The Adventures of NIKA2 from the AoD perspective

iram
Institut de
Radioastronomie
Millimétrique

Bilal Ladjelate - Observing the millimeter Universe with the NIKA2 Camera

Outline of these adventures

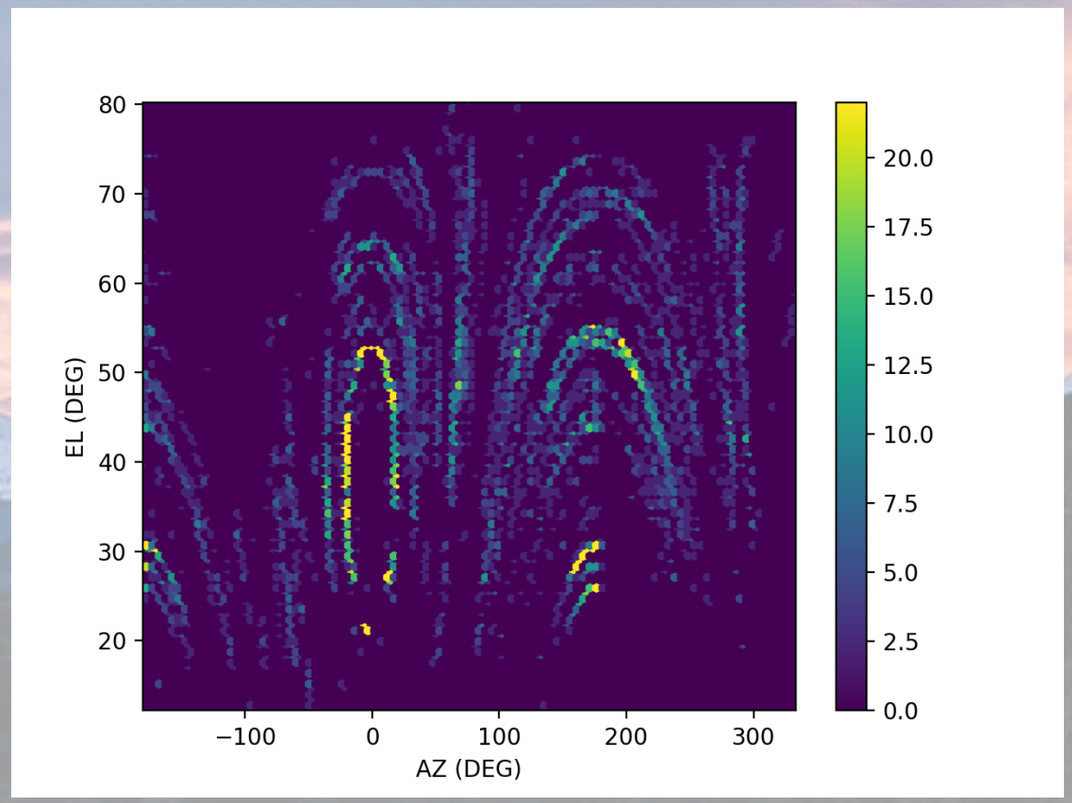
- Review of the different pools
- Overview of projects observed
- Evolution of NIKA2 performances over scientific exploitation
- Flux monitoring database
- Thank you notes

Pools overview

- N2R12
- N2R14
- N2R15
- N2R17 (bad weather)
- N2R18
- N2R22 (bad everything)
- N2R23
- N2R24
- N2R26
- N2R27 (24h of observations)
- N2R28
- N2R29
- N2R30 (non standard run)
- N2R31 (6h of tests)

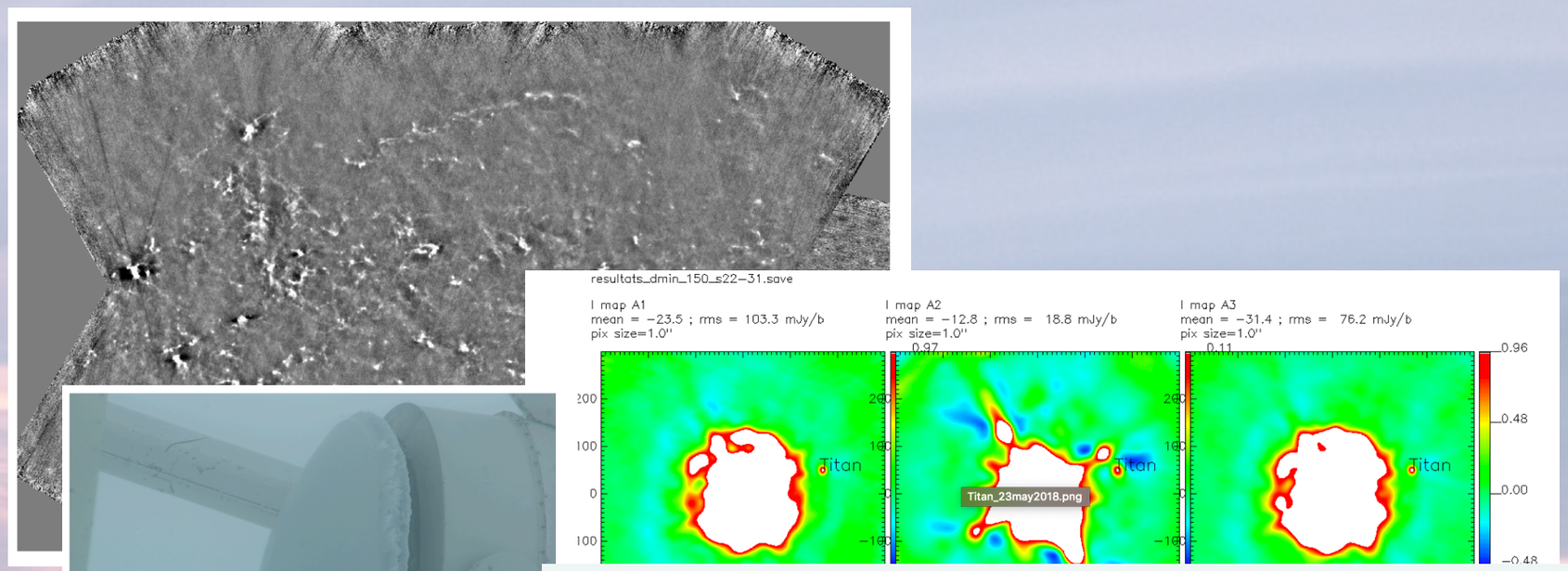
- Cryo Run 25
- Cryo Run 27
- Cryo Run 28
- Cryo Run 30 (bad weather)
- Cryo Run 31
- Cryo Run 36 (bad everything)
- Cryo Run 37
- Cryo Run 38
- Cryo Run 40
- Cryo Run 41 (24h of observations)
- Cryo Run 42
- Cryo Run 43
- Cryo Run 44 (non standard run)
- Cryo Run 45 (6h of tests)

- Lots of conflicting naming systems

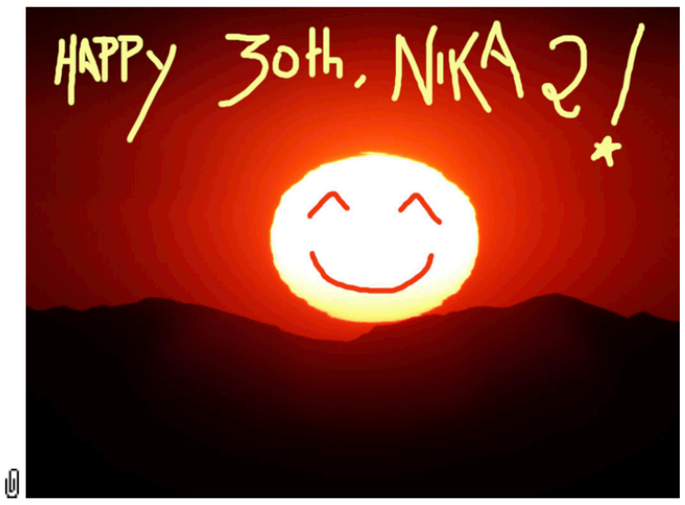


Telescope coverage

Pools overview



¯_(ツ)_/¯



Pools overview

Tableau 1

		N2R23	N2R24	N2R26	N2R27	N2R29
Array 1	**NEFD_0**	**58.810931**	**60.485918**	**59.480048**	**55.859751**	**49.818965**
	NEFD_0 MOY	1849.3266	60.924883	60.300378	55.996890	50.403764
	RMS NEFD_0	27637.023	5.9726591	9.4414223	5.2273419	7.0749554
	NEFD IRAM	70.519640	72.528101	71.321972	66.980907	59.737458
	RMS NEFD IRAM	33139.297	7.1617600	11.321122	6.2680571	8.4835132
	Nscans	178	151	161	185	208
Array 3	**NEFD_0**	**41.591163**	**44.352987**	**42.966904**	**42.613411**	**37.590258**
	NEFD_0 MOY	41.589066	44.805643	43.654881	42.956337	37.933109
	RMS NEFD_0	4.4525889	5.8340764	9.8879765	6.7324947	4.2025069
	NEFD IRAM	50.069033	53.393822	51.725203	51.299654	45.252591
	RMS NEFD IRAM	5.3601968	7.0232844	11.903524	8.1048346	5.0591385
	Nscans	178	151	161	179	209
Array 13 (1mm)	**NEFD_0**	**35.121004**	**37.288859**	**35.861915**	**32.680669**	**29.469222**
	NEFD_0 MOY	35.394415	37.534075	36.195955	32.862149	29.827334
	RMS NEFD_0	2.1354776	2.1084980	4.7776383	2.0059910	2.4800736
	NEFD IRAM	42.196556	44.801152	43.086733	39.264586	35.406154
	RMS NEFD IRAM	2.5656955	2.5332805	5.7401515	2.4101223	2.9797145
	Nscans	178	151	161	185	209
Array 2 (2mm)	**NEFD_0**	**9.3713714**	**9.4815004**	**9.1153906**	**7.8793428**	**8.0974401**
	NEFD_0 MOY	9.4998674	9.5846368	9.4183196	7.9940422	8.1927327
	RMS NEFD_0	1.1658626	1.0201457	1.8258006	0.82838595	0.68414821
	NEFD IRAM	10.391517	10.513634	10.107670	8.7370694	8.9789083
	RMS NEFD IRAM	1.2927757	1.1311964	2.0245530	0.91856209	0.75862297
	Nscans	178	151	161	185	209

Projects overview

- 176 projects to be observed
- 64 projects ranked A+
- Some of them finished, and good advances on the Large Projects (51h for GASTON, 80h for the LPSZ, 85h for the LPDF)
- But scientific time plagued by bad weather. (cf. N2R17 and N2R27)

Baseline Calibration

- After July 2018 and a training in Grenoble (Merci Laurence!)

- Calibration of NIKA2 with the IDL pipeline is now responsibility of IRAM for scientific pools.

- Many details remain to be solved, since the calibration is still being tweaked, and it is a considerable amount of work and computer ressources…

Baseline Calibration

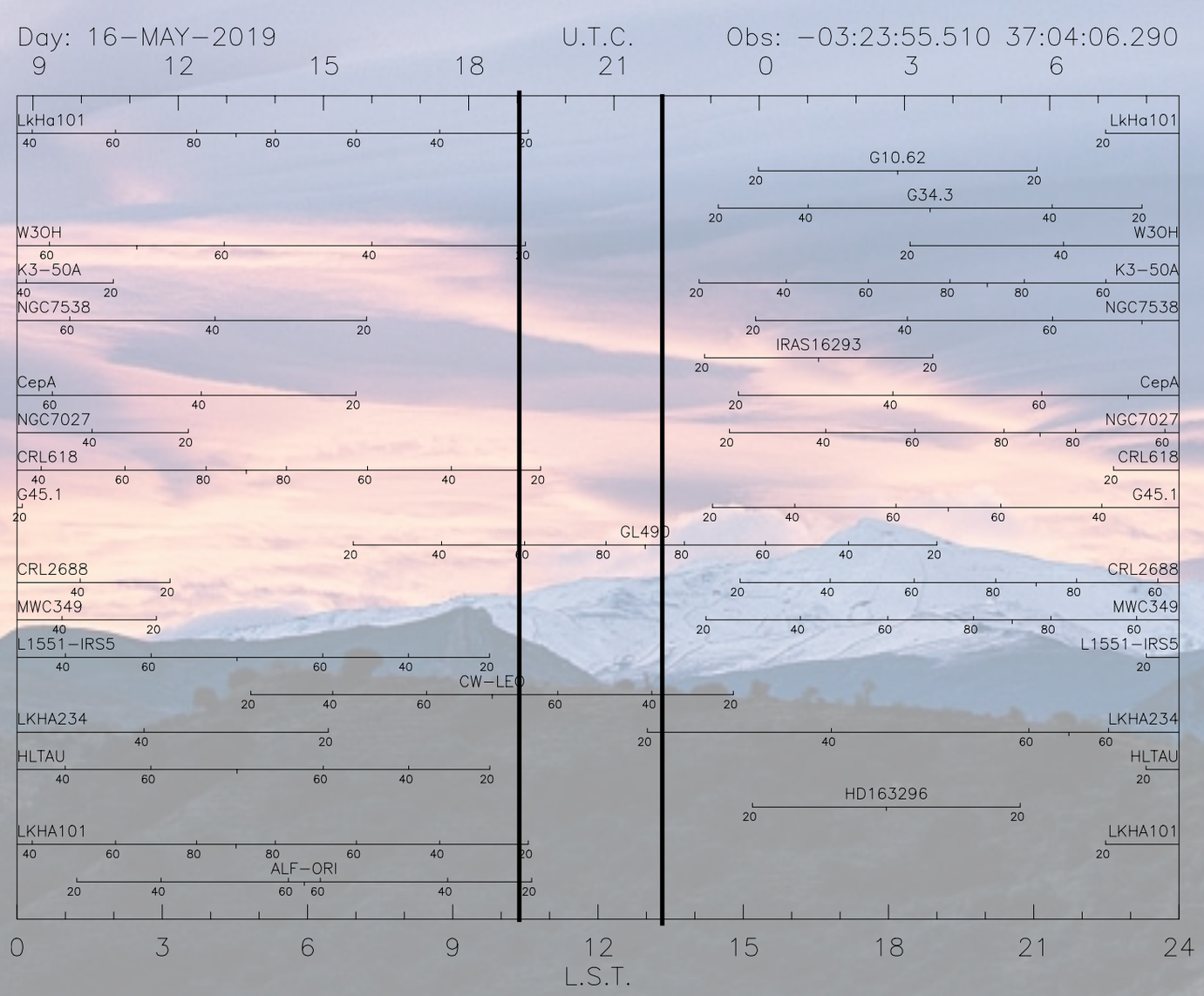
- What defines a good run for the baseline calibration?

- I have many skydips

- I have at least one good beammap, but preferably many

- I have one good scan on each calibrators, Uranus as a primary calibrator, MWC349 as a secondary calibrator (other planets are possible + NGC7027 and CRL2688)

Baseline Calibration



- But this is something very difficult to obtain and sometimes rely on pure luck (cf. run N2R29)

Baseline Calibration

- Calibration of the runs can be done quickly if run is « standard »

- Standard means one mode of observation, and one single acquisition system used.

- N2R30 is absolutely not standard. V1, V3 where used, in a mix of old and new frequency sweep, without good beam map because of poor weather conditions, and calibrators only available for one of the modes, with V3.

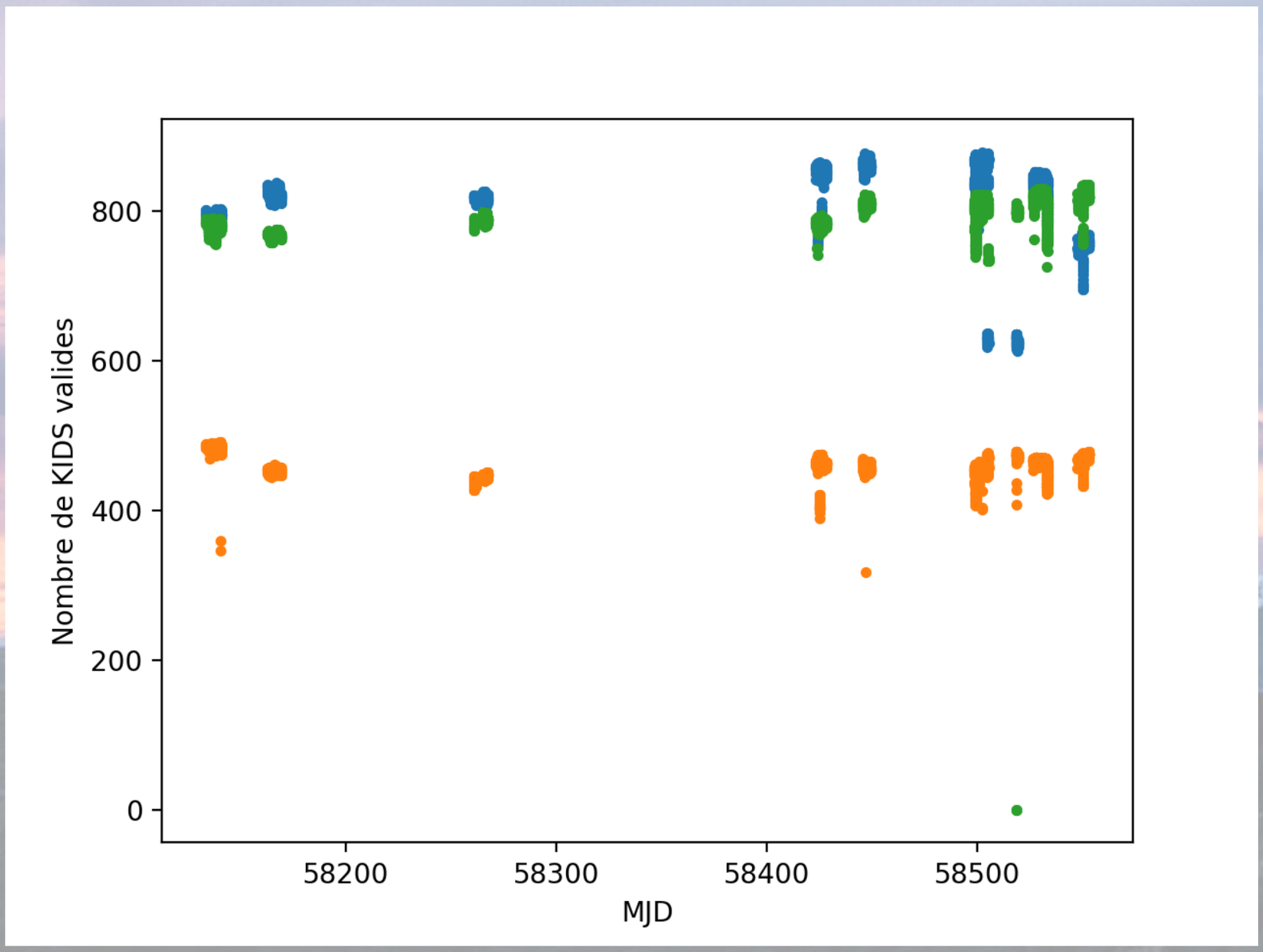
Baseline Calibration and validation! (Nov 2018)

- Calibration of the runs and their validation leads to the production of 2 valuable products

- NIKA2 kidpars, which parameters give the evolution of the instrument over time

- A result table with parameters of all the scans, useful for monitoring the instrument and the calibrator fluxes

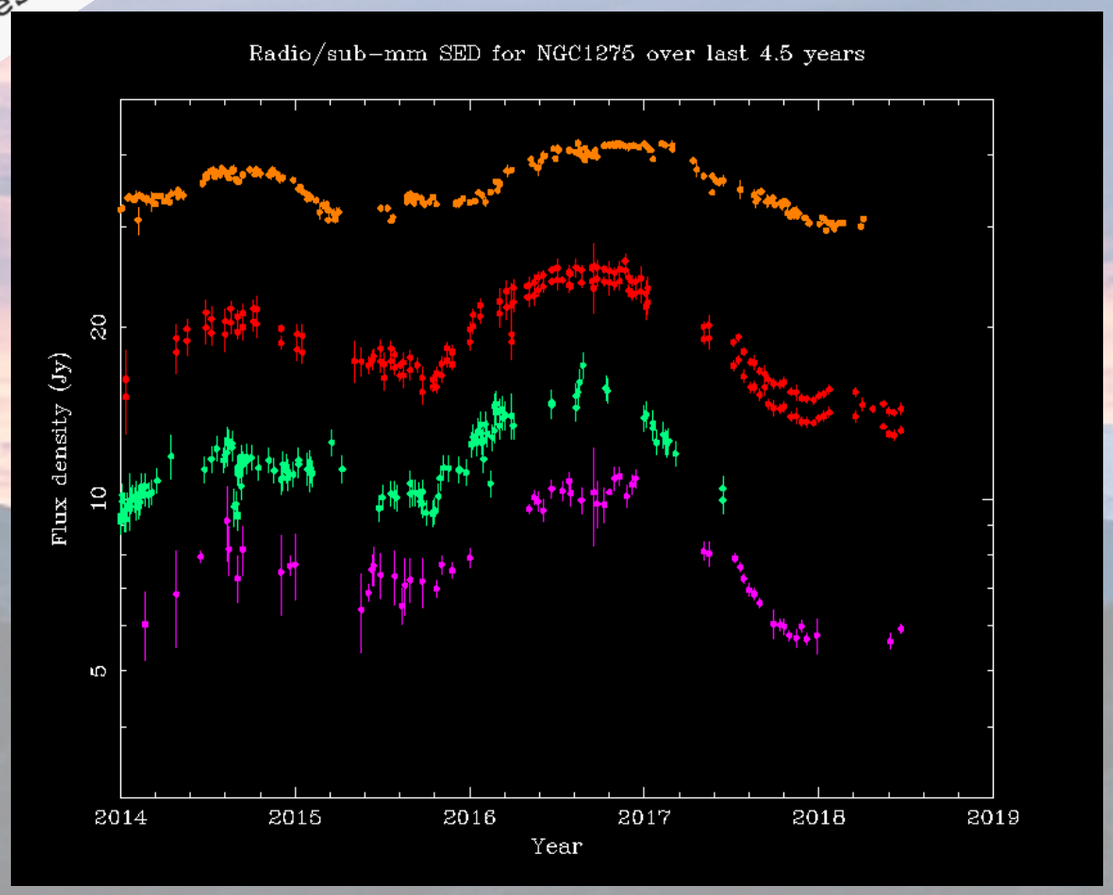
Baseline Calibration and validation! (Nov 2018)

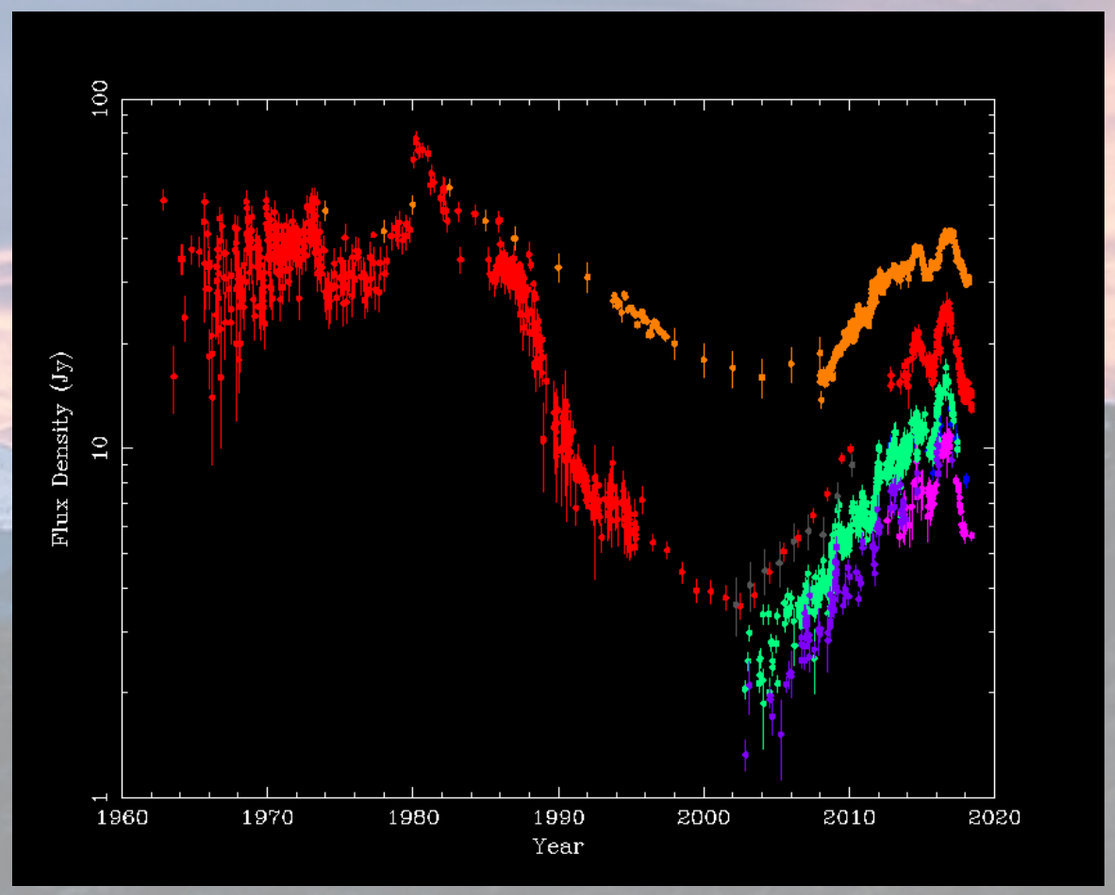


- Evolution of number of KIDs available
- No data yet for the two last runs, with the new frequency sweep

NIKA2 pointing and flux database

- NIKA2 has been monitoring many targets on routine mode
- 0316+413 is one of these examples

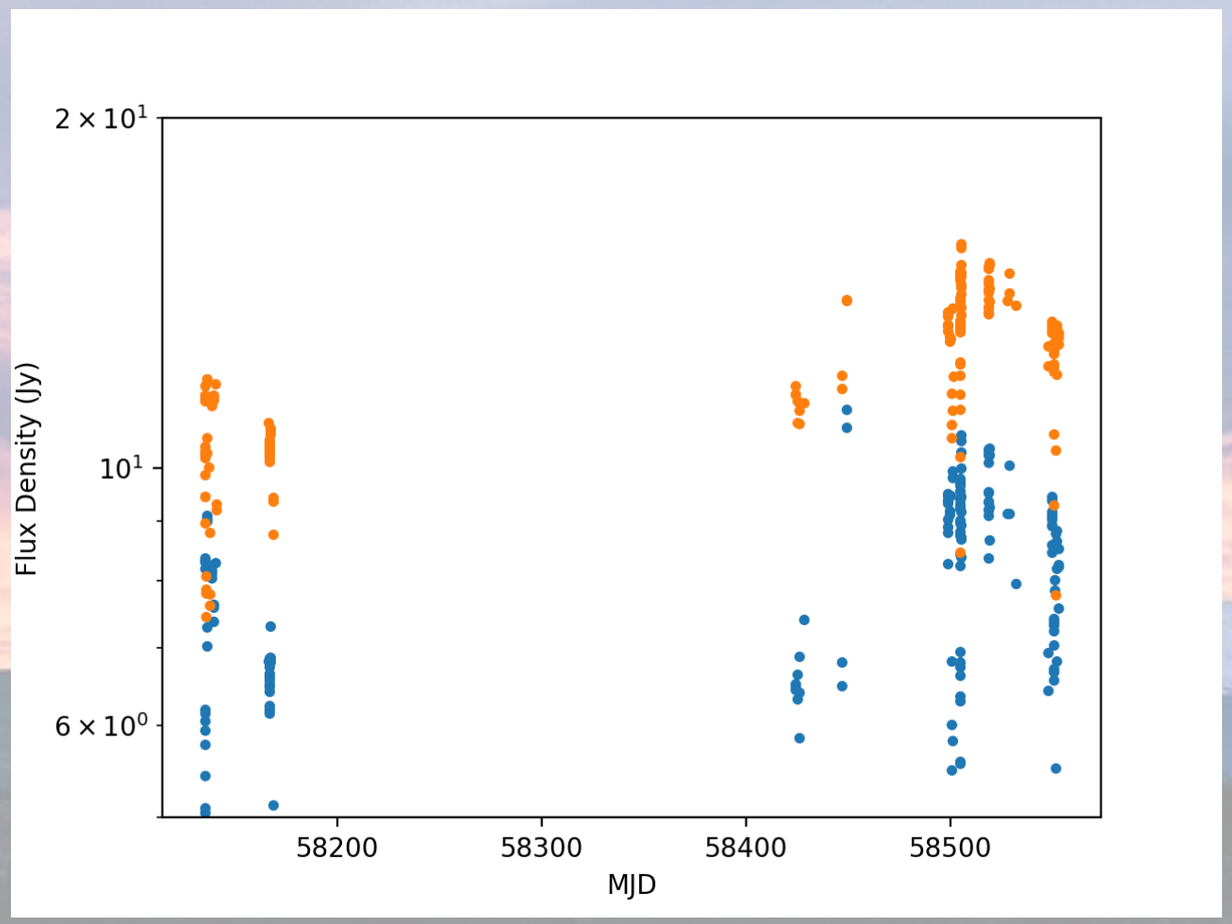




Orange - 15GHz, red - 90GHz, green - 230GHz, purple - 350GHz

Credits: Alastair Edge

NIKA2 pointing and flux database

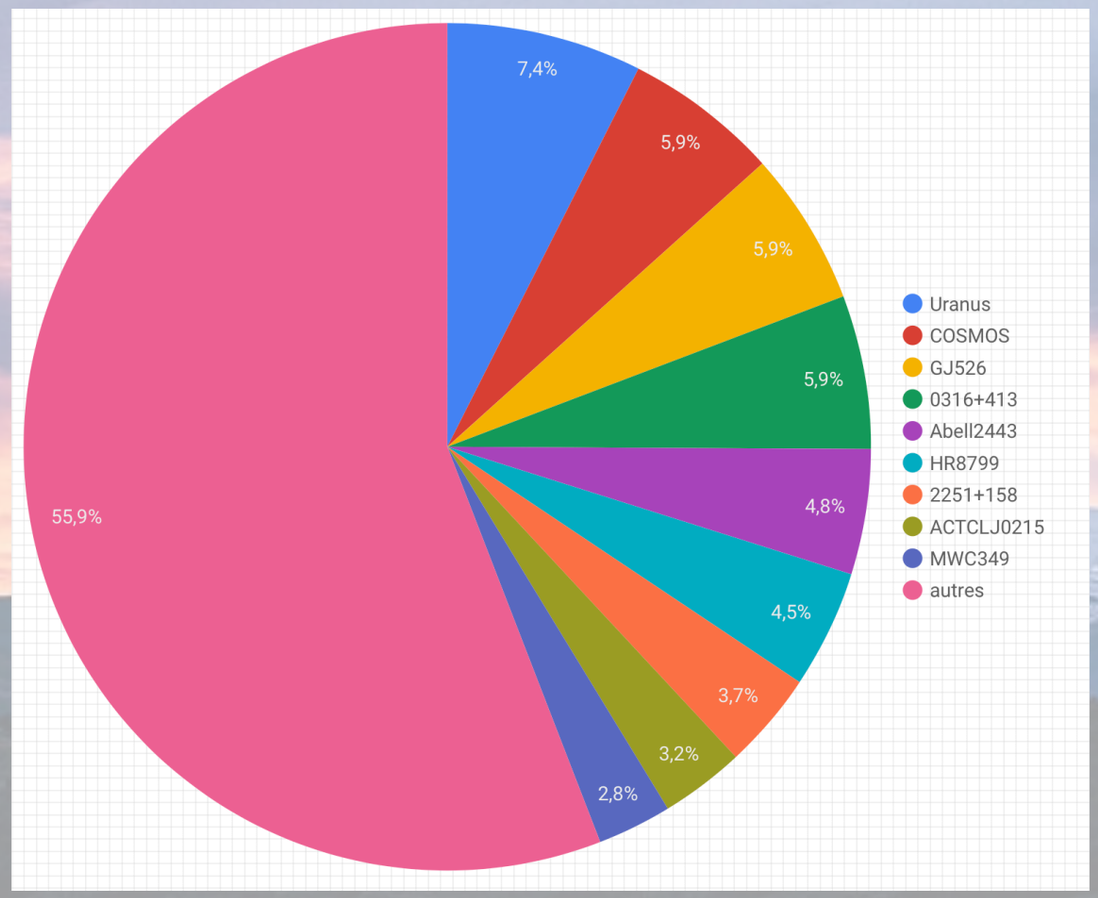


NIKA2 has been monitoring many targets on routine mode

0316+413 is one of these examples

Blue - 1mm, Orange - 2mm

NIKA2 pointing and flux database



- NIKA2 has been monitoring many targets on routine mode

The GRB events and what we can learn from them

- Excellent coordination with all the people: Ivan Agudo and Nicolas Ponthieu for the warning and the organisation, Carsten Kramer and Miguel Sanchez-Portal for their advices on the procedure and Karl Schuster for his precious approval and green light in less than 2h after getting the proposal.

- We could observe the target on time, one day after the flare.

- The target was very difficult, observable 2h at very low elevation… might be too challenging (cf. Nicolas' talk about faint sources)

- But we had an immediate « tweetable » result and the baseline calibration could be performed on a part of the run only.

The GRB events and what we can learn from them

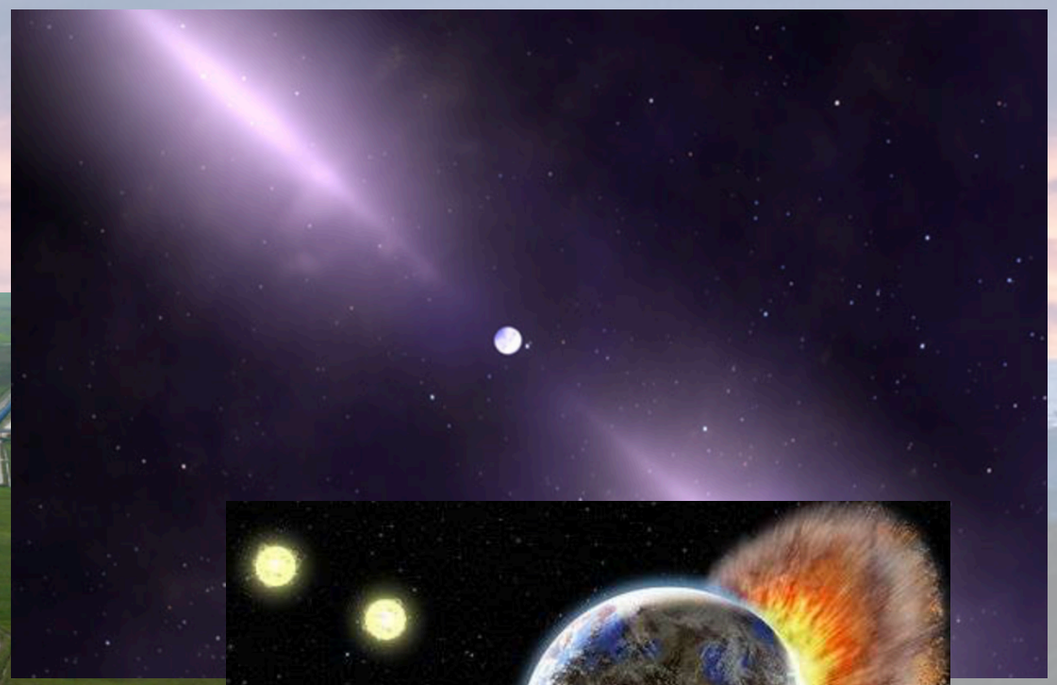
- It is very important to know that we can operate NIKA2 for immediate action if it is already cold.

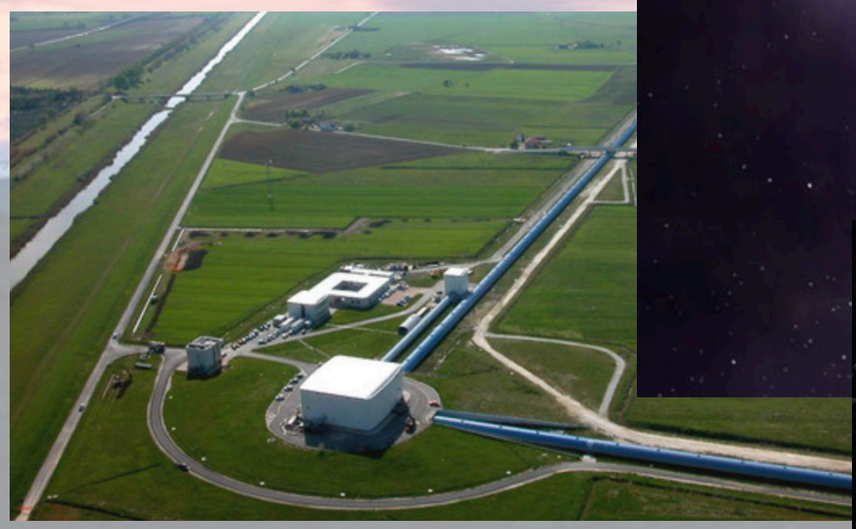
- In case of other important events, during NIKA2 warm times, we would have a reaction time of 5 days.

- The run N2R31 taught us also that we can fully observe in remote, so no need for heavy logistics to have an observer on-site, with help and assistance of the operator.

We can be reactive!

- In case of major cosmic, transient or planetary events, we can be ready at any time.





Technical times

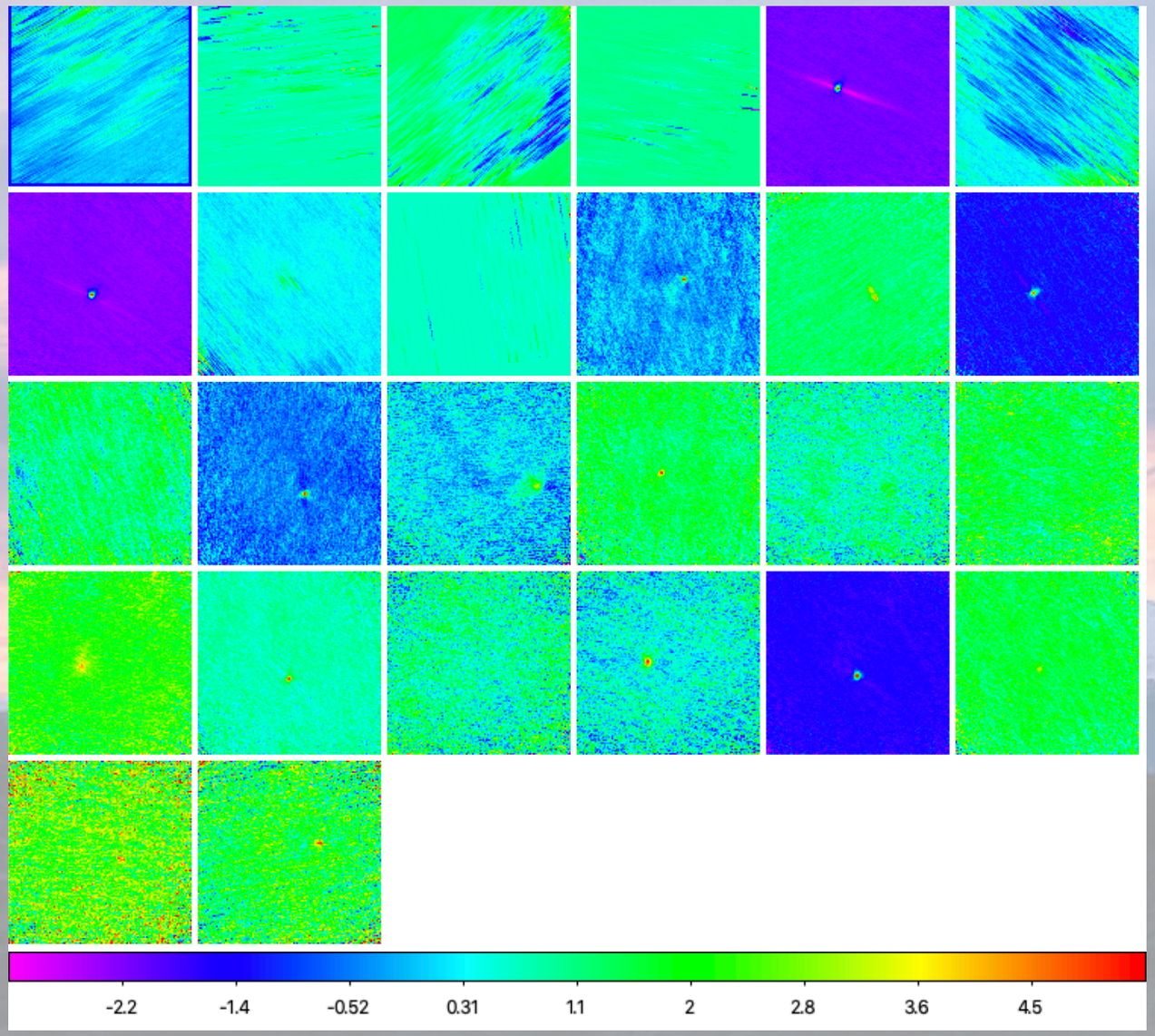
- Too many pointings fail on sources that are not seen at 1mm and barely seen at 2mm

- There is a need for a NIKA2 flux monitoring, for old quasars and… Planck Compact Catalog Sources

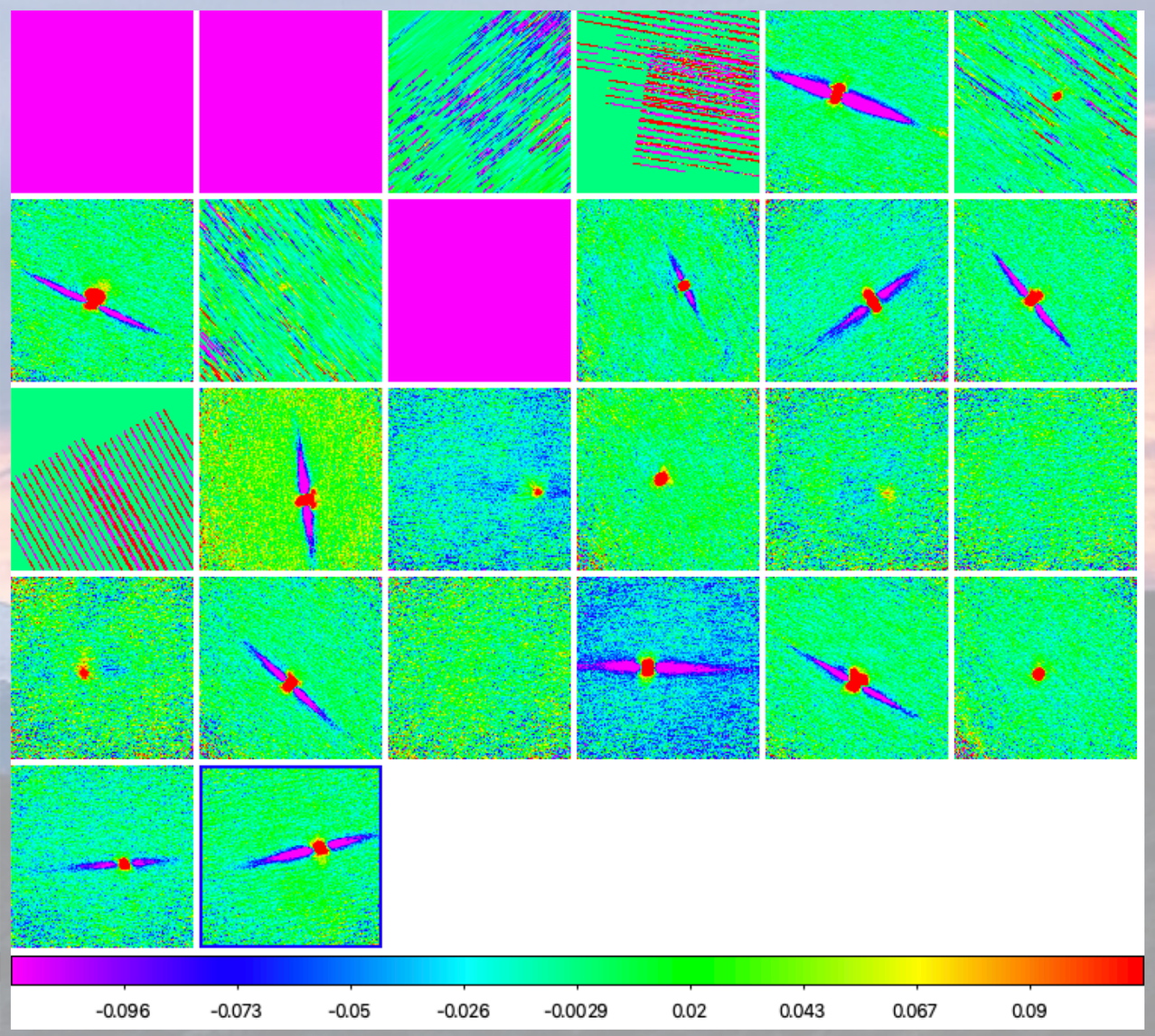
Technical times

Planck Compact Source Catalog

1MM



2MM



Possible synergy with NOEMA!

Credits for the idea, Alexandre Beelen

iram
Institut de
Radioastronomie
Millimétrique

A few advices for future observations

Preparation advices

- Prioritize your targets.

- Don’t stress about sending me the scripts long time before but ask all the questions you need long before the run. I usually add the scripts the day before and during the maintenance before the run: if you think you’re late… I am later.

- If your program does not have a good grade, I will contact you directly depending on your scientific goals (aka: integrating 70h on an empty field won’t happen, but 10 minutes on a bright source might)

- If that’s the case, prepare a worst case scenario plan: shorter scans, tinier area to map, priority targets…

Preparation advices

- In general, don’t go for scans shorter than 6 arcminutes. The NIKA2 FoV is 6.5 arcminutes and we need good baselines for good processing.
- Rule of thumb is Source Size + FOV + 2*HPBW
- Make sure that the map will reach/start in an « empty area »

The Future

- 4 more runs planned for the summer semester in blocks of 2 weeks in October and November

- Many more projects to finish and start, but we're getting there

- Data delivery is still problematic, but IRAM internal pipeline is entering a phase of internal validation (with Alessia and Stefano, coordinated by Carsten Kramer and Stefano), again, we're getting there, and progressing after almost 2 years of science operation.

- And apparently people have ideas for hardware improvements?

THANK YOU

- Many thanks to all the pool participants. Their help has proven very valuable and the discussions entertaining in sometimes very bad weather conditions

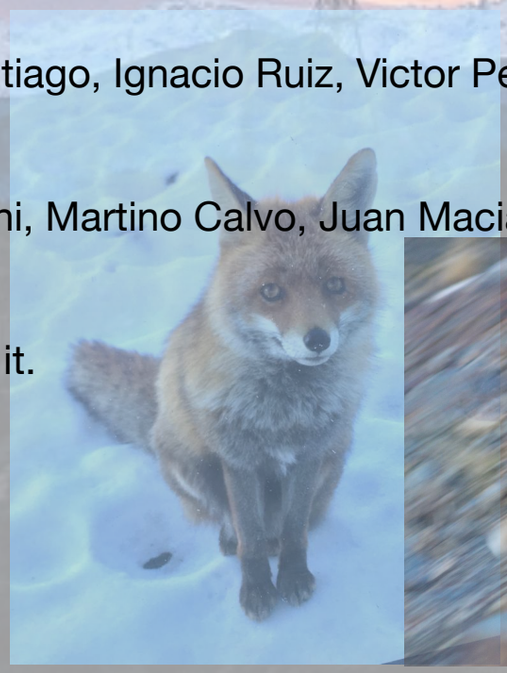
- Namely: Stefano Andreon (N2R14), Hervé Aussel (N2R14), Iacopo Bartalucci (N2R18), Alexandre Beelen (N2R26), Stefano Berta (N2R22, N2R24, N2R28, N2R30), Mathieu Béthermin (N2R17, N2R22, N2R23), Stephanie Birr (N2R31), Léa Bonnefoy (N2R17, N2R18, N2R27), Sean Bryan (N2R23), Denis Burgarella (N2R28), Sandra Burkutean (N2R17), Martino Calvo (N2R14), Steve Corlew (N2R31), Morgane Cousin (N2R15), Jens Erler (N2R15), Ruth Evans (N2R17), Alicia Gomez (N2R15), Florian Kéruzoré (N2R23, N2R26), Guilaine Lagache (N2R29), Isabelle Lamperti (N2R22), Samuel Leclercq (N2R30), Charlène Lefèvre (N2R24, N2R26), Jean-François Lestrade (N2R15, N2R17, N2R18, N2R24, N2R29), Matthias Maercker (N2R27), Juan Macias-Pérez (N2R15, N2R30), Frederic Mayet (N2R23), Marko Mecina (N2R27), Tony Mroczkowski (N2R15), Laurent Pagani (N2R22, N2R27), Gabriel Paubert (N2R29), Laurence Perotto (N2R14, N2R24, N2R27), Marco de Petris (N2R15, N2R28), Nicolas Ponthieu (N2R28), Roberto Néri (N2R24), Marina Ricci (N2R17, N2R24), Andrew Rigby (N2R22, N2R26), Isabelle Ristorcelli (N2R30), Alessia Ritacco (N2R14, N2R28, N2R30), Nellig Roué (N2R31), Charles Romero (N2R14), Miguel Sanchez-Portal (N2R29), Jack Sayers (N2R22), Aidan Sedgewick (N2R29), Devika Sharma (N2R23), Shibo Shu (N2R17), Albrecht Sievers (N2R17, N2R23)

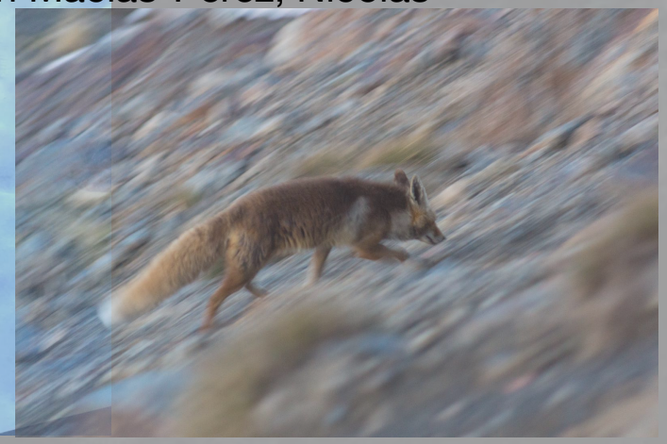
- And IRAM operators: Frederic Damour, Enrique Lobato, Joaquin Santiago, Ignacio Ruiz, Victor Peula, Juan-Luis Santaren, Manuel Ruiz

- The NIKA2 Instrument Team and collaboration, Alessandro Monfardini, Martino Calvo, Juan Macias-Perez, Nicolas Ponthieu

- The person who cursed NIKA2 for bad weather, but I am working on it.

- And the fox for comic and cuteness relief.





The instant the photo was taken…

I was there…

Credits: D. Nahabedian

Evolution of C0 and C1 coefficients