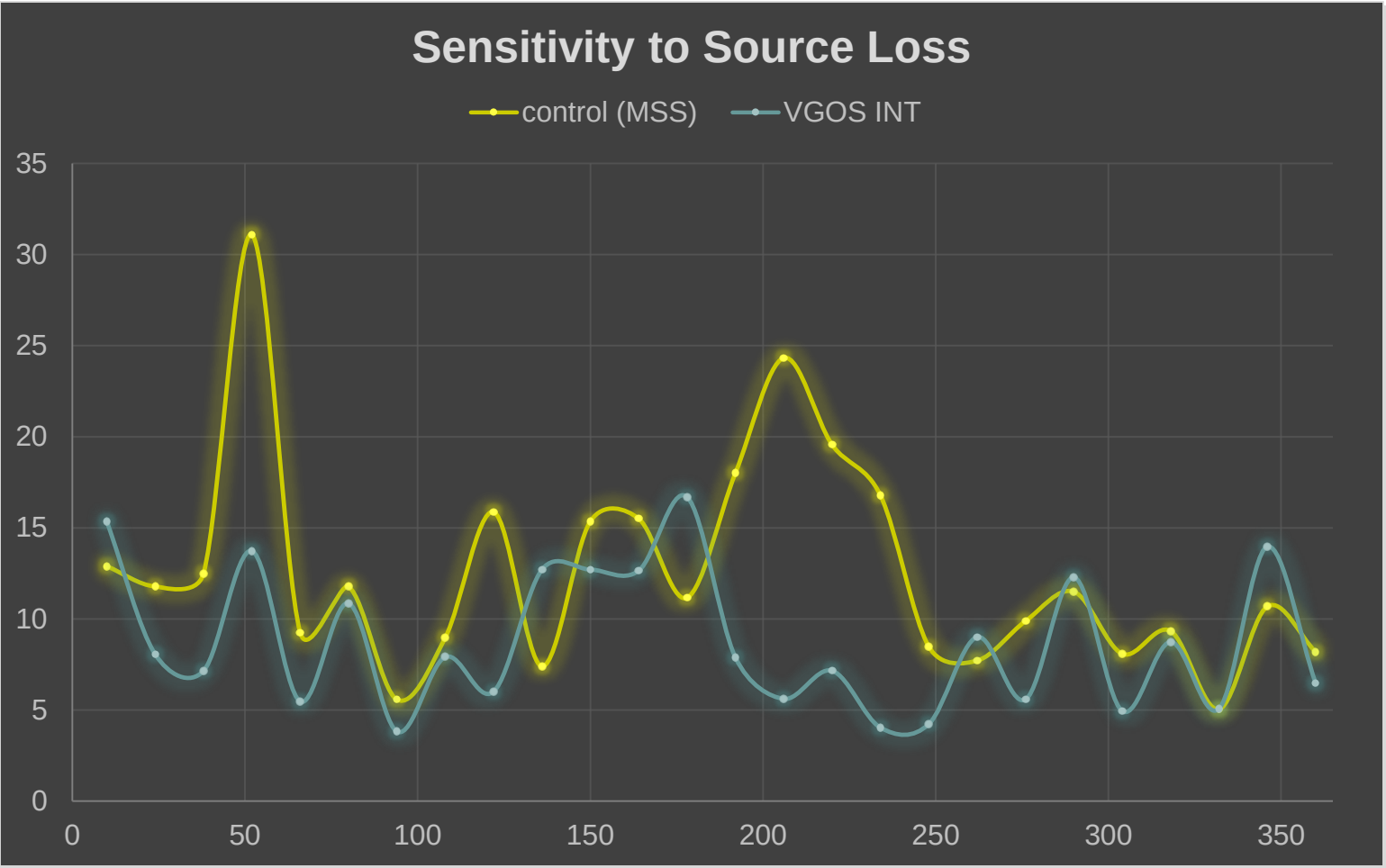
Sensitivity to Source Loss



	MSS	VGOS
Avg	12.57	8.78
STD	5.77	3.76
STD/Avg	46%	43%

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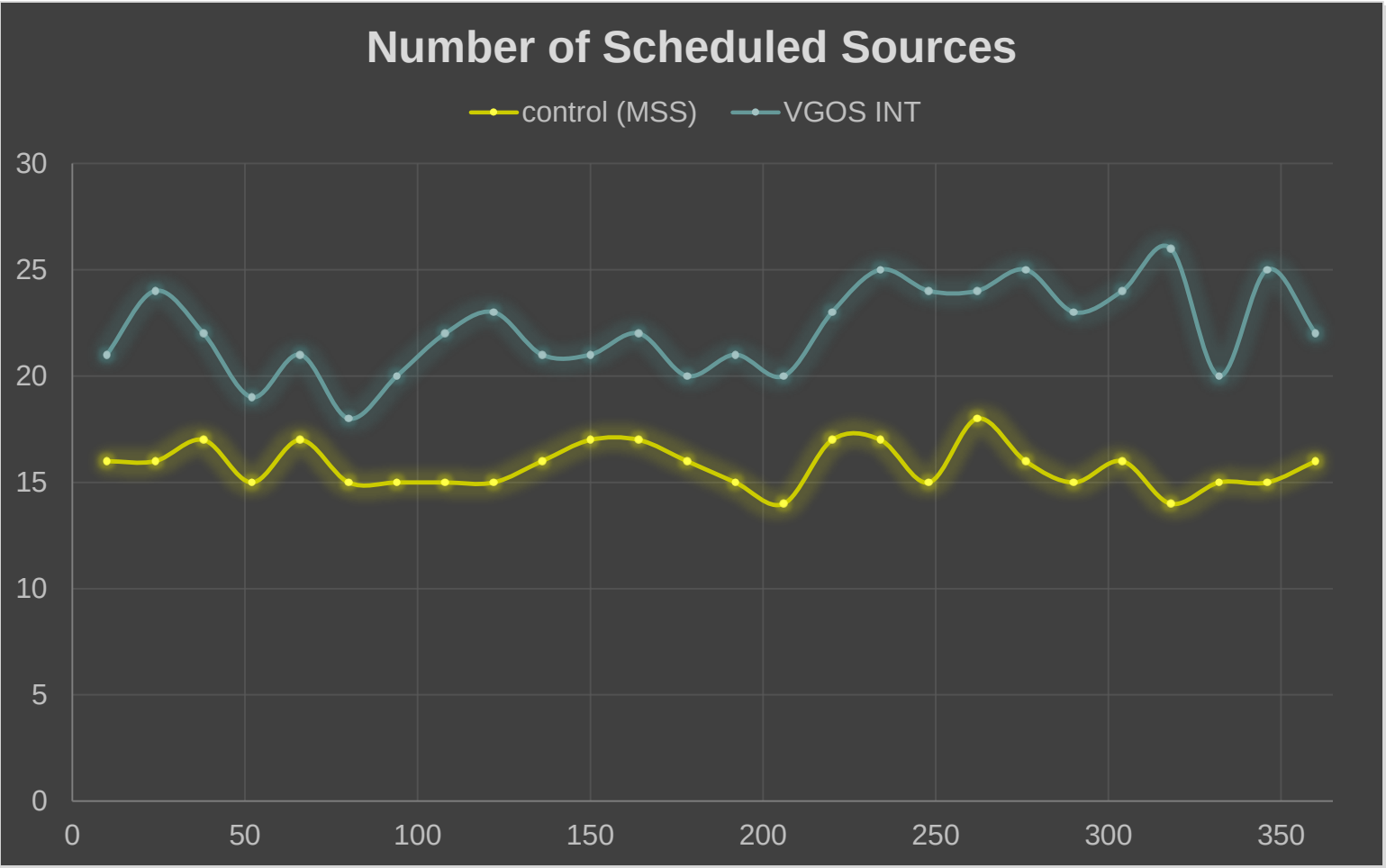
Number of Sources



	MSS	VGOS
Avg	15.77	22.15
STD	1.01	2.03
STD/Avg	6%	9%

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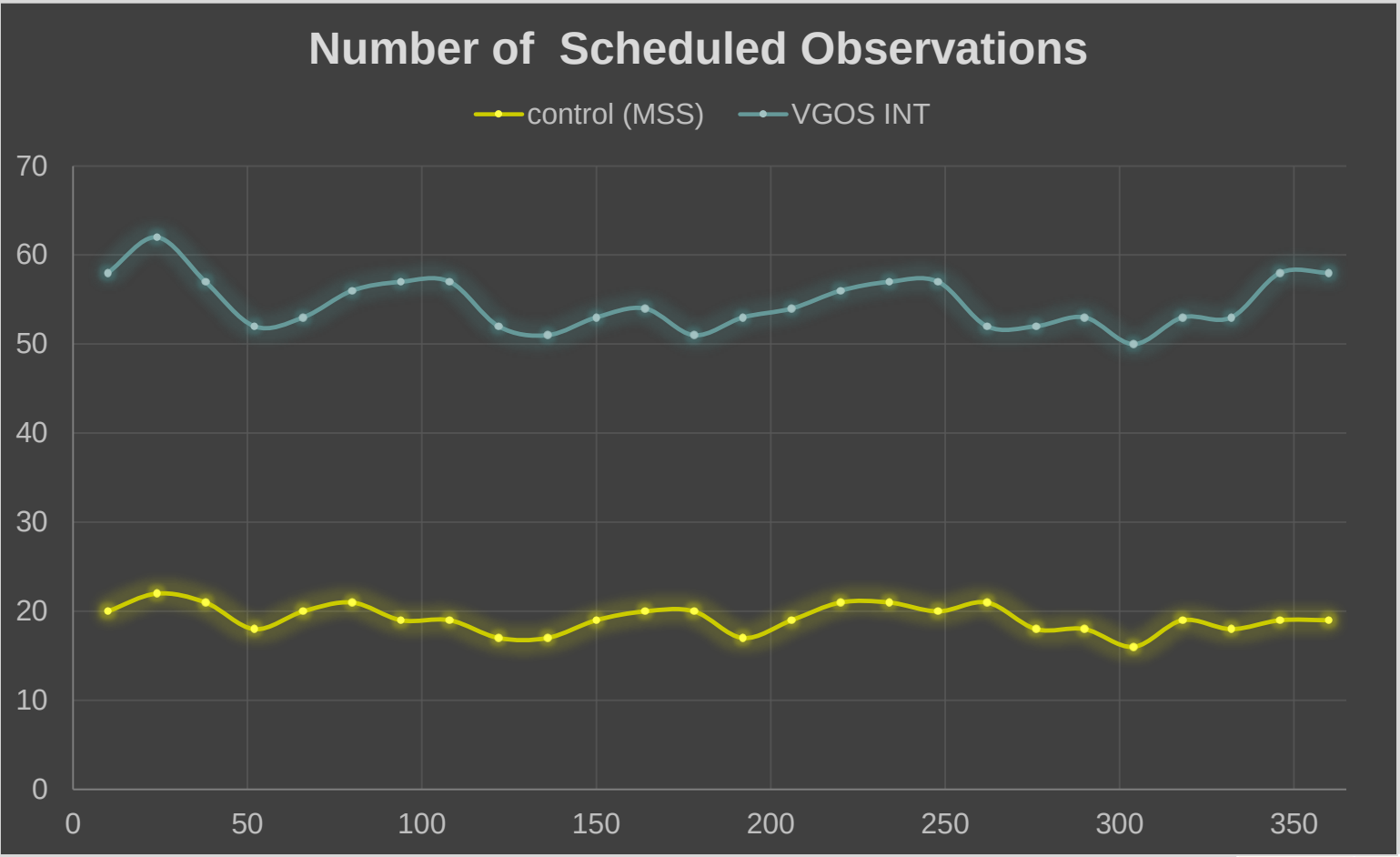
Number of Observations



	MSS	VGOS
Avg	19.19	54.58
STD	1.49	2.86
STD/Avg	8%	5%

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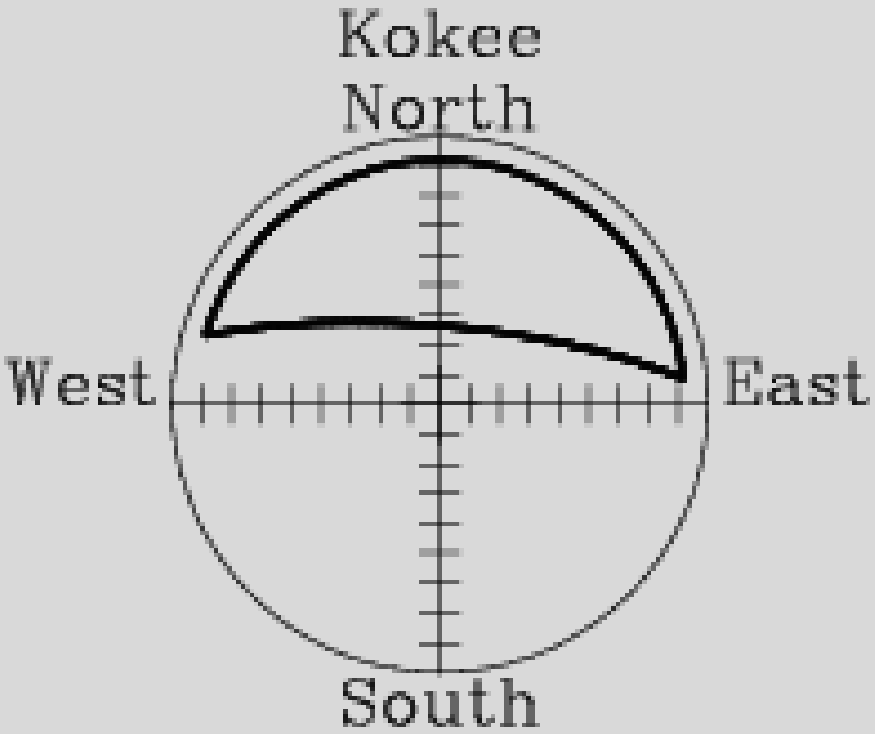
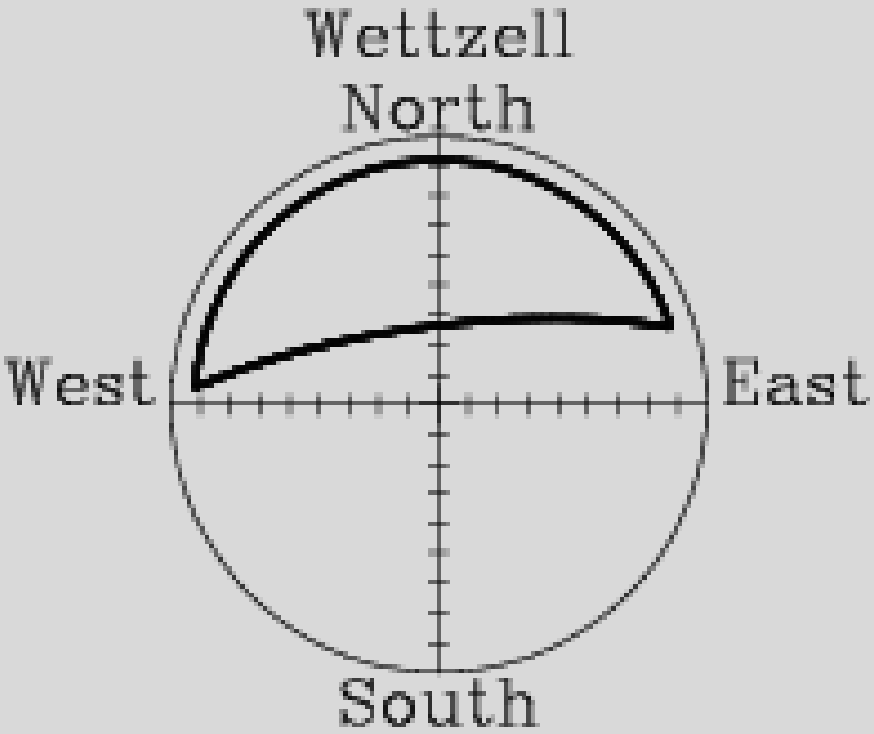
Observation Space Kokee-Wettzell





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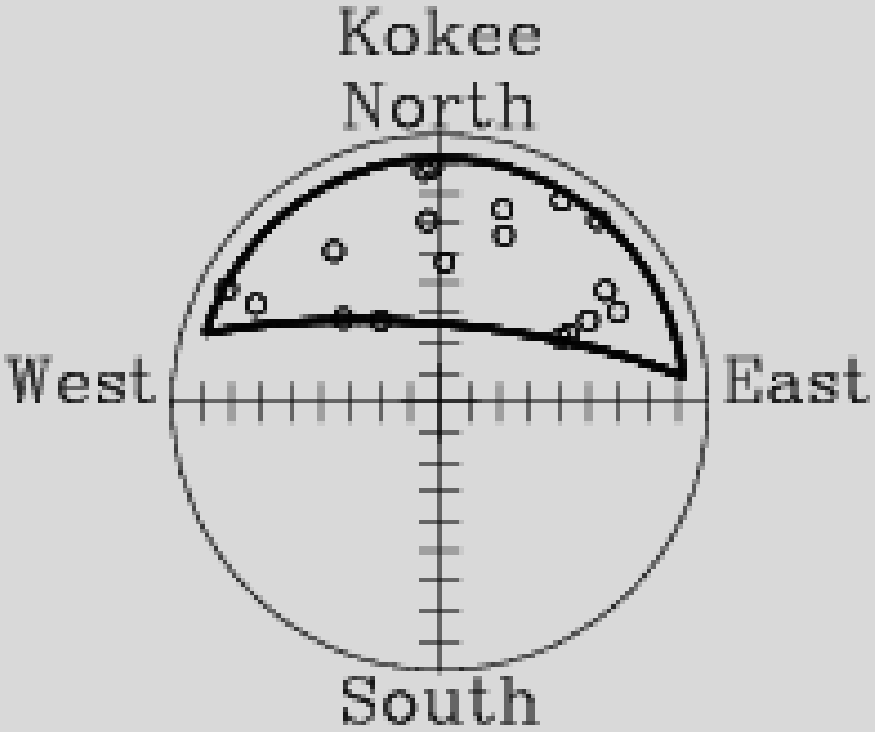
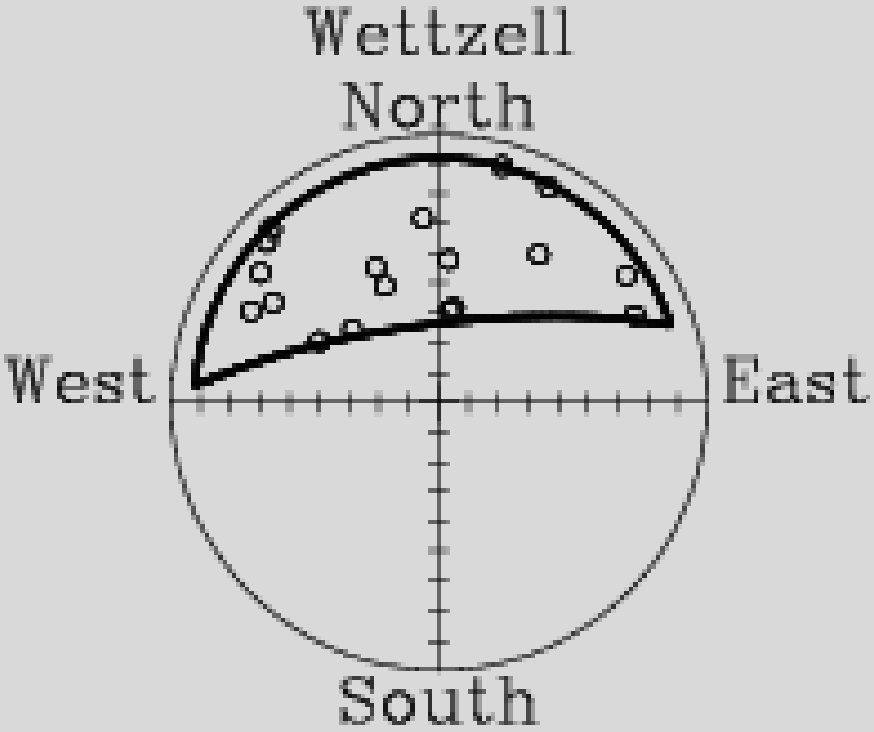
Typical Schedule Kokee-Wettzell





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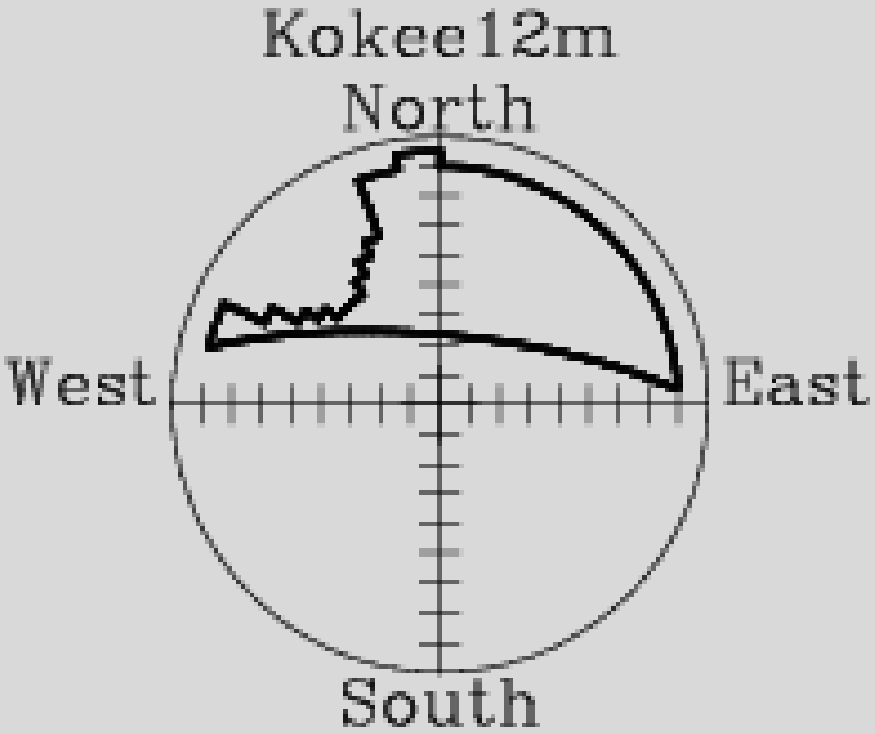
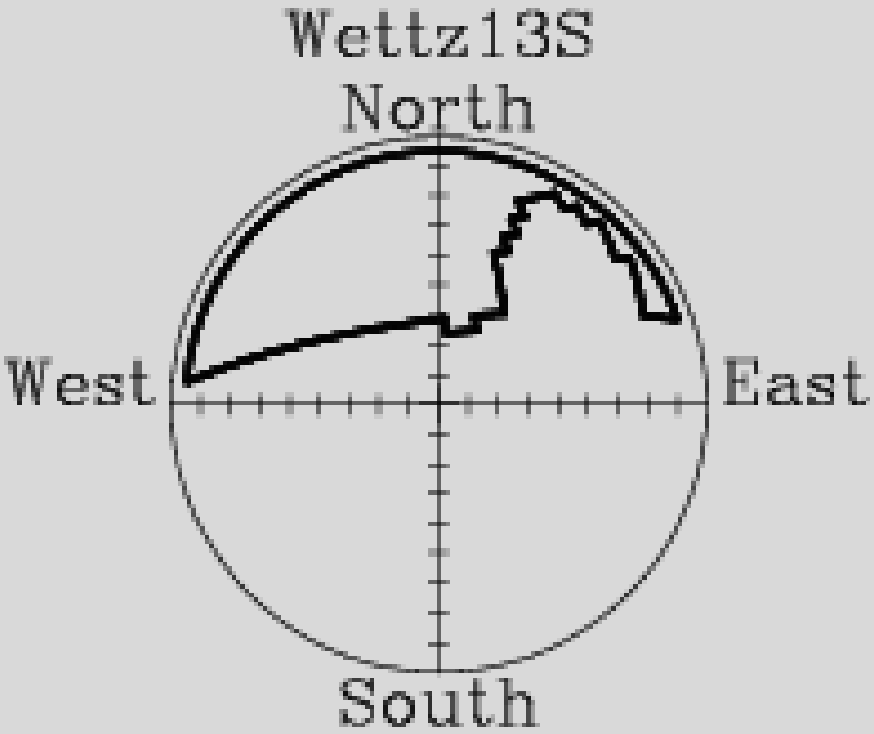
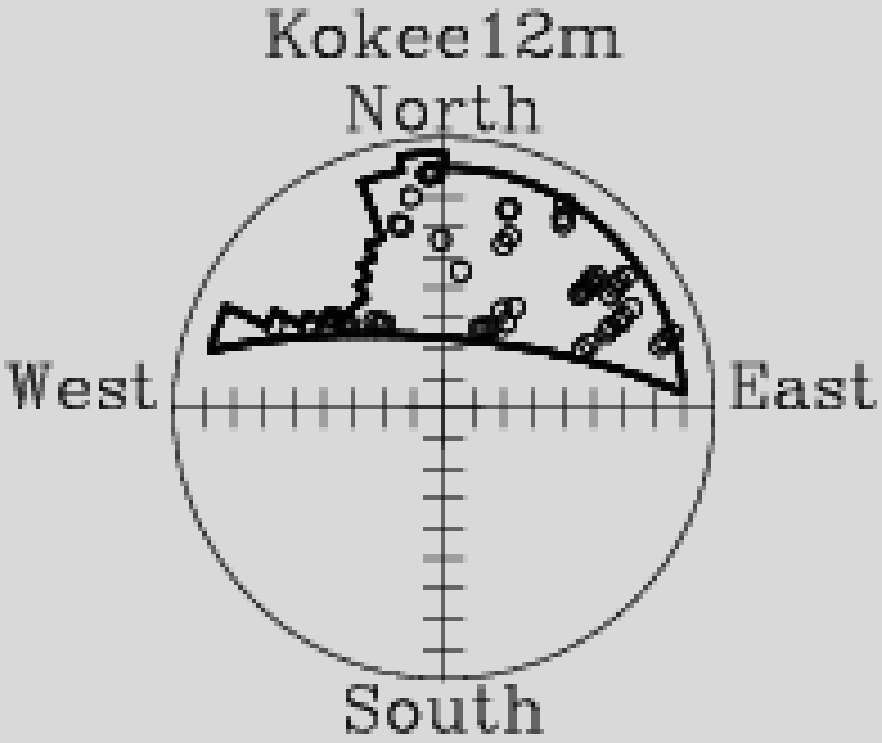
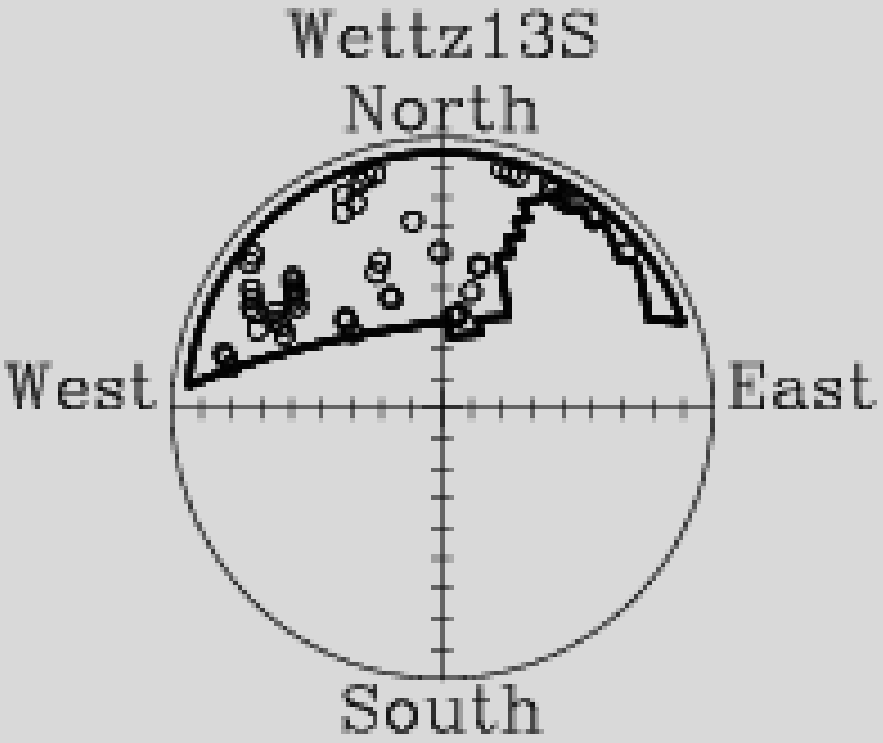
Observation Space Kokee12-Wettzell13S





Observation Space Kokee12-Wettzell13S





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EVLBI (or E-xfer) Considerations

Will focus on Kokee because that is where current bottleneck is.

Typical Intensive records 43GB of data at each site.
VGOS Intensive records 1.7TB of data at each site.
Roughly 40 times as much data.

Presently Kokee's BW is 100 Mb/s

Intensive xfer time=[8*43*1000 Mb]/100 Mb/s=3440 sec~1 hour
VGOS Intensive xfer time ~ 40 hours.

This summer Kokee's BW will increase to 1GB/s.
This will decrease transfer time by a factor of 10.
Quasi-realtime E-xfer is doable.

Conclusions

	S/X	VGOS
Formal Error	7.68	3.38
Sensitivity to Turbulence	16.09	14.01
Sensitivity to Source Loss	12.66	9.22
Number of Sources	16.08	20.53
Number of Observations	19.18	56.29

VGOS Intensives clearly better

E-xfer is possible in a reasonable time, which is important for short latency.

Questions/Comments?