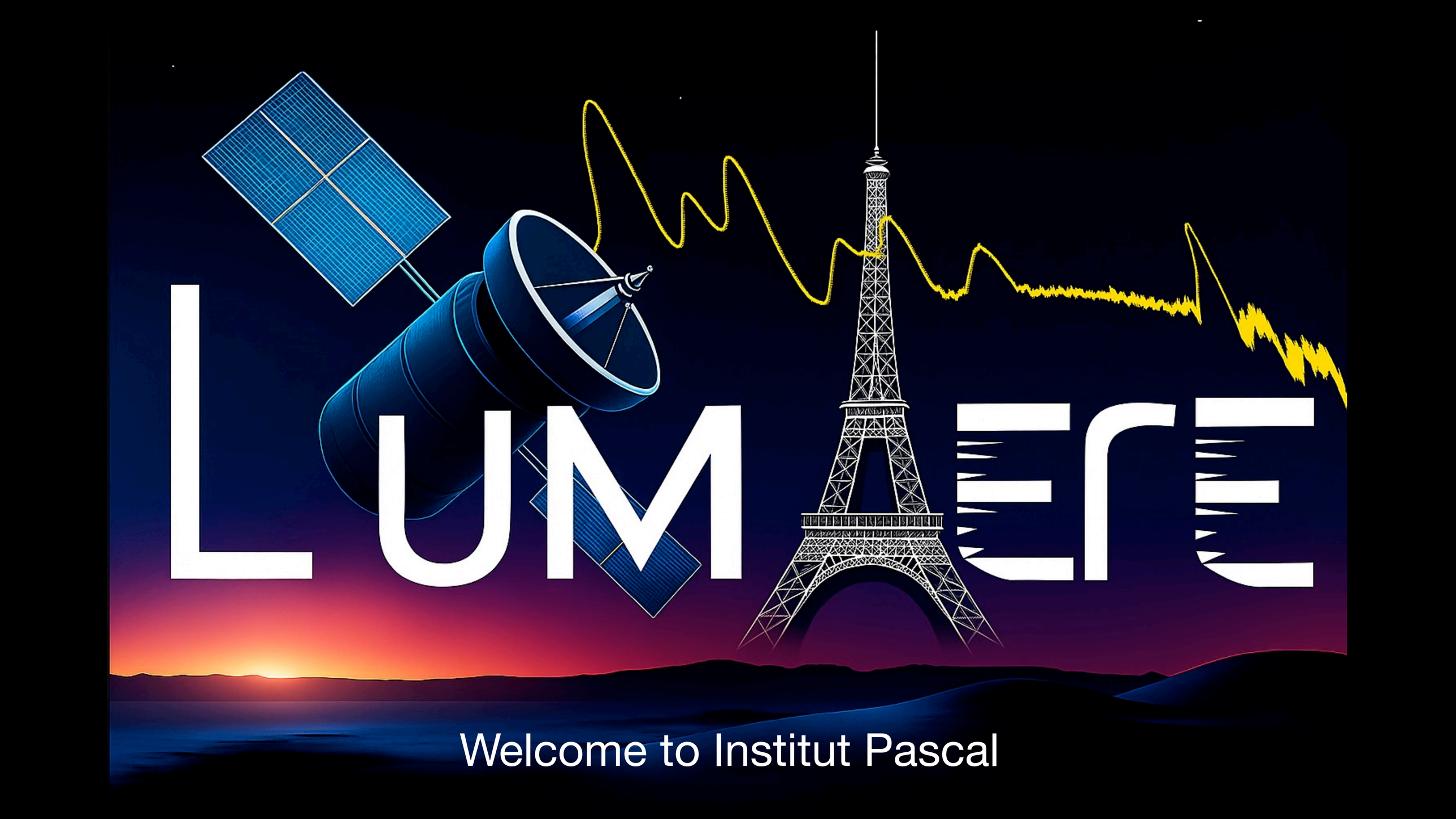
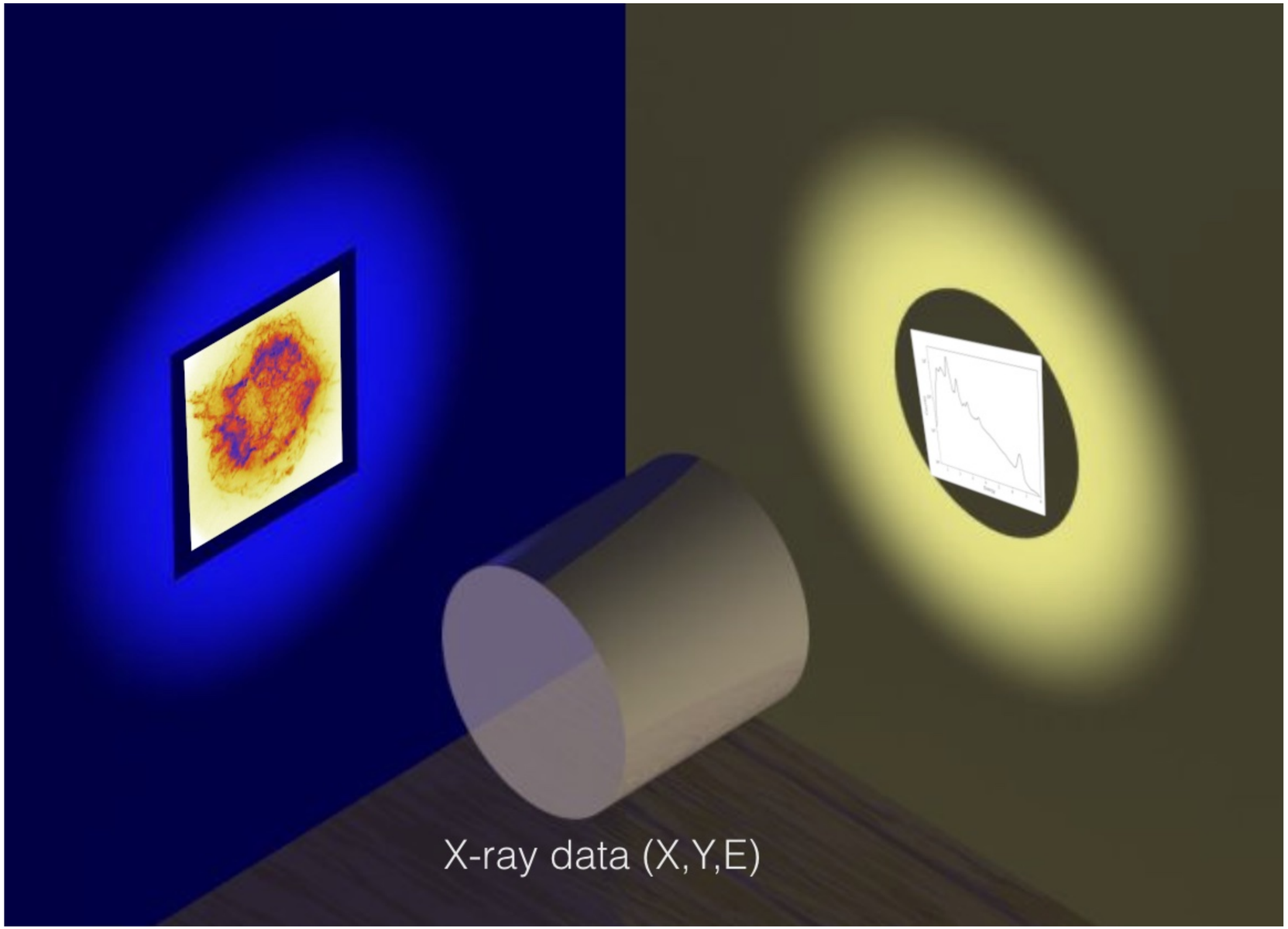


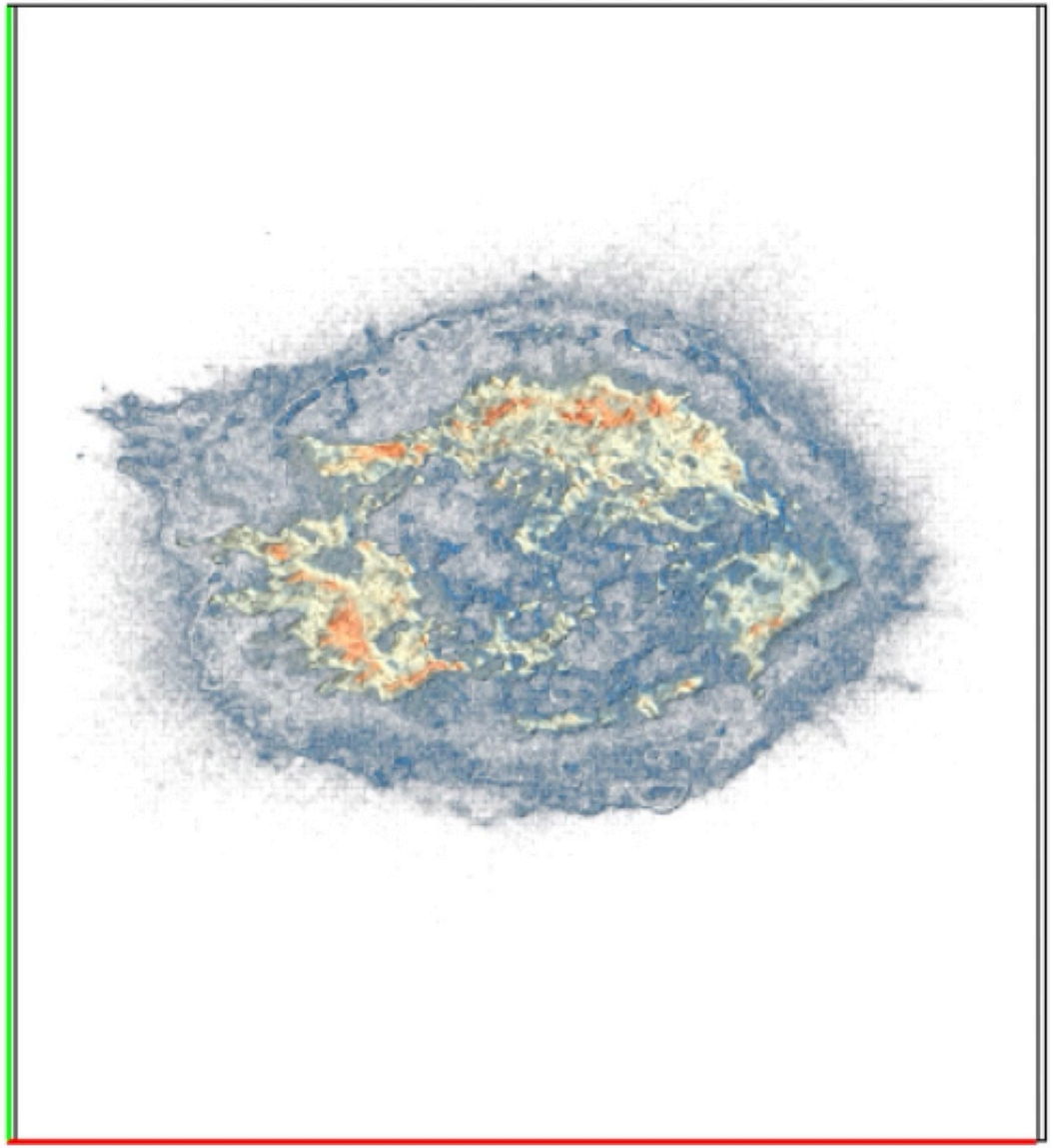
Welcome to Institut Pascal

The spectro-imagers schizophrenia



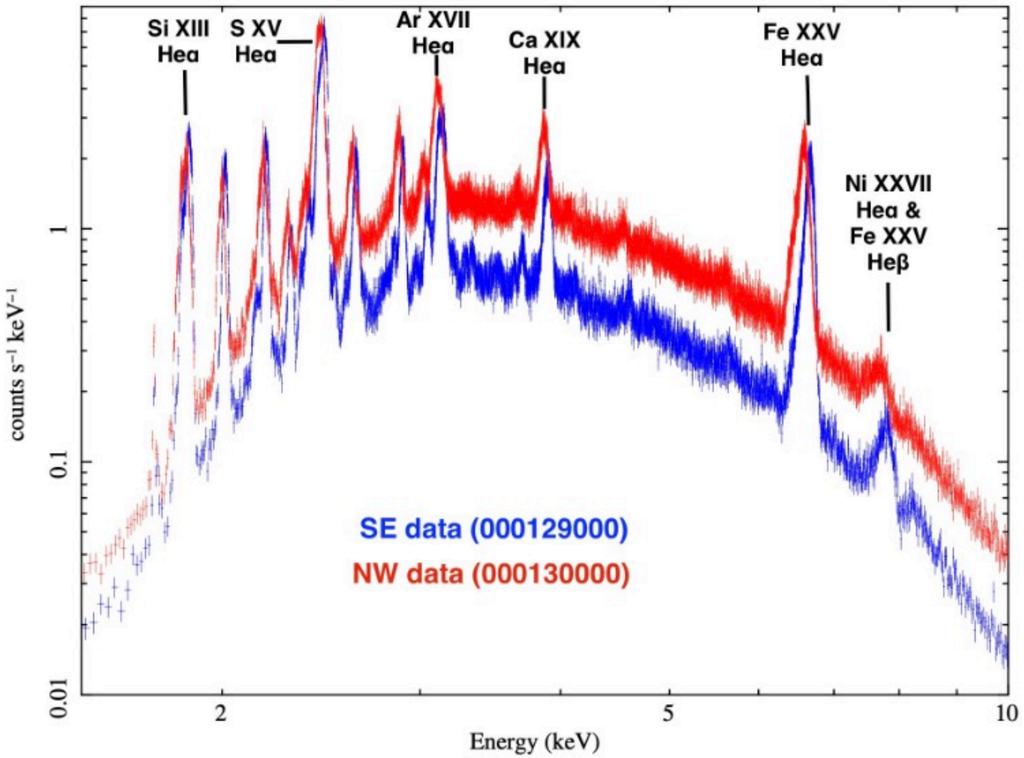
X-ray data are complex 3d (4d) datasets

Cassiopeia A Chandra X,Y,E cube

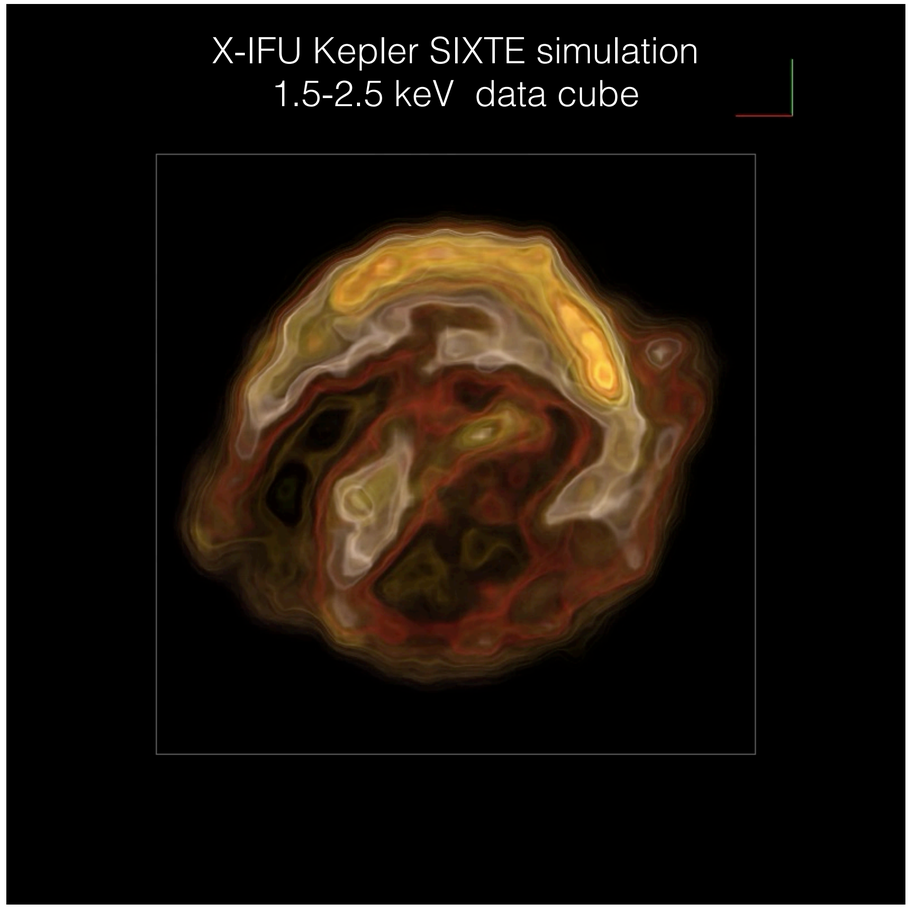


Data visualization
with vaex

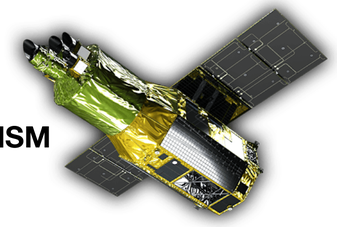
And even more complex now with Resolve + XIFU



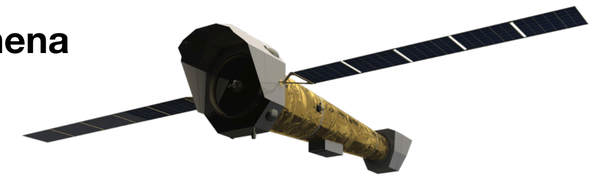
XRISM, CasA, Plucinsky et al. 2025



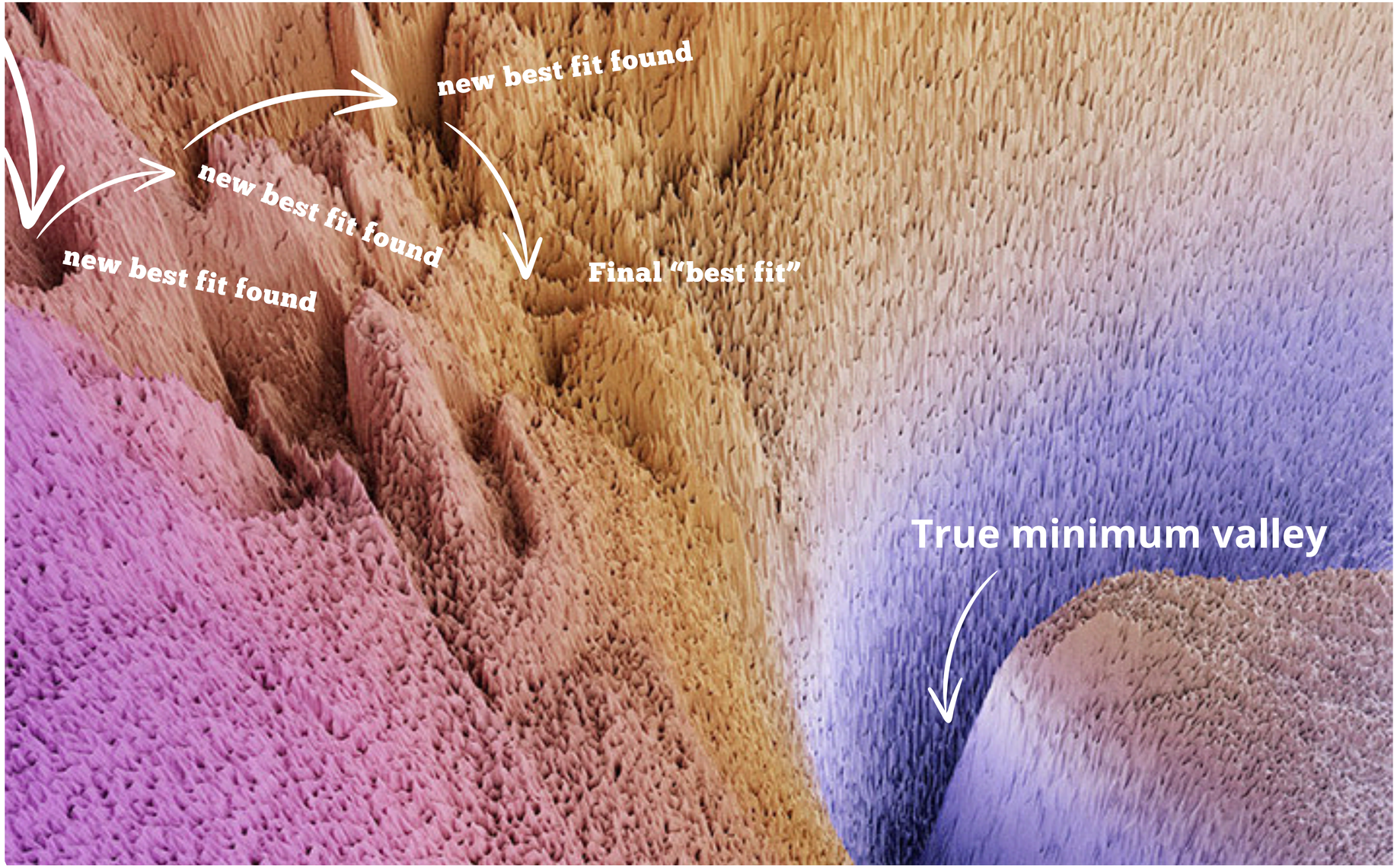
XRISM



Athena



Complex models parameter optimization: the local minima nightmare



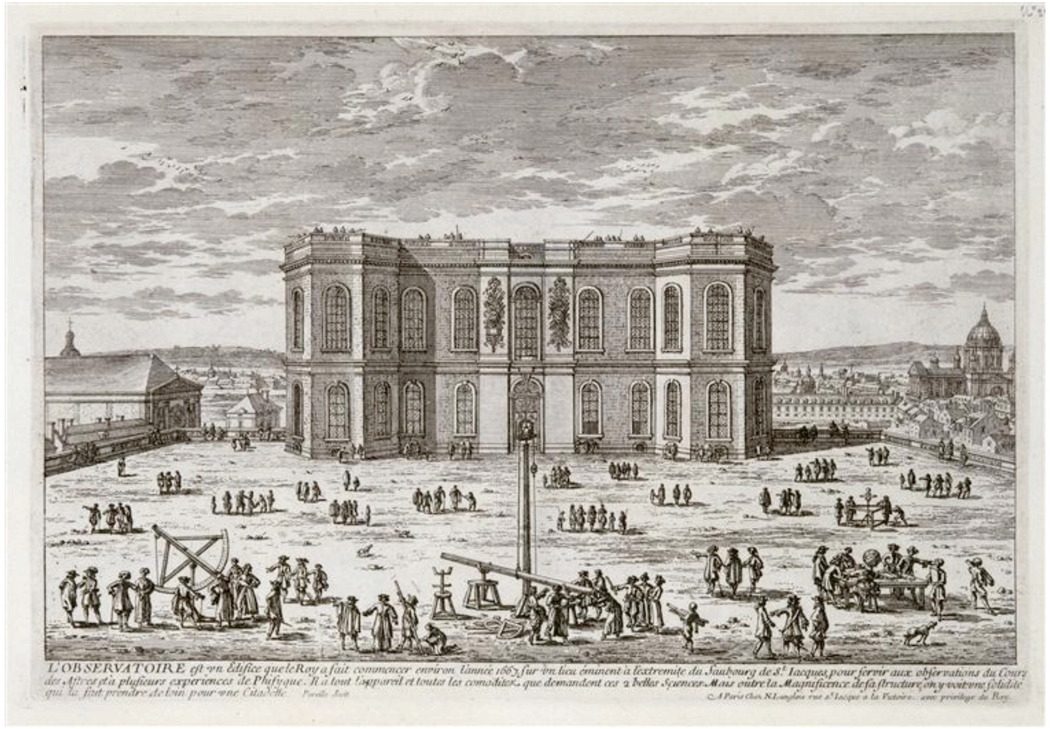
Program and spirit of the workshop

Presentations/hands on

Discussion/group work

	Monday 12/01	Tuesday 13/01	Wednesday 14/01	Thursday 15/01	Friday 16/01
9.30-10.00		**Liyi Gu:** *lessons learnt from XRISM analysis and statistical methods.*	**Simon Dupourqué:** Simulation Based Inference introduction	**Peter Boorman, Johannes Buchner:** Statistical Aspects of X-ray Spectral Analysis and BXA tutorial	
10.00-10.15	Registration and welcome coffee	**Camille Diaz:** *First look at Vela X-1 with XRISM*	**Christian Krisch**: *SIXTE simulations of extended sources (XRISM/NewAthena)*		**Julia Lascar:** fully exploiting the 3d aspects of IFU
10.15-10.30	**Welcome: Introduction from Fabio Acero**	**Vincenzo Sapienza**: *Synthetic X-ray Spectra from 3D MHD Simulations: The Case of SN 1987A*			
10.30-11.00	**Francois Mernier**: *Challenges of extended sources analysis with XRISM*	Coffee break	Coffee break	Coffee break	Coffee break
11.00-11.15	**Jacco Vink:** *XRISM status and challenges on SNR*	**Silvano Molendi:** *Challenges in extended sources analysis related to the handling of the background (and background modeling in general)*	**Iacopo Bartalucci**: A *Simulation Framework for Synthetic X-ray Observations with NewAthena*	Hands on BXA	**Simon Dupourqué:** *New methods for fast X-ray inference*
11.15-11.30			**Emanuele Greco**: *Pinpointing pure-metal ejecta X-ray emission in SNRs with NewAthena*		
11.30-11.45	**Dominique Eckert**: *XRISM status and challenges on galaxy clusters*	**Martin Mayer**: *Quantifying the Spectacular - Applying Power-Spectral Analysis to X-ray Images of Supernova Remnants*	**Alexeï MOLIN:** *Using Simulation Based Inference for inferring turbulence in galaxy clusters*		**Johannes Buchner**: *A simulation-based likelihood for X-ray surveys*
11.45-12.00		**Marco Miceli**: *Dendrogram clustering and quantum extreme learning for the study of supernova remnants images and optically-thin X-ray spectra*	**Dider Barret**: Simulation-based inference for X-ray spectral fitting (SIXSA)		**David Bogensberger**: *SUSHI science*
12.00-12.15	**Roberta Giuffrida:** spatially resolved spectral analysis with XRISM	**Mariachiara Rossetti**: *Lessons learnt on background modeling and MCMC spectral fitting in the CHEX-MATE project*			**Fabio Acero:** 3d X-ray analysis using gammapy
12.15-12.30	**Manan Agarwal**: *XRISM analysis of supernova remnant Cassiopeia A: Bayesian study with UltraSPEX*	**Erwan Quentin**: A *Variational Auto-Encoder to classify & explore the XMM-Newton archive*	**Dider Barret:** NewAthena status		**Leila Godinaud:** component separation method application to young SNRs
12.30-13.00	Time for discussion/questions	**Edoardo Baraldi:** *Investigating Deviations from Self-Similarity in a Sample of Massive Galaxy Clusters*	Time for discussion/questions	Time for discussion/questions	Time for discussion/questions
13.00-14.30	Lunch break	Lunch break	Lunch break	Lunch break	Lunch break
14.30-14.45	Discussion. Topic: analysis of extended sources with XRISM. Chair: Jacco and Dominique	Discussion/working groups	Hands on on SIXTE	Discussion: Bayesian statistical metrics	**Jerom Bobin:** machine learning usage in signal processing
14.45-15.00					
15.00-15.30	Brainstorming on working group topics				Discusion/working groups
15.30-17.30		Discussion/working groups	Discussion/working groups	Discussion. Topic:comparison of new fitting methods (BXA, SBI...)	
				Social Dinner	

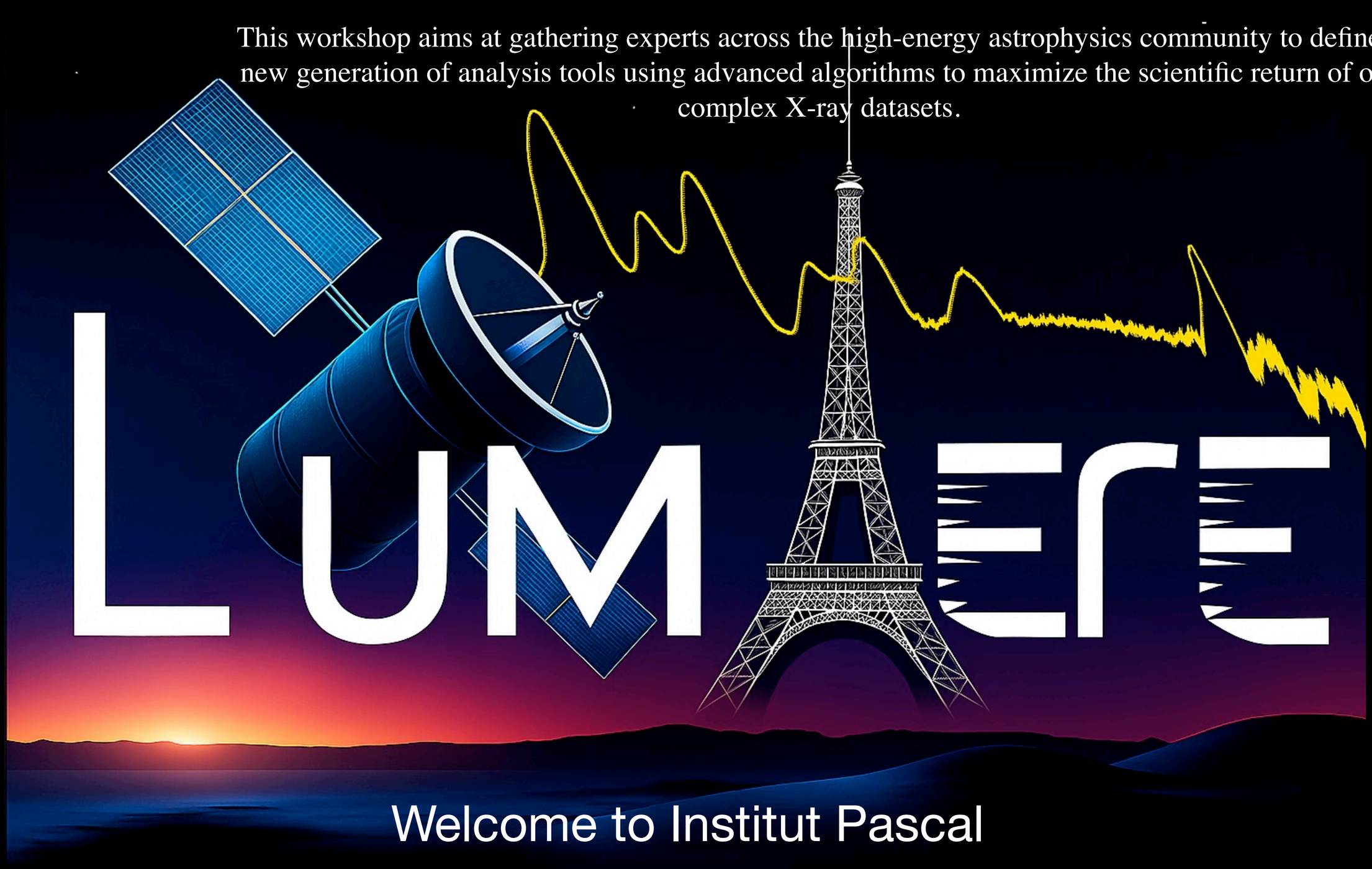
Surprise: thursday social event



Built in 1672 by order of Louis XIV

- **Visit to the historical building of Observatoire de Paris and its cupola**
- **Visit at 6 pm and dinner nearby at 8pm**

This workshop aims at gathering experts across the high-energy astrophysics community to define a new generation of analysis tools using advanced algorithms to maximize the scientific return of our complex X-ray datasets.



Welcome to Institut Pascal

Thoughts on this week

- **Many new techniques presented this week**
  - Exciting to see many possible ways to move forward
  - Particularly nice to see many young researchers : you will be the ones in charge when Athena launches in 10 years

- **Surrogate models:**
  - Seems that this could be helpful for many application
  - Would allow for a faster sampling (eg surrogates in BXA)
  - But tricky to train on large channels
  - Could be trained in sub groups of physical processes (cont, lines)

- **SBI:**
  - Seems to be gaining tractions in the astro community
  - SIXSA seems very promising
  - Multi-fidelity inference could be interesting (low quality surrogate+importance sampling)

- **Model comparison :**
  - Seems like there is no simple/guaranteed threshold and simulations are needed for each case
  - Sensitivity study could be nice to explore how much the threshold is data dependent

Supercharge the X-ray analysis

micro-calorimeters New methods