



VLTI update

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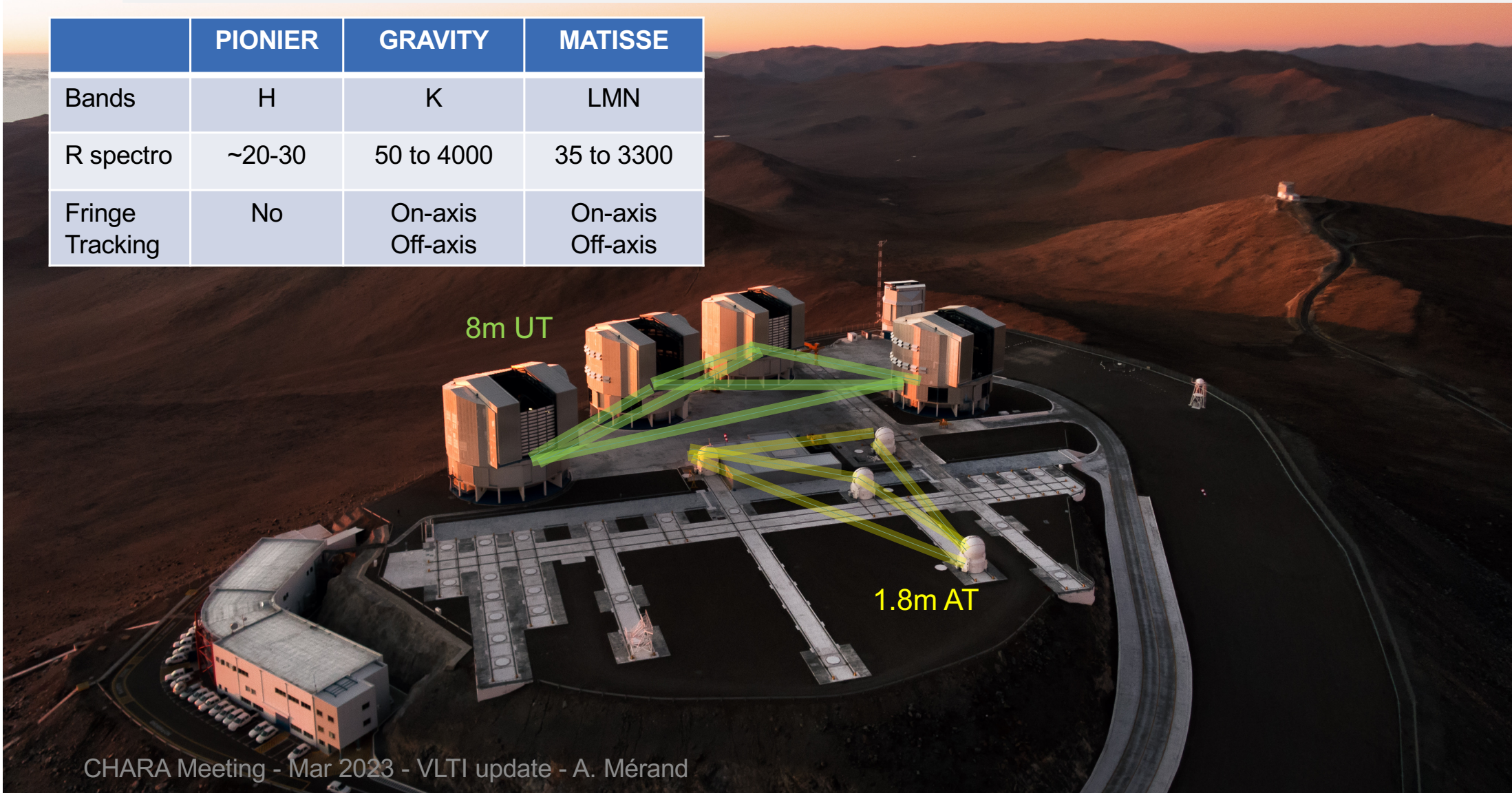
CHARA Meeting – March 13, 2023





Instruments and Telescopes

	PIONIER	GRAVITY	MATISSE
Bands	H	K	LMN
R spectro	~20-30	50 to 4000	35 to 3300
Fringe Tracking	No	On-axis Off-axis	On-axis Off-axis



8m UT

1.8m AT



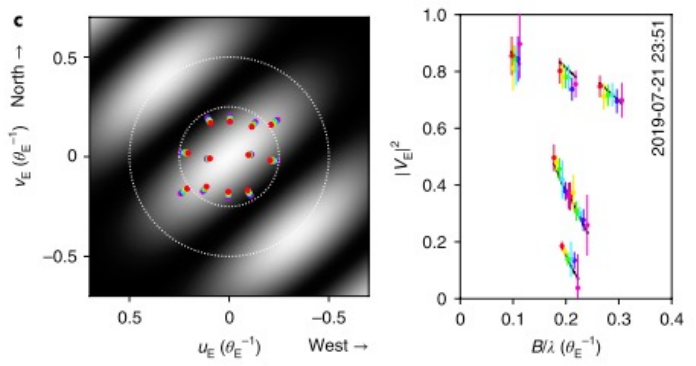
2022 (selected) results

MATISSE

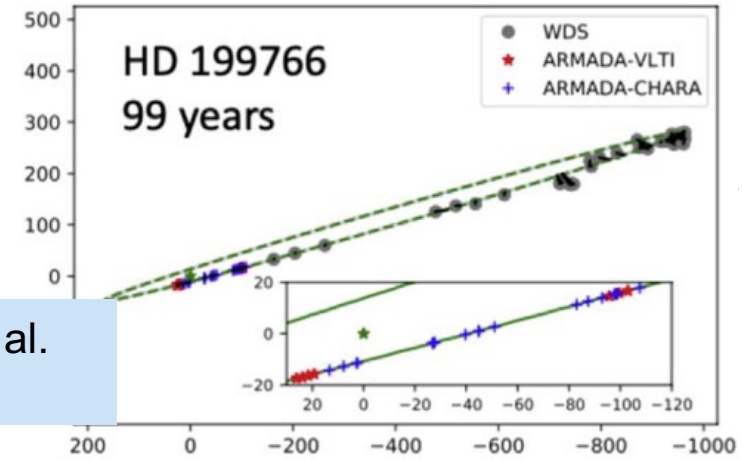
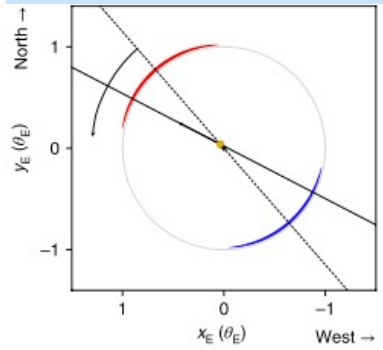


Gómez-Rosas et al. (2022)
<https://www.eso.org/public/news/eso2203/>

PIONIER

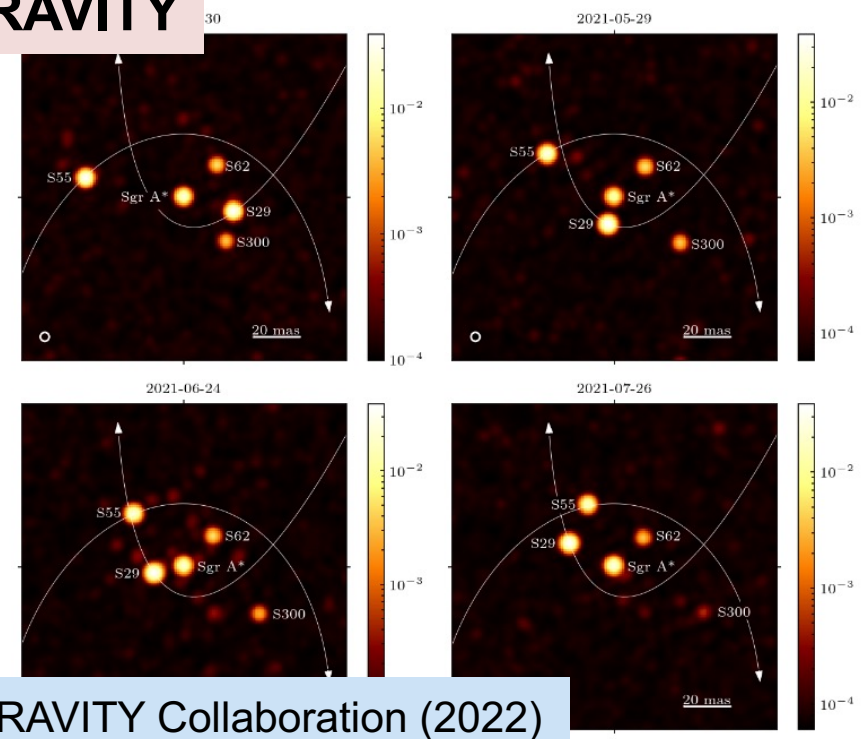


Cassan et al. 2022



Gardner et al. (2022)

GRAVITY



GRAVITY Collaboration (2022)





Upcoming Call for Proposal 112

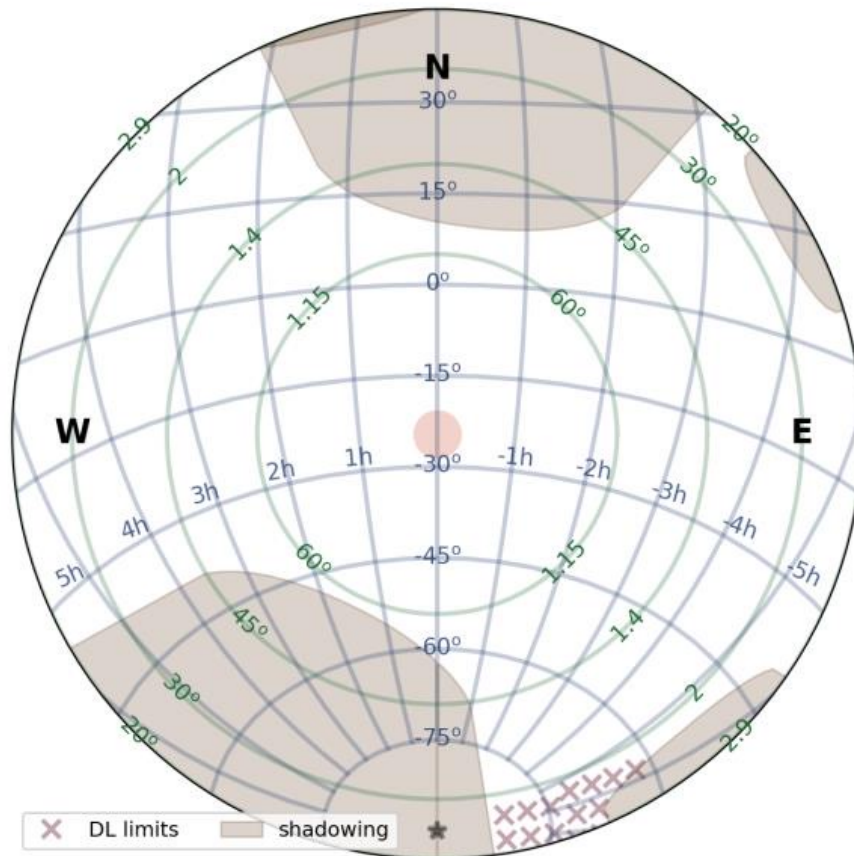
The deadline for Period 112 (1 October 2023 – 31 March 2024) is:

28 March, 2023

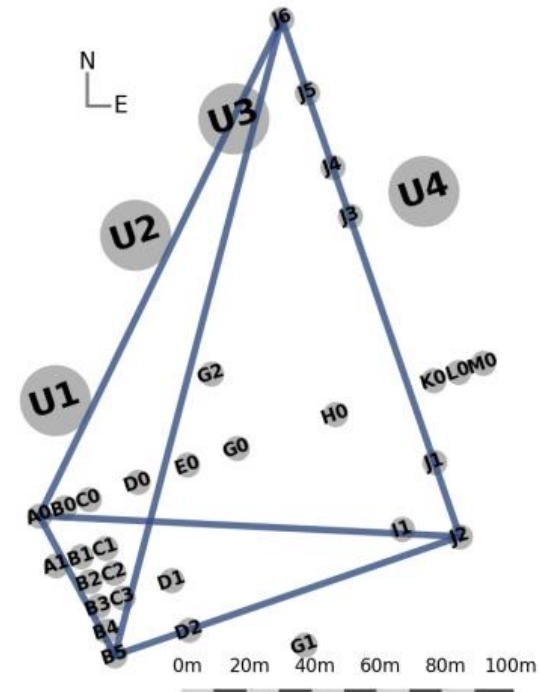
(12:00 noon, Central European Summer Time)

- New extended AT configuration (B=202m)
- Instruments news:
 - GRAVITY wide
 - MATISSE coherent flux and GRA4MAT narrow off-axis
 - PIONIER limited to single semester (problems with cryostat)

Extended baselines



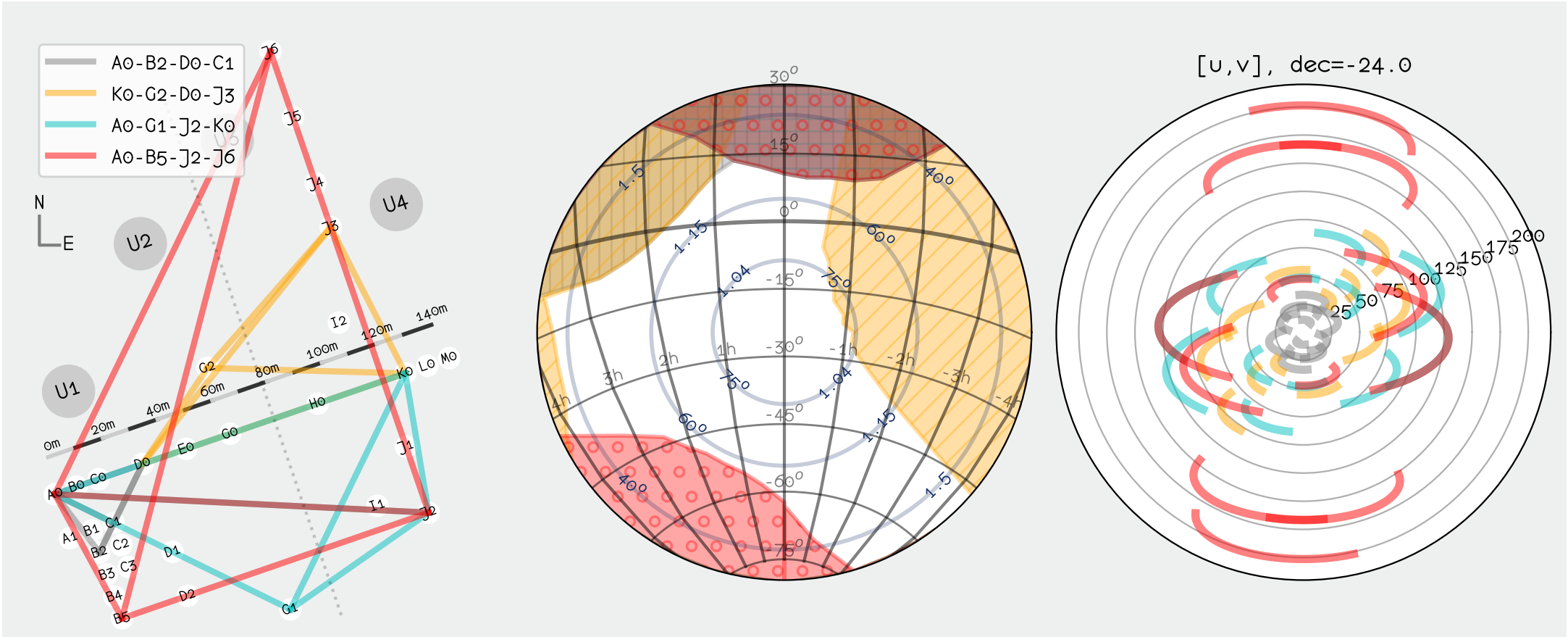
A0DL6-B5DL5-J2DL4-J6DL3: 49 -> 202m



Using DL double pass: 30% flux loss (0.3 limiting magnitude loss)



New u,v coverage



Large no longer offered, only “astrometric” configuration





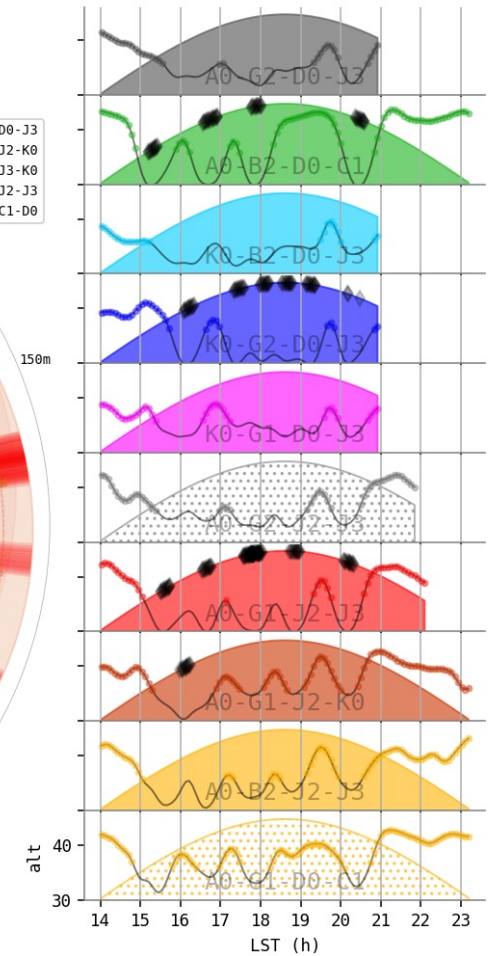
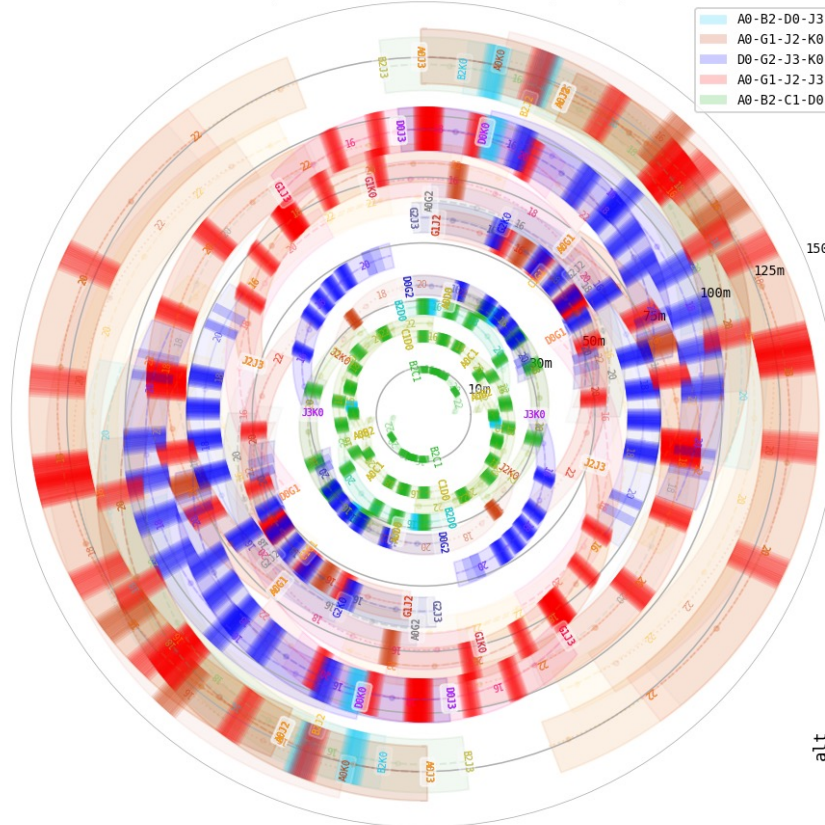
Imaging operations

Imaging slots:

- Service mode only
- Cycle through AT configurations
- Monitor and fill u,v plane

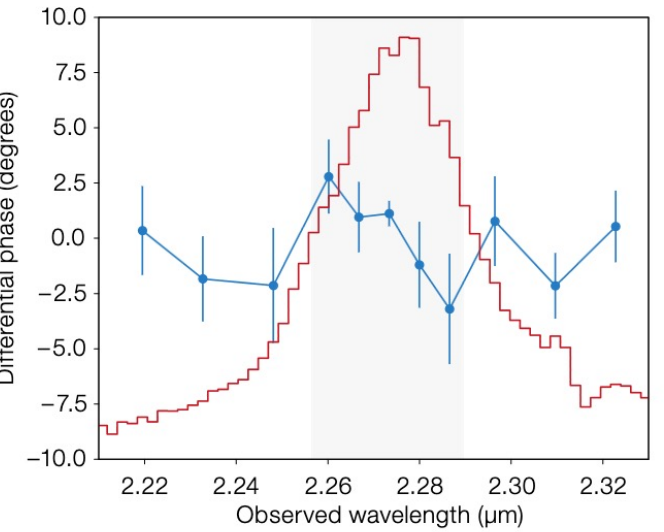
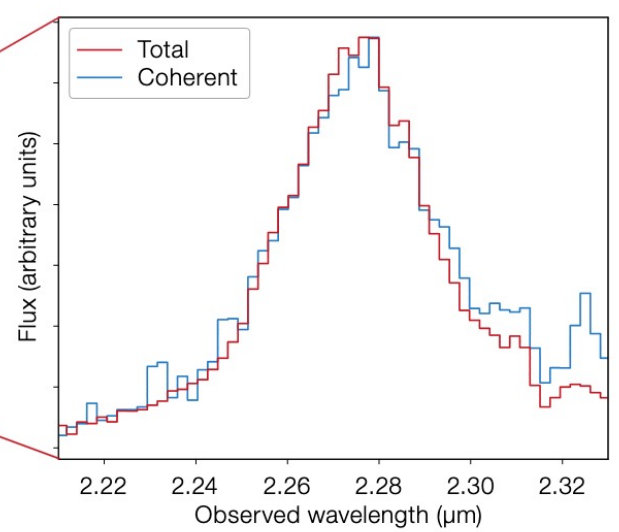
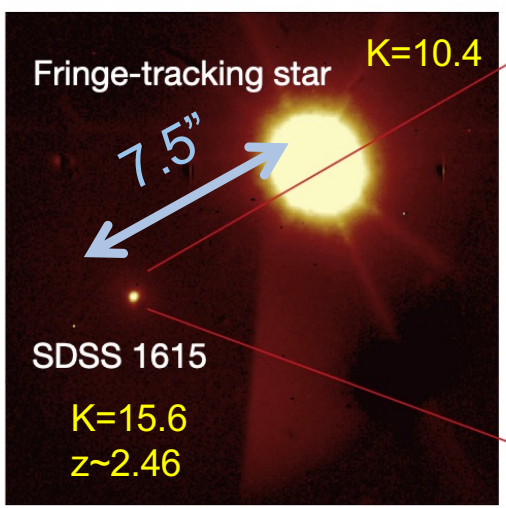
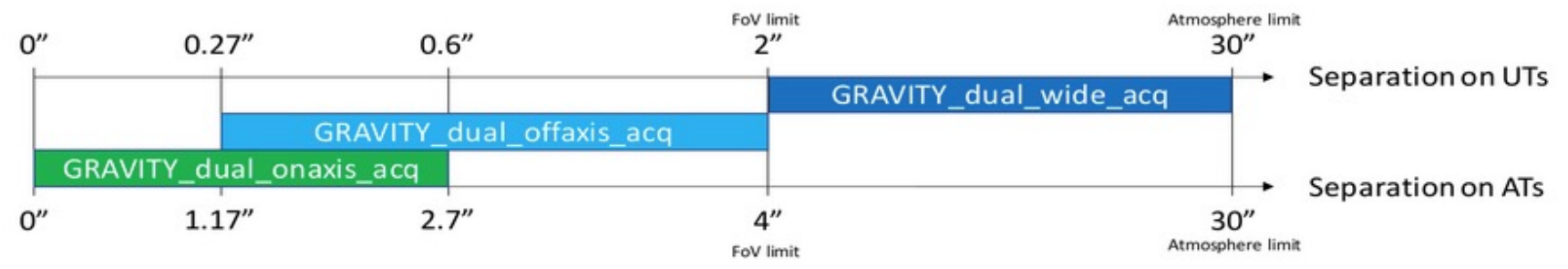
Period 110																														
November - 22																														
Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7						
Shift M3							Shift N3							Shift O3																
NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT	NO VLT-AT		
							Technical time									Reconfiguration														
							A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	A0-B2-C1-D0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	D0-G2-J3-K0	
															Reconfiguration															
															A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	A0-G1-J2-K0	
															GRAVITY+Commissioning															

MATISSE,
2022-04-08T07:04:55 -> 2022-08-31T02:24:01
last updated on 2023-03-08 07:30:19 (UT Time)





GRAVITY Wide: AO, FT and SC in 30''



Gravity Collaboration (2022A&A...665A..75G)





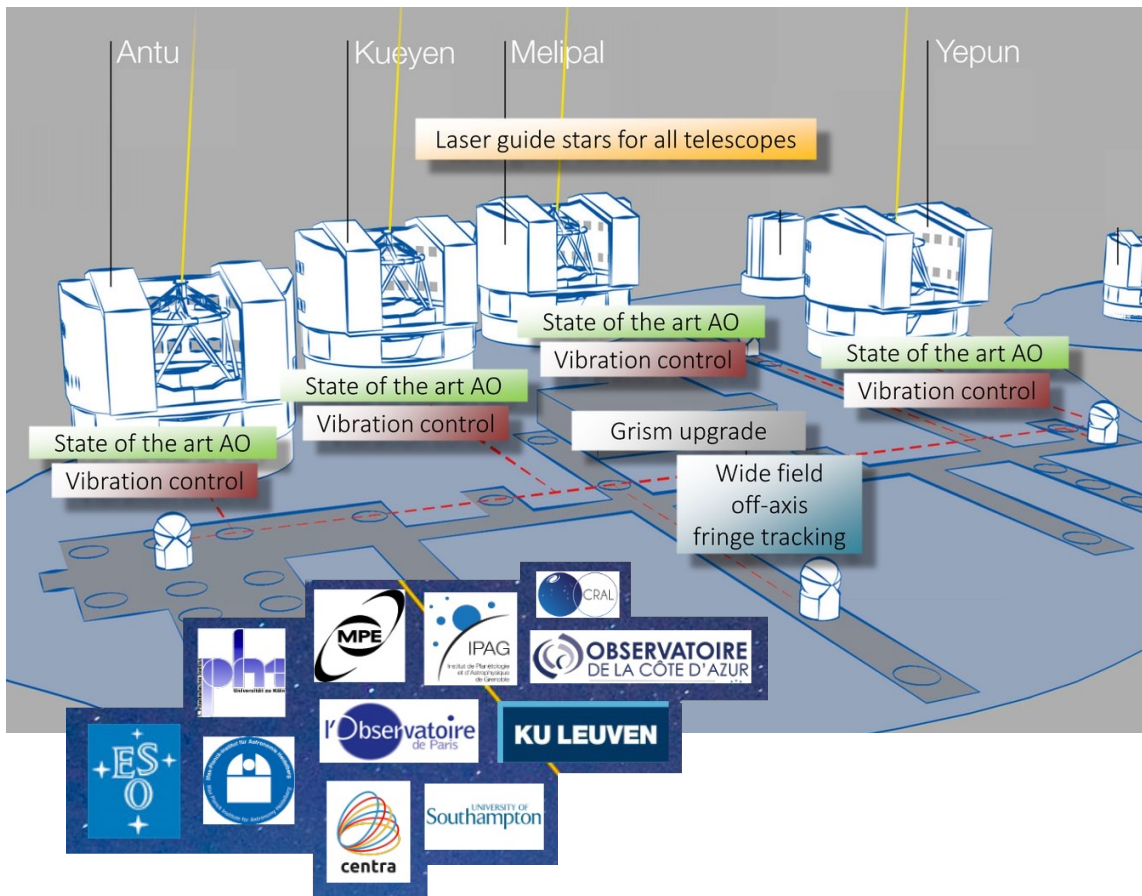
MATISSE Correlated Flux

- In thermal IR, limit is set by capacity to measure IR background in the photometry
- $CF(\lambda, \vec{B}) = SED(\lambda)V(\lambda, \vec{B})$
- **Gain of x2 to x3 in sensitivity**
- Absolute calibration of correlated fluxes requires special calibrators, as not only their sizes need to be known, but also their SED
 - Contact VLTI expertise Centre in Leiden for help with selecting calibrators

https://home.strw.leidenuniv.nl/~michiel/vlti_ec_nl.html

Setup	AT	UT
	$T \leq 30\%$ Seeing $\leq 0.8''$ $\tau_0 > 4.1 \text{ ms}$	
Low L-band	0.3 Jy	0.04 Jy
Low M-band	1.1 Jy	0.15 Jy
Low N-band	6 Jy	0.5 Jy

Exploit uniqueness of VLTI



■ +5mag and better sky coverage:

- off-axis fringe tracking (2" → 30")
- Laser Guide Star on every UT
- Higher performance Adaptive Optics
- Better vibration control

■ Science Cases:

- The Galactic Centre
- Galaxy AGN coevolution and the masses of supermassive Black Holes (up to $z \sim 2.5$)
- Characterization of exoplanets
- Young suns and their planet-forming disks

Timeline:

- ~2022: GRAVITY Wide: offered Apr 2023
- ~2023: test and validation of AO in Europe
- ~2024: AO installation and commissioning
- ~2025: 3 new UT equipped with LGS



Multi-actors users support

■ Current support to VLTI Users

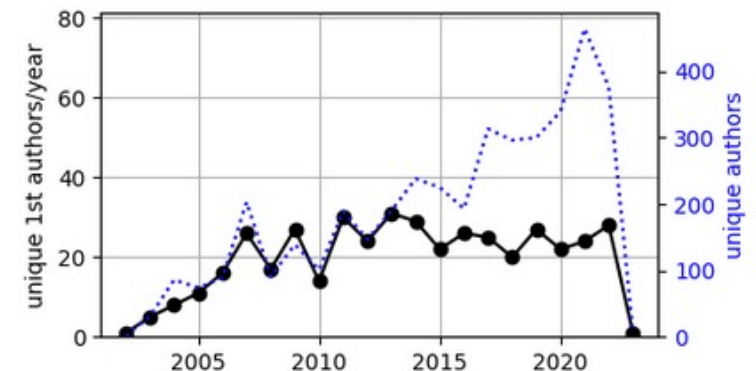
- **ESO:** Observation preparation (Phase1, Phase2) and execution, pipeline maintenance, distribution and documentation
- **VLTI Expertise Centres:** idea to proposal, reduce and calibrate data, interpretation



■ Newcomers need extra help to apply for time and analyse their data

■ Experts benefit from data reduction support:

- New modes (e.g. astrometry, off axis, correlated flux, etc,)



Userbase seems to grow via larger collaborations



VLTI expertise centres

<https://european-interferometry.eu/vlti-expertise-centers>

- One-on-one support
 - Proposal preparation
 - Data reduction
 - Data interpretation” modelling, imaging
 - Fizeau programme to fund mobility
- On-site data reduction
 - Reduced data hosted on OIDB
- Some centres support CHARA instruments
- Recent ongoing project: reduce and curate GRAVITY Data
 - ESO to reduce all GRAVITY Data
 - VECs to provide curation





Summary

- Ongoing call for proposal (deadline March 28)
 - Max baseline of 202m finally offered!
 - GRAVITY and MATISSE still improving performances and new modes
 - Possibility to apply to ALMA simultaneously
 - Everybody can apply!

- Main development: GRAVITY+ facility upgrade (AO+LGS for UT telescopes)