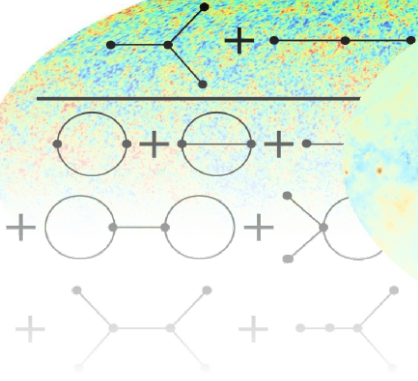




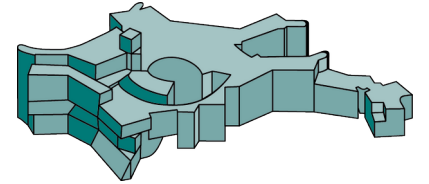
# A Decade of Information Field Theory

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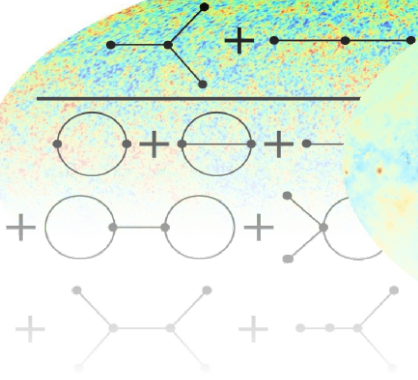
**DFG**

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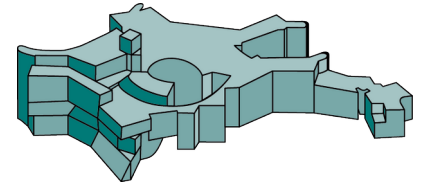




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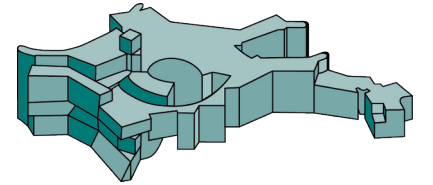
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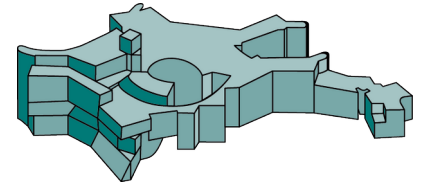
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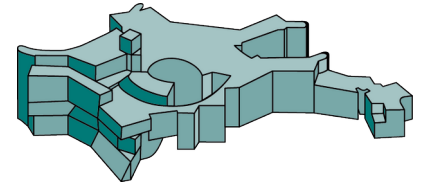
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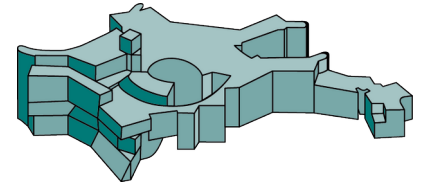


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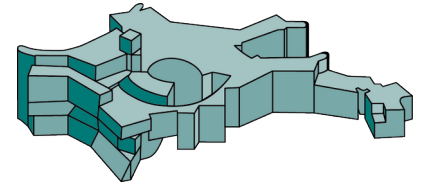
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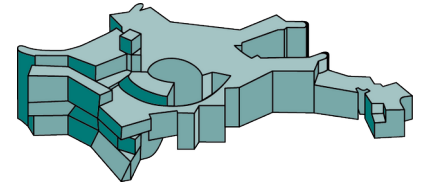




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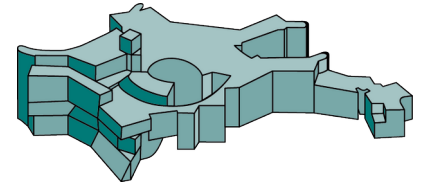
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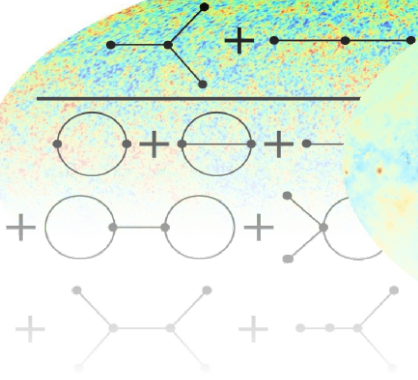


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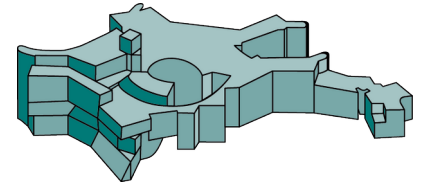
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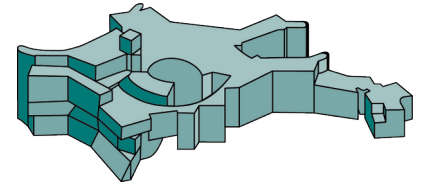
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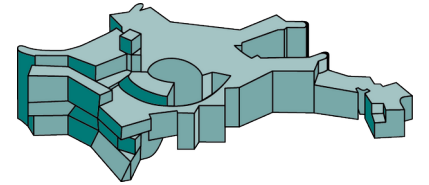
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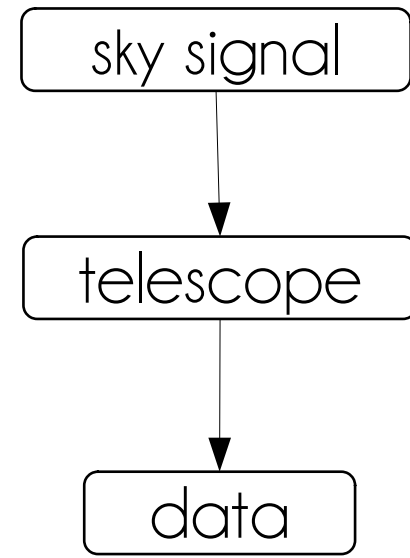
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Credit: SKA



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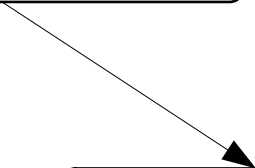


diffuse emission

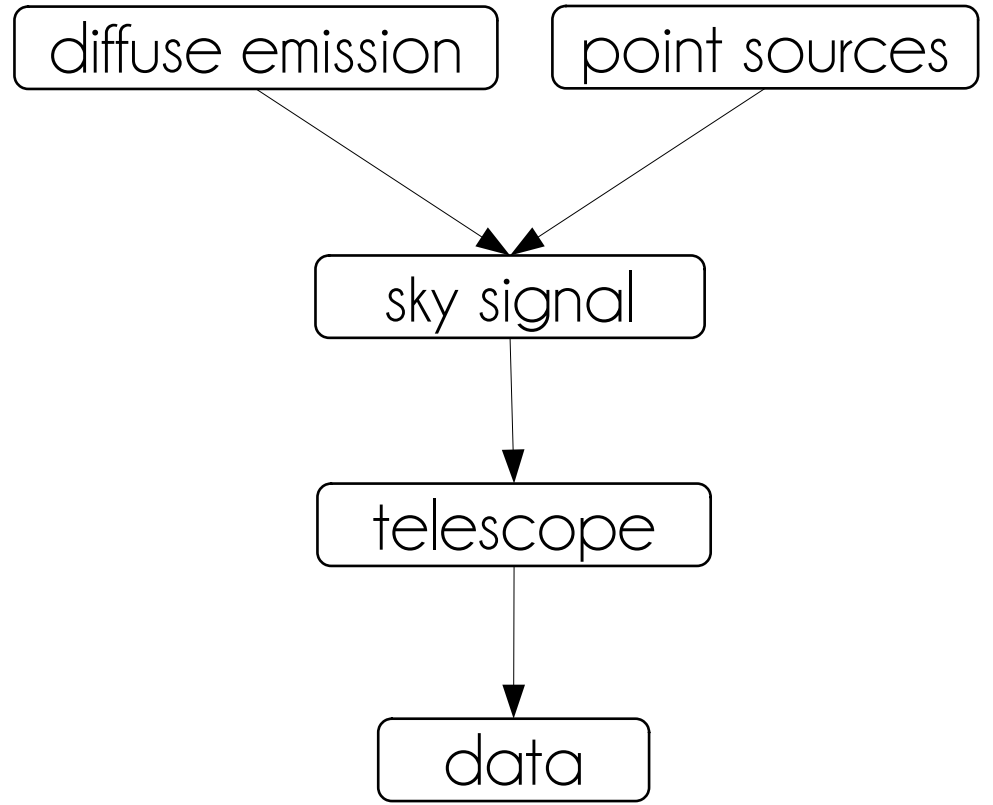
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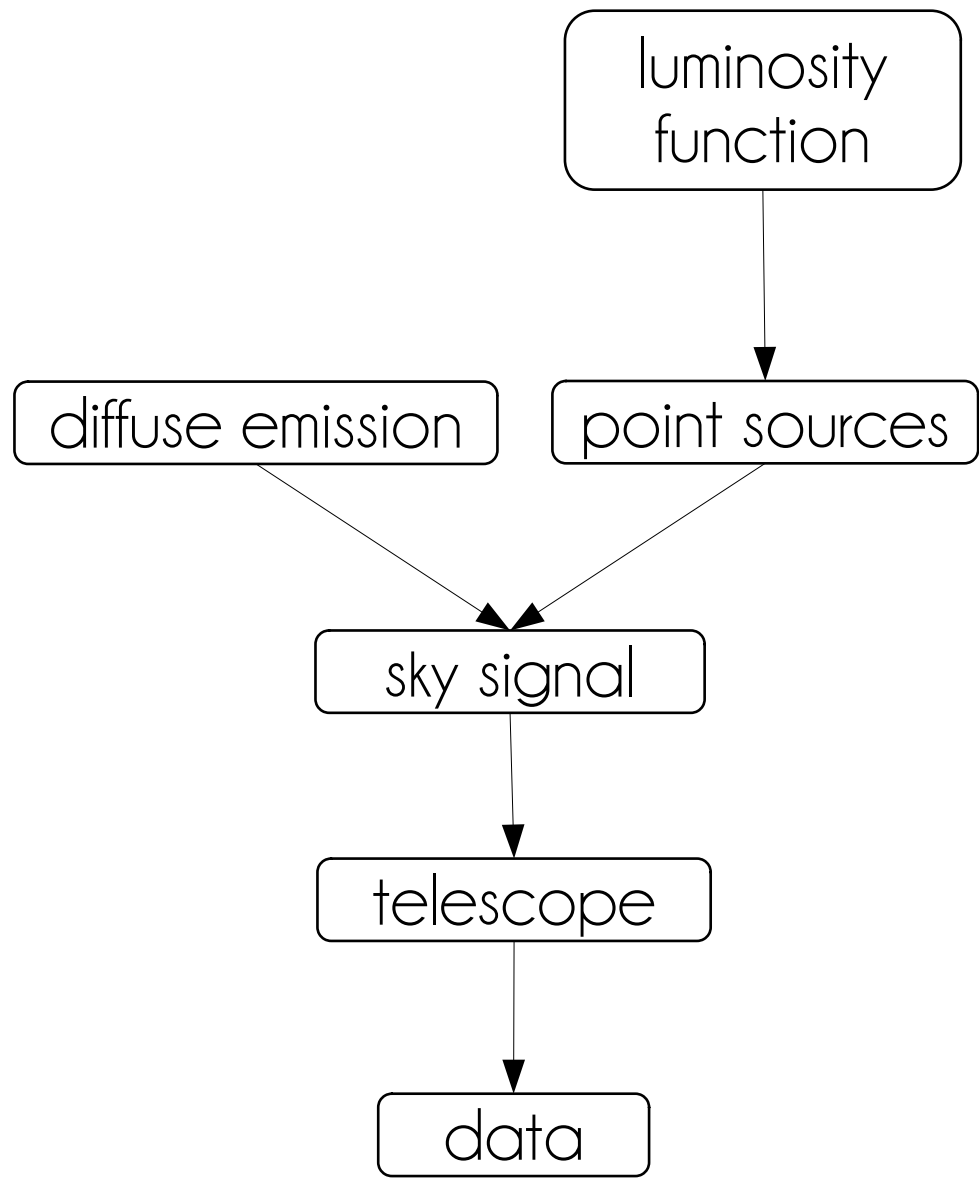
telescope

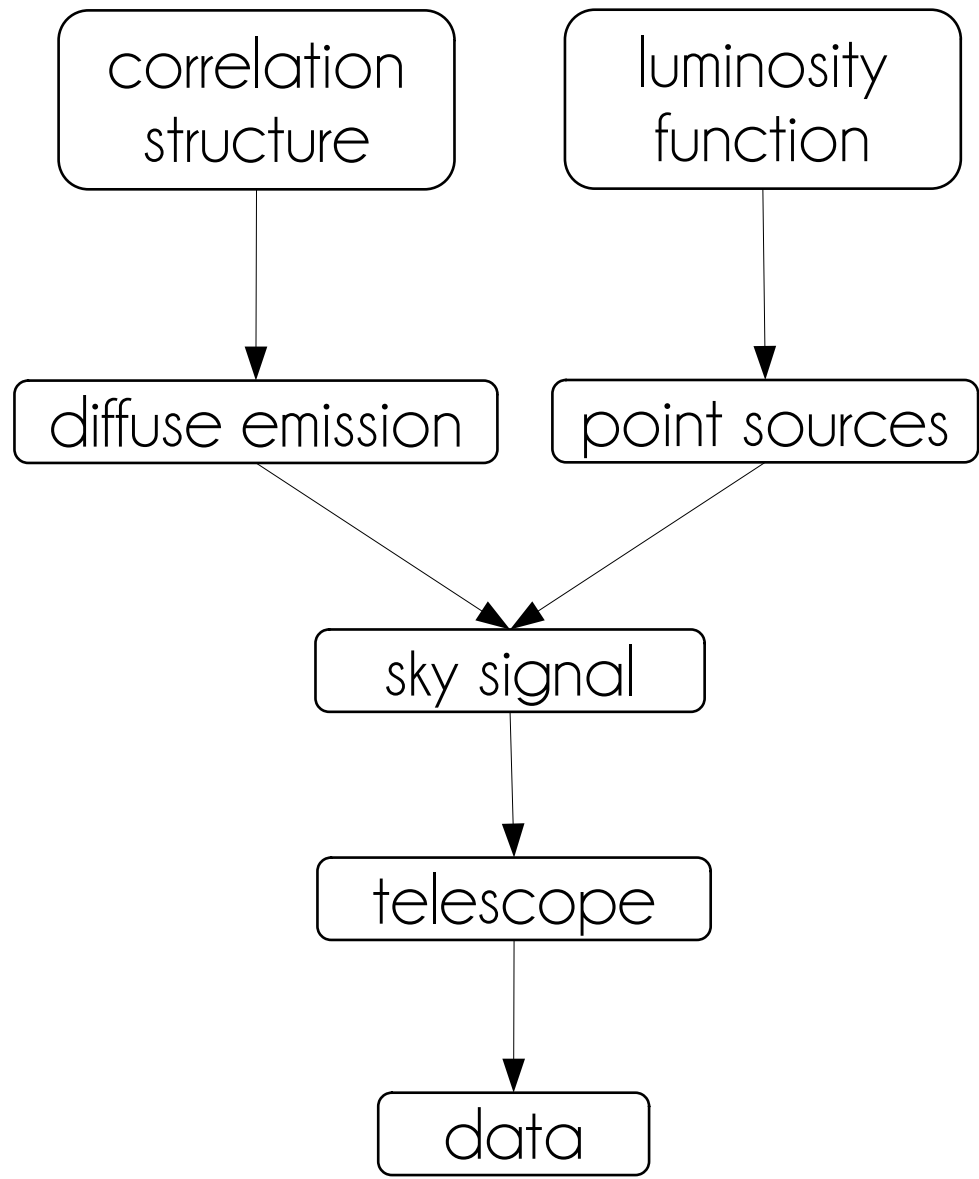
data





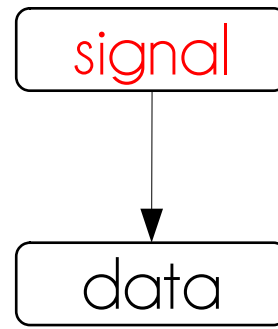








Credit: SKA





signal





signal



data





Credit: SKA

signal



logic

data





signal



logic

uncertainty



data







signal



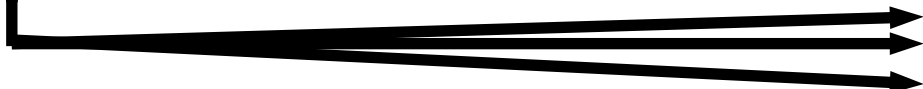
logic

uncertainty



probability

data





signal

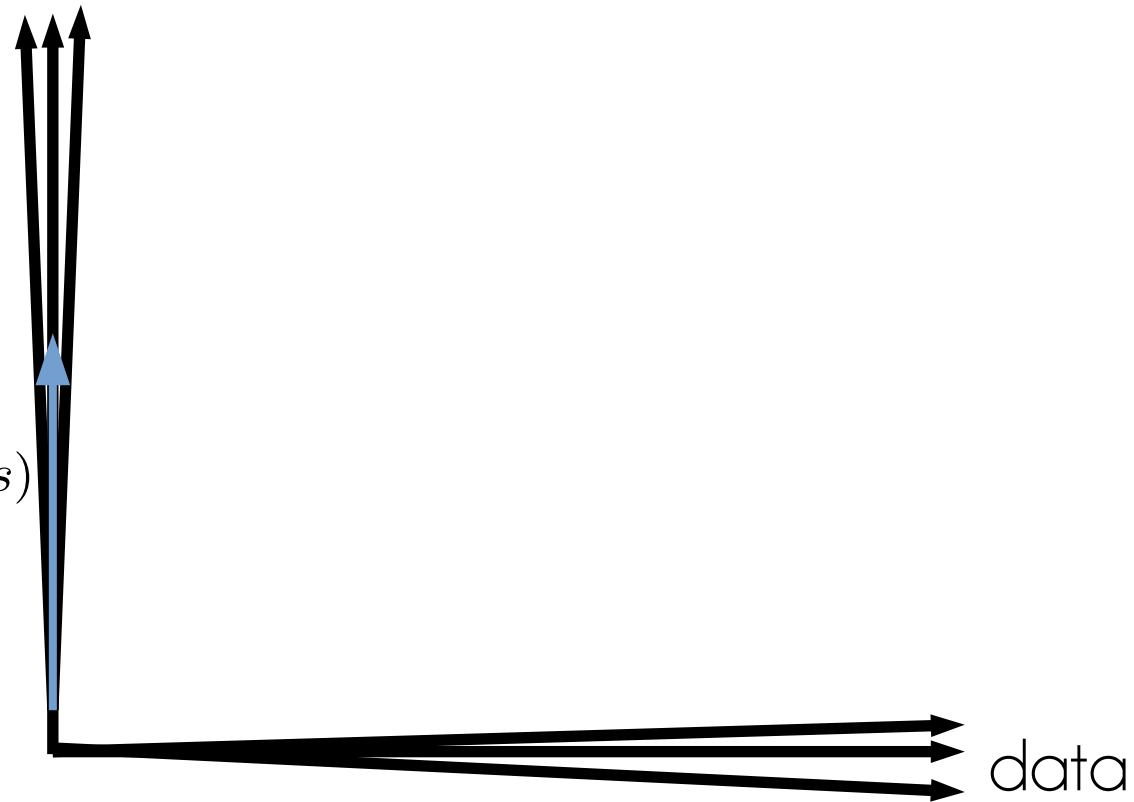
$\mathcal{P}(s)$

logic

uncertainty

probability

data





prior signal  
knowledge

$\mathcal{P}(s)$

signal



data

logic

uncertainty



probability



prior signal knowledge

signal

$\mathcal{P}(s)$

$\mathcal{P}(d|s)$

data

logic

uncertainty

probability



instrument model

prior signal knowledge

signal

$\mathcal{P}(s)$

$\mathcal{P}(d|s)$

data

logic

uncertainty

probability



instrument model

prior signal knowledge

signal

$\mathcal{P}(s)$

$\mathcal{P}(d|s)$

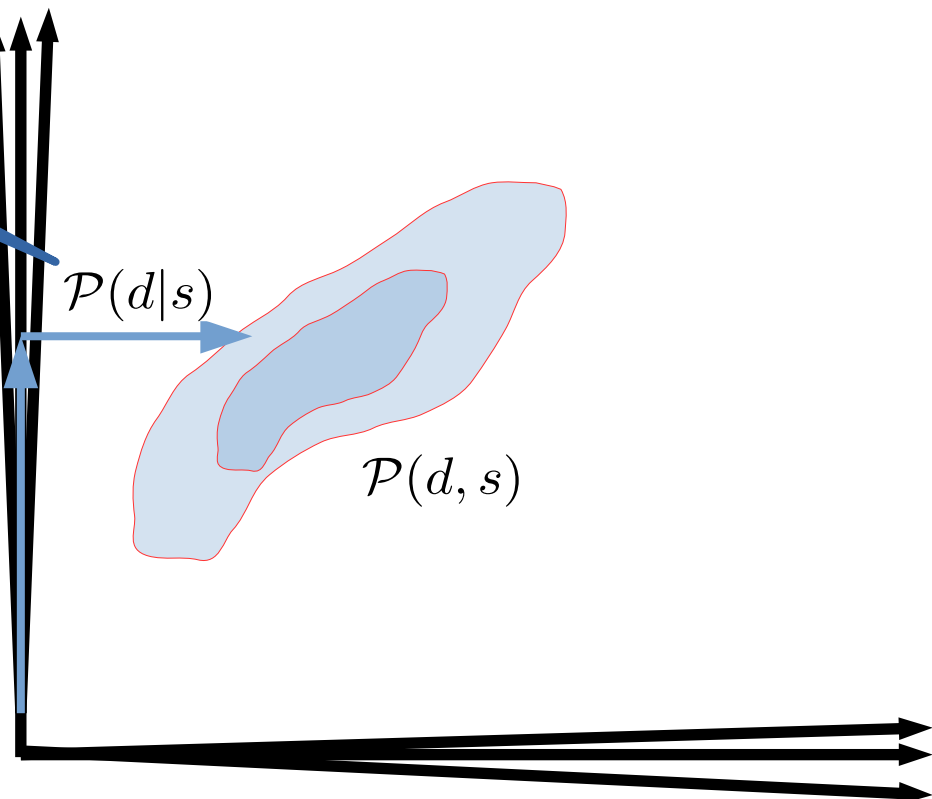
$\mathcal{P}(d, s)$

data

logic

uncertainty

probability





instrument model

prior signal knowledge

signal

$\mathcal{P}(s)$

$\mathcal{P}(d|s)$

$\mathcal{P}(d, s)$

data

logic

uncertainty

probability



instrument model

prior signal knowledge

signal

$\mathcal{P}(s)$

$\mathcal{P}(d|s)$

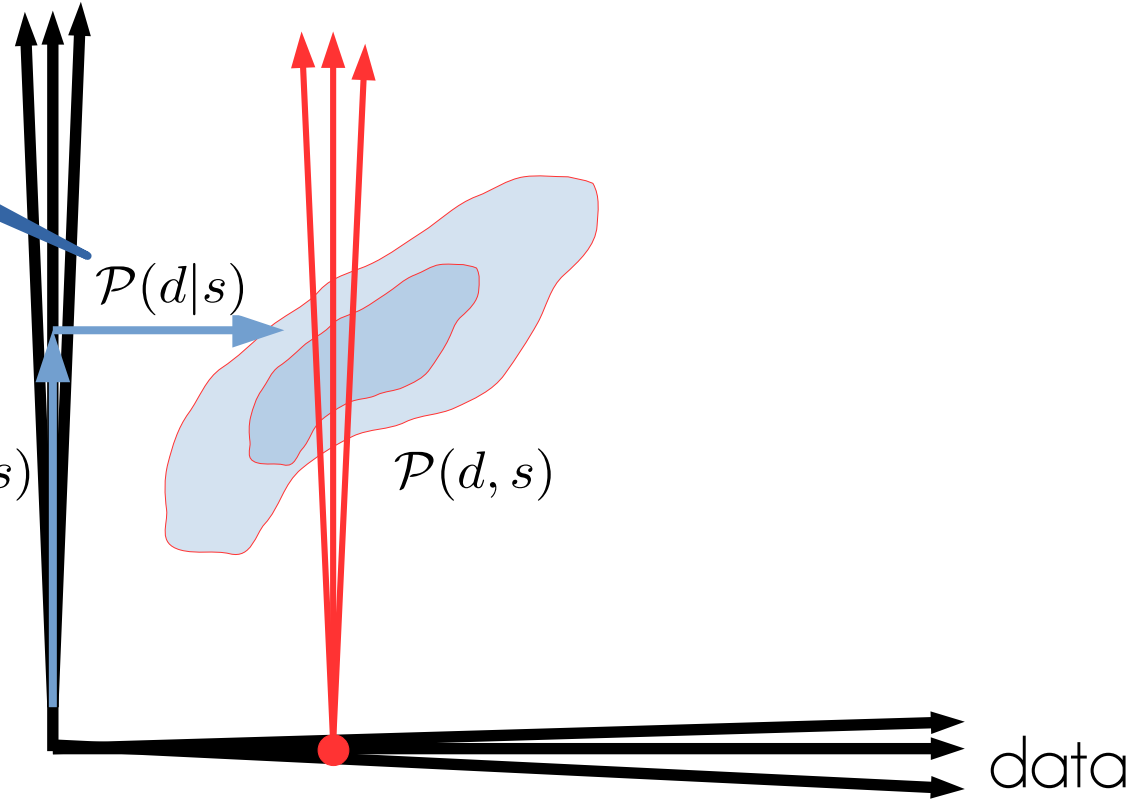
$\mathcal{P}(d, s)$

data

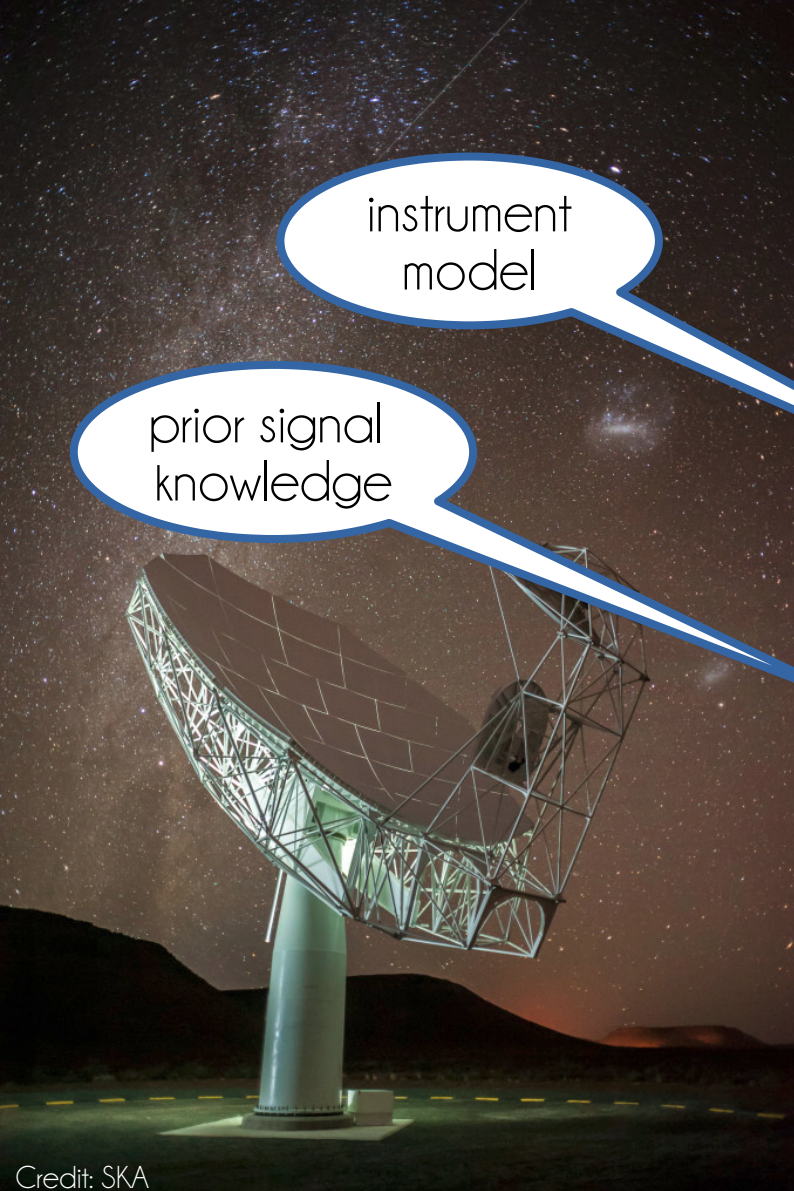
logic

uncertainty

probability







instrument model

prior signal knowledge

signal

$\mathcal{P}(s|d)$

$\mathcal{P}(d|s)$

$\mathcal{P}(s)$

$\mathcal{P}(d, s)$

data

logic

uncertainty

probability



instrument model

prior signal knowledge

signal

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d|s) \mathcal{P}(s)}{\mathcal{P}(d)}$$

$\mathcal{P}(s)$

$\mathcal{P}(d|s)$

$\mathcal{P}(d, s)$

data

logic

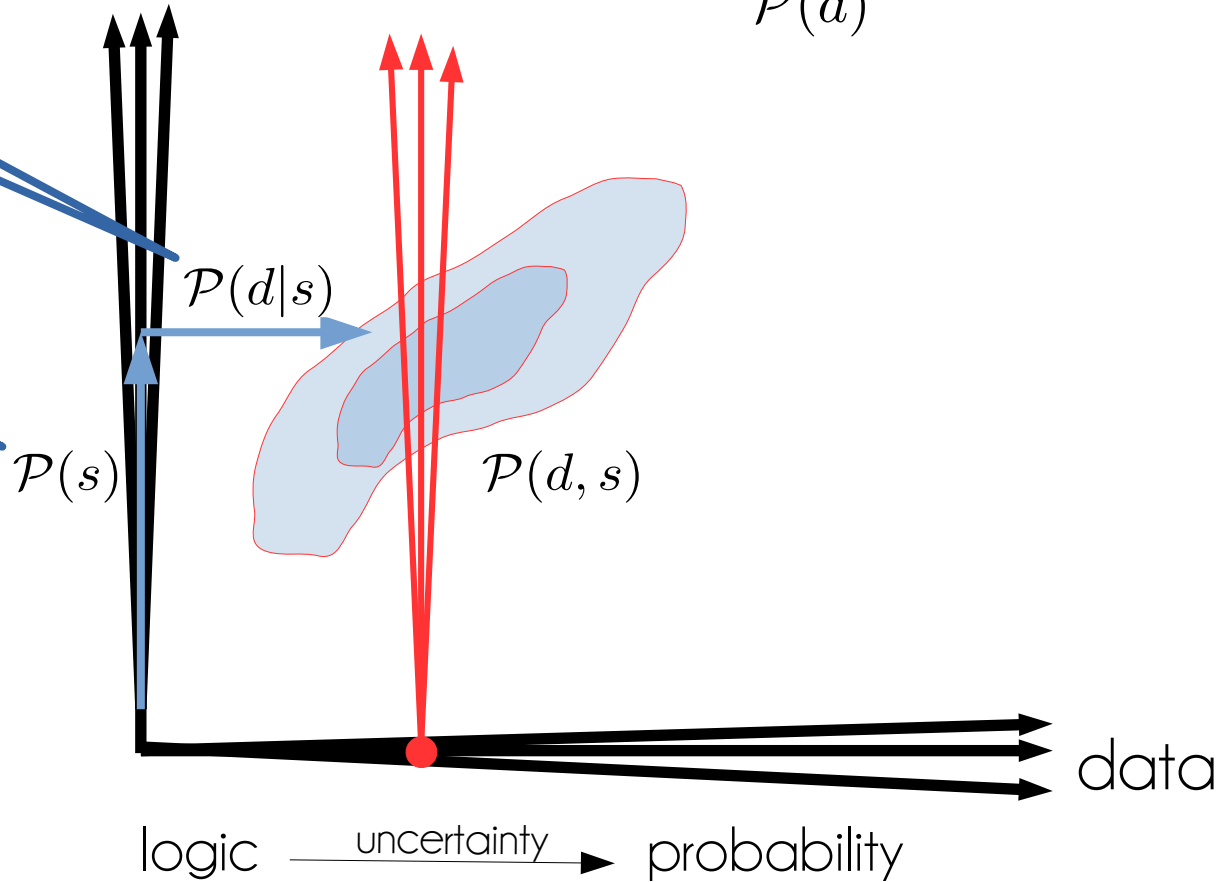
uncertainty

probability



# Bayes' theorem

$$\text{signal } \mathcal{P}(s|d) = \frac{\mathcal{P}(d|s) \mathcal{P}(s)}{\mathcal{P}(d)}$$



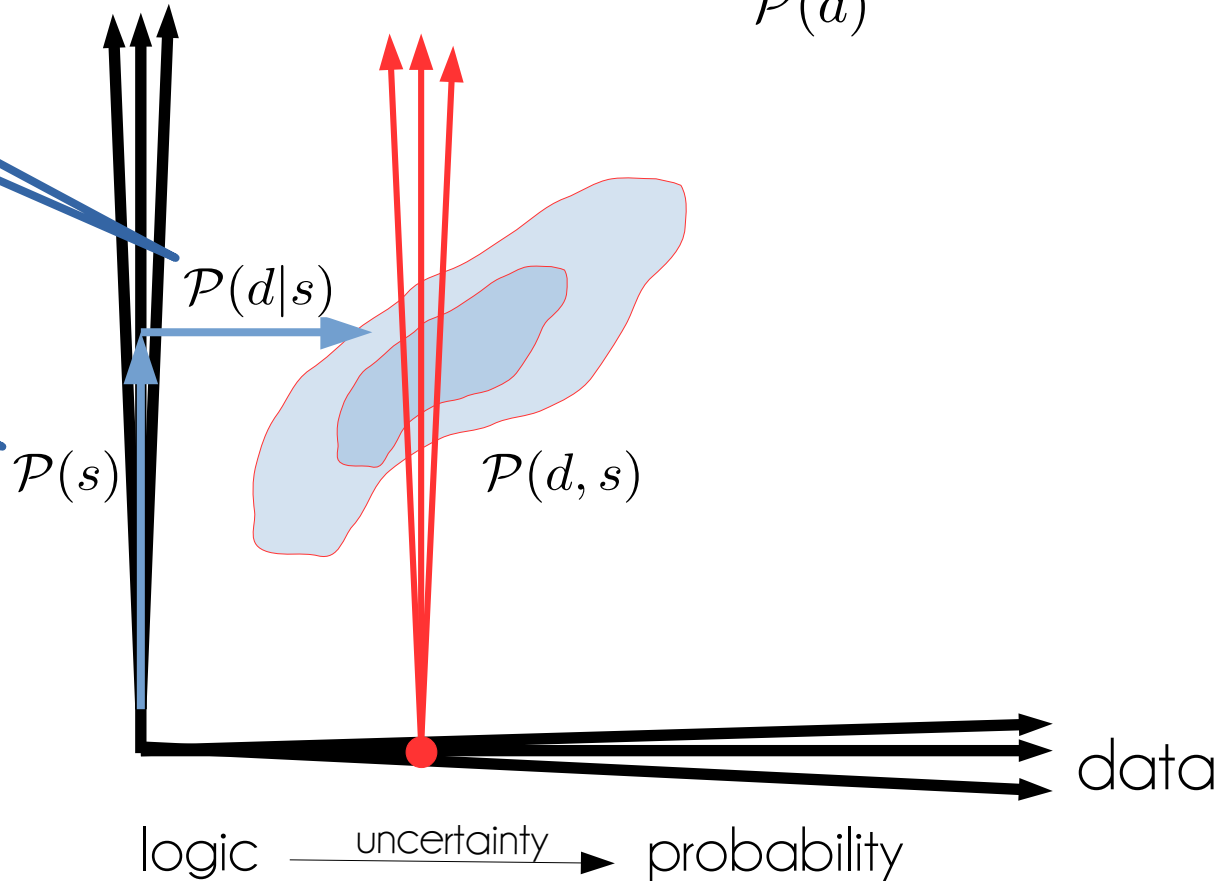


Bayes' theorem

Information theory

signal

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d|s) \mathcal{P}(s)}{\mathcal{P}(d)}$$



$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)}$$

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$
$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

Information



$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

$$\mathcal{Z}(d) = \mathcal{P}(d)$$

Information

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

$$\mathcal{Z}(d) = \mathcal{P}(d)$$

$$= \int \mathcal{D}s \mathcal{P}(d, s)$$

Information

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

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$$\mathcal{P}(d, s) = \mathcal{P}(d|s) \mathcal{P}(s)$$

Information

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

$$\mathcal{Z}(d) = \mathcal{P}(d)$$

$$= \int \mathcal{D}s \mathcal{P}(d, s)$$

$$\mathcal{P}(d, s) = \mathcal{P}(d|s) \mathcal{P}(s)$$

$$\mathcal{H}(d, s) = \mathcal{H}(d|s) + \mathcal{H}(s)$$

Information

# Information theory

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

$$\mathcal{Z}(d) = \mathcal{P}(d)$$

$$= \int \mathcal{D}s \mathcal{P}(d, s)$$

$$\mathcal{P}(d, s) = \mathcal{P}(d|s) \mathcal{P}(s)$$

$$\mathcal{H}(d, s) = \mathcal{H}(d|s) + \mathcal{H}(s)$$

Information

is additive

# Information theory

$$\mathcal{P}(s|d) = \frac{\mathcal{P}(d, s)}{\mathcal{P}(d)} = \frac{e^{-\mathcal{H}(d, s)}}{\mathcal{Z}(d)}$$

$$\mathcal{H}(d, s) = -\log \mathcal{P}(d, s)$$

$$\mathcal{Z}(d) = \mathcal{P}(d)$$

$$= \int \mathcal{D}s \mathcal{P}(d, s)$$

$$\mathcal{P}(d, s) = \mathcal{P}(d|s) \mathcal{P}(s)$$

$$\mathcal{H}(d_1, d_2, s) = \mathcal{H}(d_1|s) + \mathcal{H}(d_2|s) + \mathcal{H}(s) \quad \text{is additive}$$

Information

# Information theory

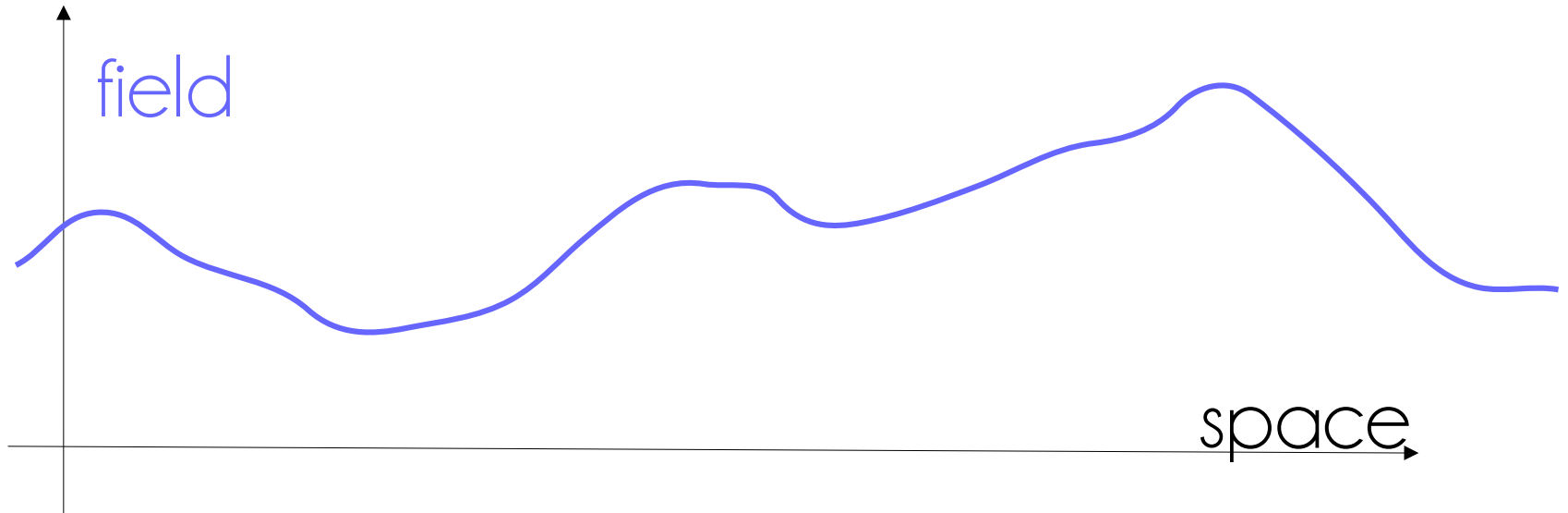
Field

Information theory



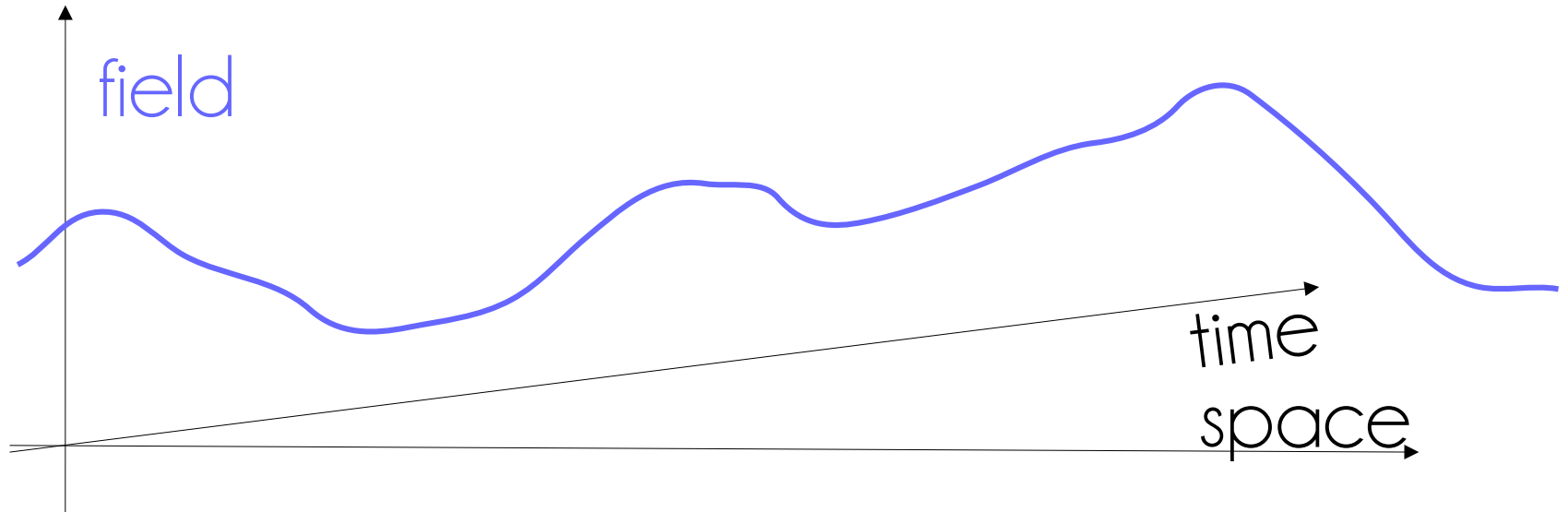
Field

Information theory



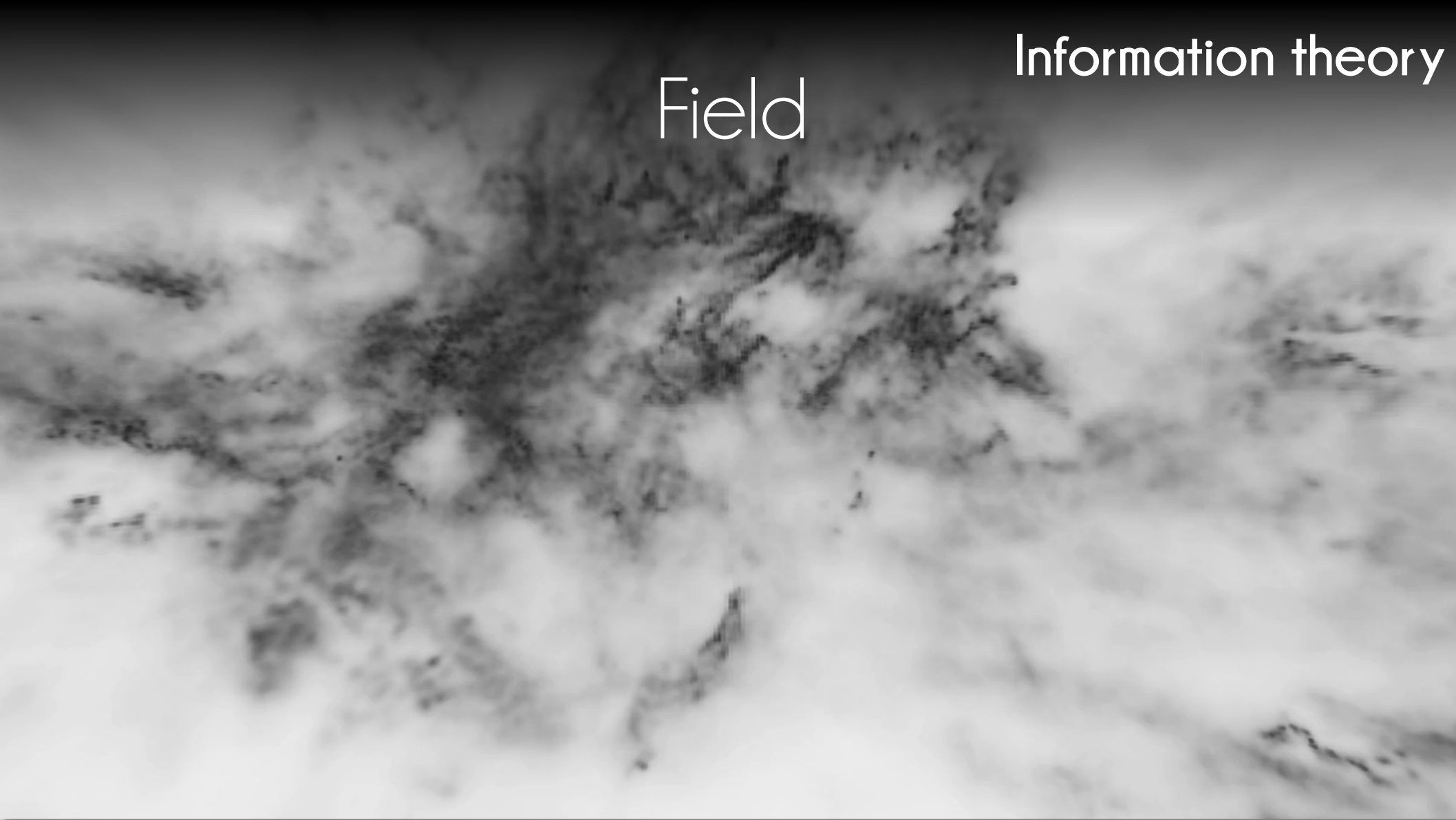
# Field

# Information theory



Field

Information theory



Information theory

Field

Correlations

The image features a central, dark, irregularly shaped region with a complex, fibrous or fractal-like internal structure. This central region is surrounded by a lighter, more uniform, and slightly grainy background. A horizontal double-headed arrow is superimposed over the center of the dark region, with the word "Correlations" written above it. The overall appearance is that of a scientific or technical visualization, possibly representing a field or a complex system's structure.

Field

Correlations



Information theory

Field

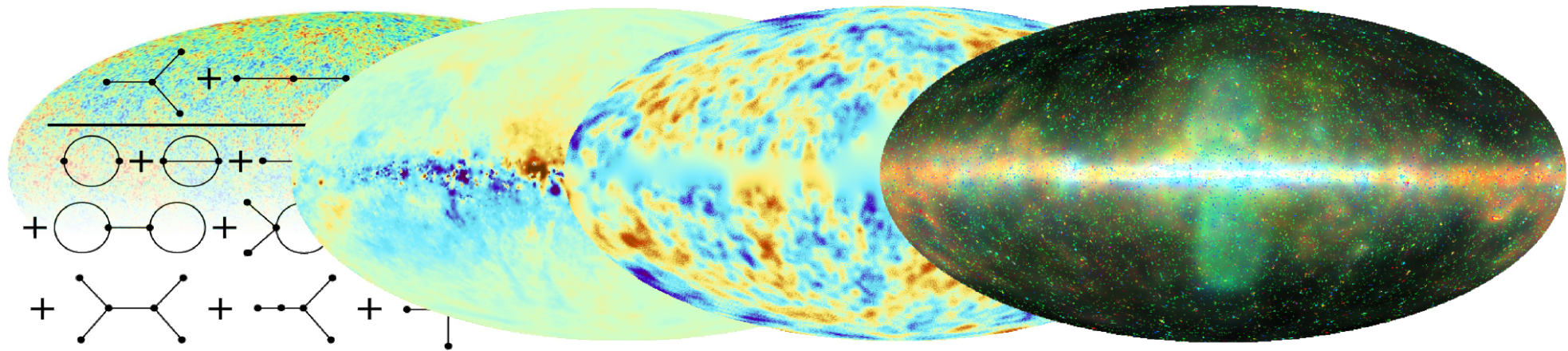
Correlations



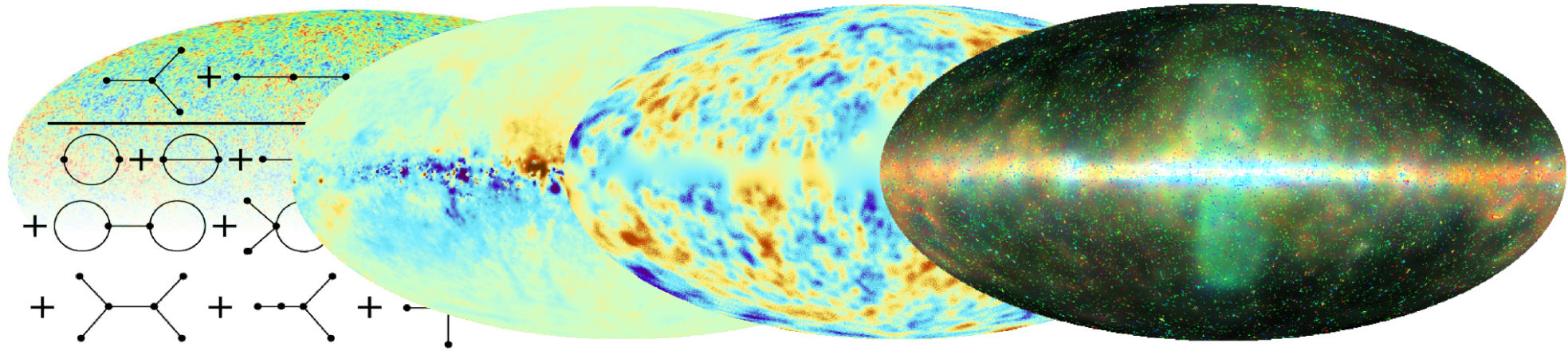
# Information theory for fields

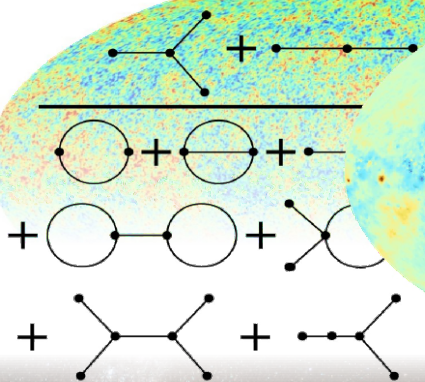
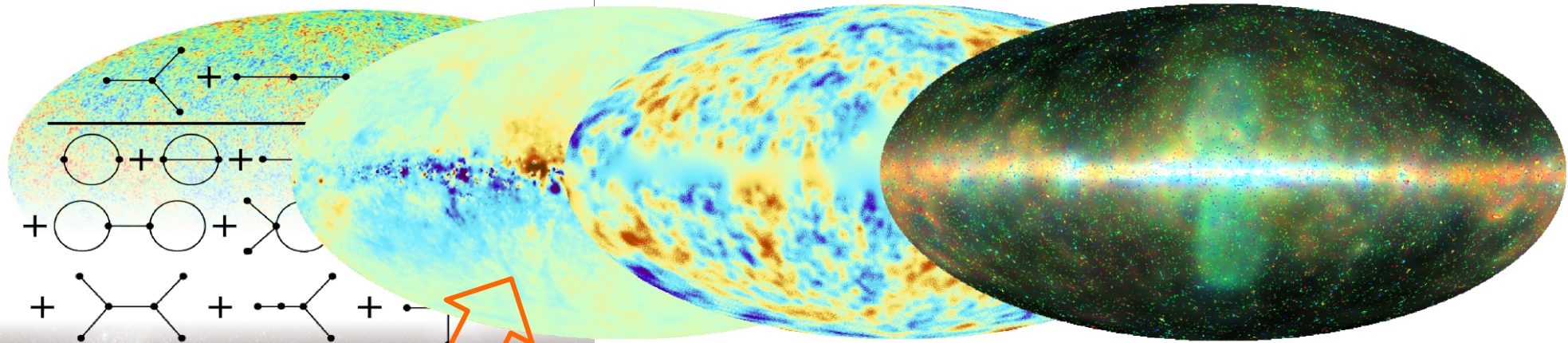
Information field theory

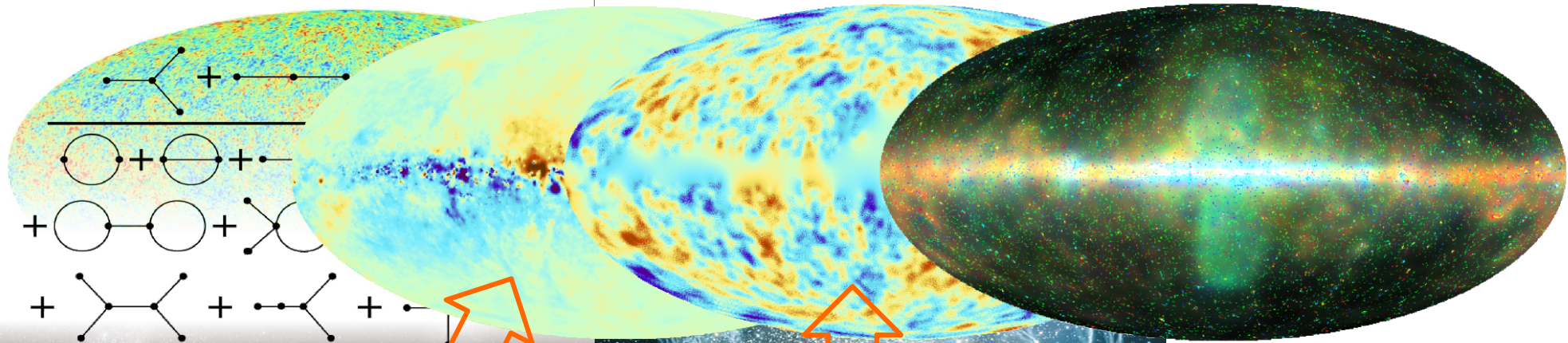




Information field theory

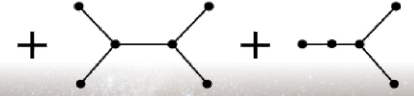
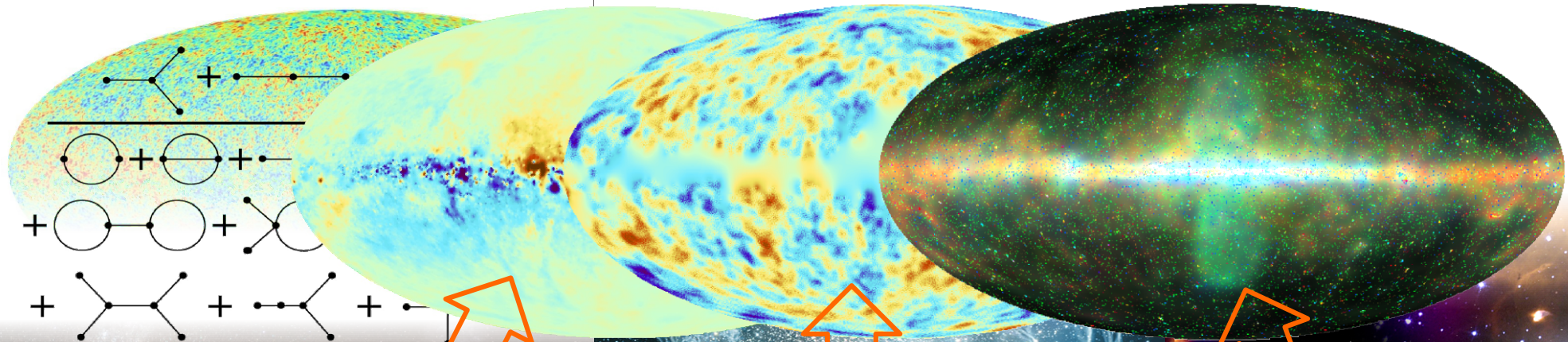




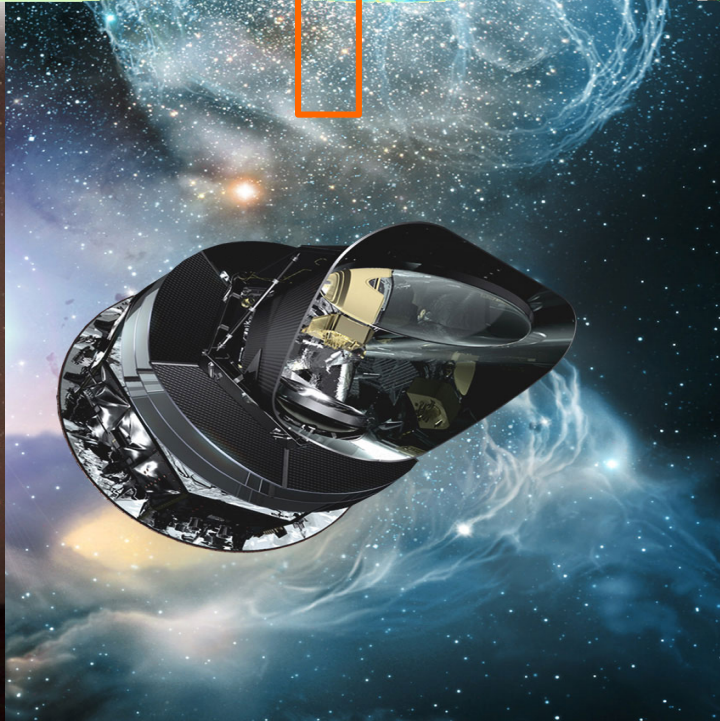


Credit: SKA

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Credit: NASA



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## NIFTy – Numerical Information Field Theory

**NIFTy** <sup>1</sup> <sup>2</sup> <sup>3</sup>, “Numerical Information Field Theory“, is a versatile library designed to enable the development of signal inference algorithms that are independent of the underlying grids (spatial, spectral, temporal, ...) and their resolutions. Its object-oriented framework is written in Python, although it accesses libraries written in C++ and C for efficiency.

NIFTy offers a toolkit that abstracts discretized representations of continuous spaces, fields in these spaces, and operators acting on these fields into classes. This allows for an abstract formulation and programming of inference algorithms, including those derived within information field theory. NIFTy’s interface is designed to resemble IFT formulae in the sense that the user implements algorithms in NIFTy independent of the topology of the underlying spaces and the discretization scheme. Thus, the user can develop algorithms on subsets of problems and on spaces where the detailed performance of the algorithm can be properly evaluated and then easily generalize them to other, more complex spaces and the full problem, respectively.

# NIFTy



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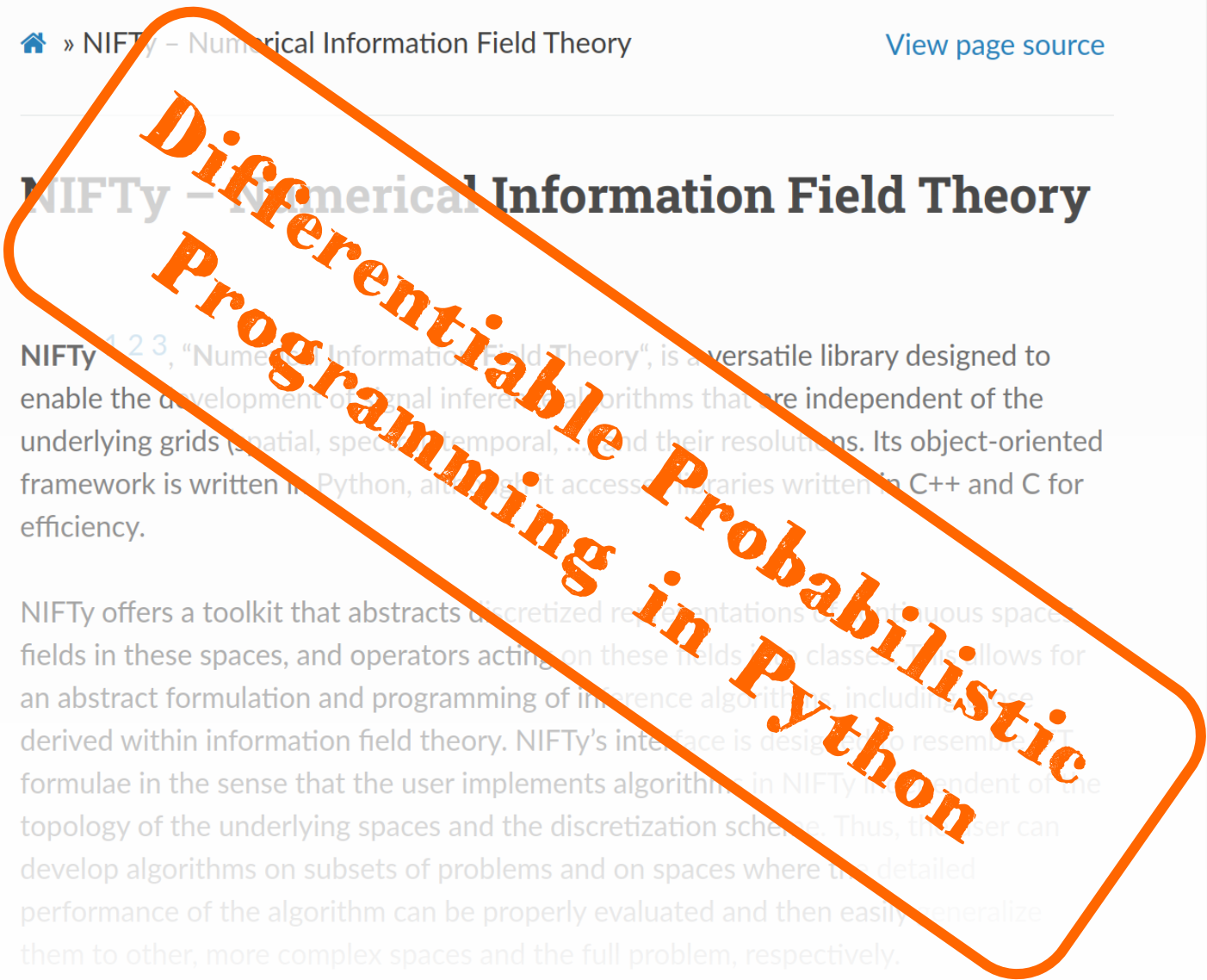
NIFTy-related publications

Package Documentation

## NIFTy – Numerical Information Field Theory

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# NIFTy



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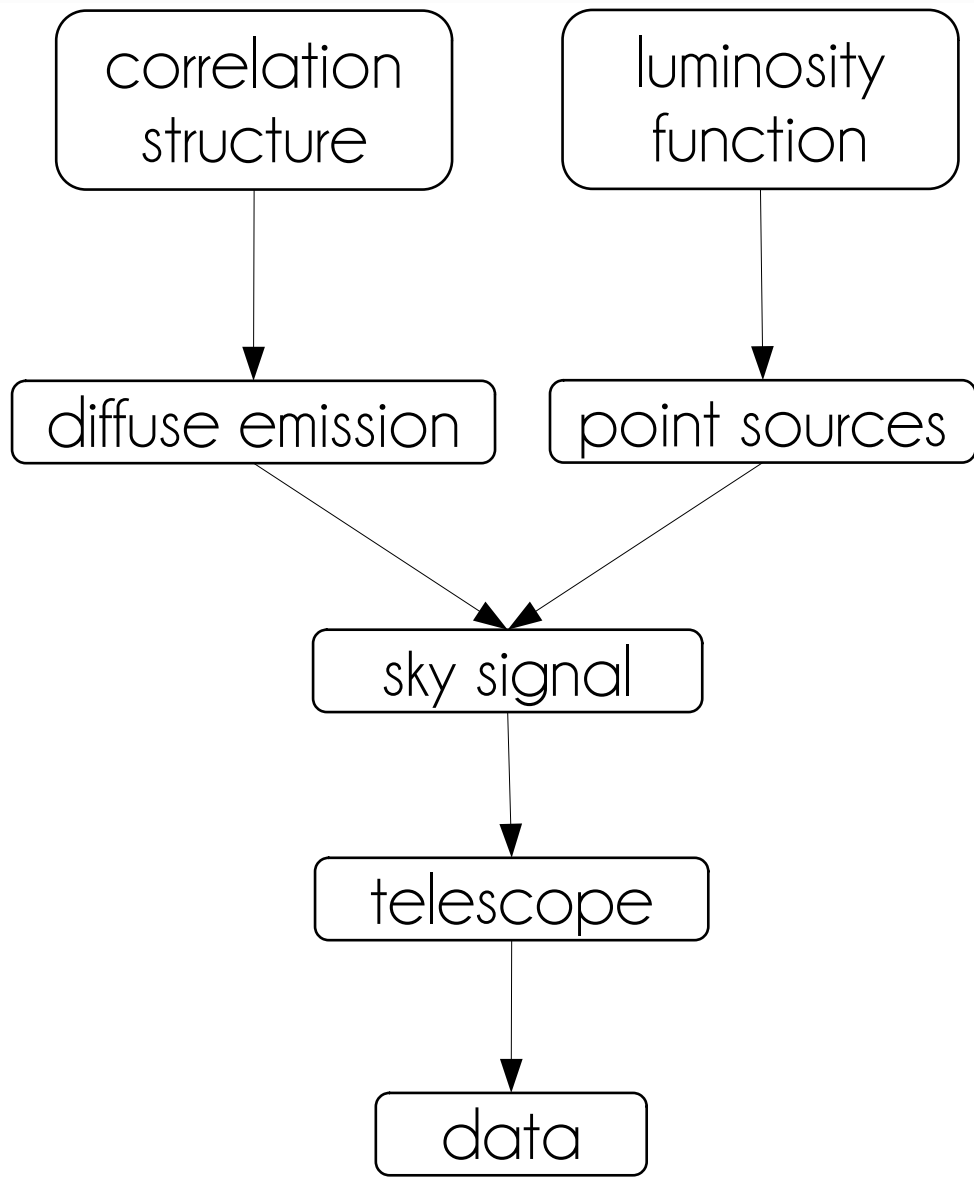
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# NIFTy



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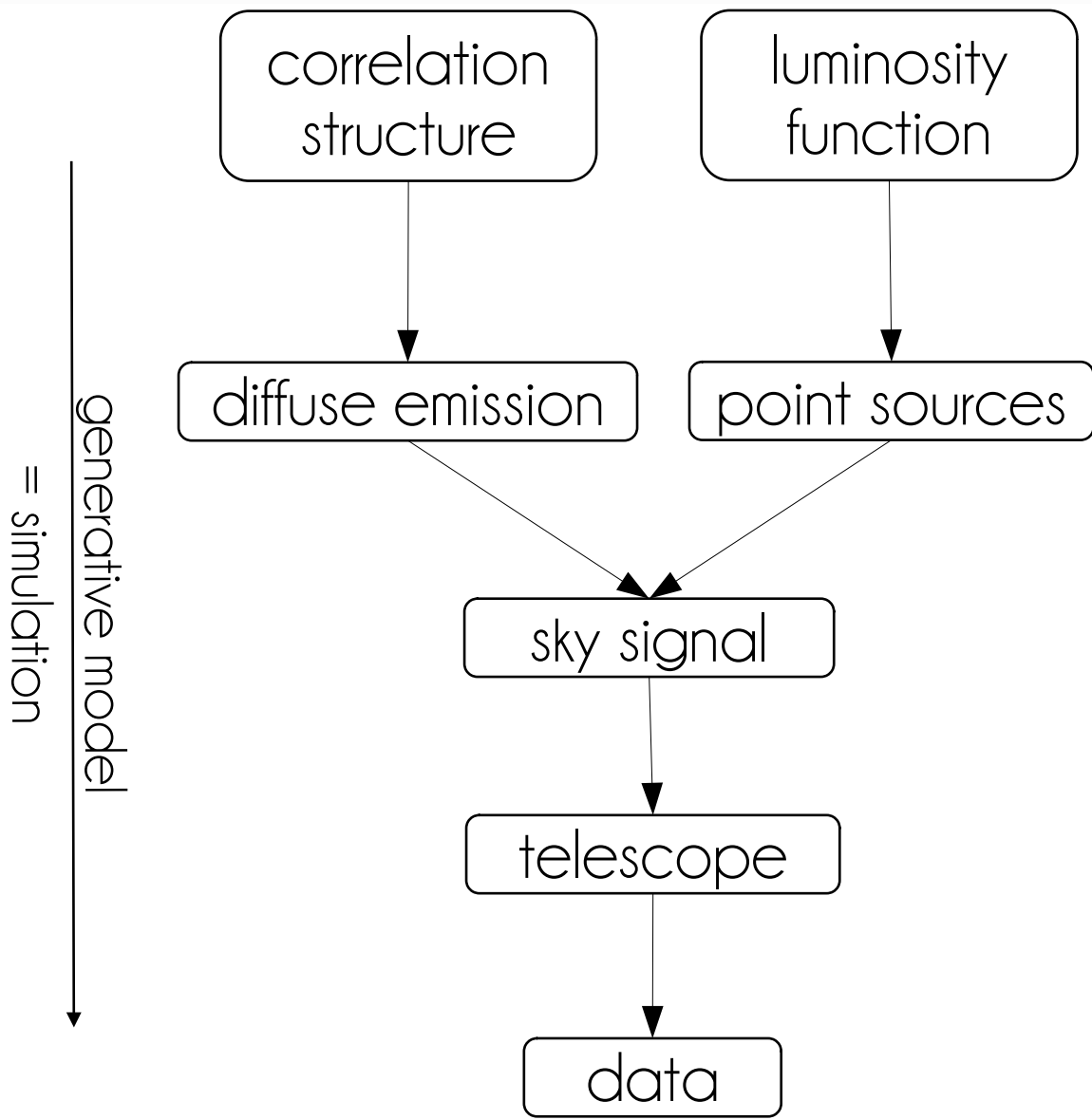
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# NIFTy



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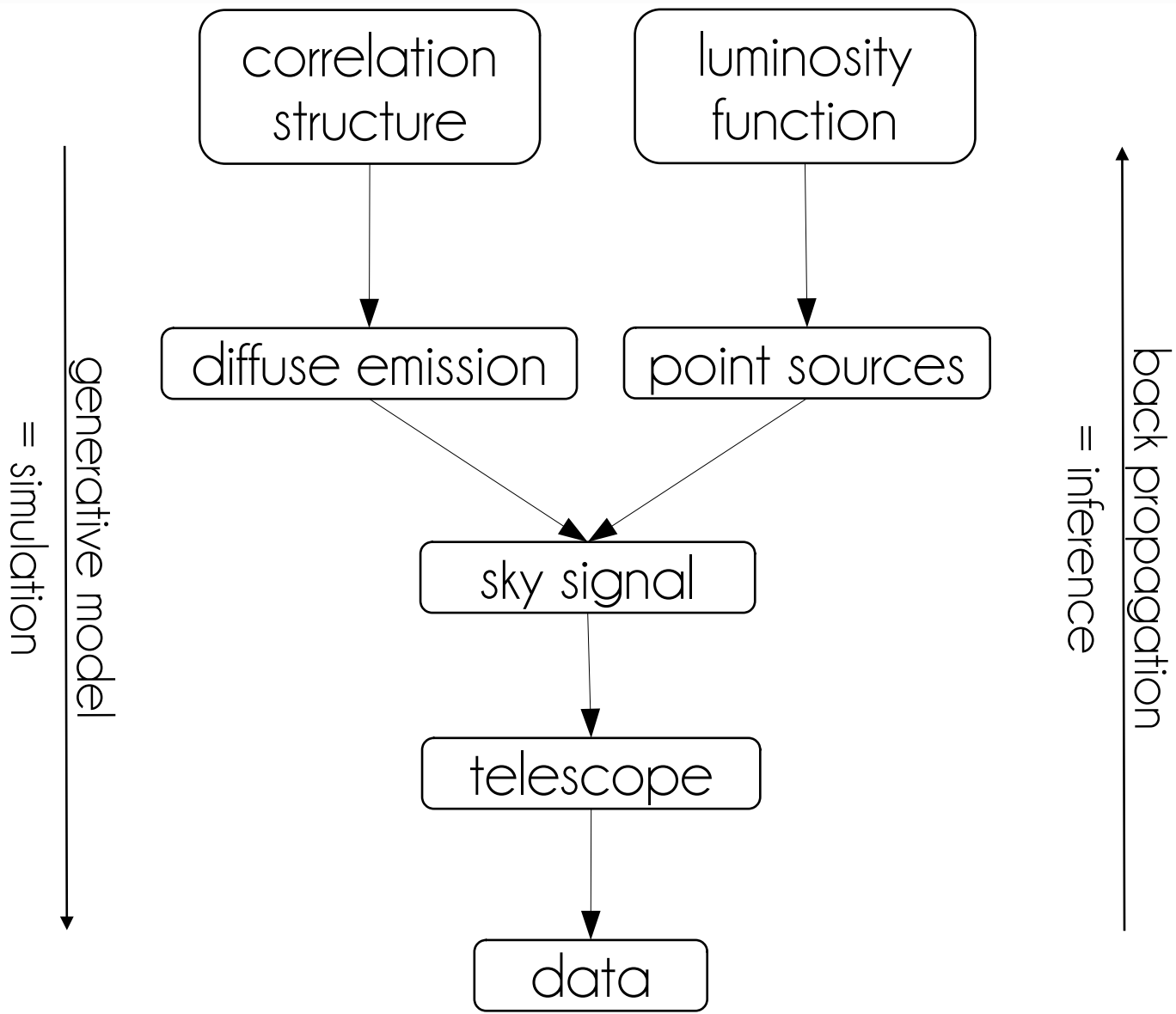
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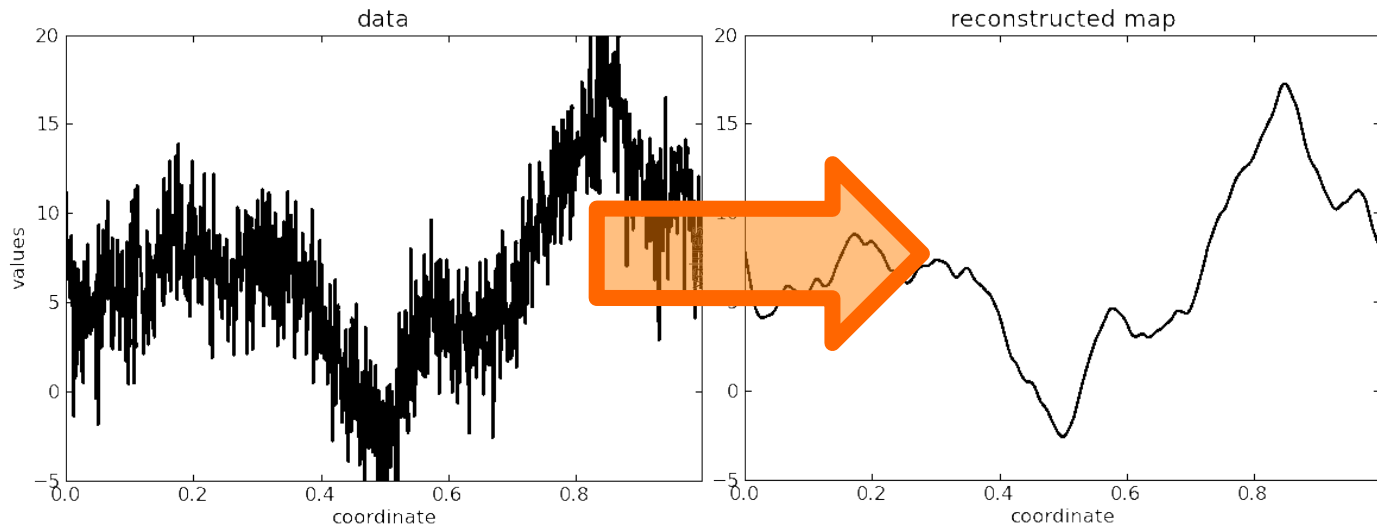
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```
import nifty8 as ift
space = ift.RGSpace([N])
```

# NIFTy



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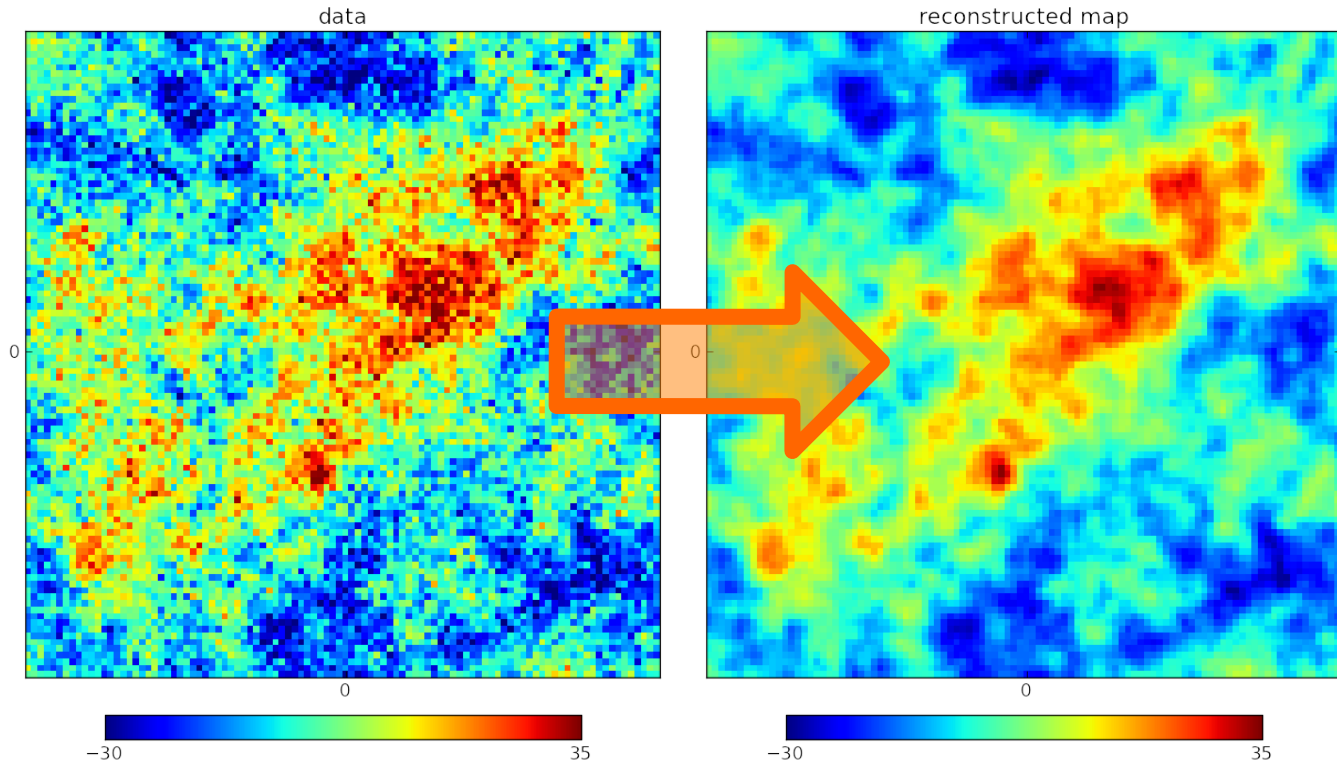
Discretisation and Volume in NIFTy

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Code Overview

NIFTy-related publications



```
import nifty8 as ift
space = ift.RGSpace([N,N])
```

# NIFTy



7

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IFT – Information Field Theory

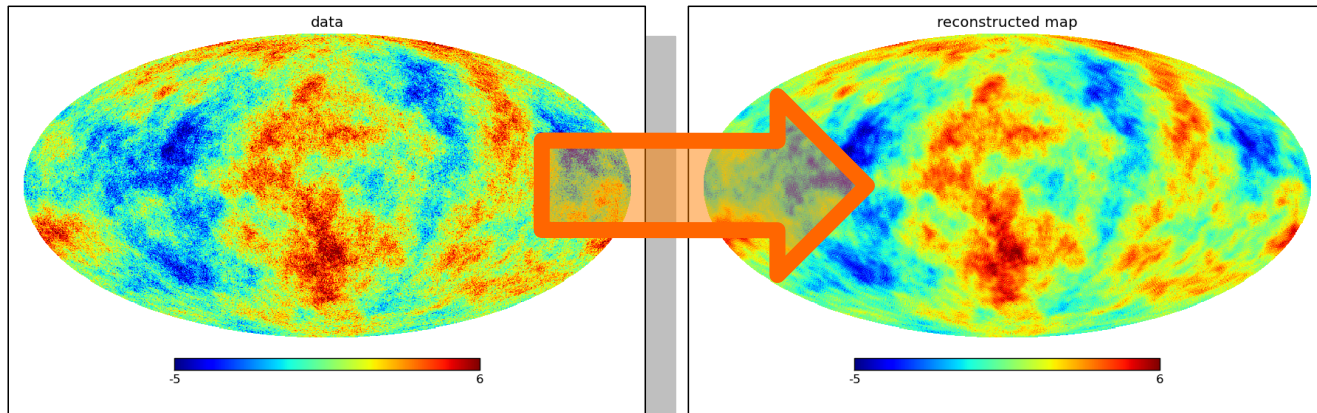
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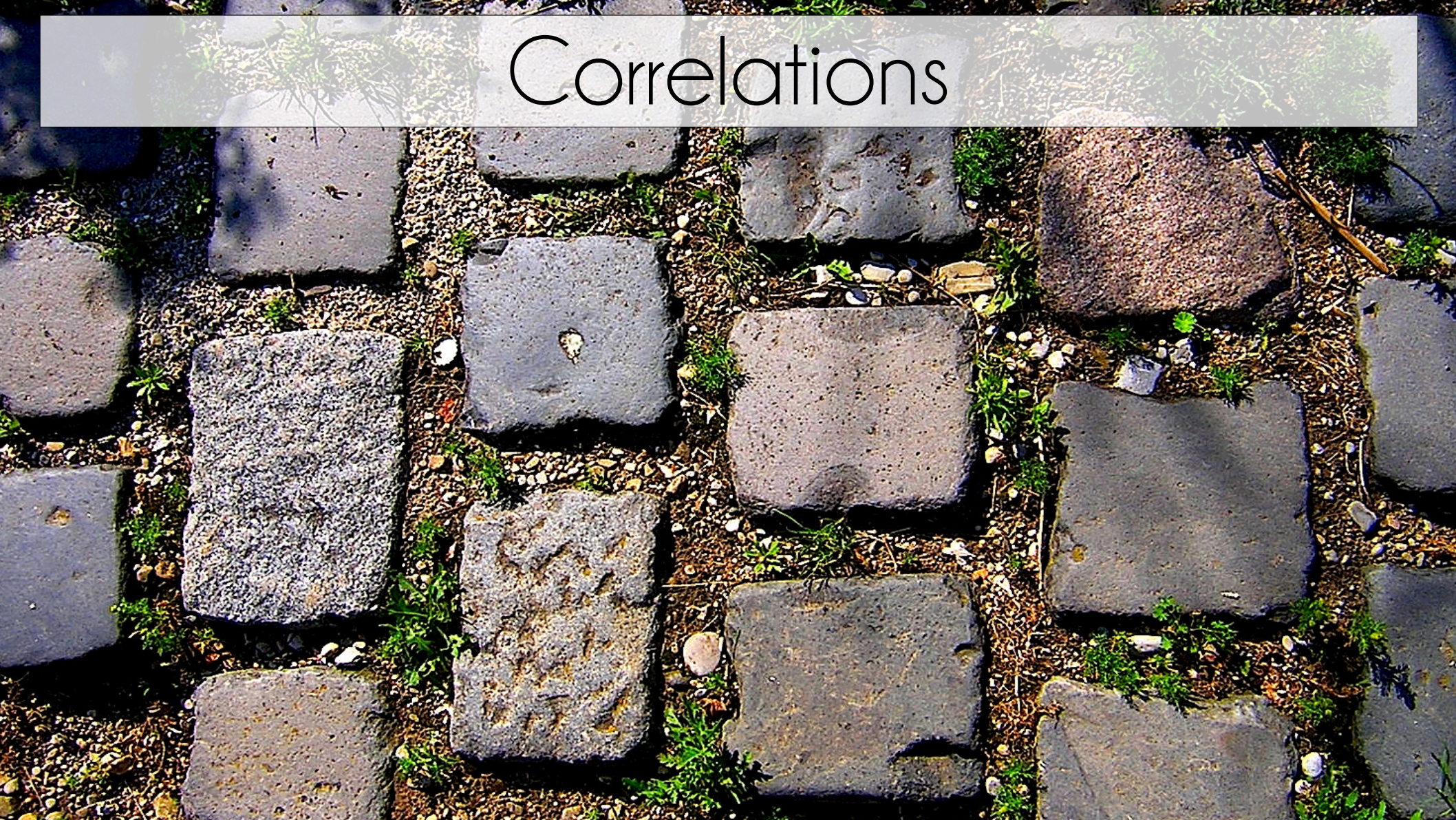
Code Overview

NIFTy-related publications



```
import nifty8 as ift
space = ift.HPSpace(NSide)
```

# Correlations



# Correlations



# Correlations





# Correlations

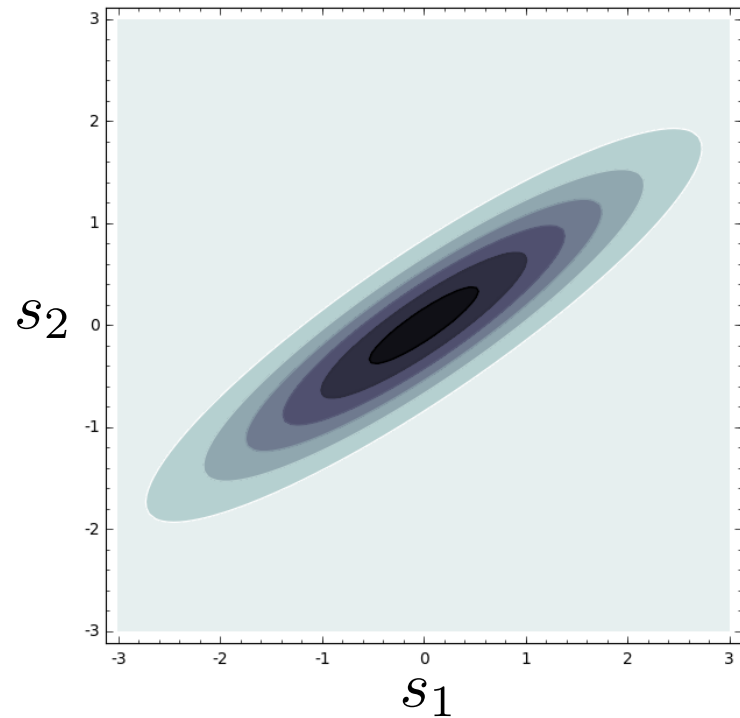
$$s = \begin{pmatrix} s_1 \\ s_2 \end{pmatrix}$$



# Correlations

$\mathcal{P}(s)$

$$s = \begin{pmatrix} s_1 \\ s_2 \end{pmatrix}$$

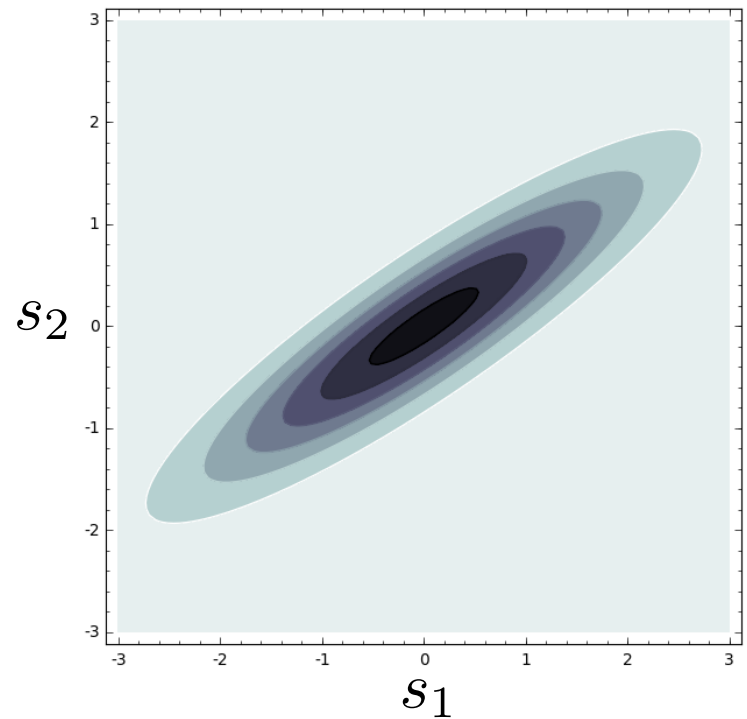


# Correlations

$\mathcal{P}(s)$

$$s = \begin{pmatrix} s_1 \\ s_2 \end{pmatrix}$$

$$d = s_1 + n$$



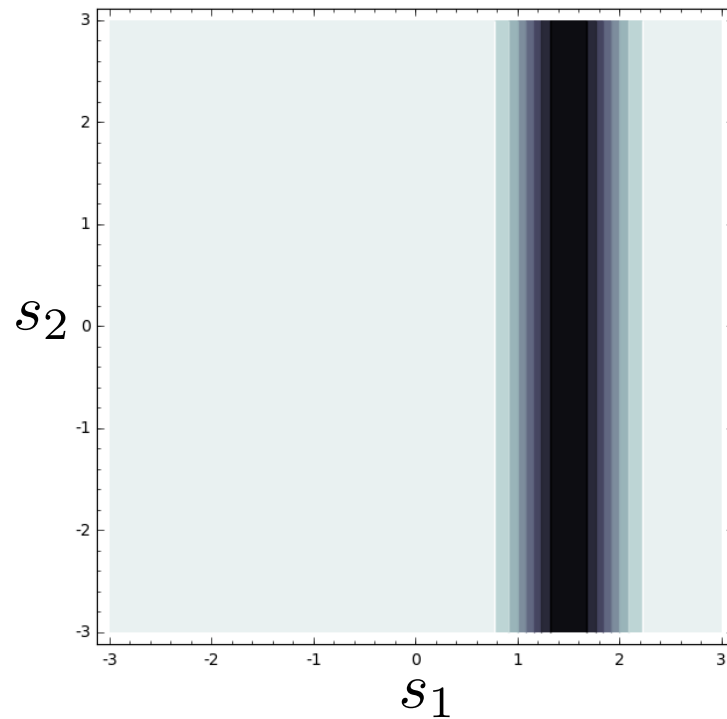
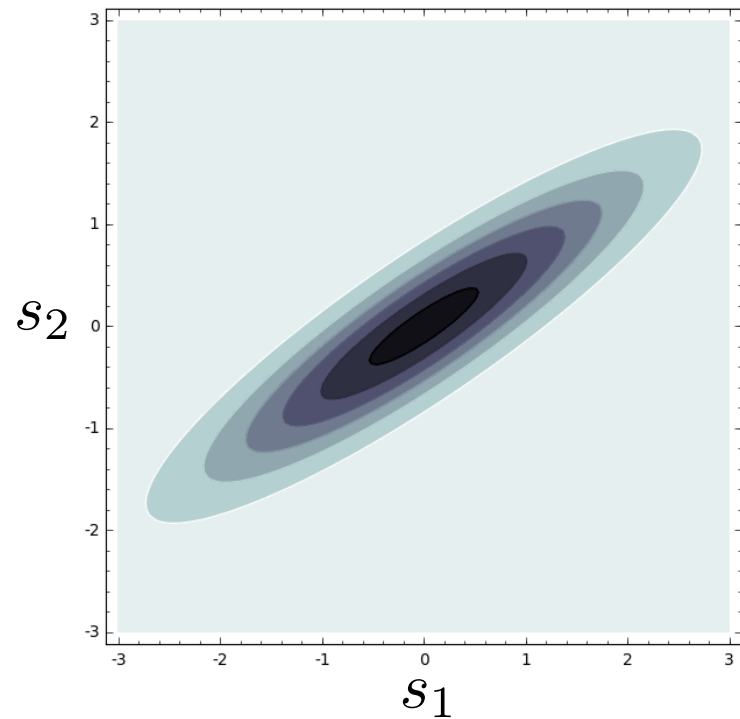
# Correlations

$\mathcal{P}(s)$

$$s = \begin{pmatrix} s_1 \\ s_2 \end{pmatrix}$$

$\mathcal{P}(d|s)$

$$d = s_1 + n.$$



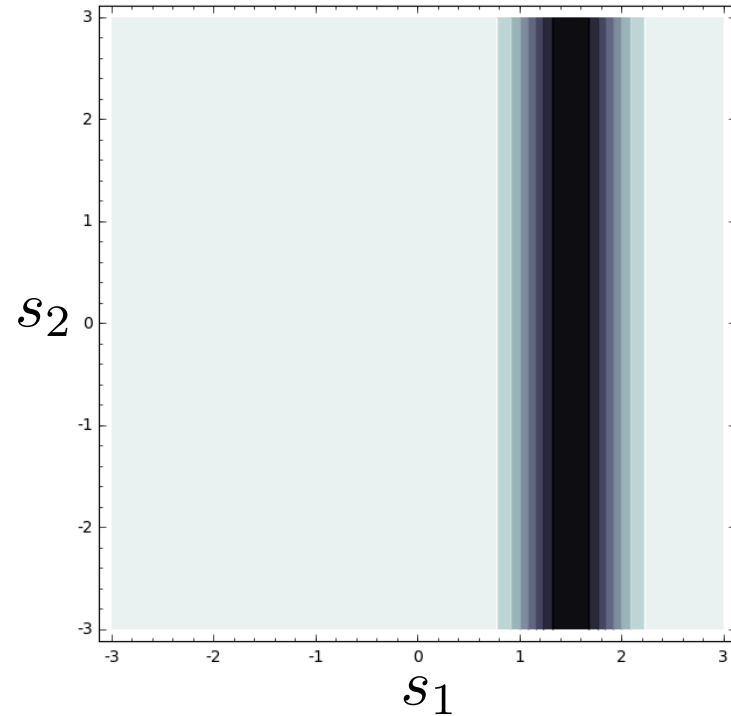
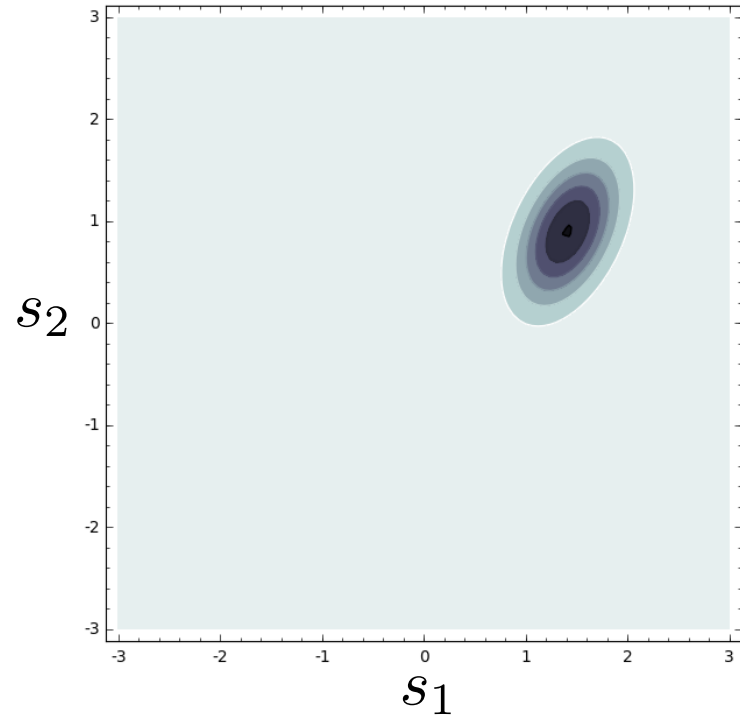
# Correlations

$$\mathcal{P}(s|d)$$

$$s = \begin{pmatrix} s_1 \\ s_2 \end{pmatrix}$$

$$\mathcal{P}(d|s)$$

$$d = s_1 + n.$$



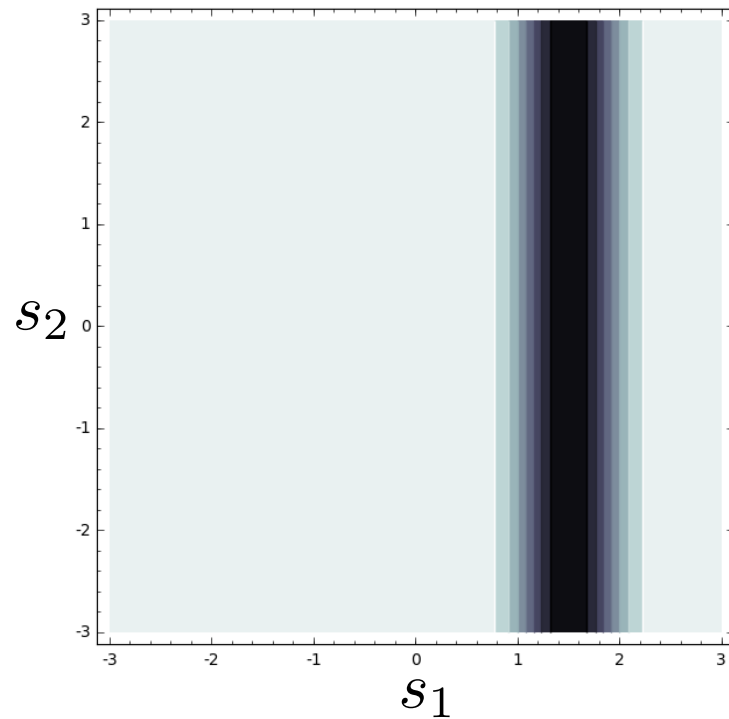
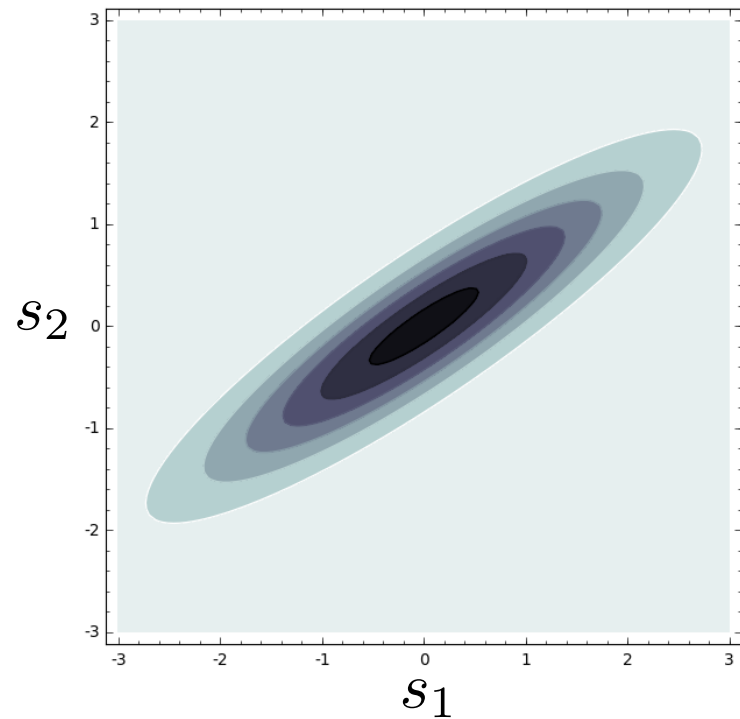
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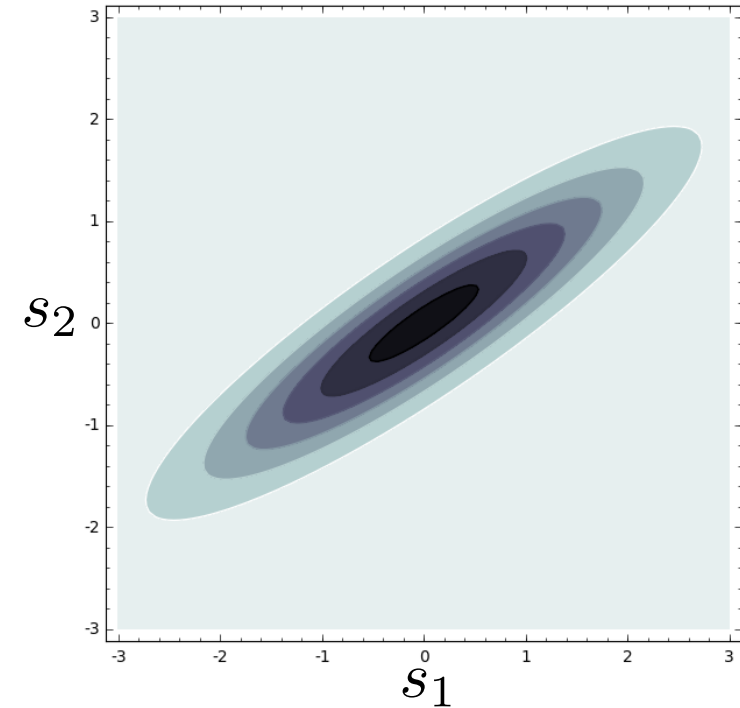
# Correlations

$\mathcal{P}(s)$

$$s = \begin{pmatrix} s_1 \\ s_2 \end{pmatrix}$$

$$\mathcal{P}(s) = \mathcal{G}(s, S)$$

$$= \frac{1}{\sqrt{|2\pi S|}} \exp\left(-\frac{1}{2} s^\dagger S^{-1} s\right)$$



# Correlations

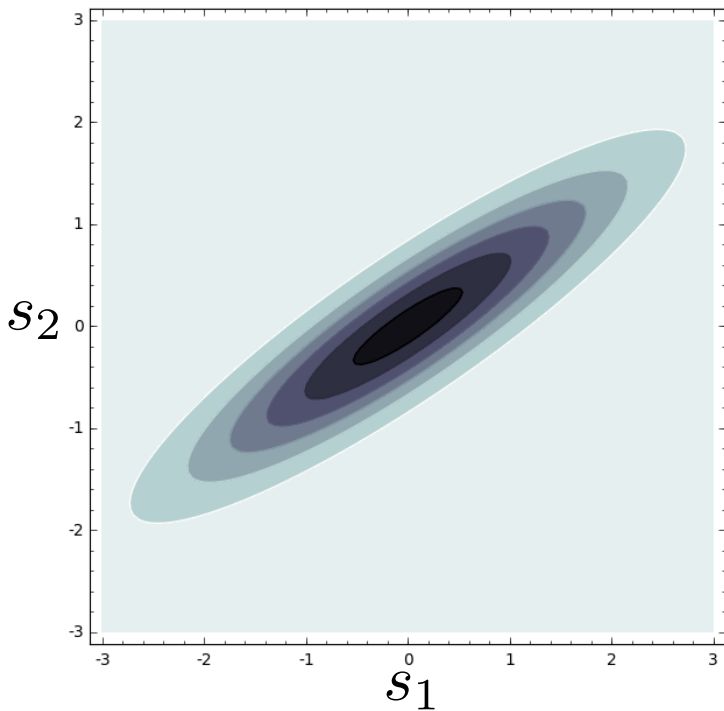
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# Correlations

$\mathcal{P}(s)$

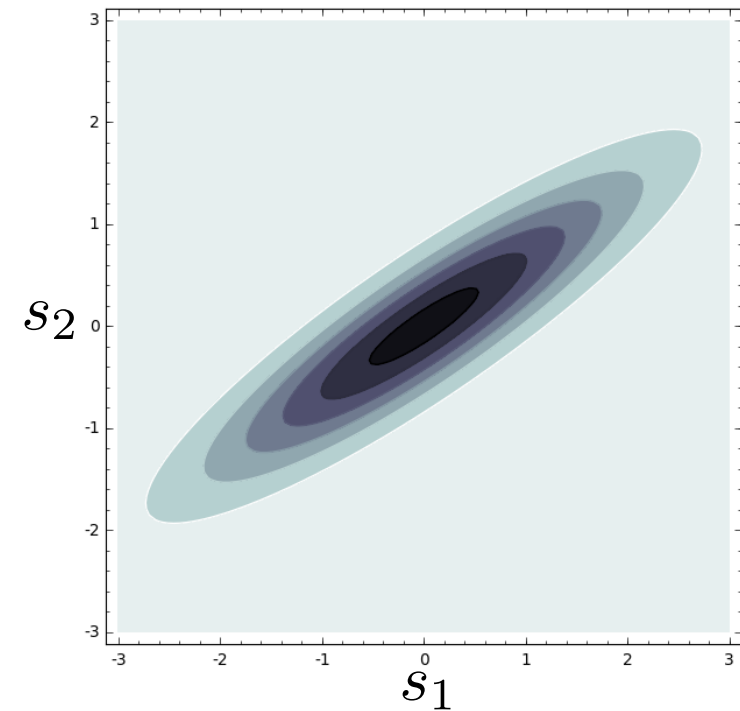
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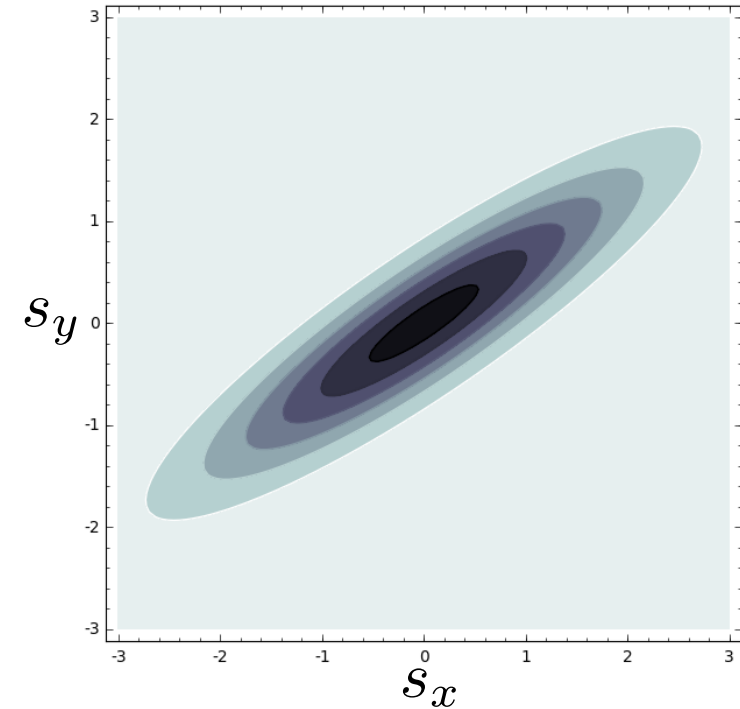
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$$S_{xy} = \langle s_x s_y \rangle, \quad x \in \mathbb{R}^n \quad \infty\text{-dim.}$$



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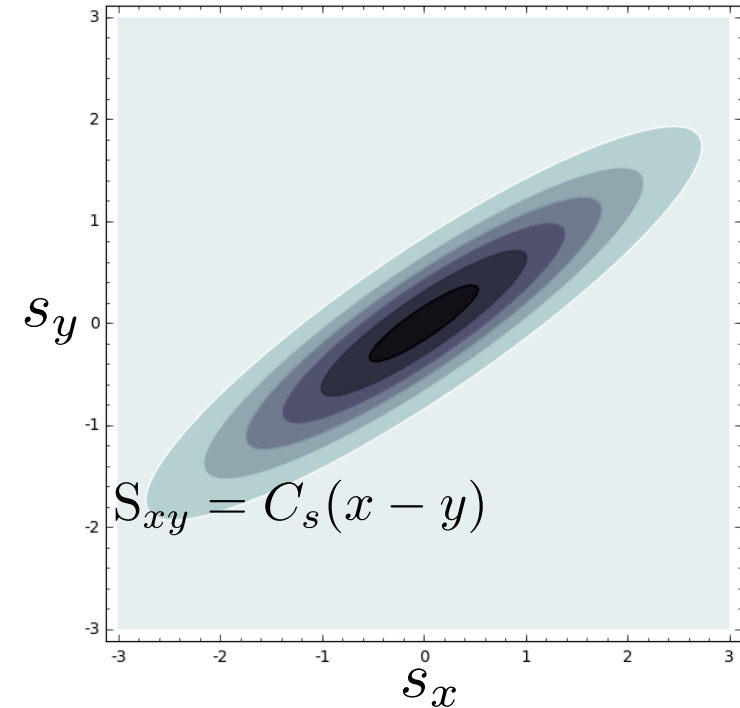
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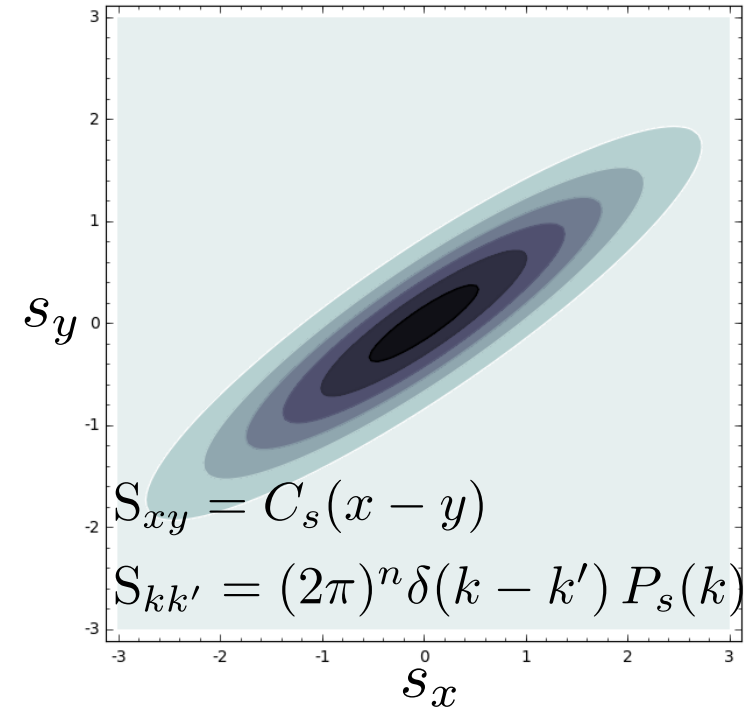
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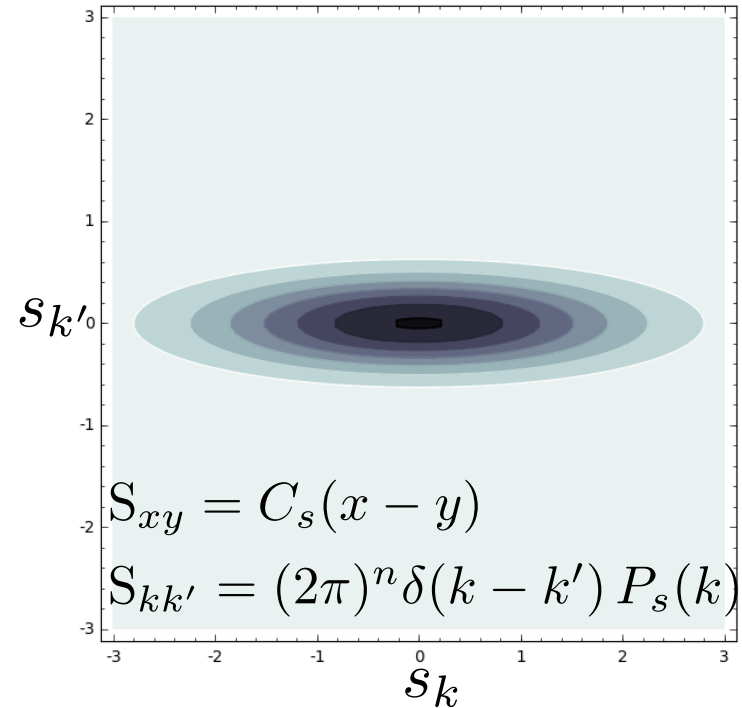
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# Correlations

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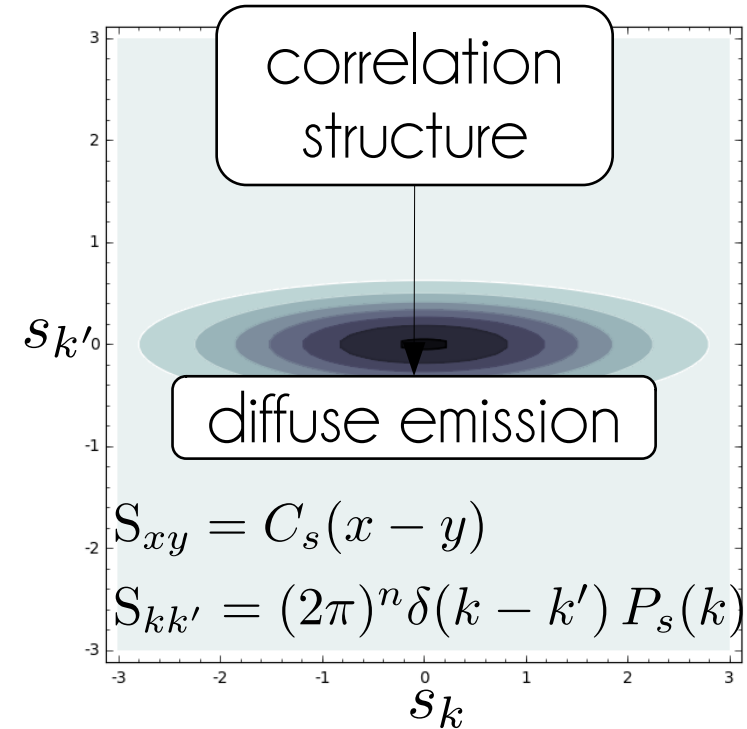
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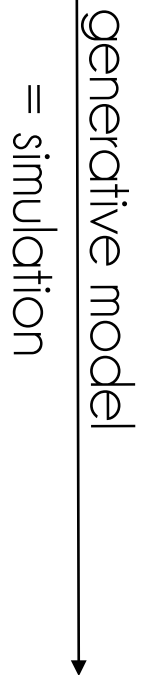


generative model  
= simulation

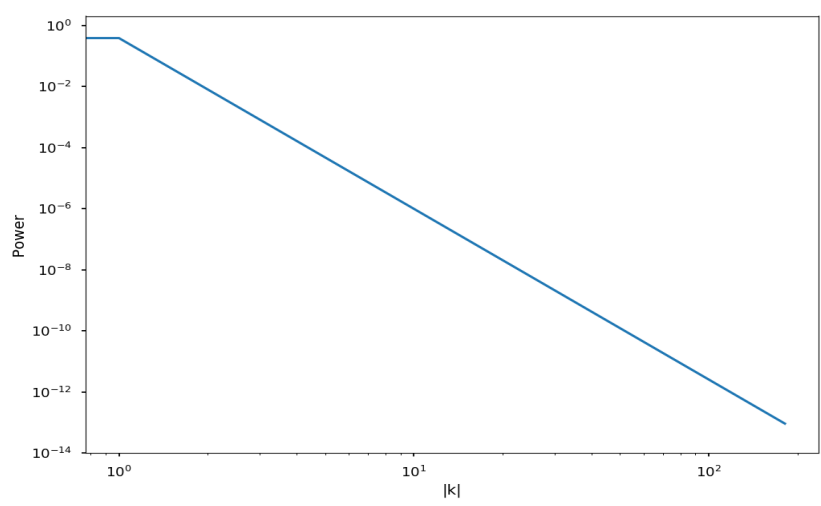


correlation  
structure

generative model  
= simulation

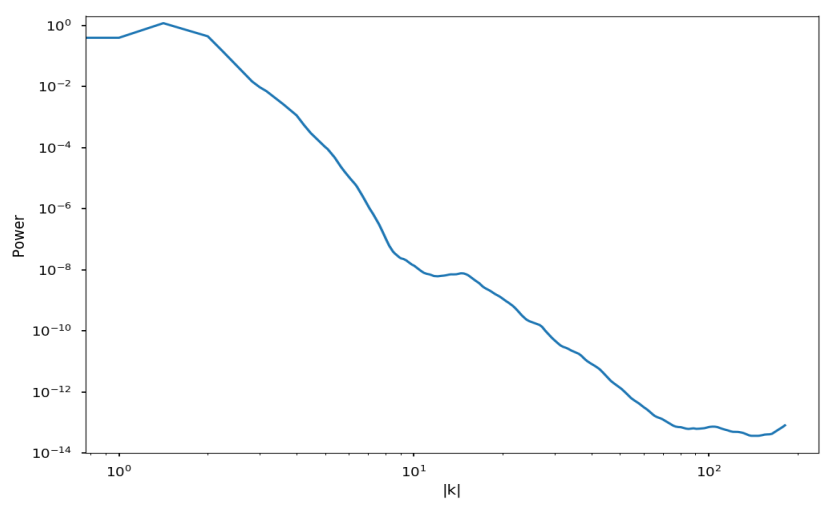






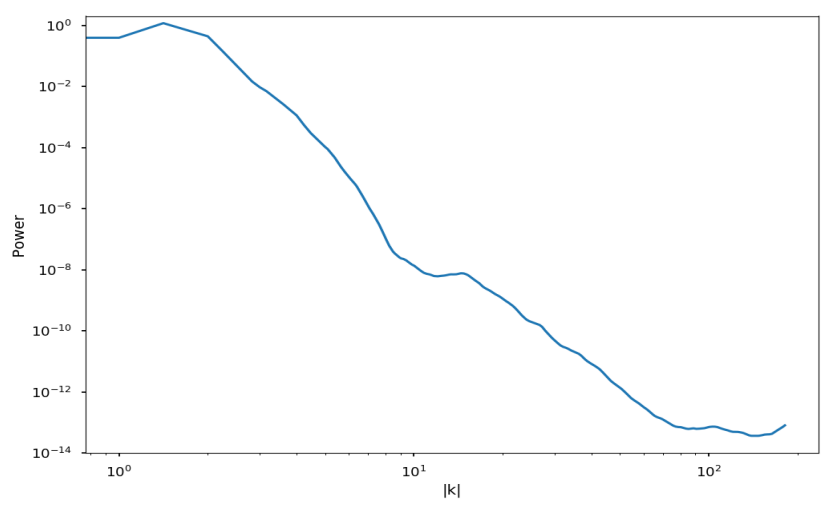
generative model  
= simulation

correlation  
structure

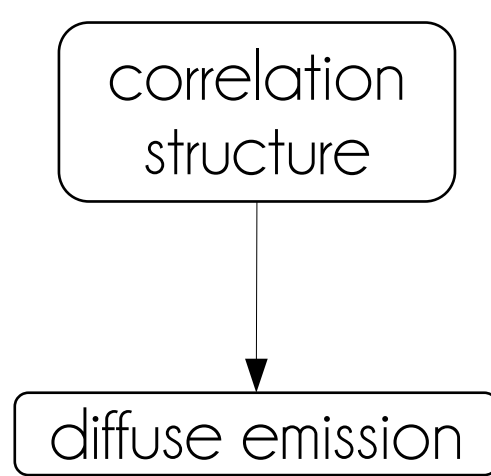


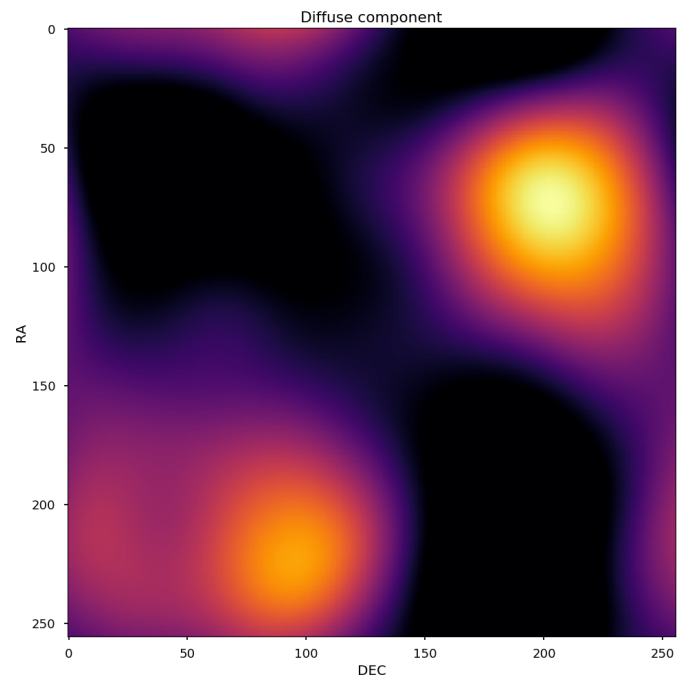
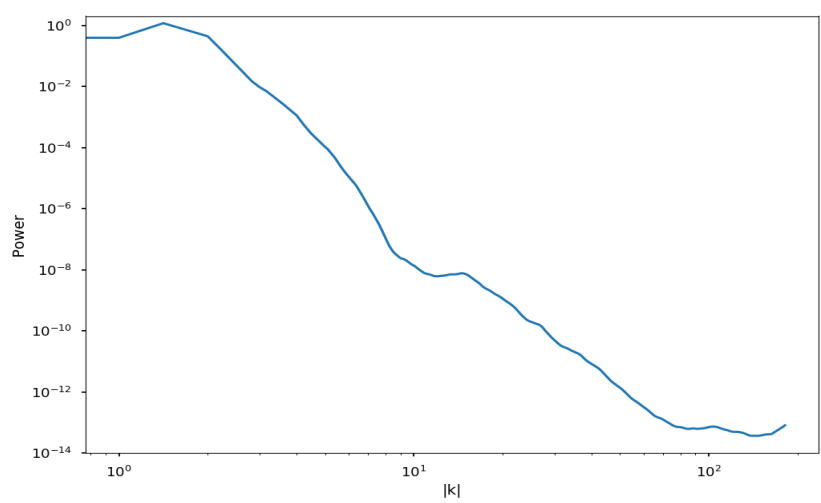
generative model  
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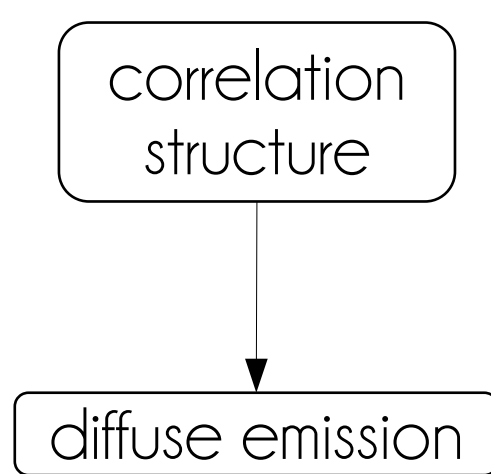


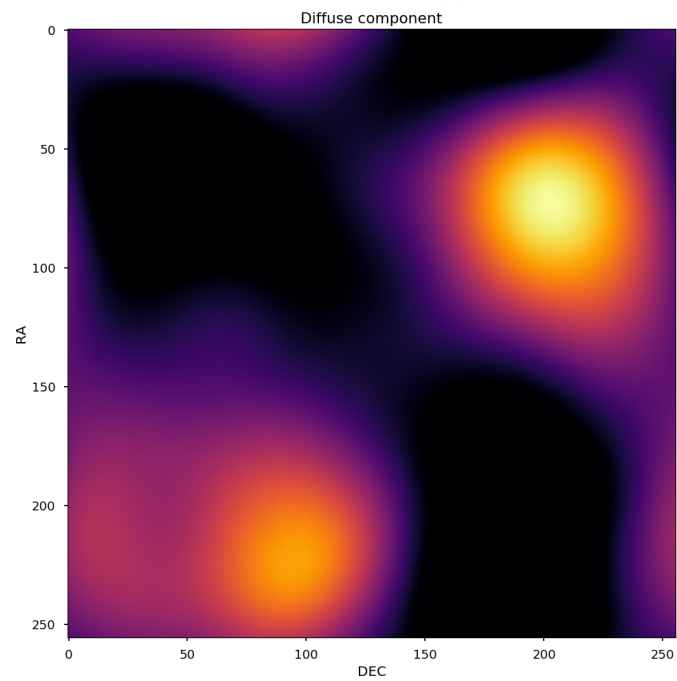
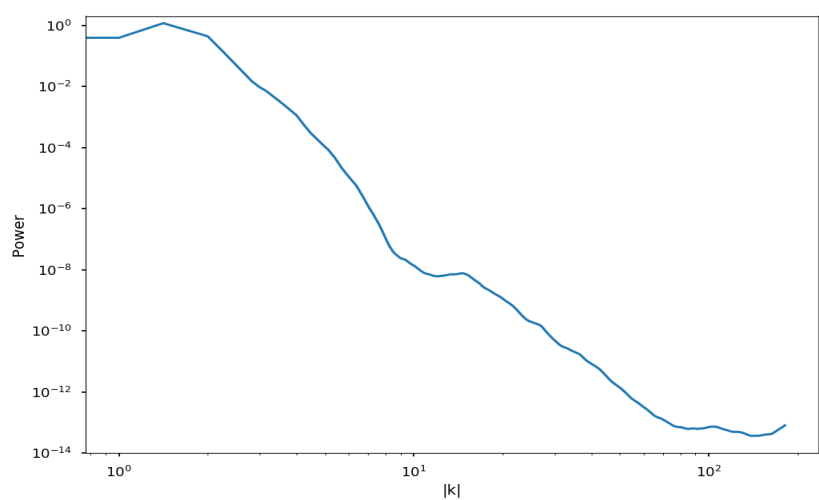
generative model  
= simulation





generative model  
= simulation





= simulation

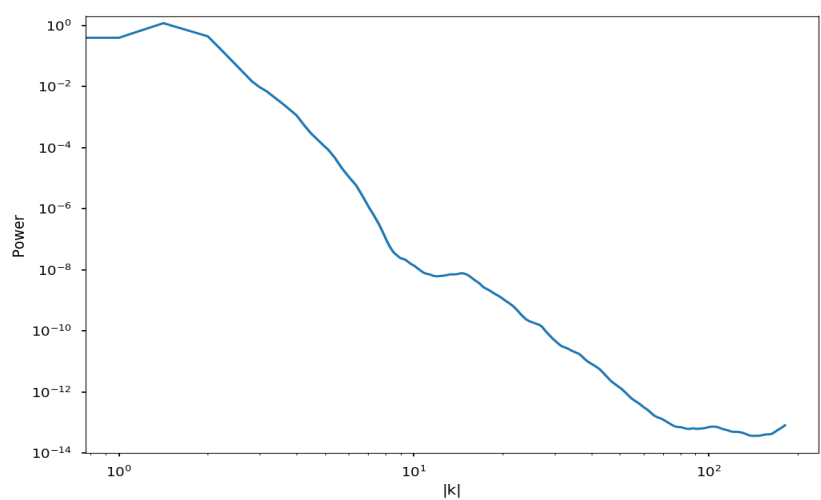
generative model

correlation  
structure

luminosity  
function

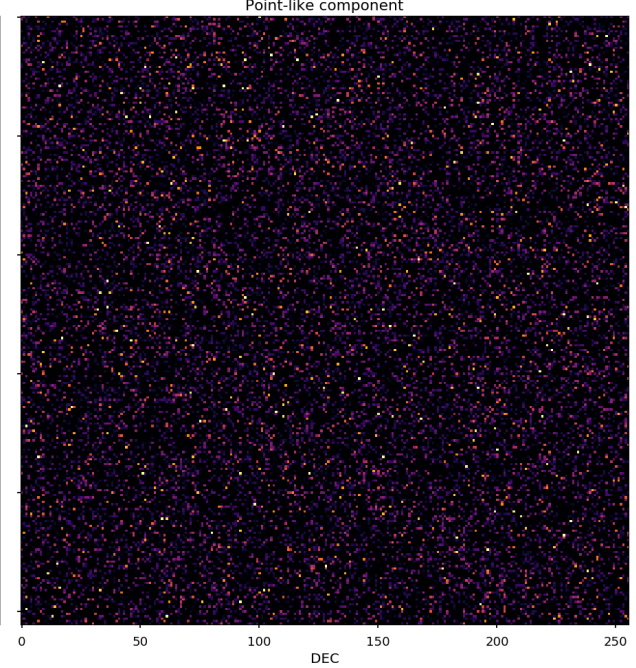
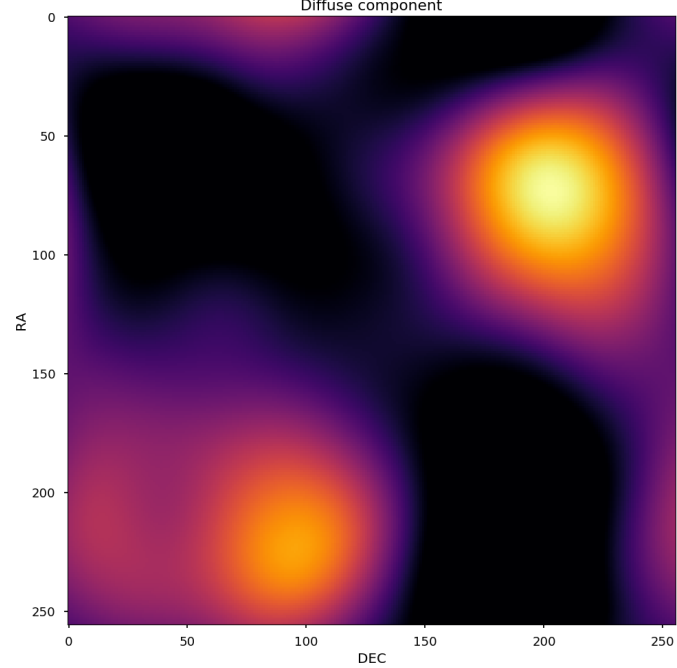
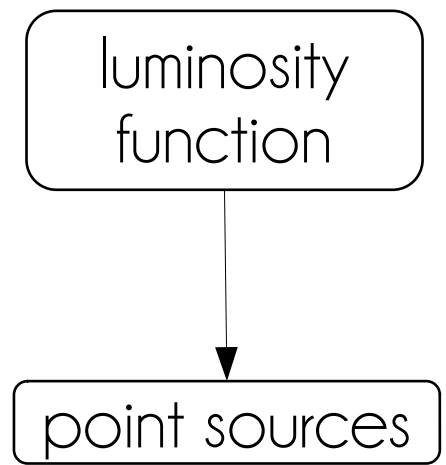
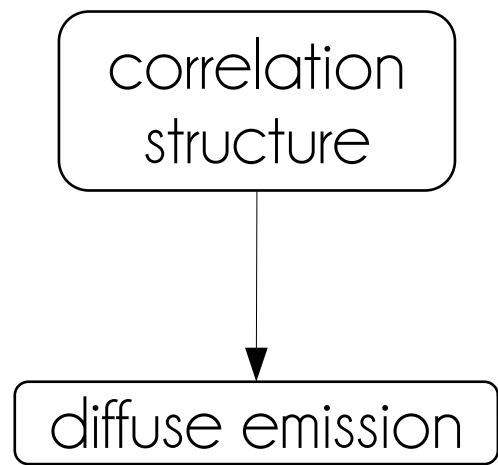
diffuse emission

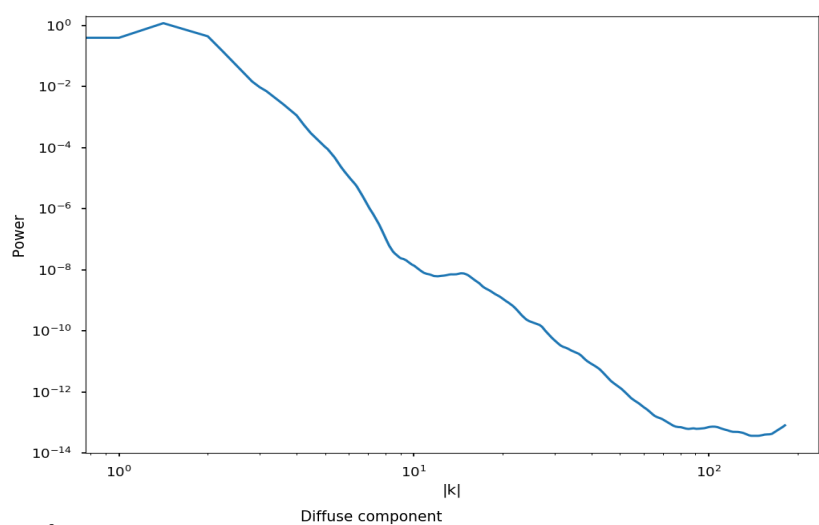
point sources



Diffuse component

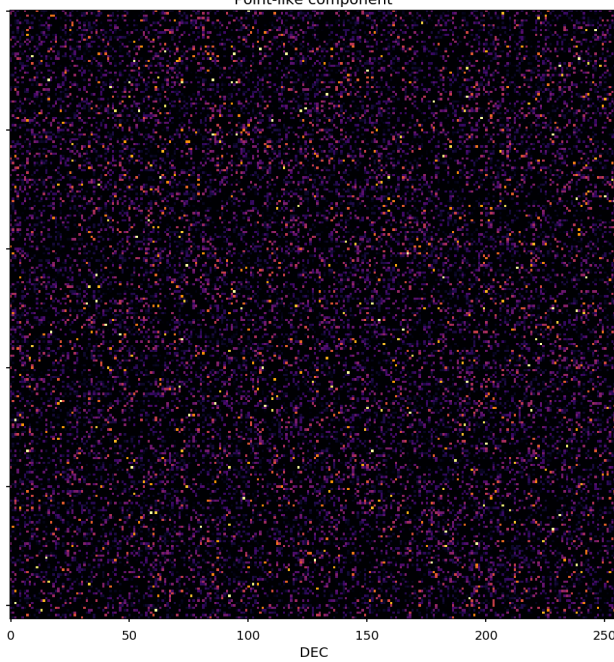
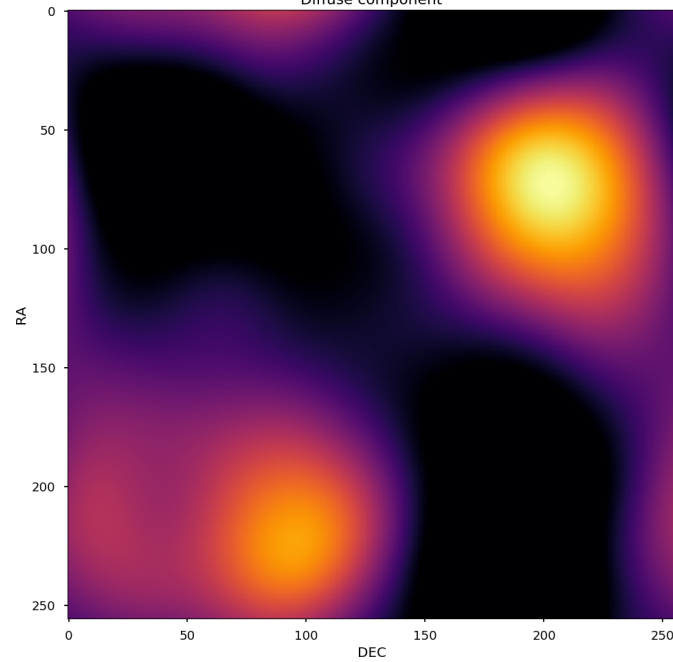
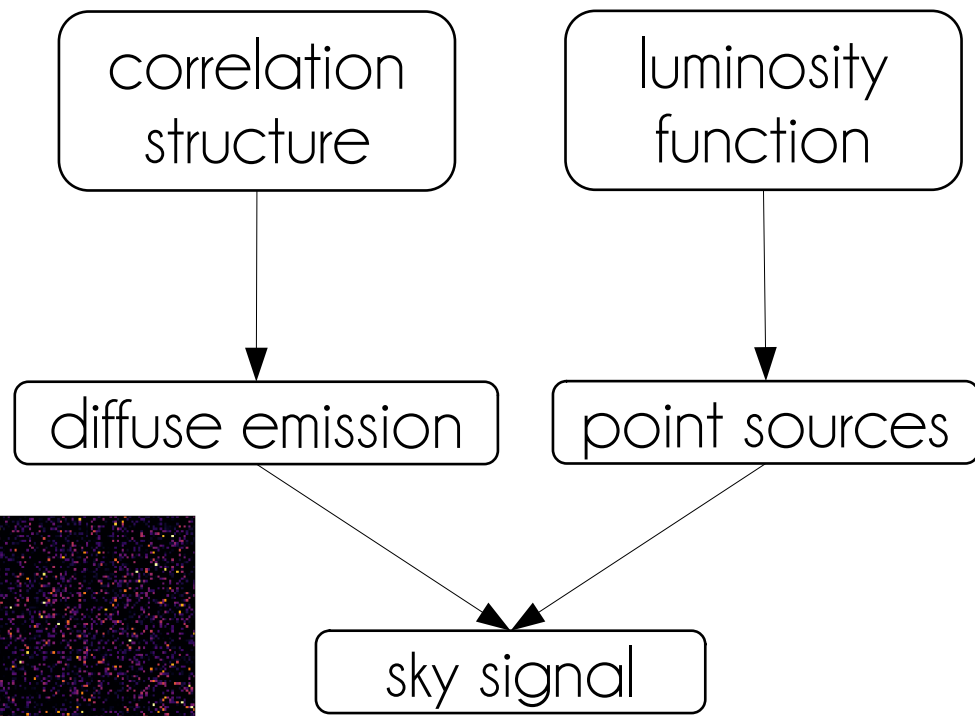
$$= \frac{\text{gener}}{s_i} \text{Point-like component}$$

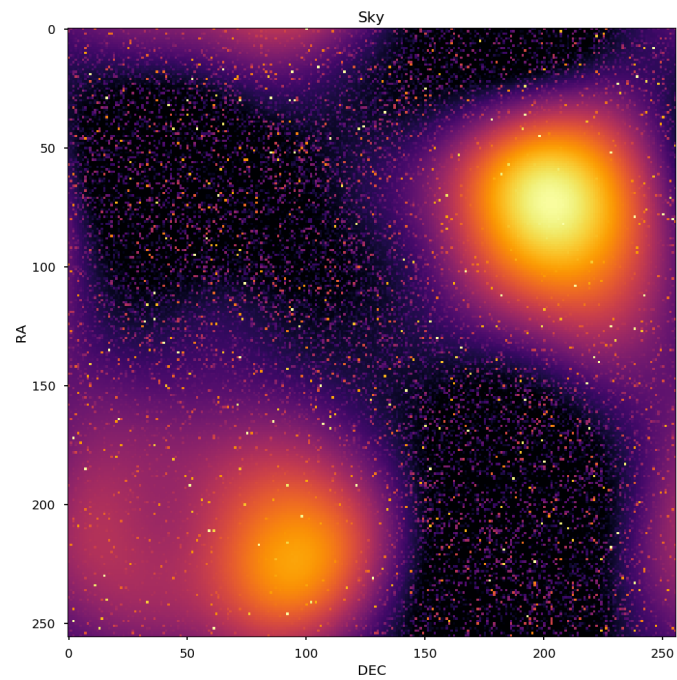
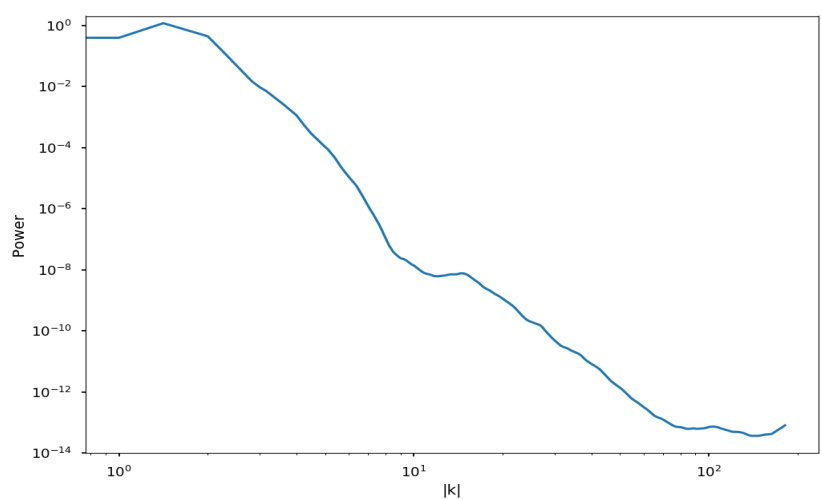




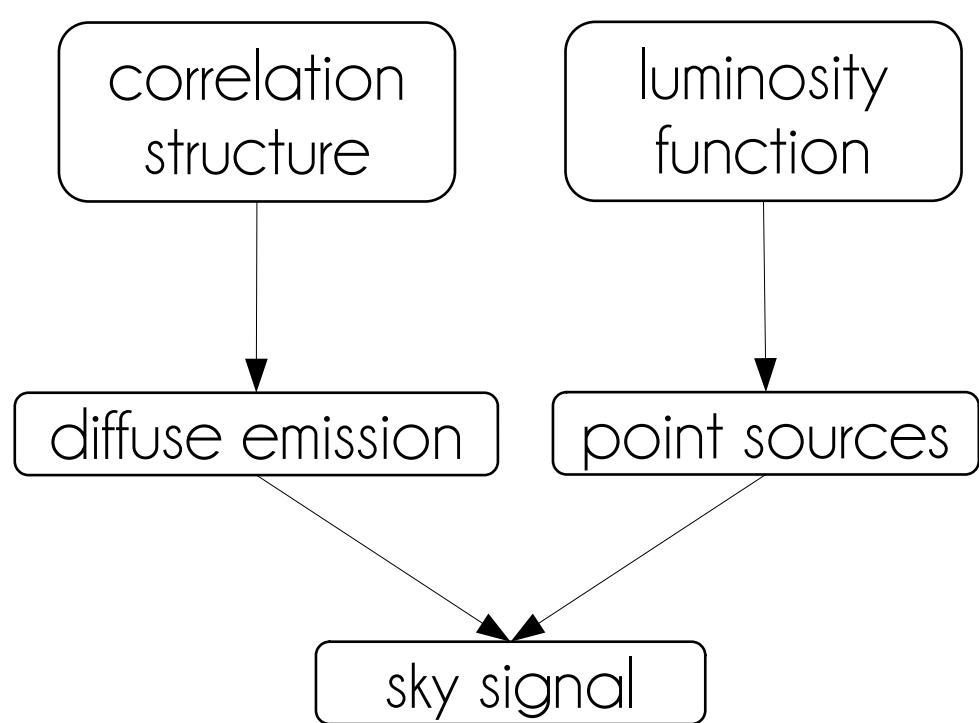
Diffuse component

$\frac{\text{gener}}{\text{si}}$   
 =  
 Point-like component

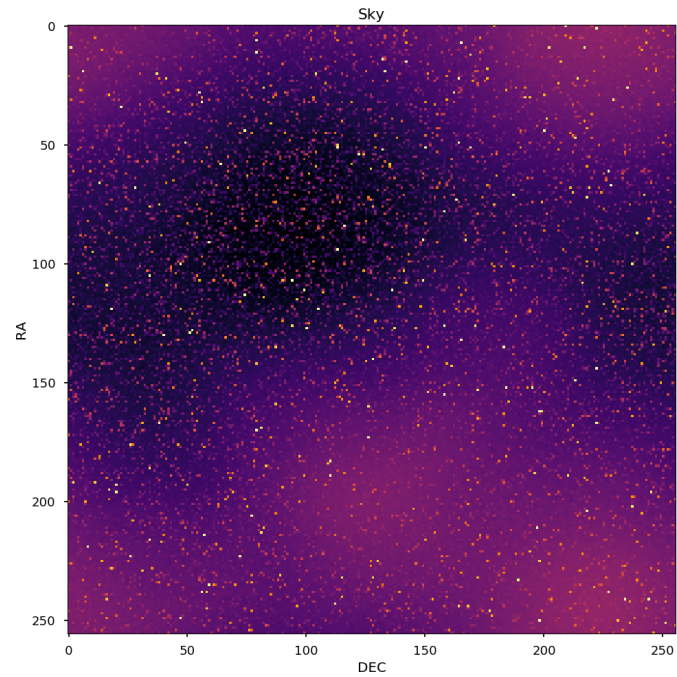
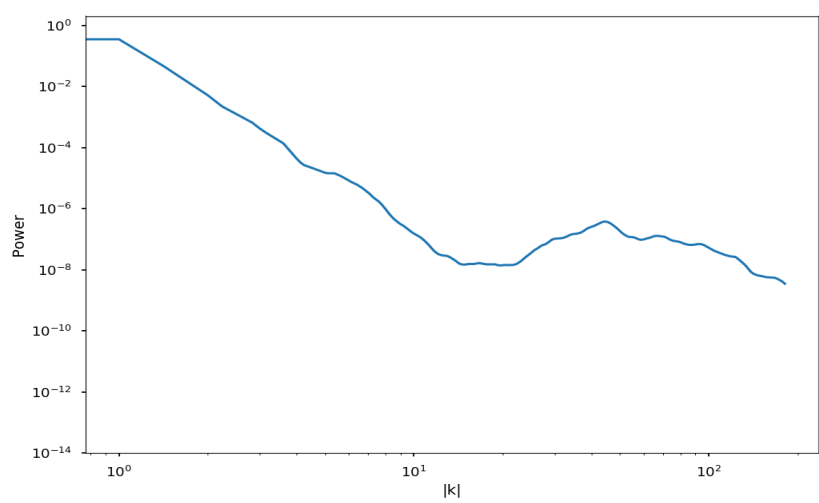




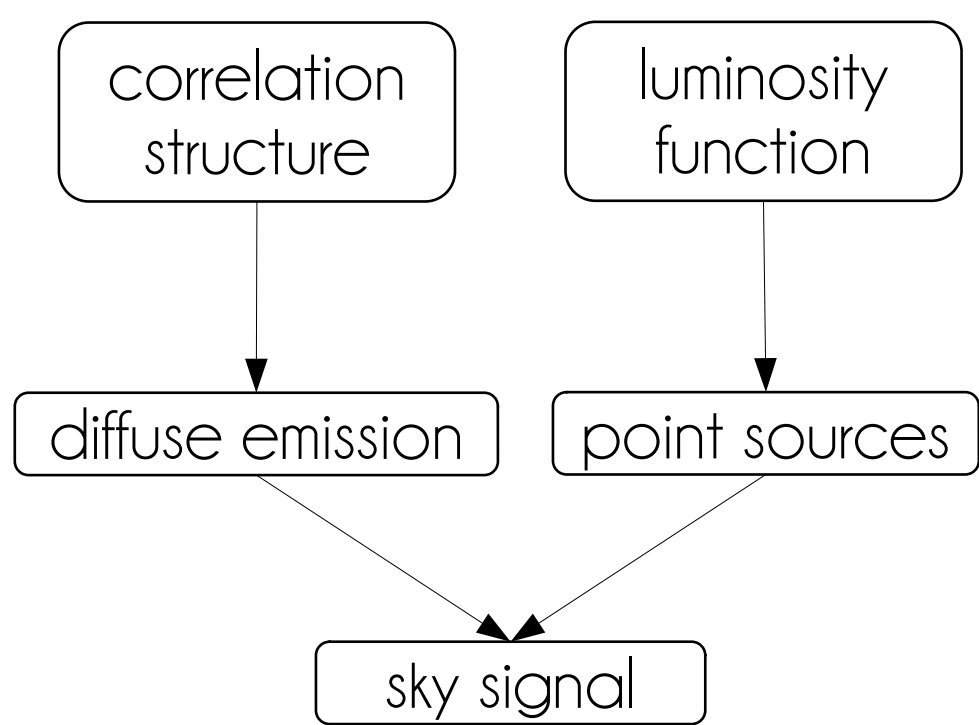
generative model  
= simulation

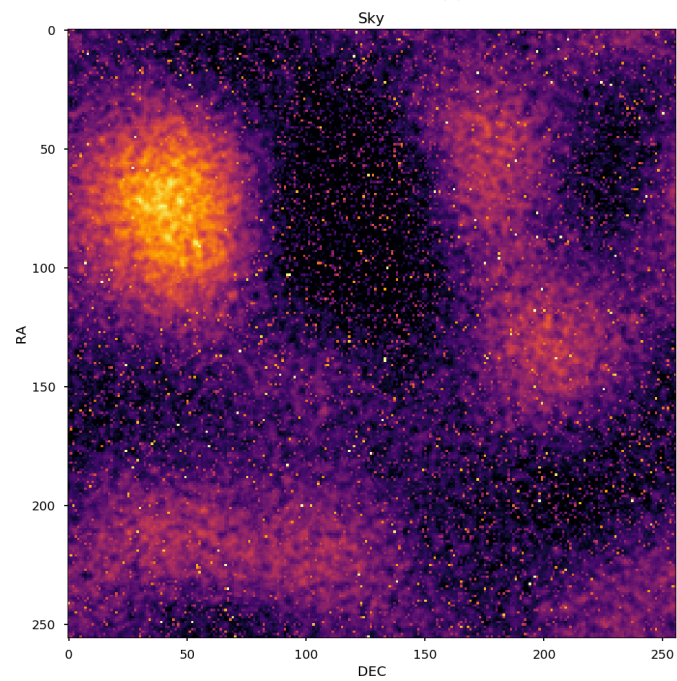
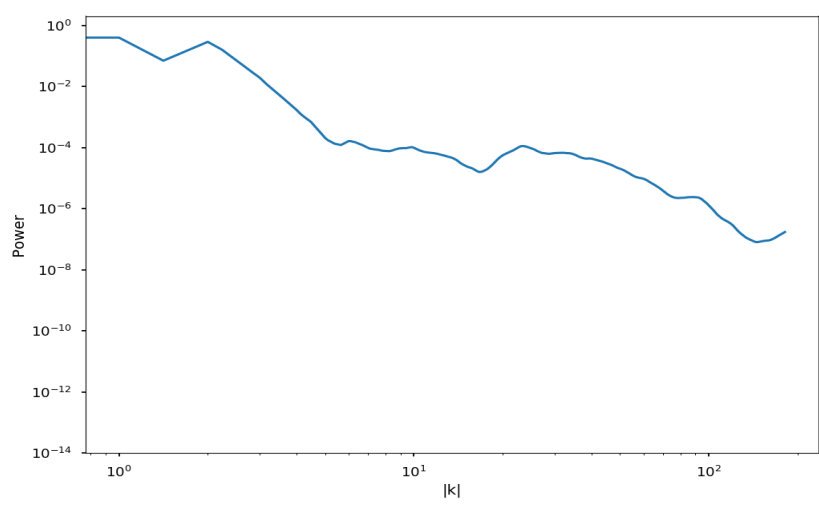




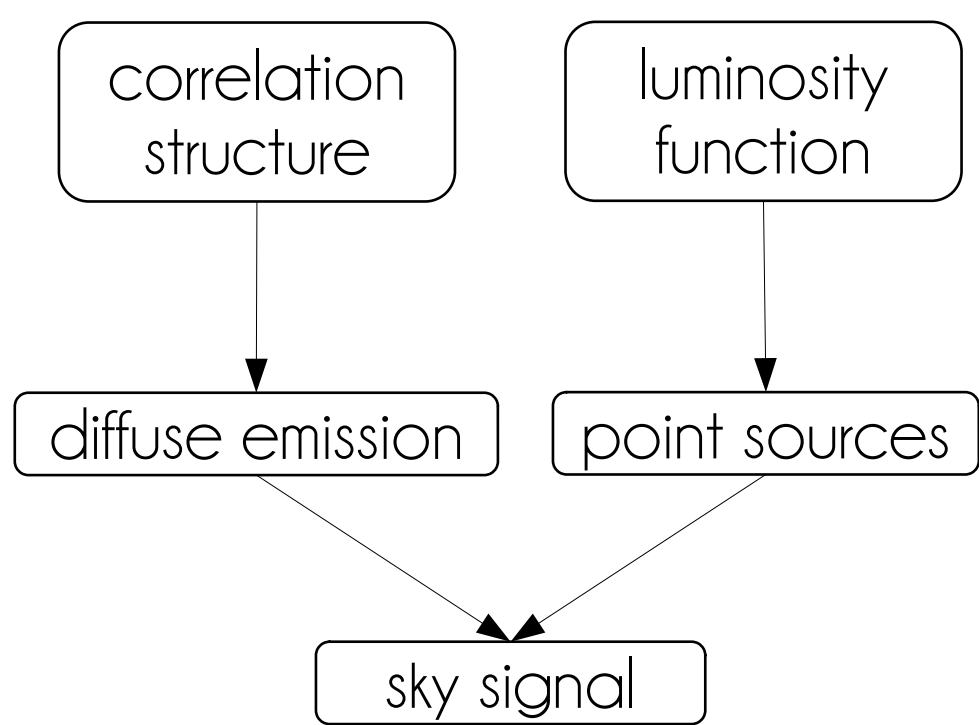


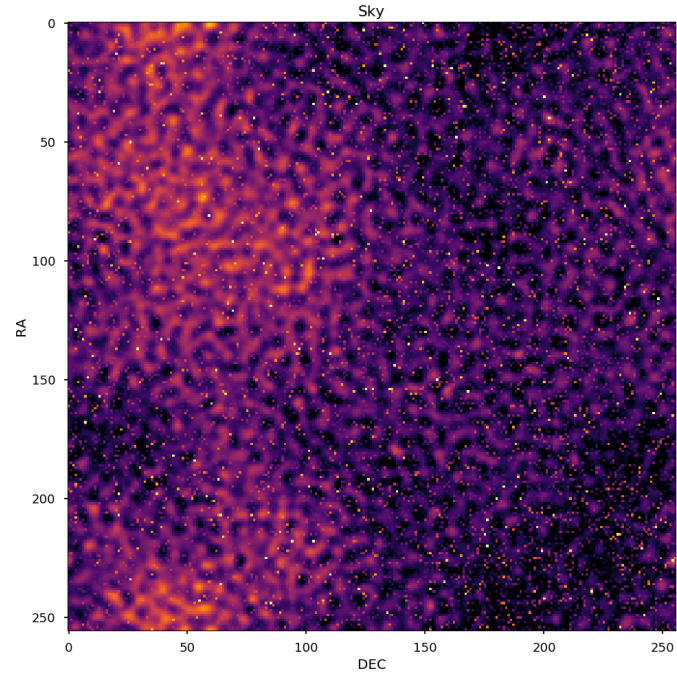
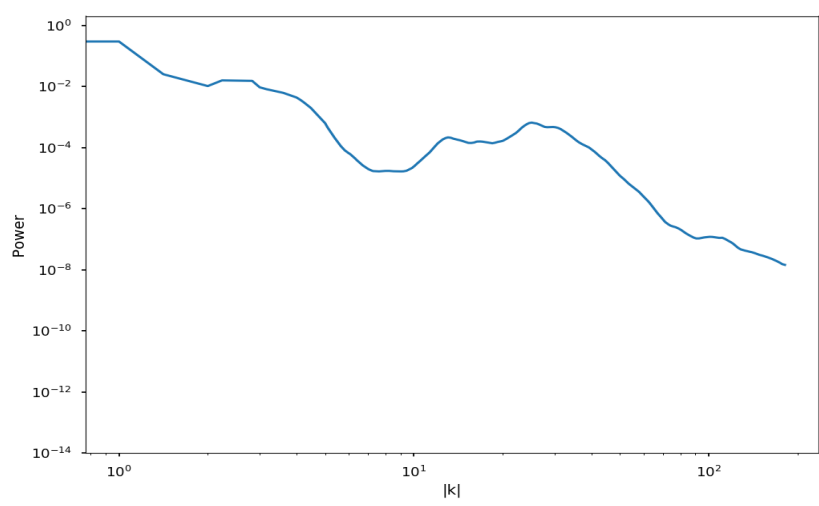
generative model  
= simulation



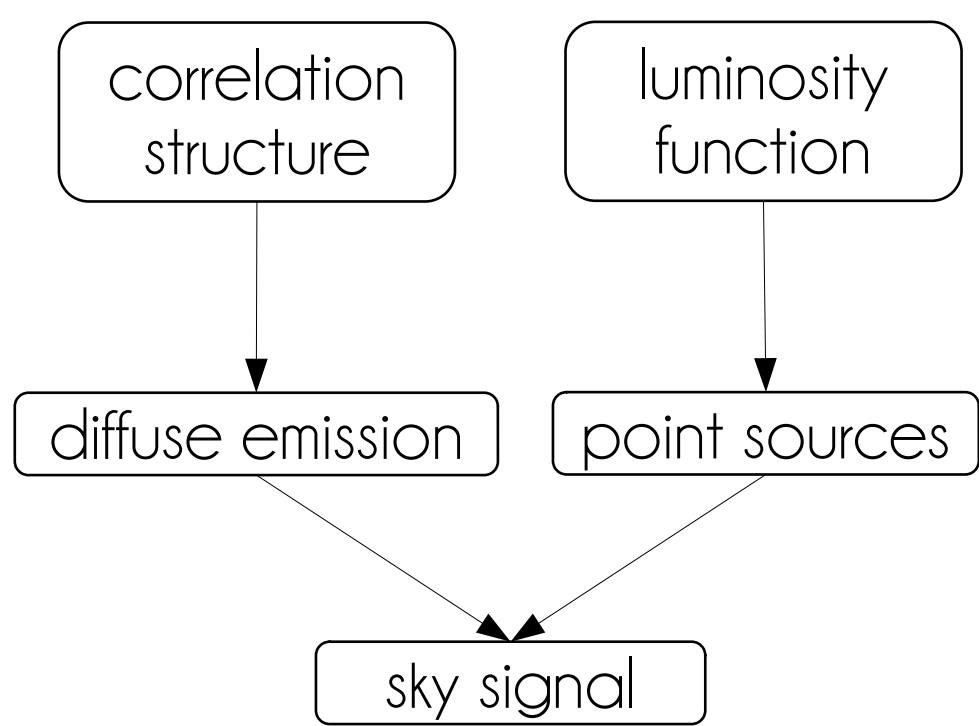


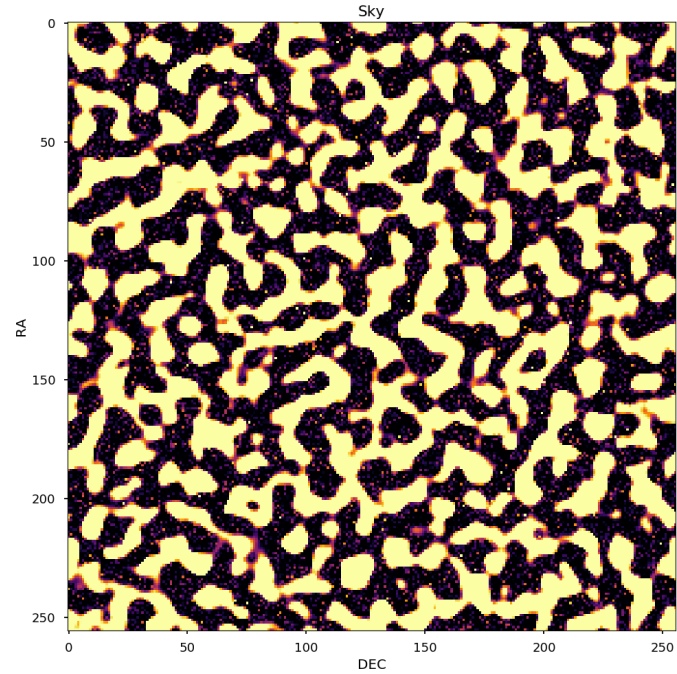
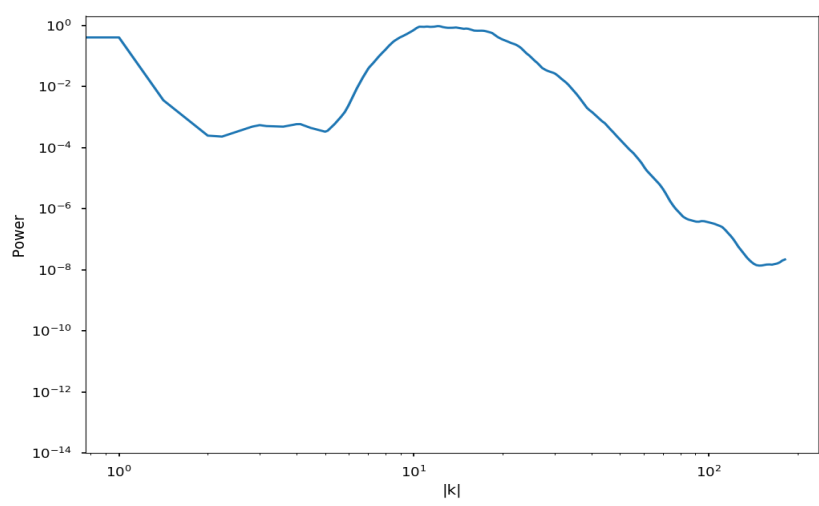
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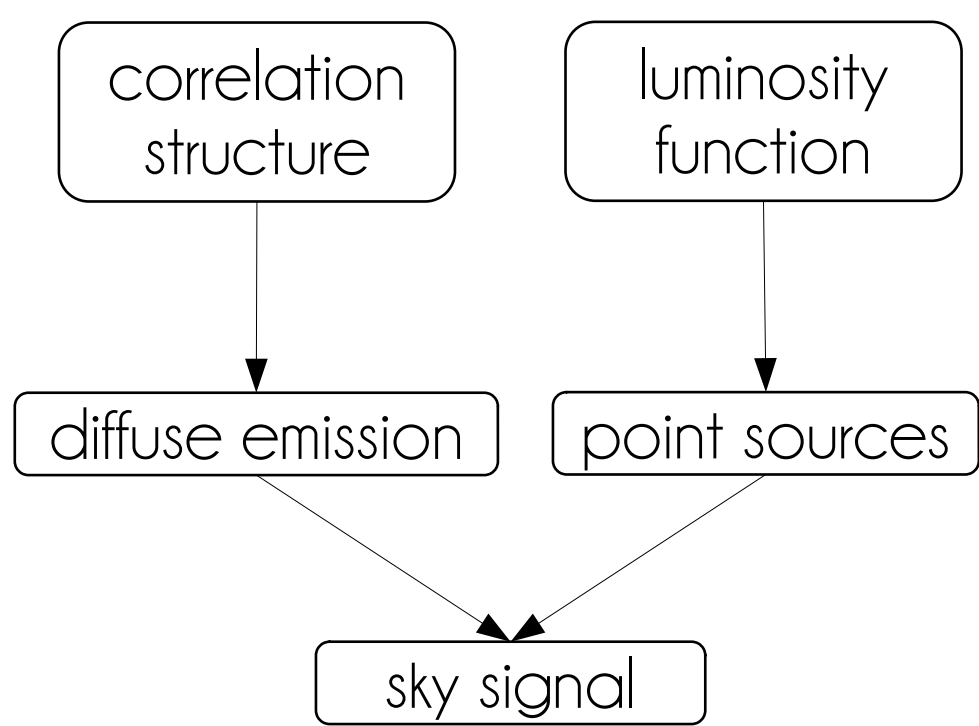


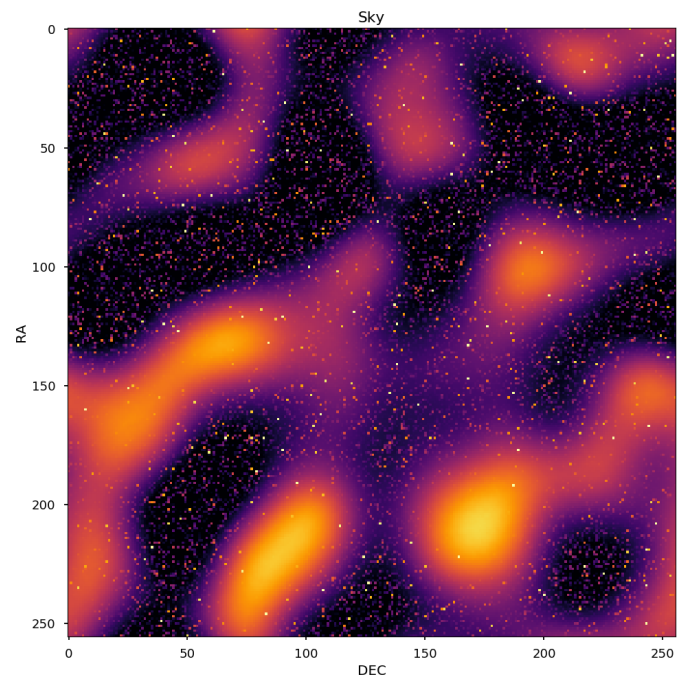
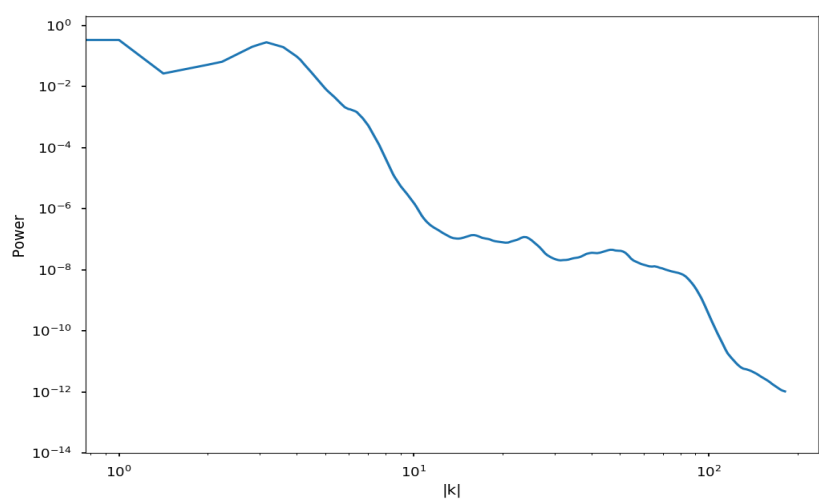
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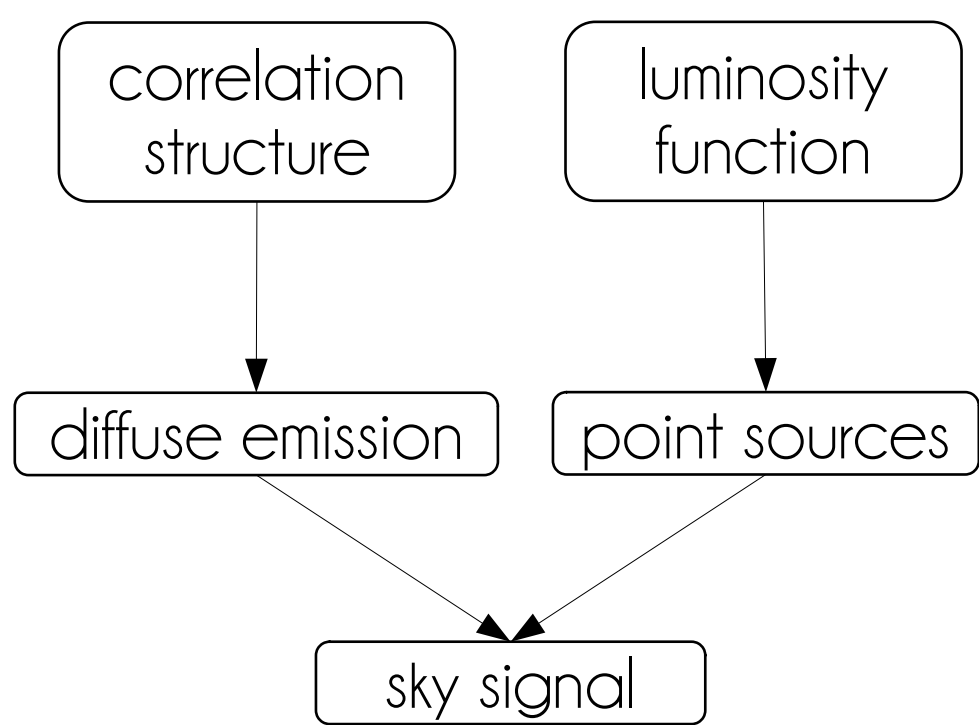


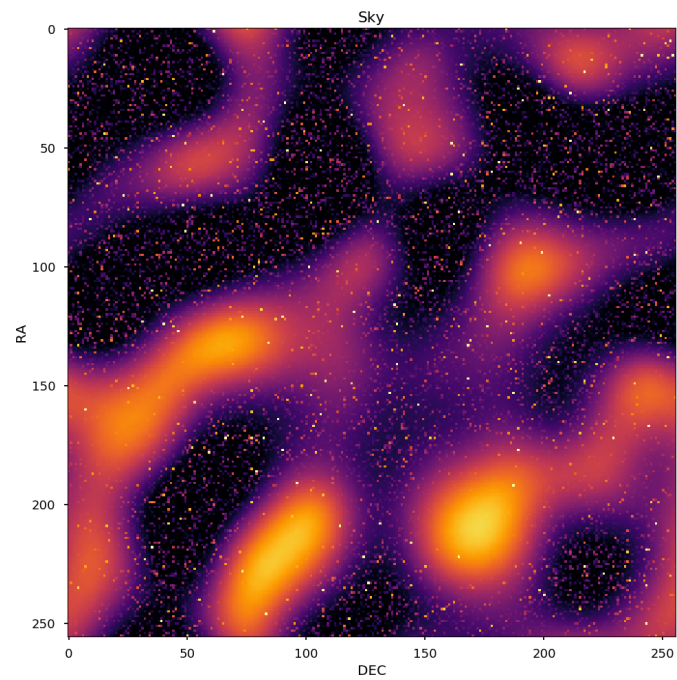
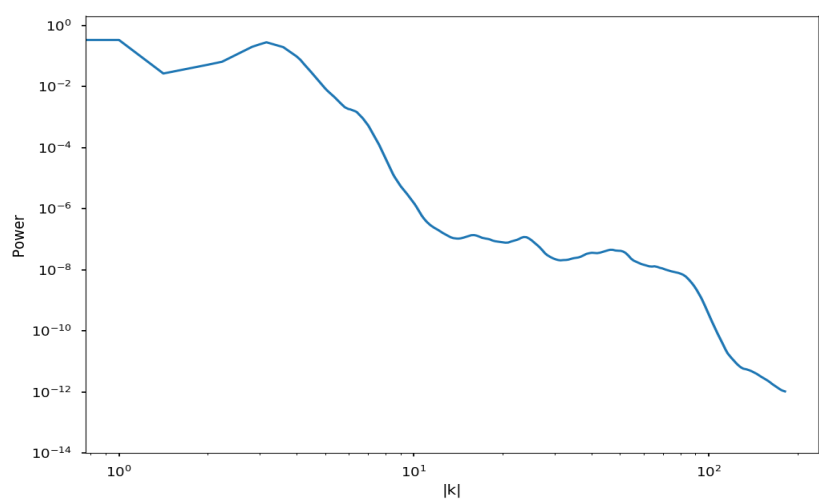
generative model  
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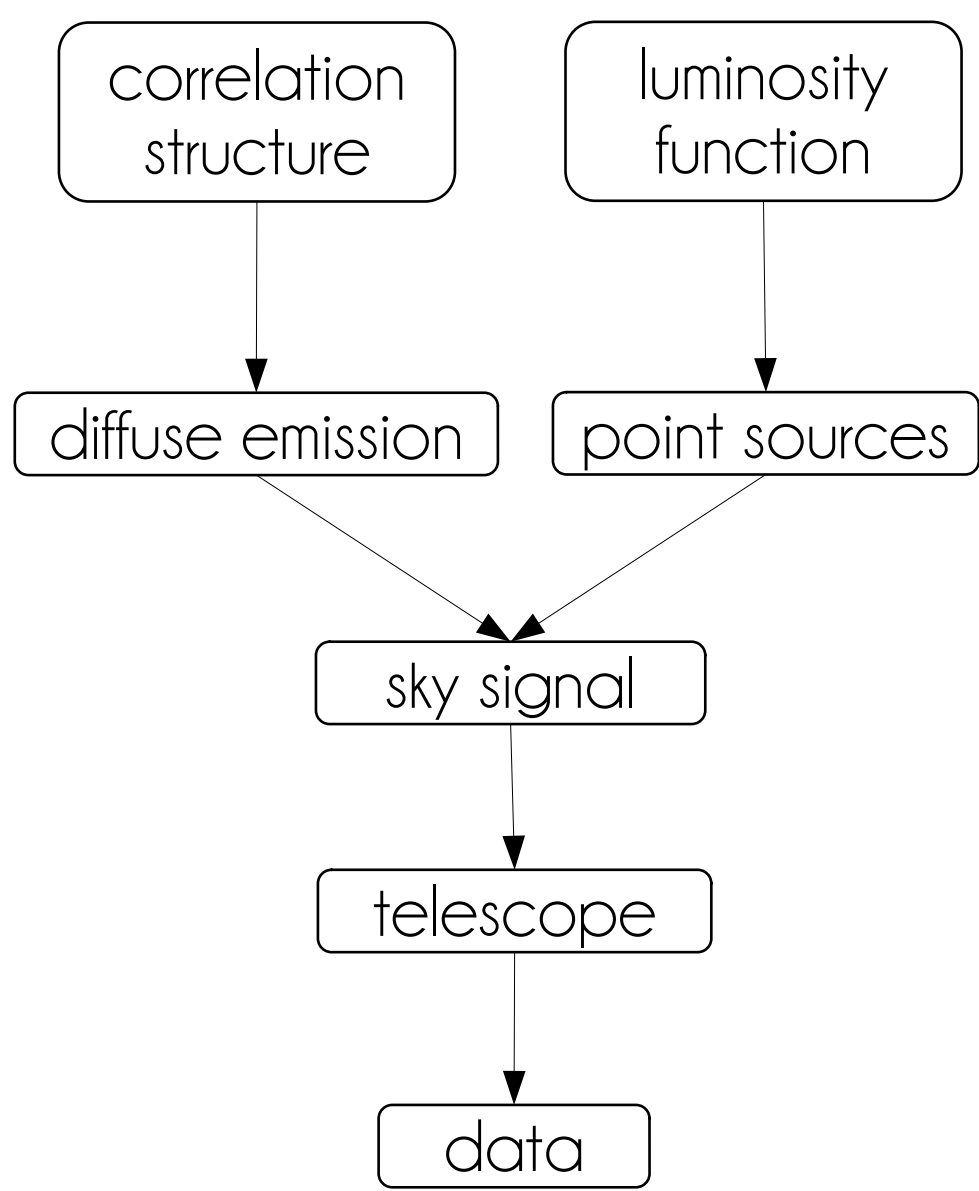


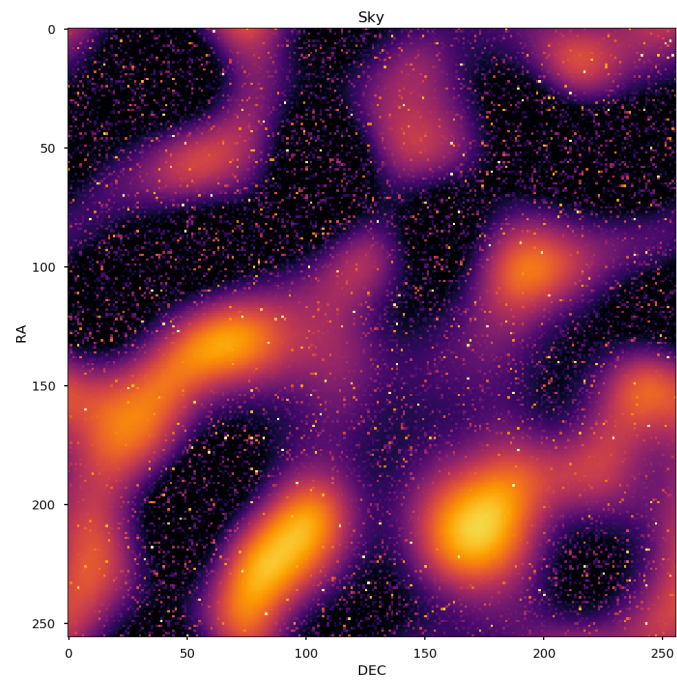
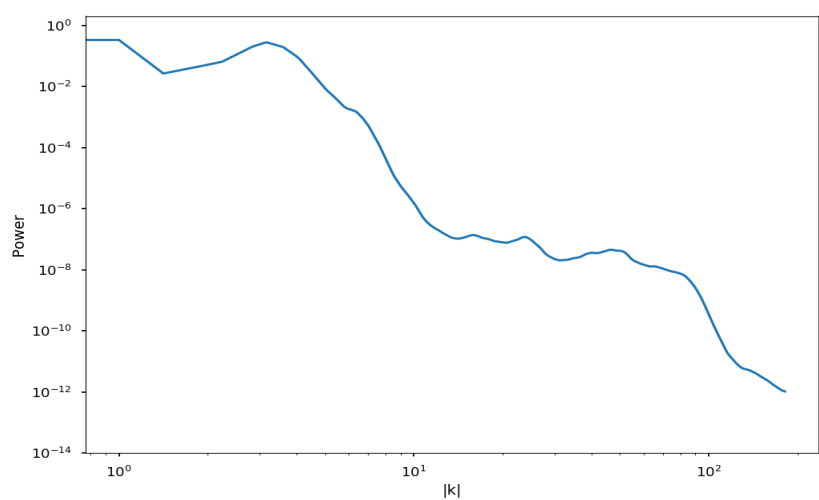
generative model  
= simulation



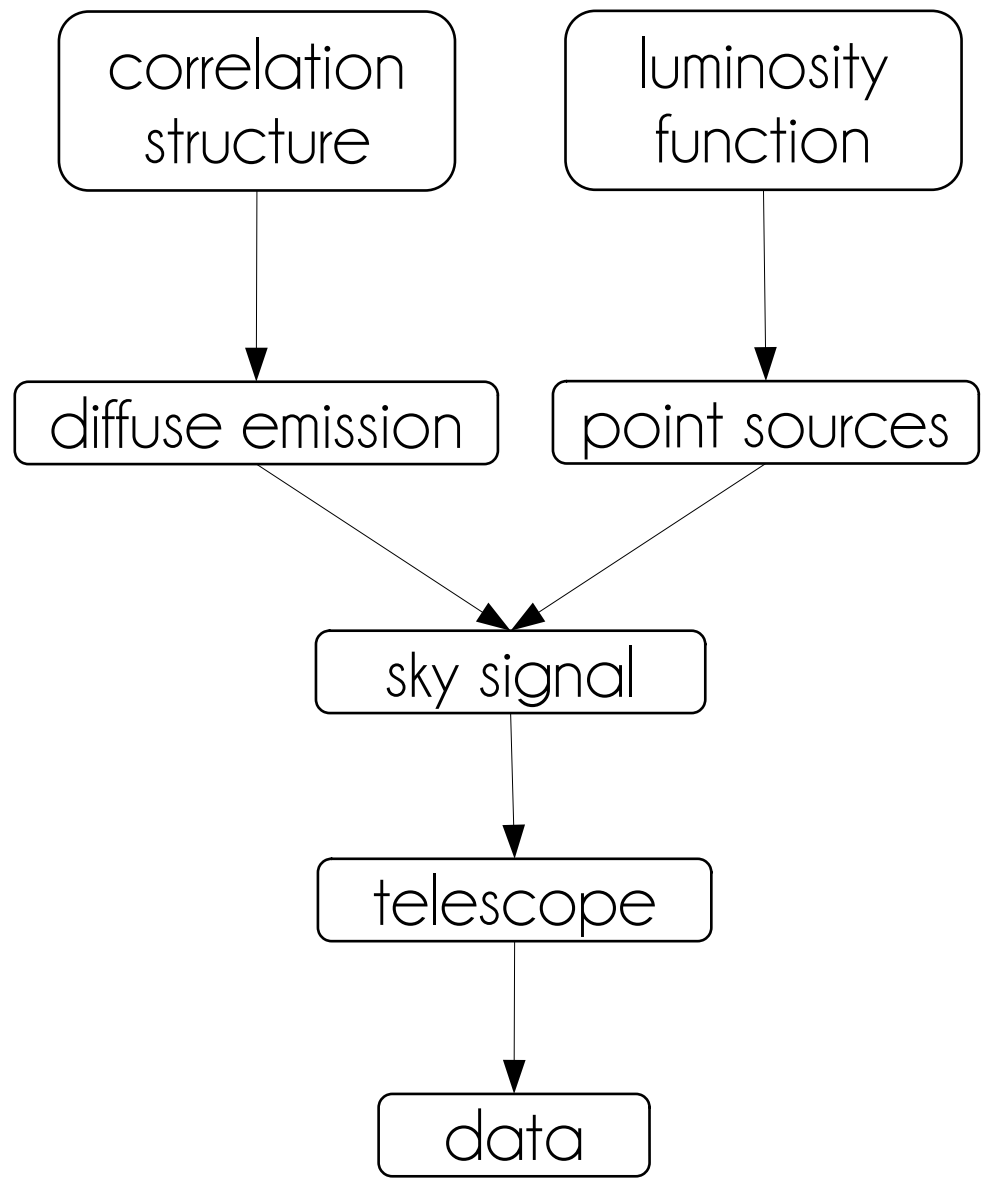


generative model  
= simulation

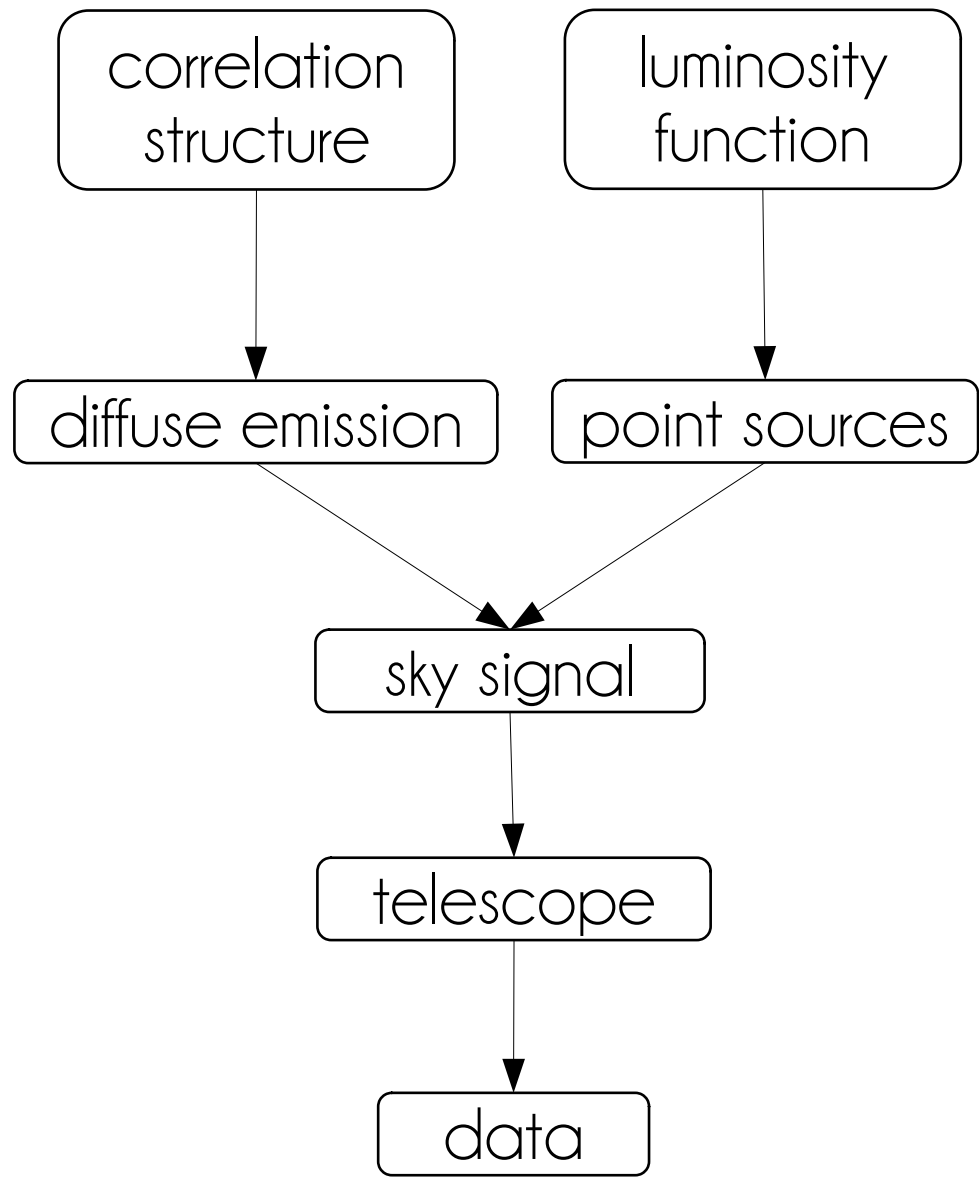




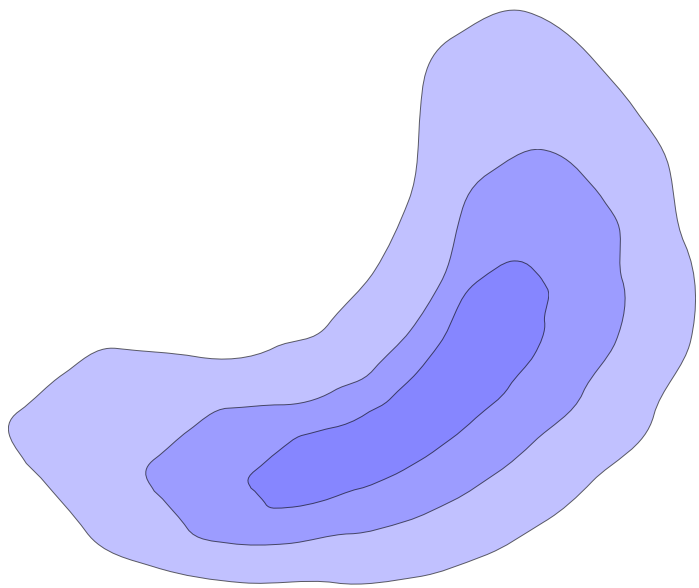
back propagation  
= inference



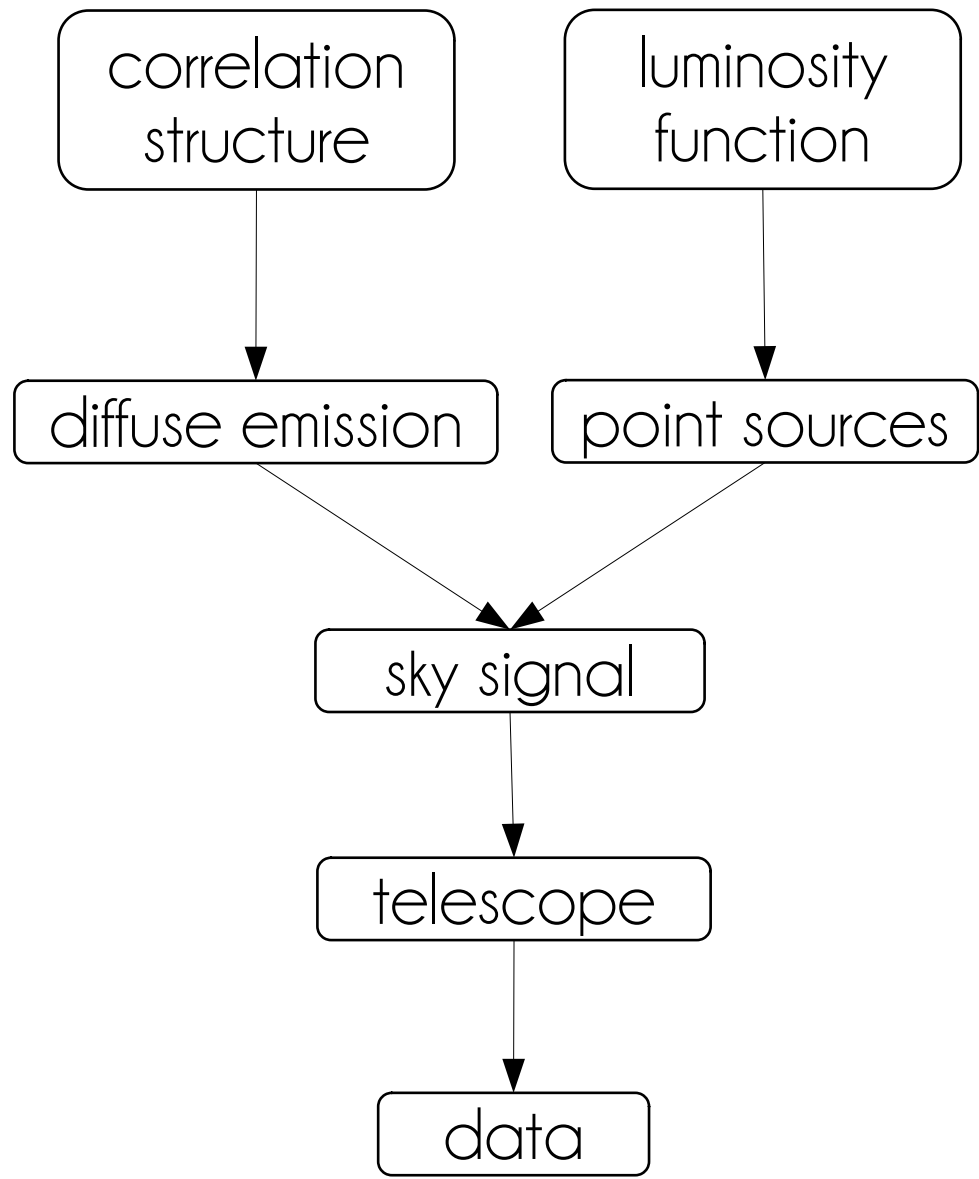
back propagation  
= inference

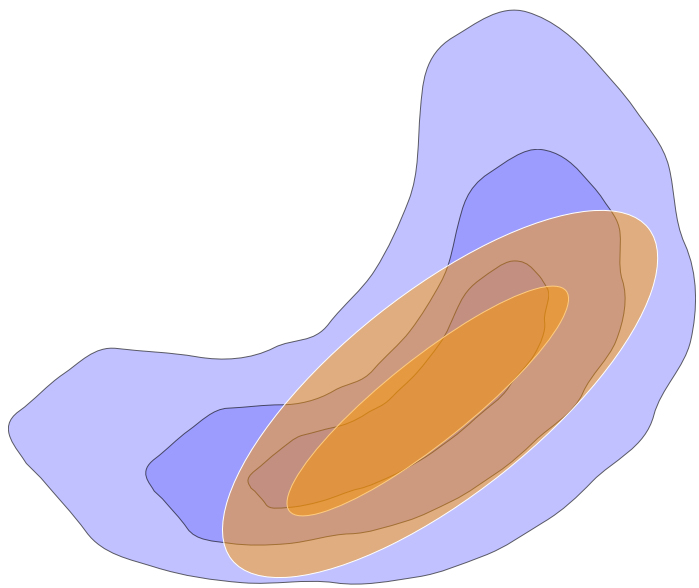




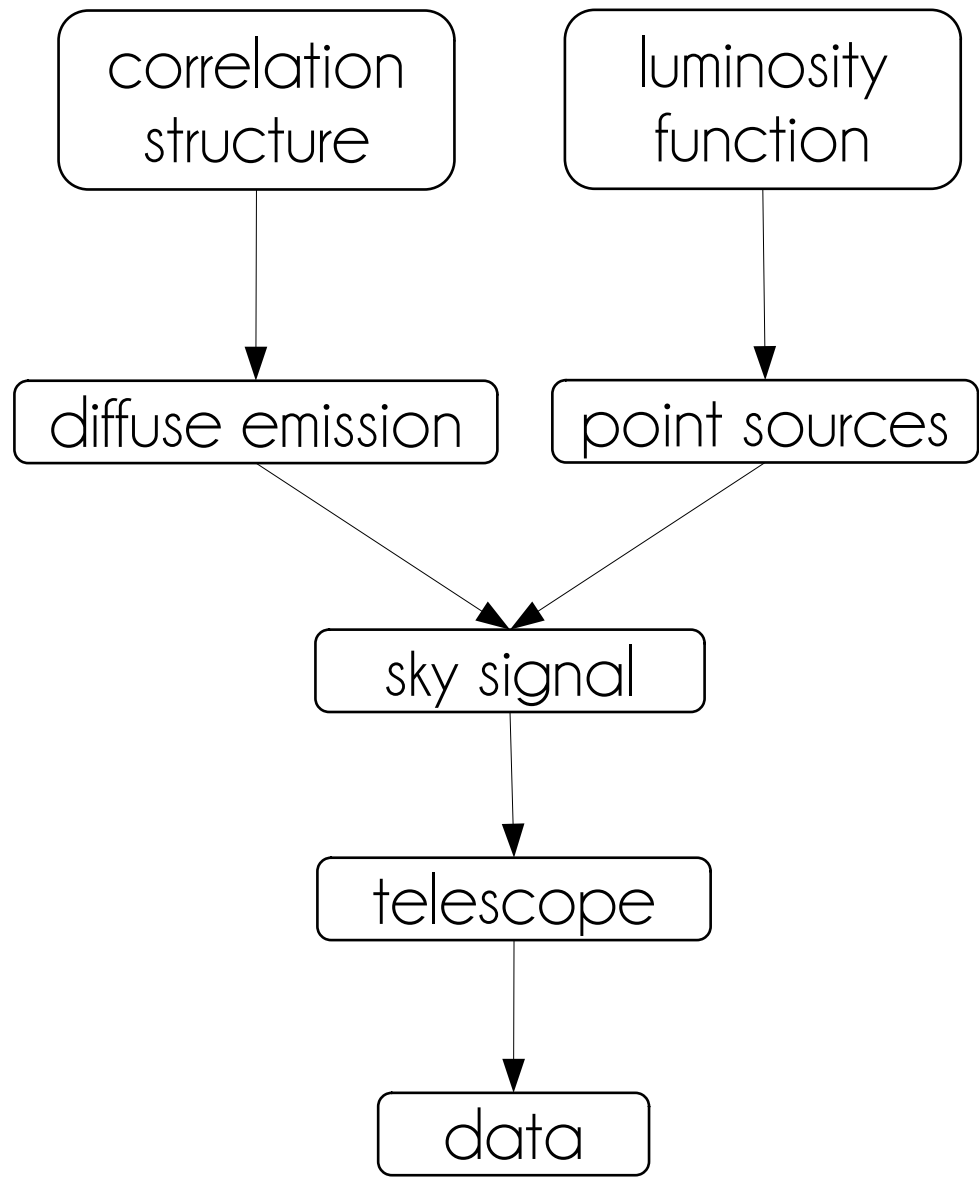


back propagation  
= inference



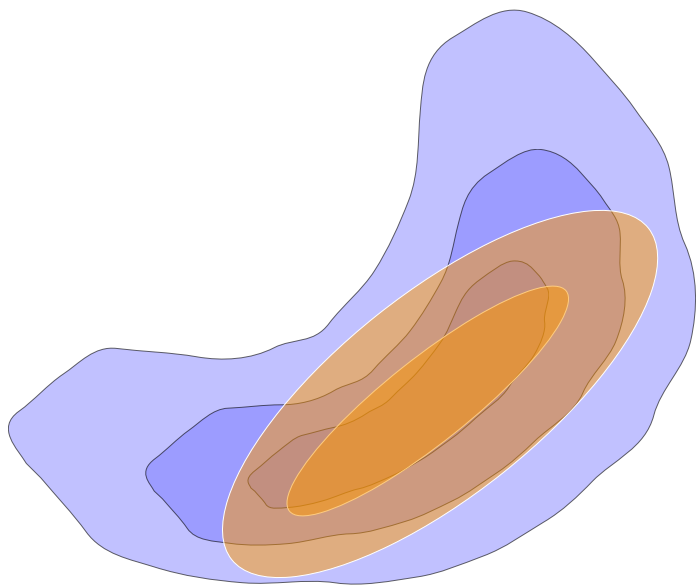


back propagation  
= inference

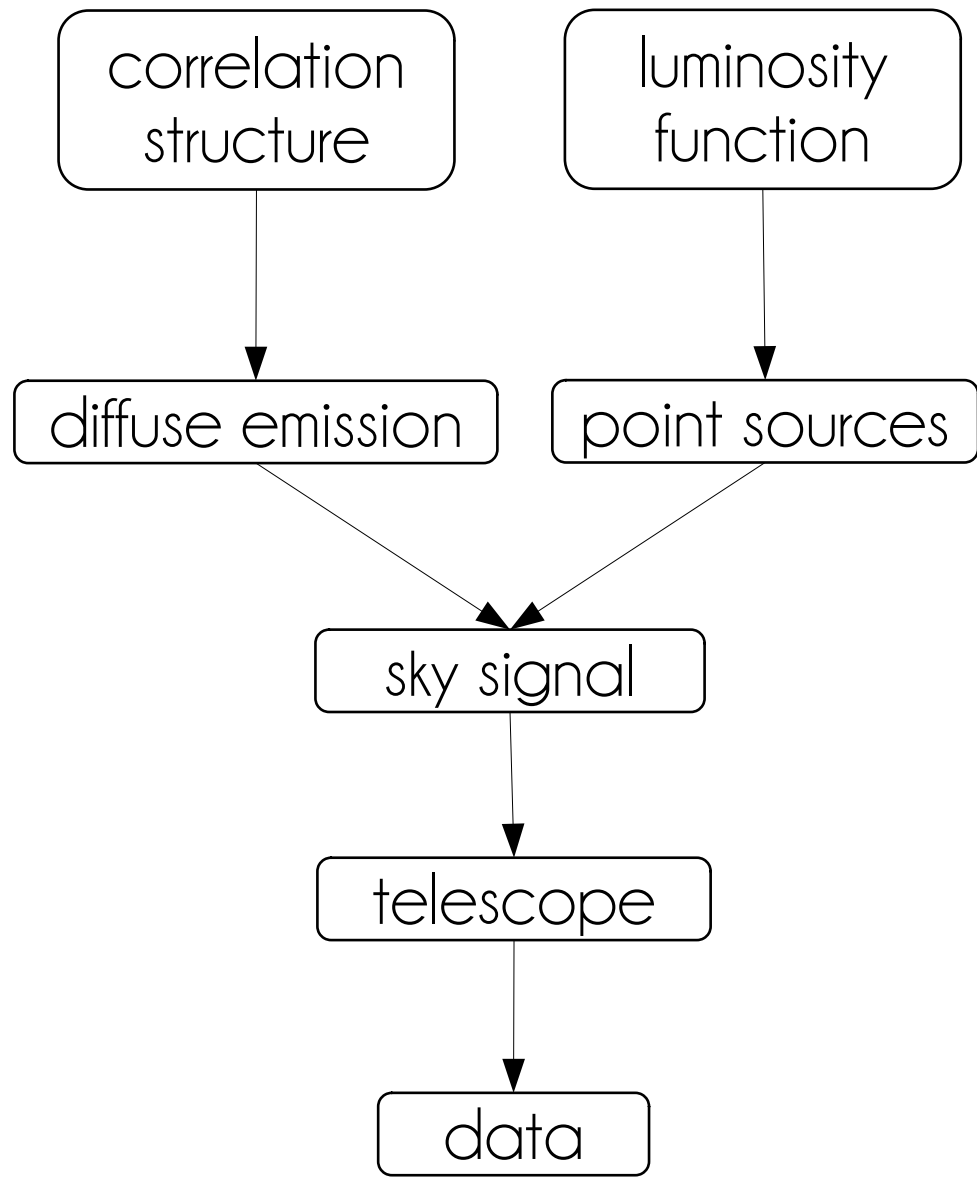


# Metric Gaussian Variational Inference

Knollmüller & Enßlin (arXiv:1901.11033)



back propagation  
= inference

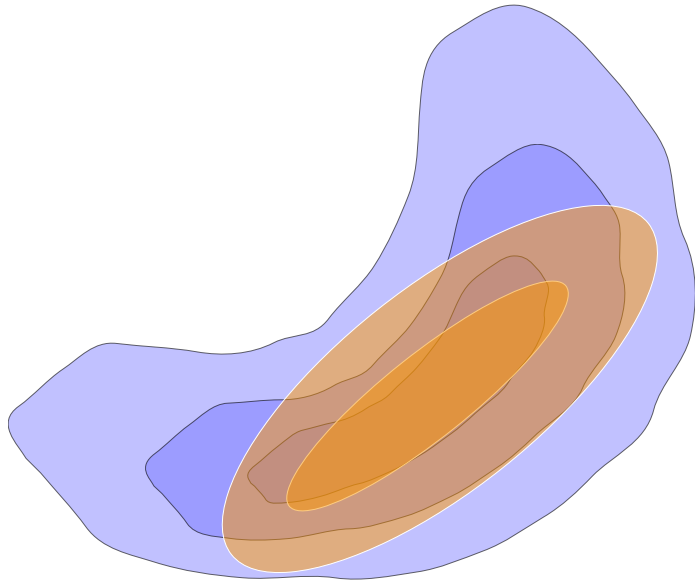


# Metric Gaussian Variational Inference

**Knollmüller** & Enßlin (arXiv:1901.11033)

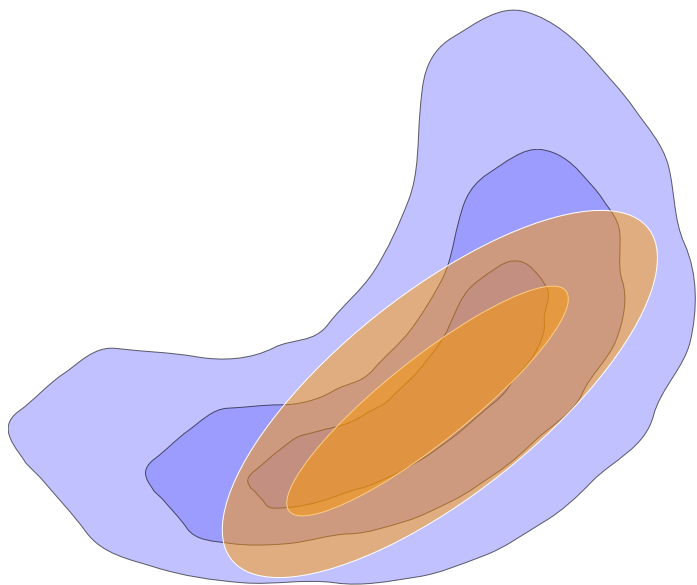
# Geometric Variational Inference

**Frank**, Leike, & Enßlin (arXiv:2105.10470)



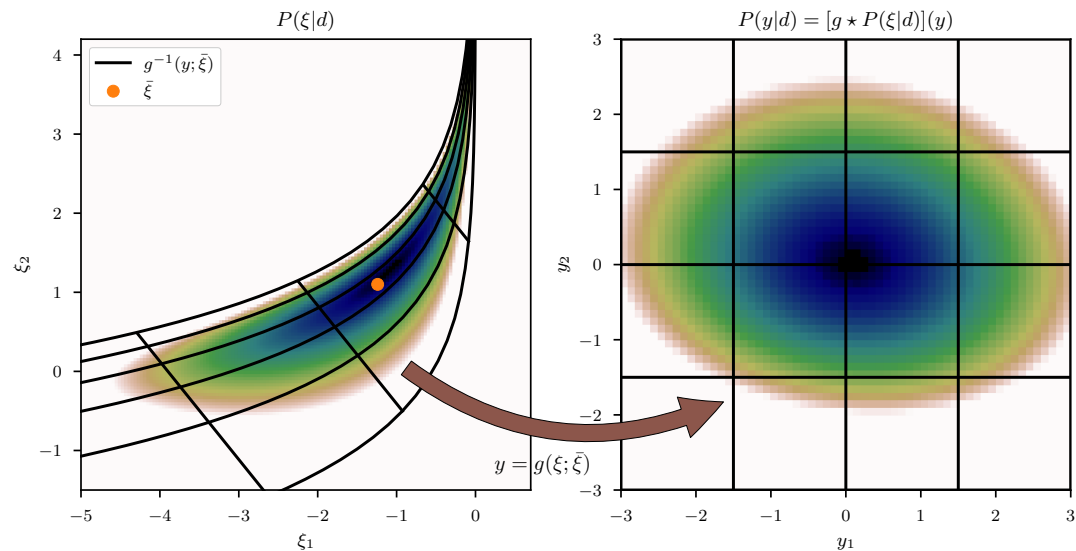
# Metric Gaussian Variational Inference

Knollmüller & Enßlin (arXiv:1901.11033)



# Geometric Variational Inference

Frank, Leike, & Enßlin (arXiv:2105.10470)



# NIFTy



7

[IFT - Information Field Theory](#)

[Discretisation and Volume in NIFTy](#)

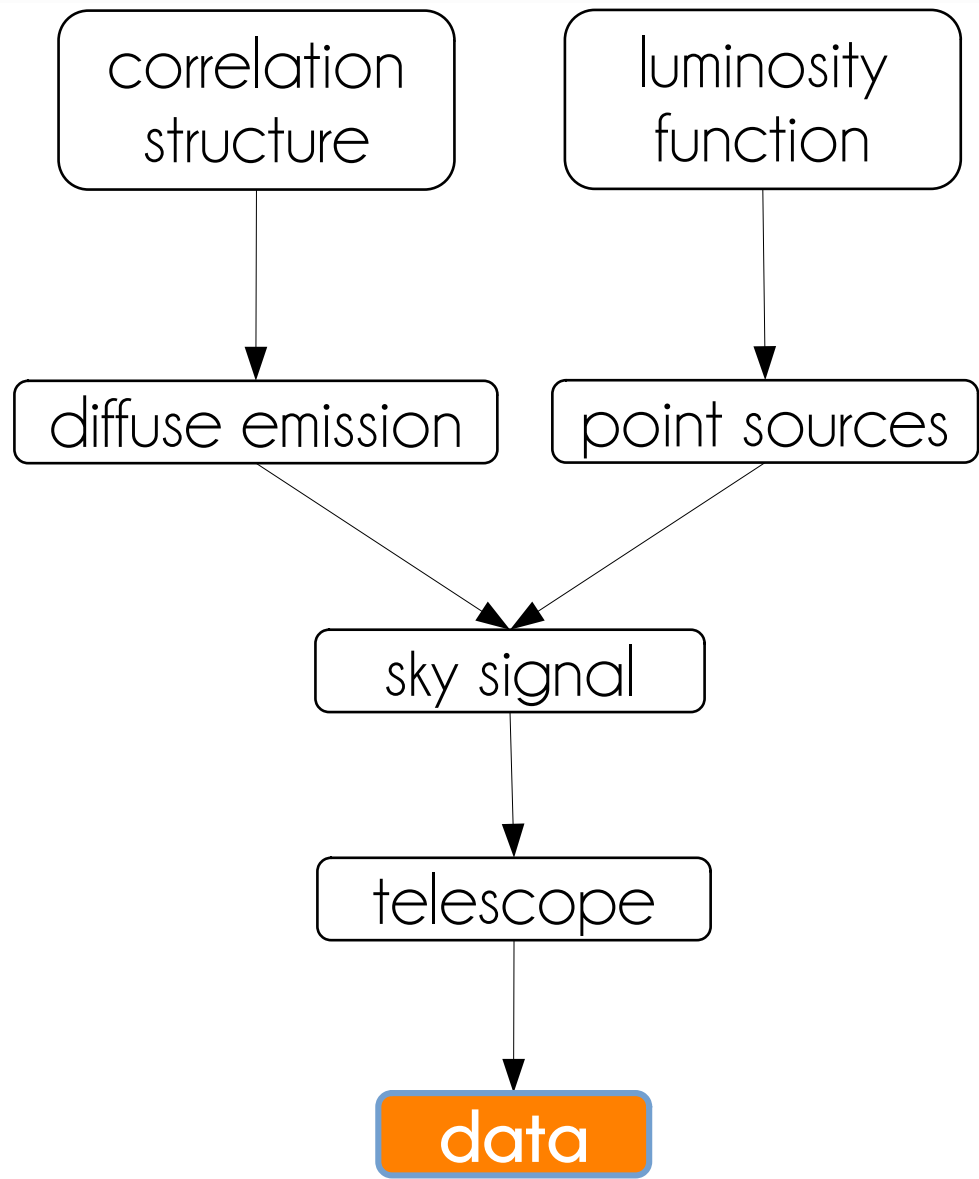
[Gallery](#)

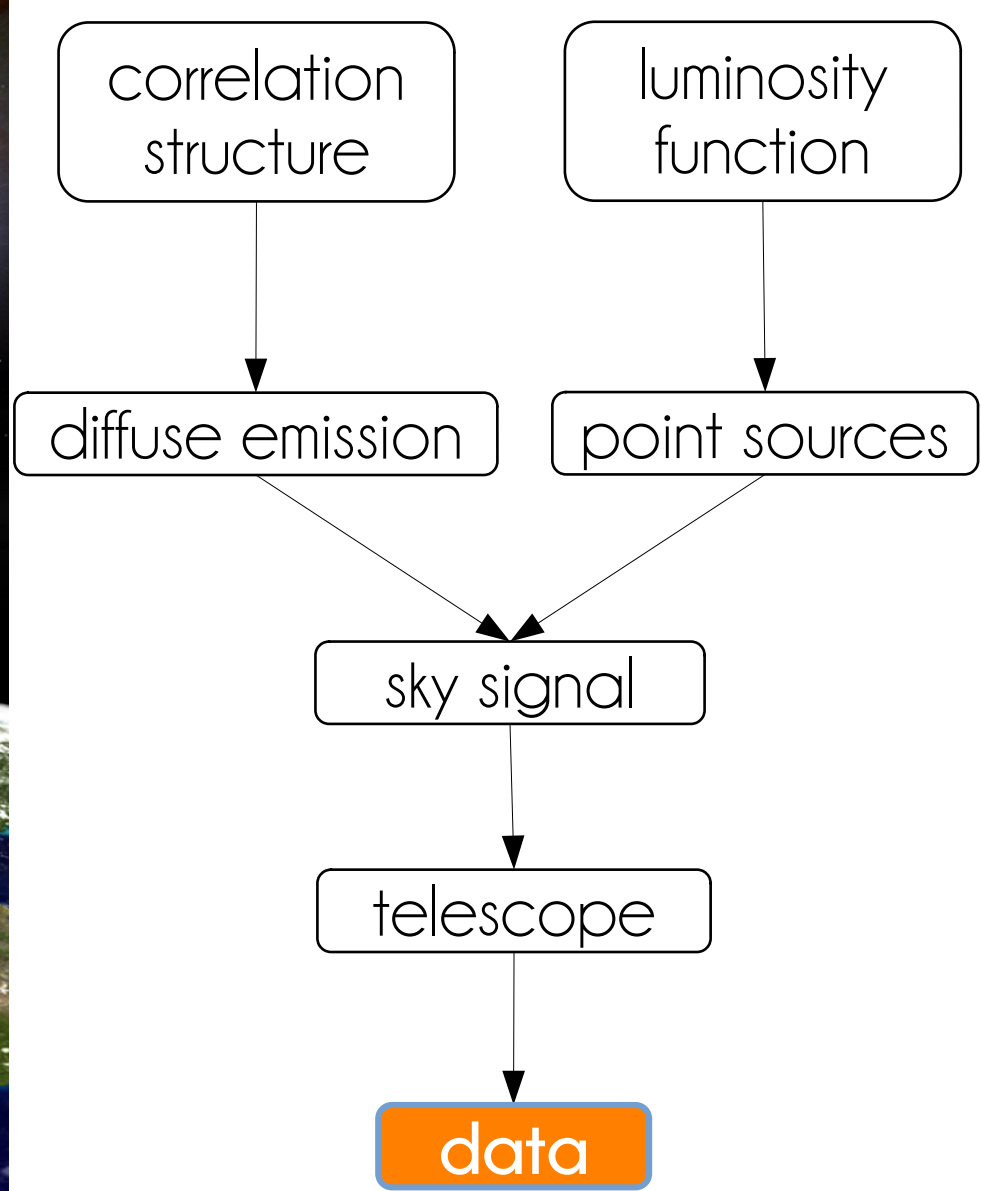
[Installation](#)

[Code Overview](#)

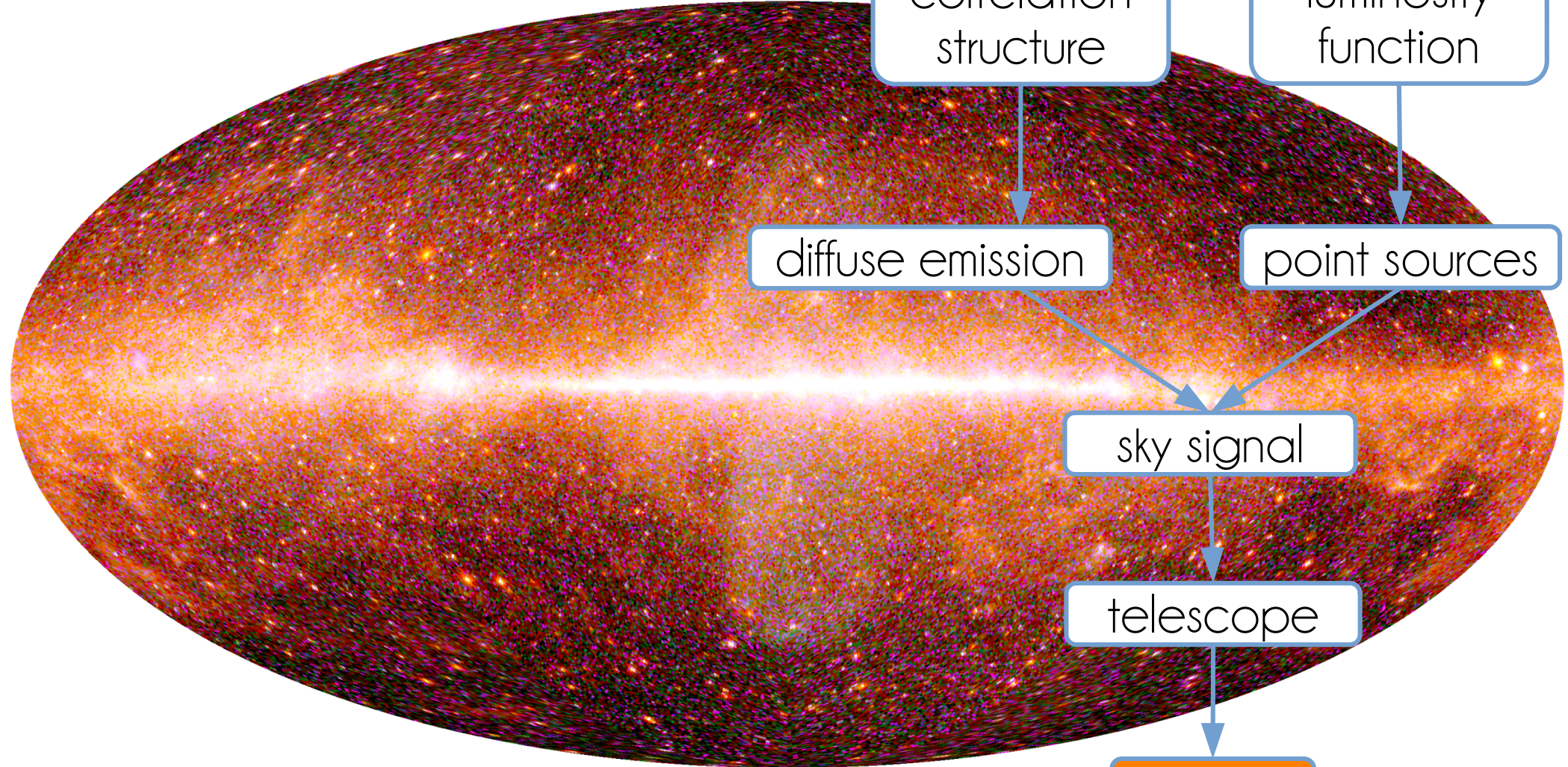
[NIFTy-related publications](#)

[Package Documentation](#)



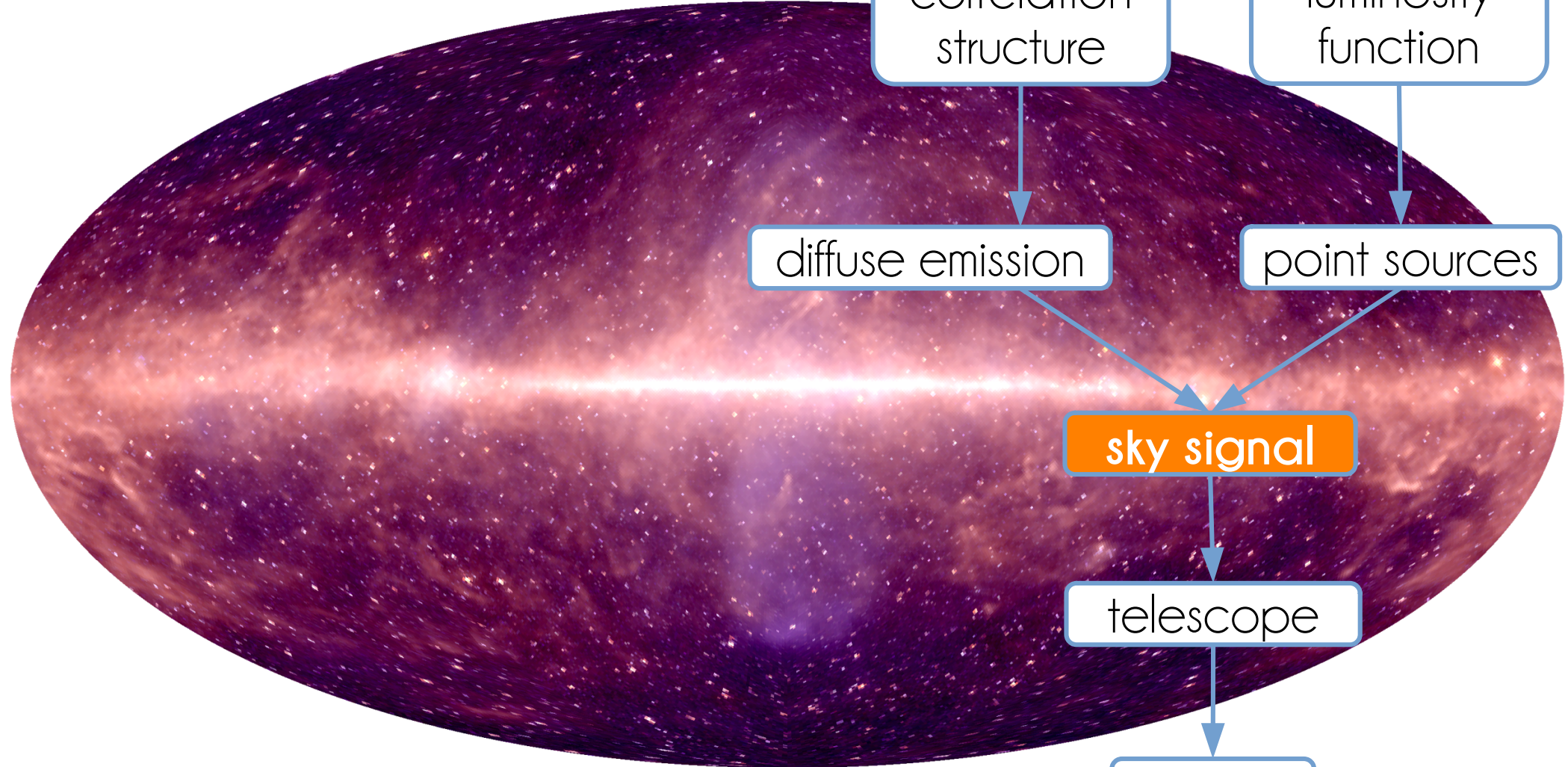


# Fermi gamma ray sky with IFT

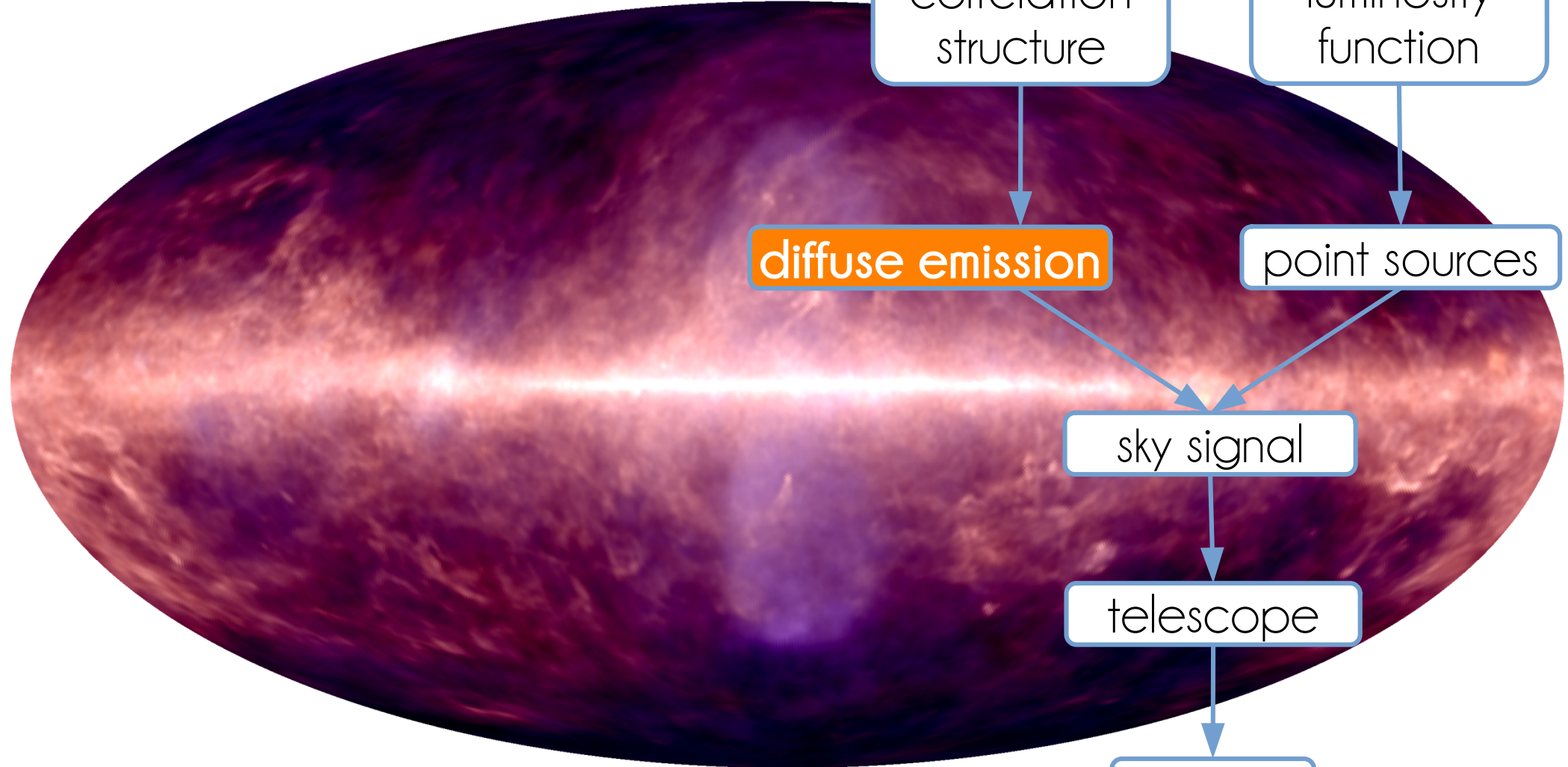




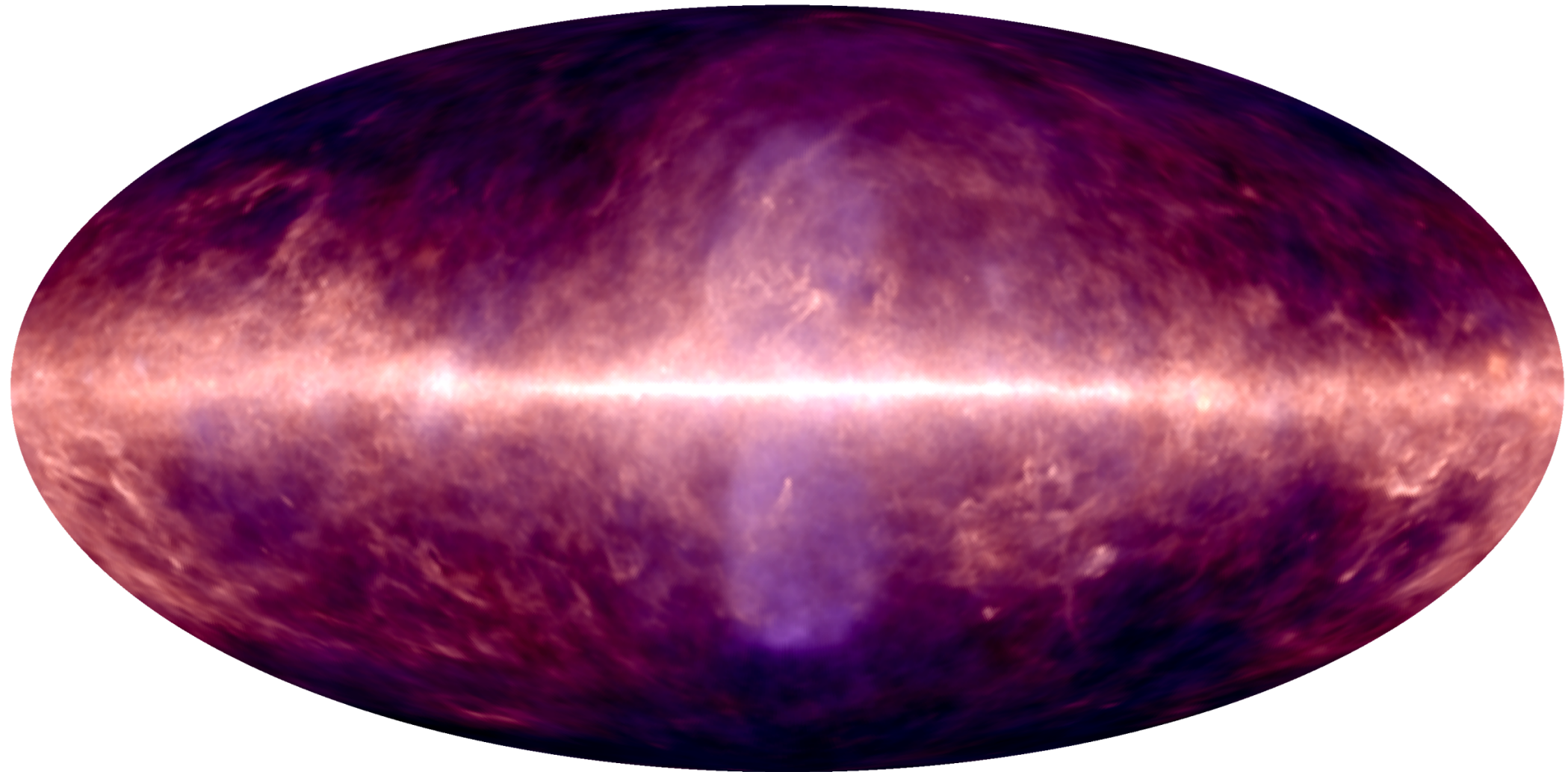
# Fermi gamma ray sky with IFT



# Fermi gamma ray sky with IFT

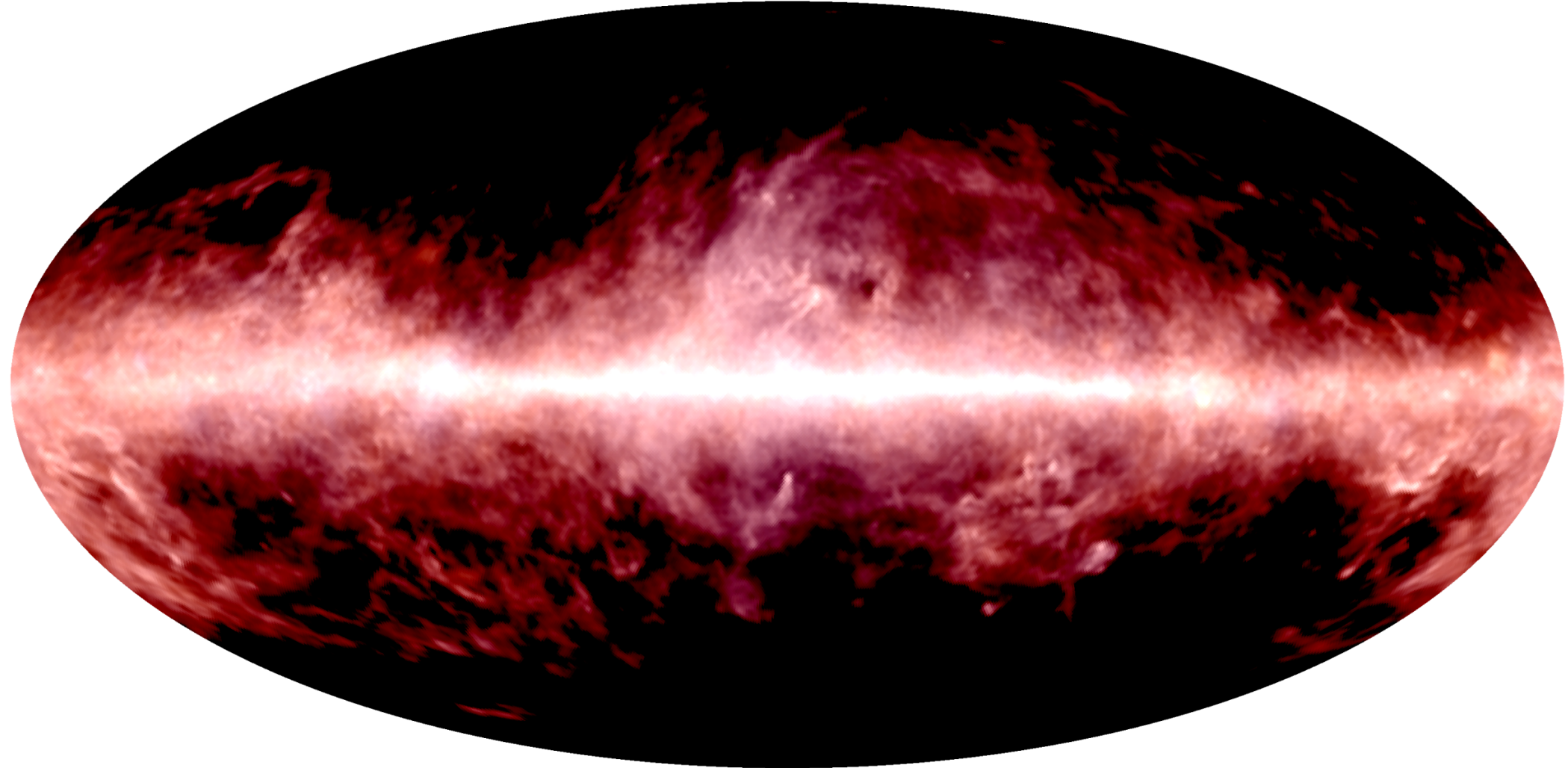


Fermi gamma ray sky with IFT



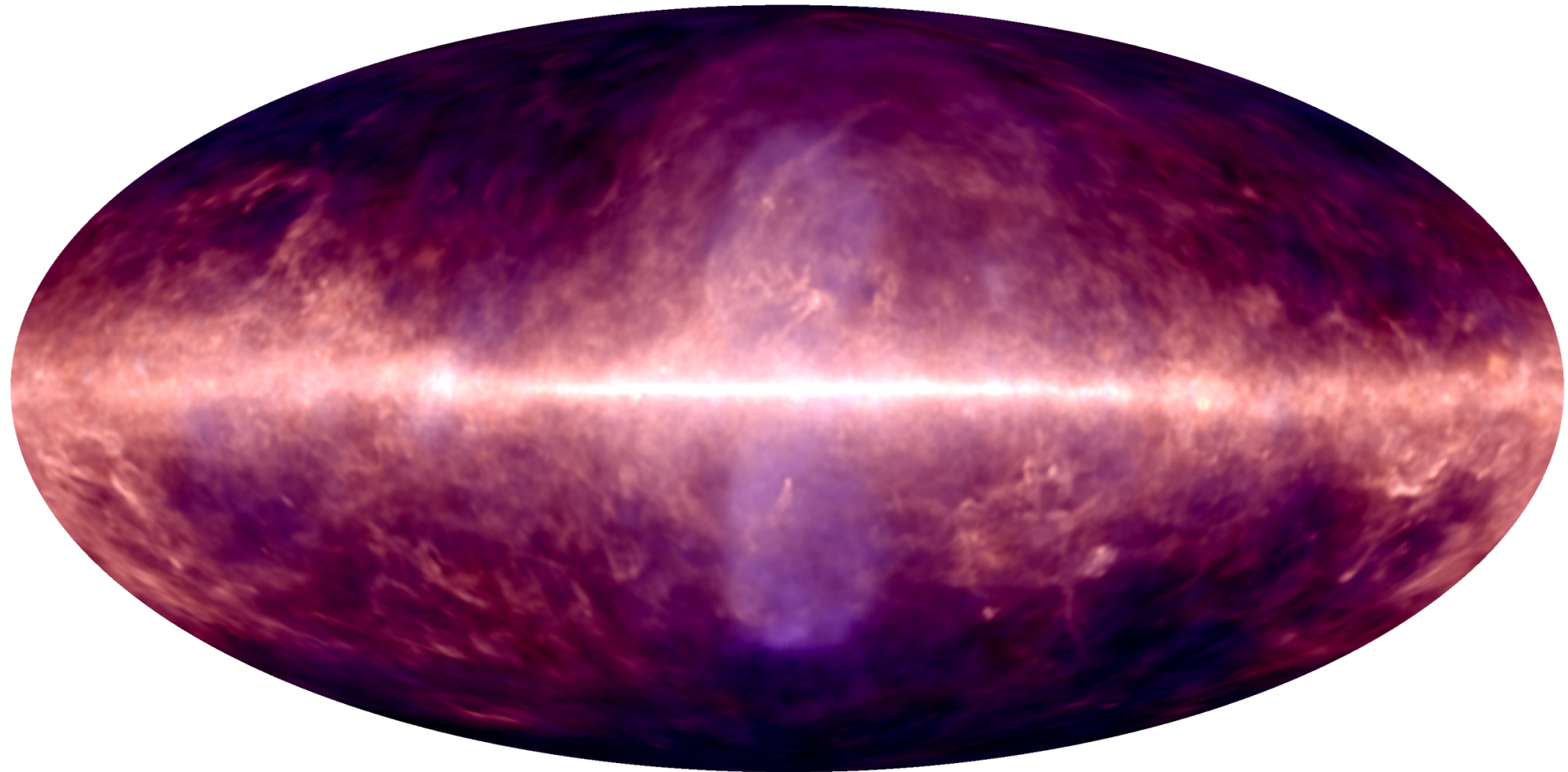
Platz et al (arXiv:2204.09360)

Fermi gamma ray sky 1-300 GeV



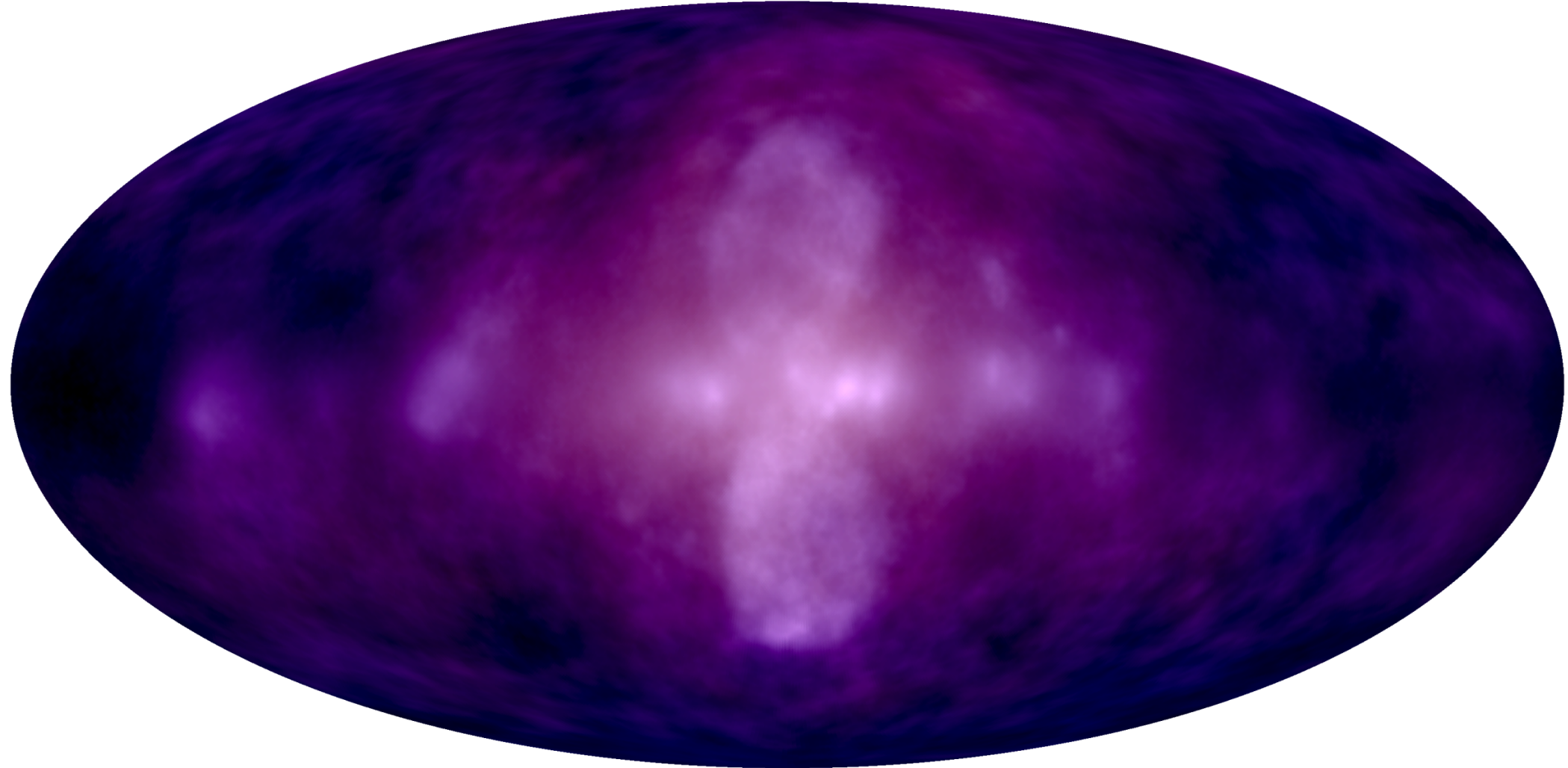
Platz et al (arXiv:2204.09360)

Fermi gamma ray sky with IFT



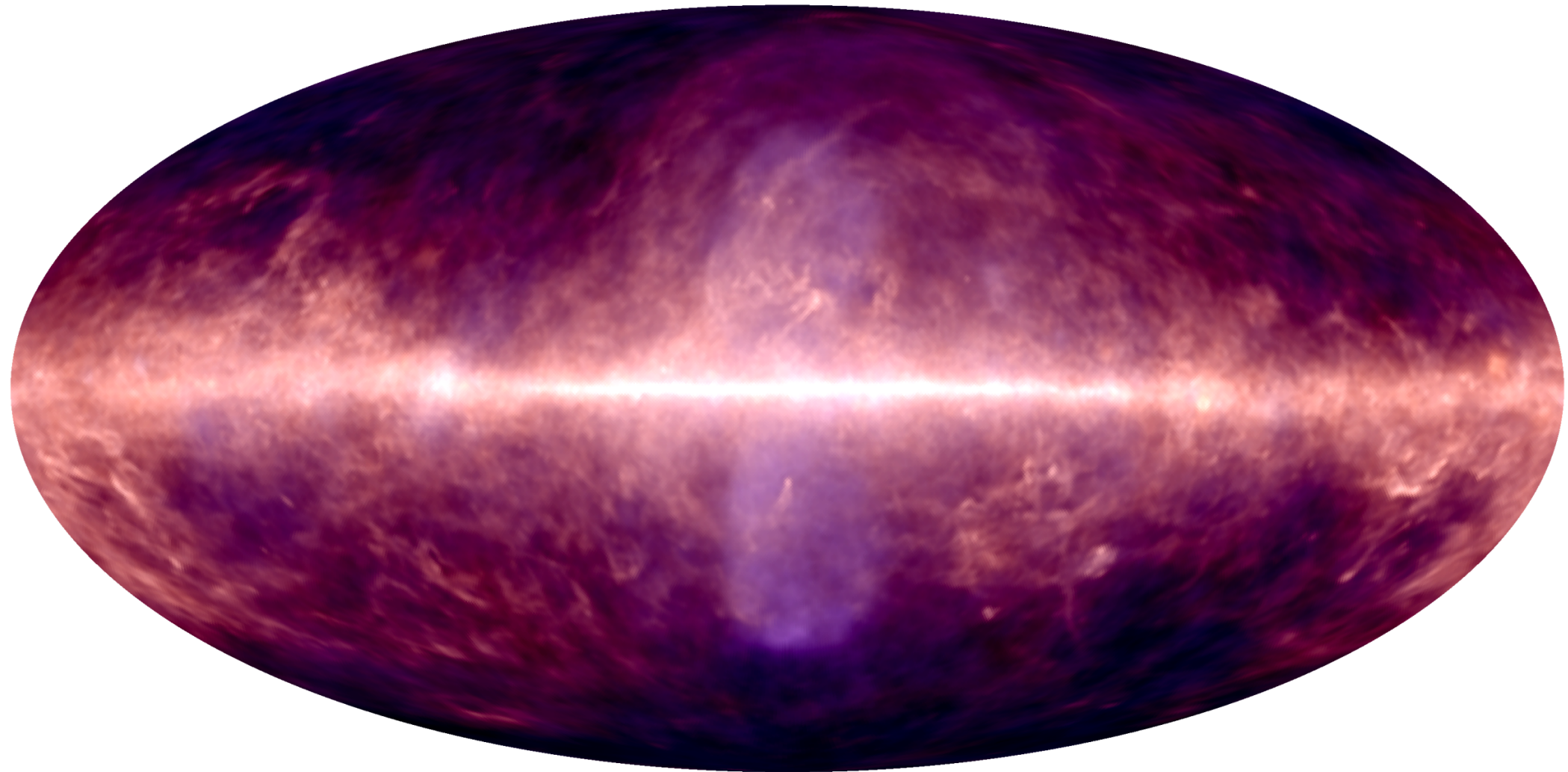
Platz et al (arXiv:2204.09360)

Fermi gamma ray sky 1-300 GeV



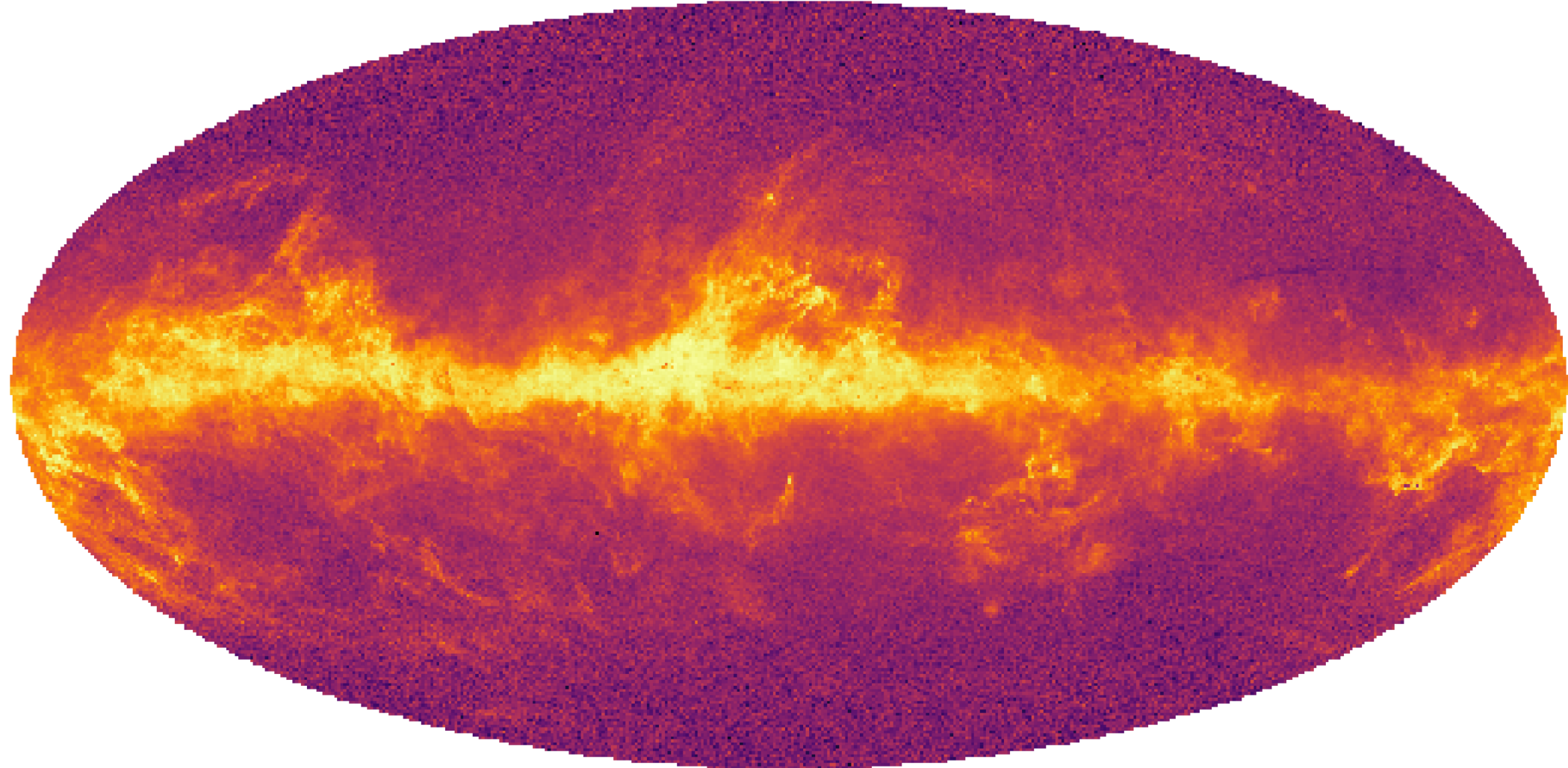
Platz et al (arXiv:2204.09360)

Fermi gamma ray sky with IFT



Platz et al (arXiv:2204.09360)

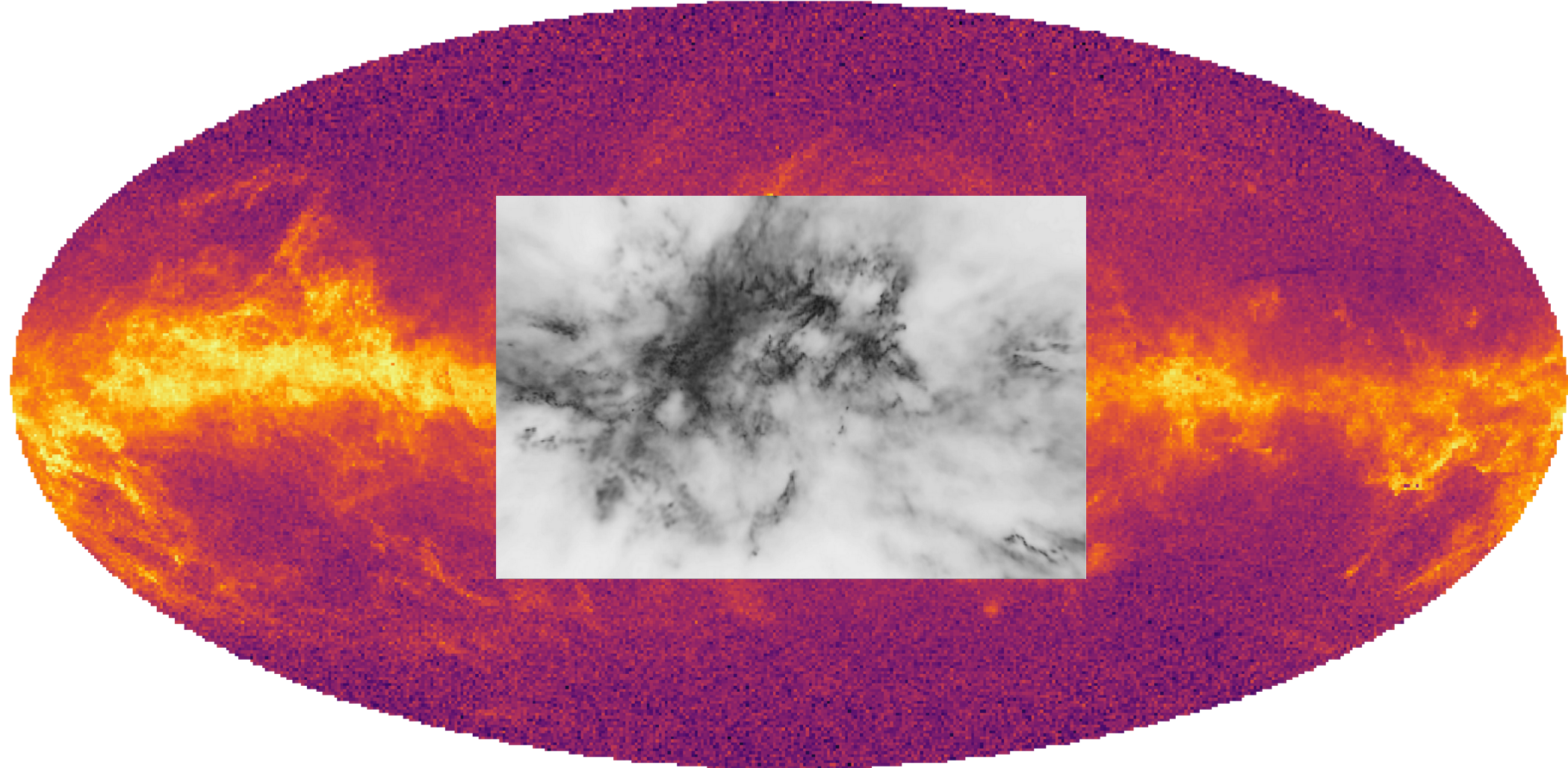
# Starlight absorption by dust



Leike & Enßlin (2019.)

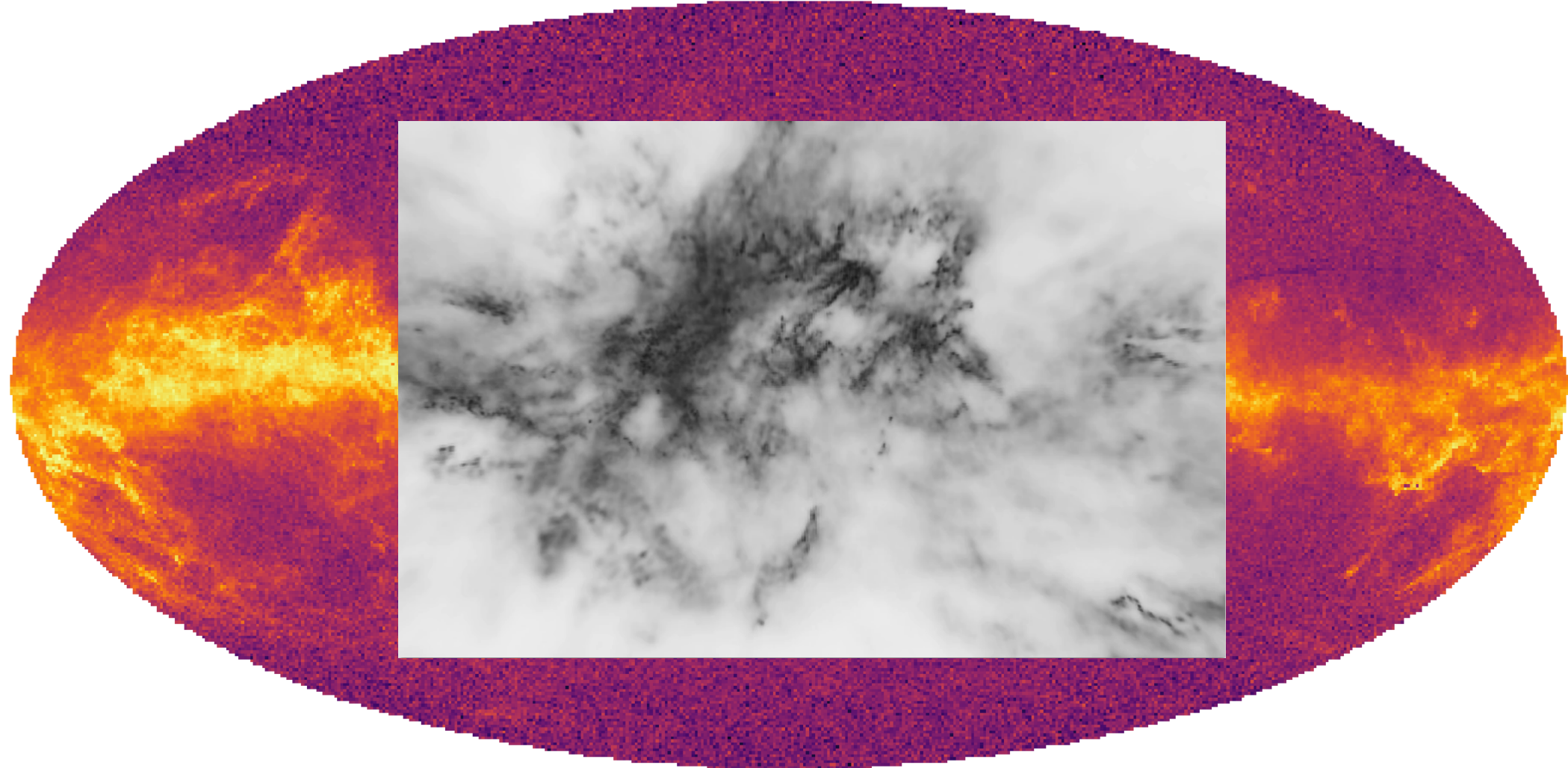


# Starlight absorption by dust



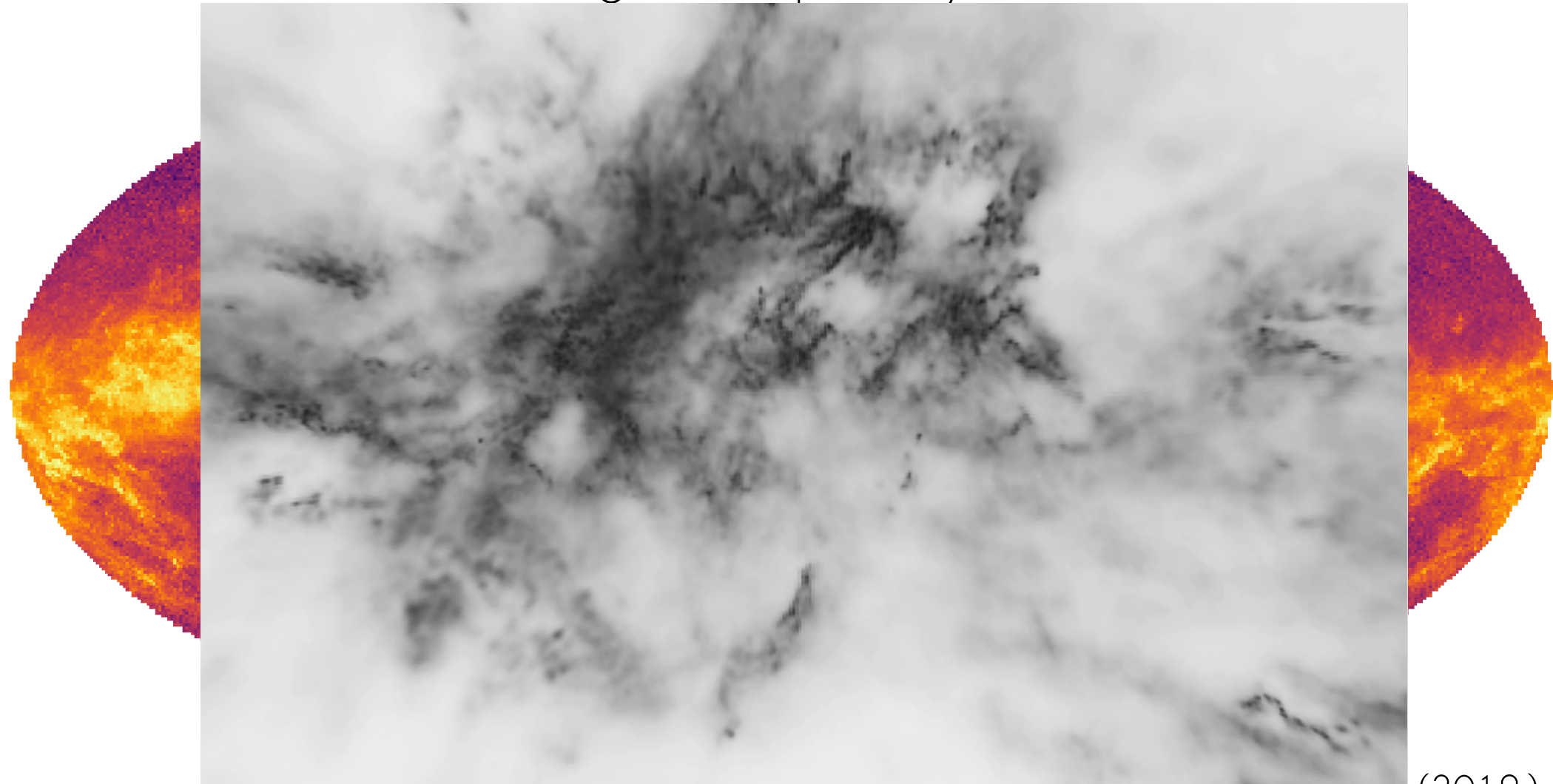
Leike & Enßlin (2019.)

# Starlight absorption by dust



Leike & Enßlin (2019.)

# Starlight absorption by dust



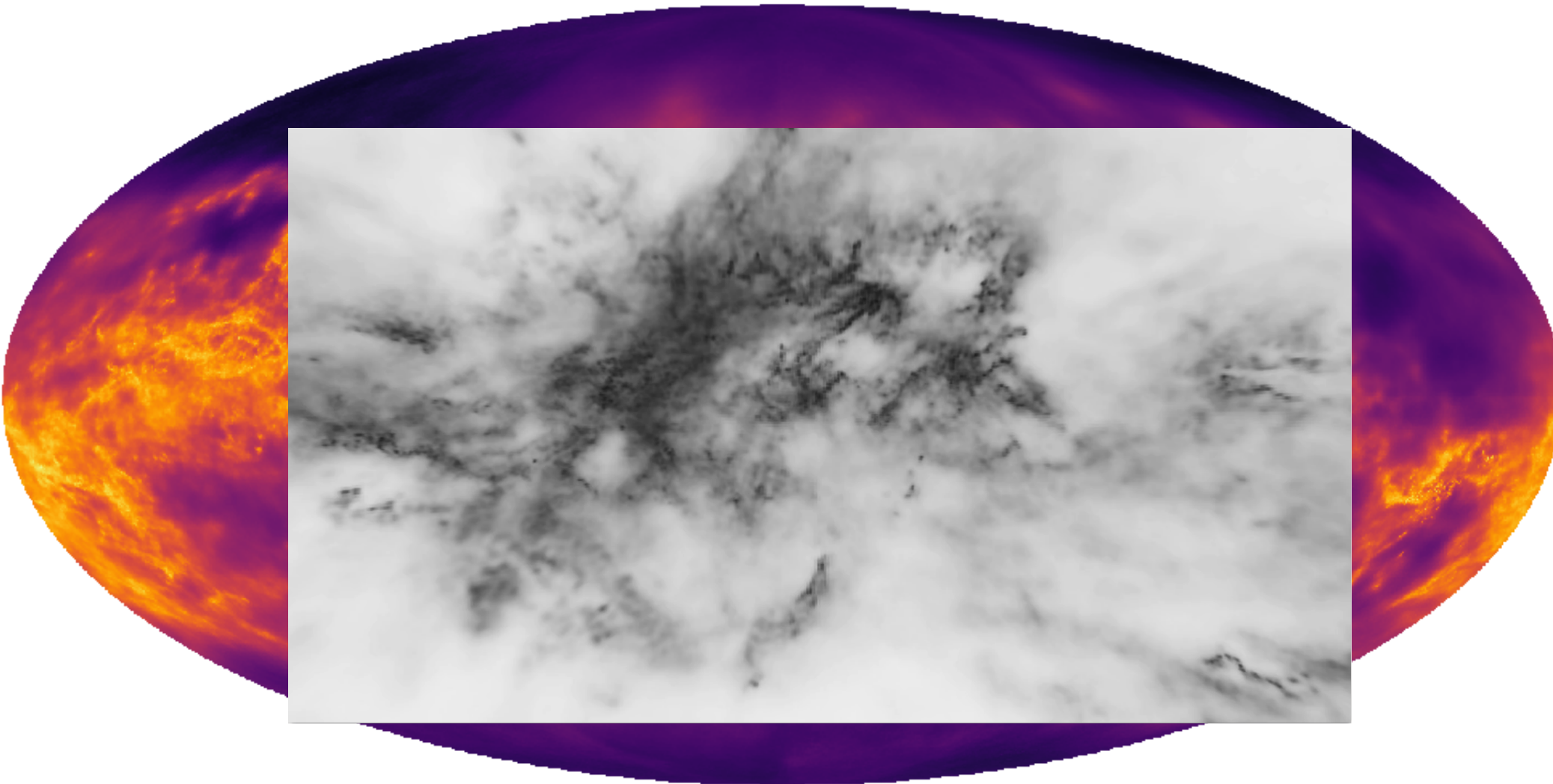
Leike & Enslin (2019.)





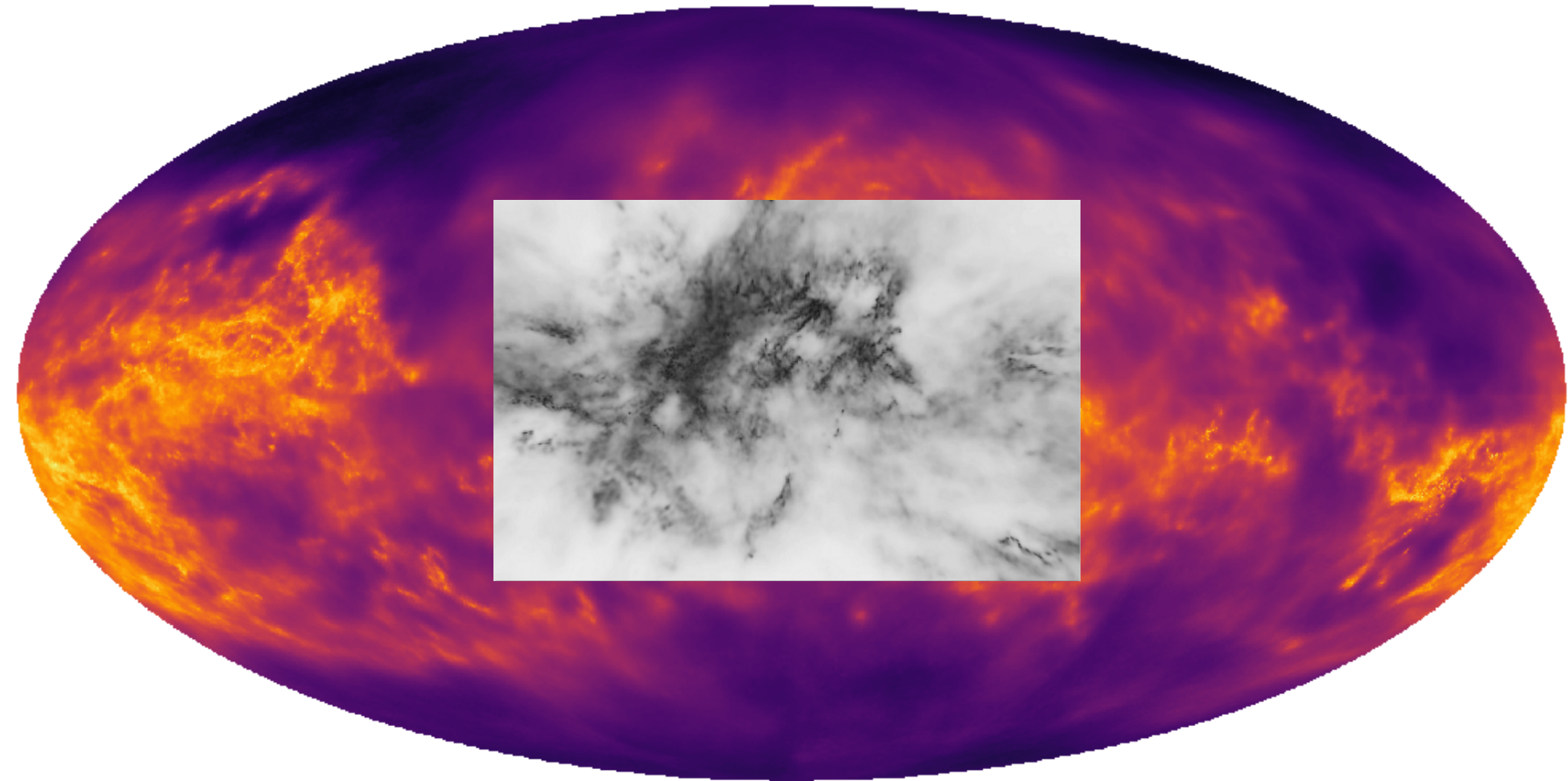
# Reconstructed dust sky

Leike, Glatzle, & Enßlin. (2020)



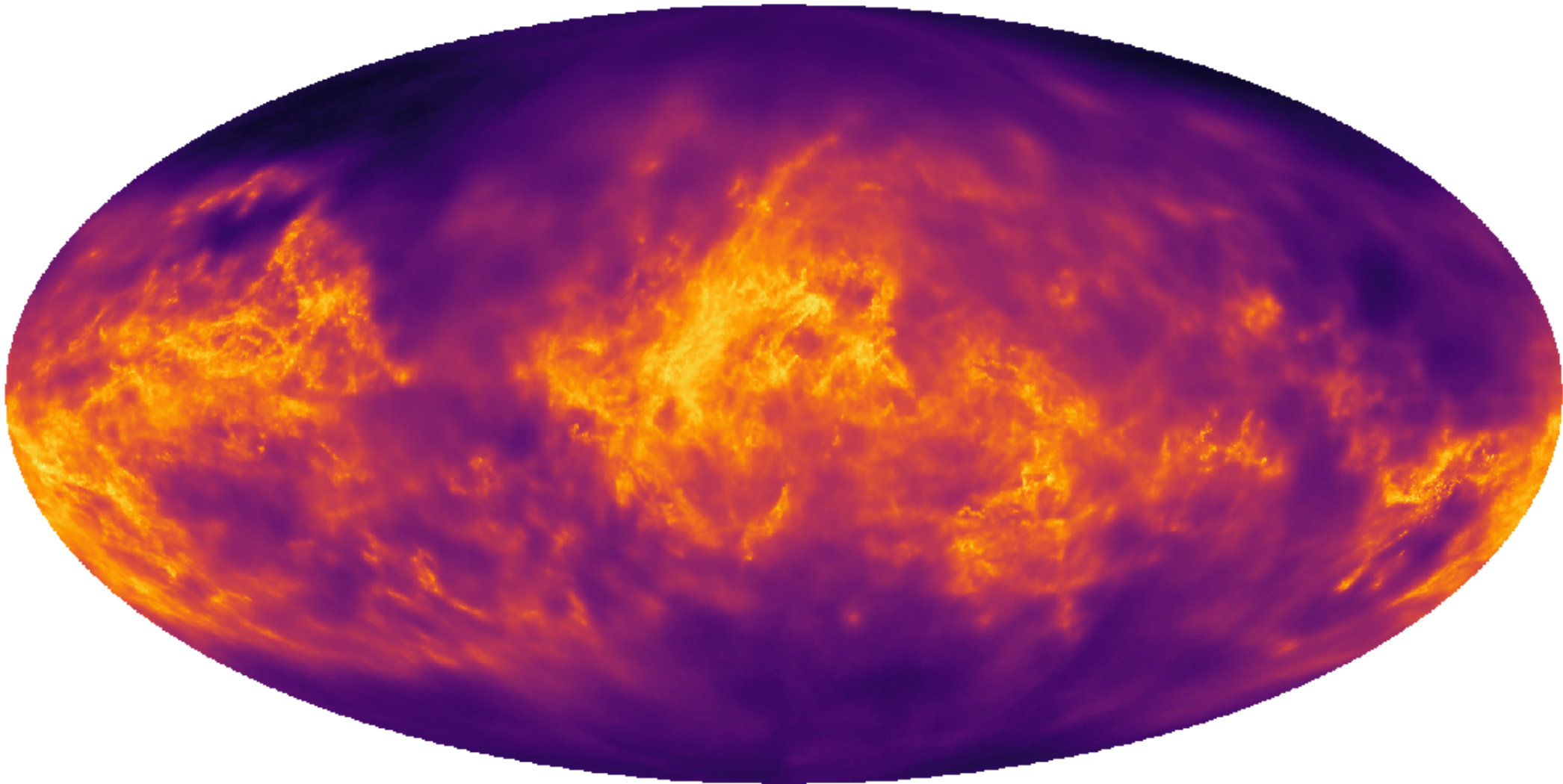
# Reconstructed dust sky

Leike, Glatzle, & Enßlin. (2020)



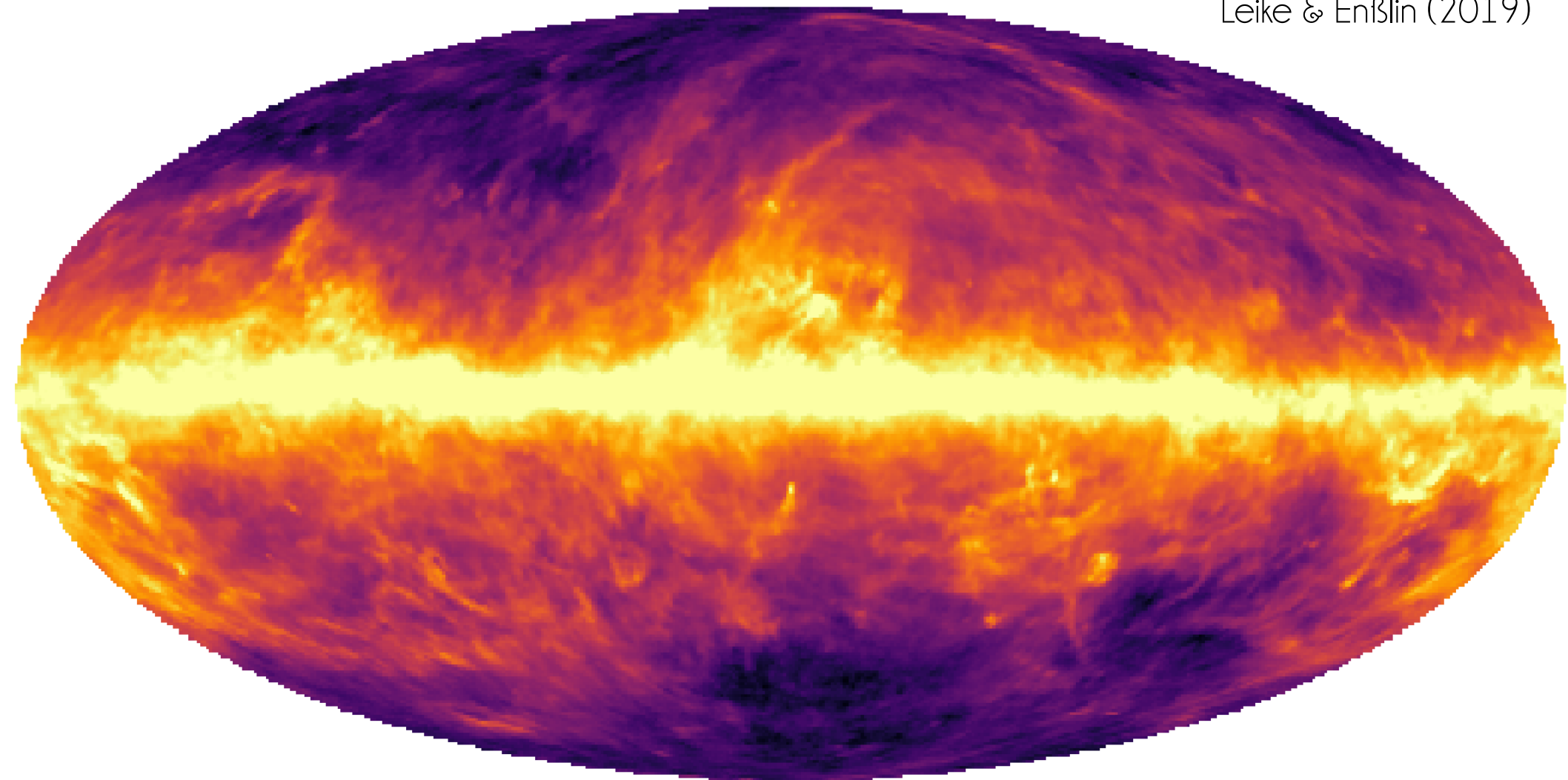
Reconstructed dust sky

Leike, Glatzle, & Enßlin. (2020)



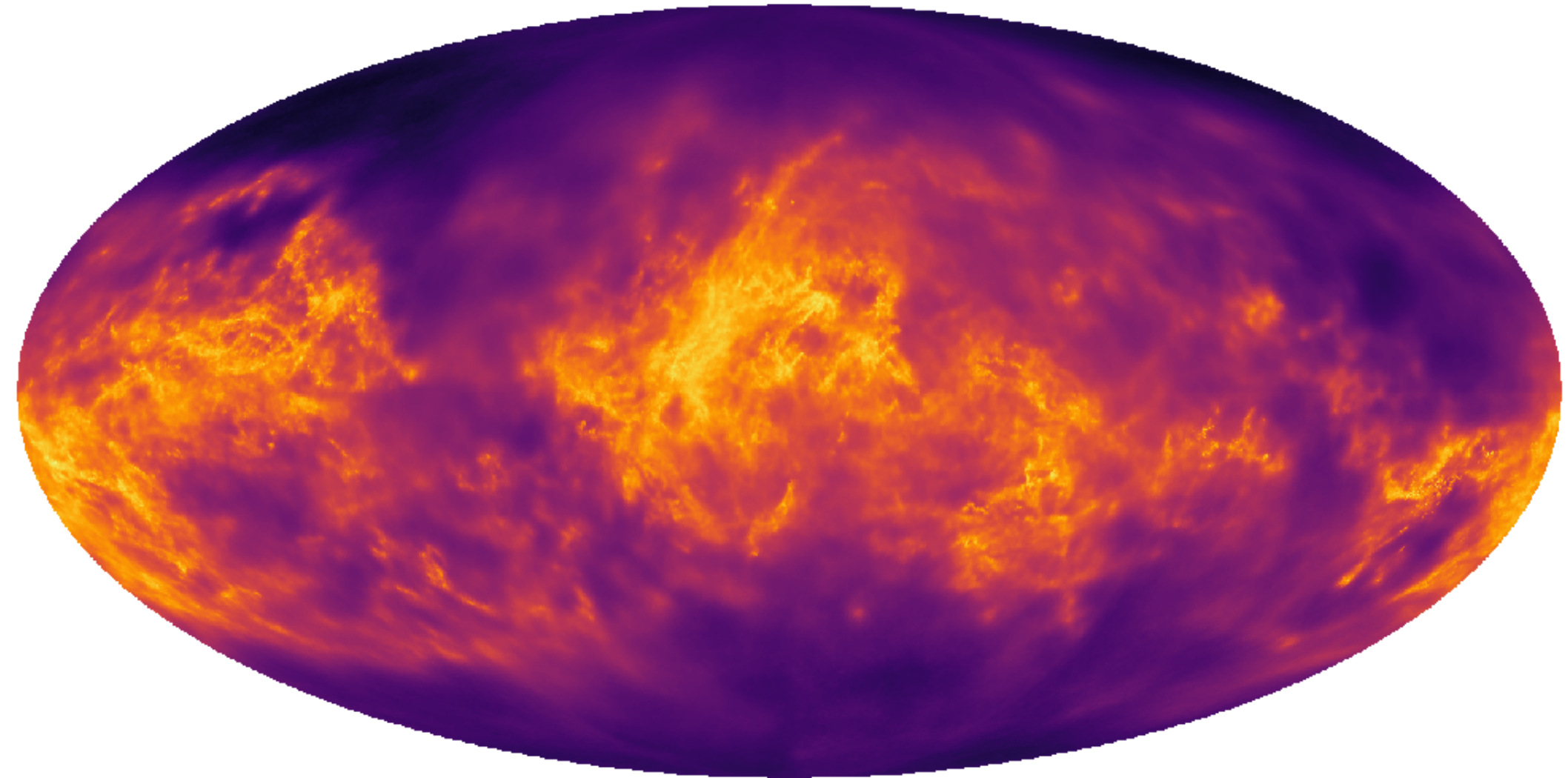


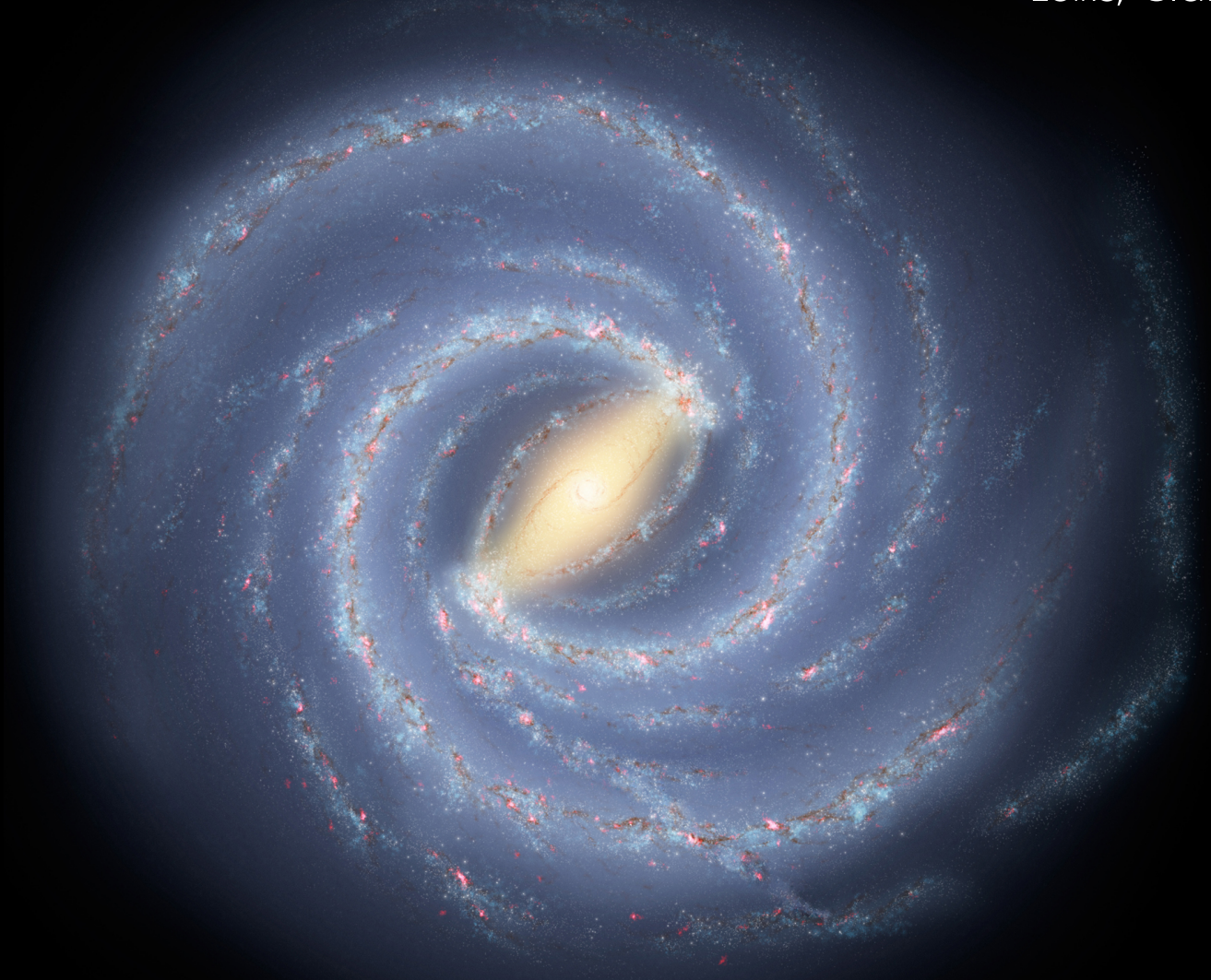
dust emission by IRAS + Planck  
Leike & Enßlin (2019)

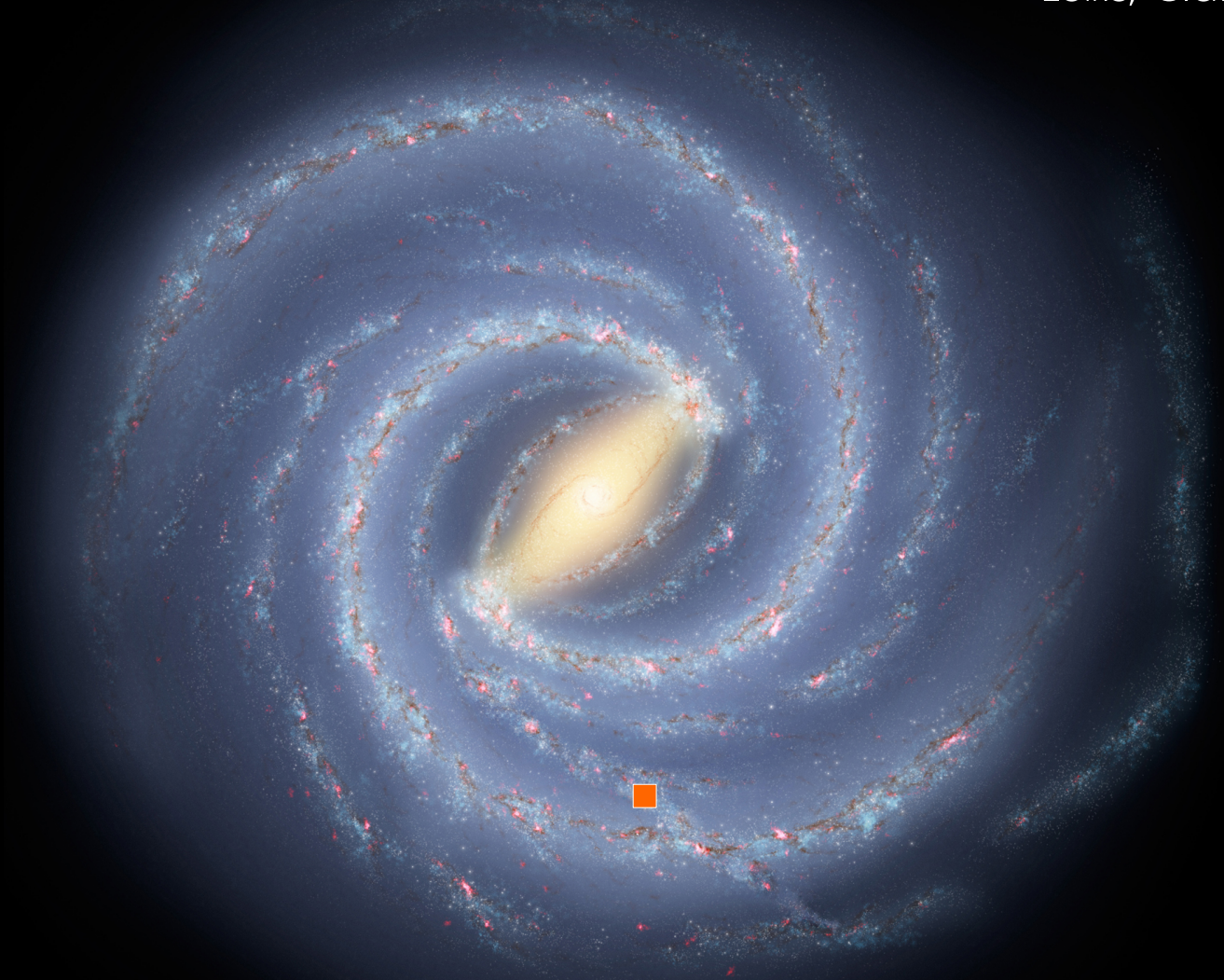


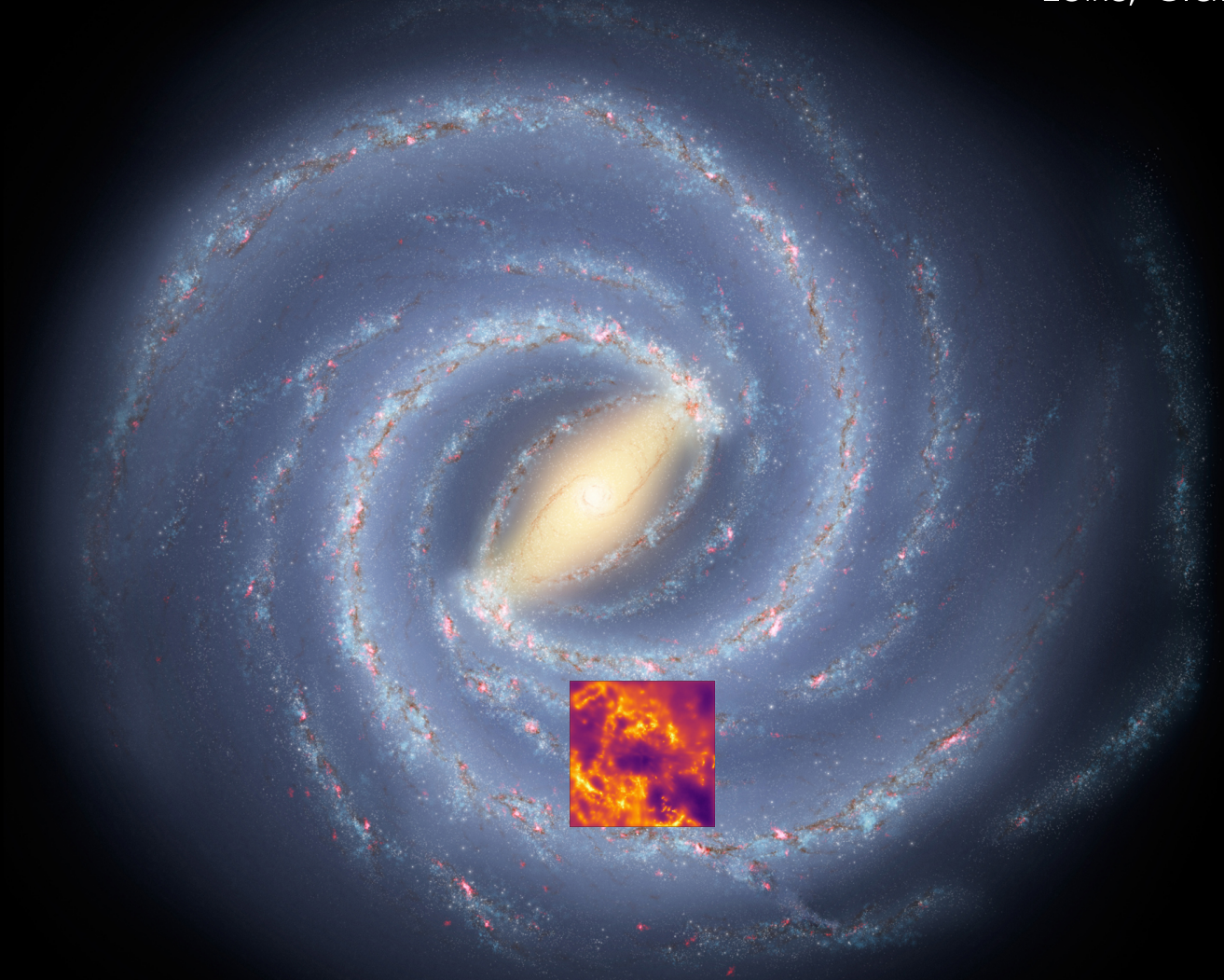
Reconstructed dust sky

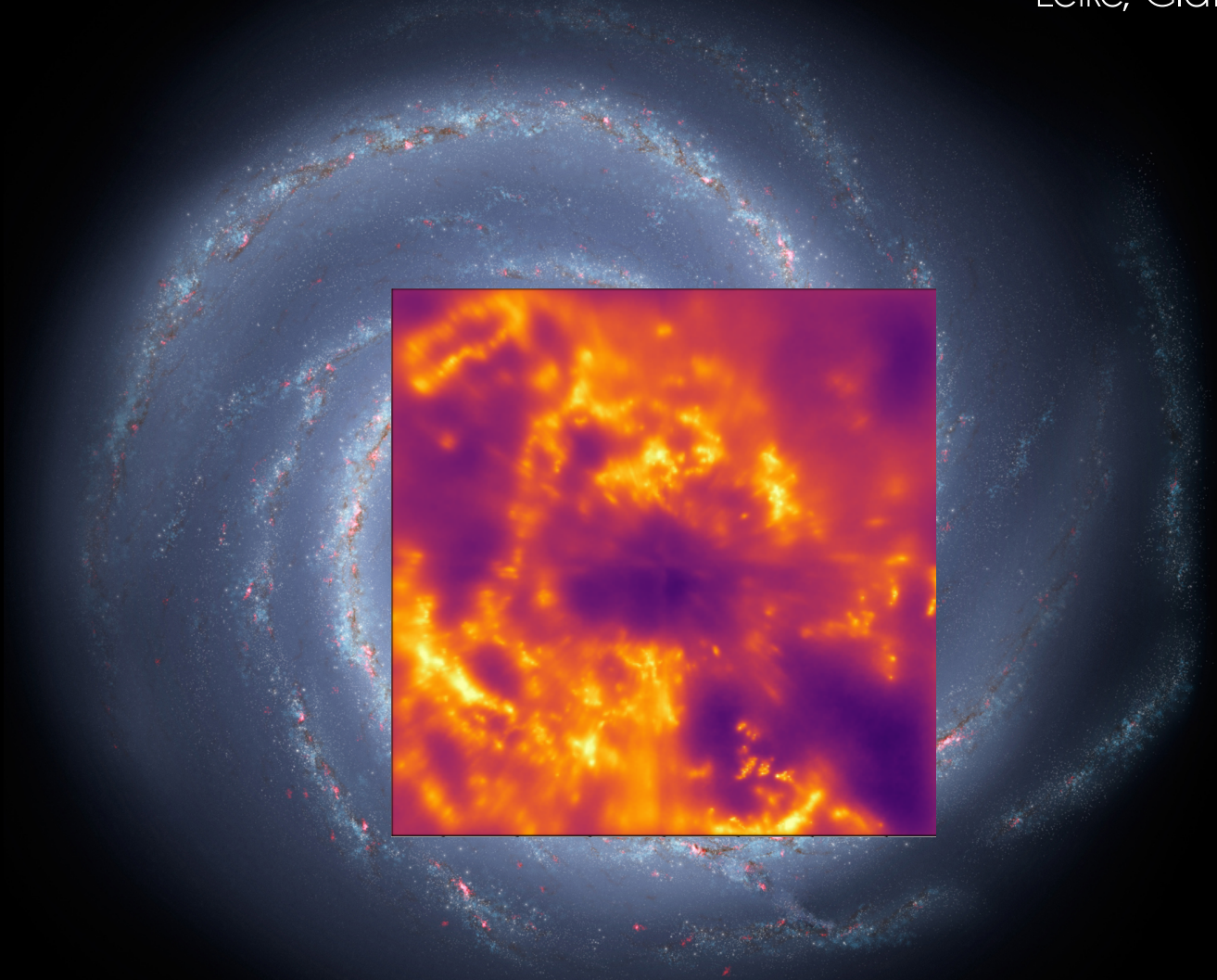
Leike, Glatzle, & Enßlin. (2020)

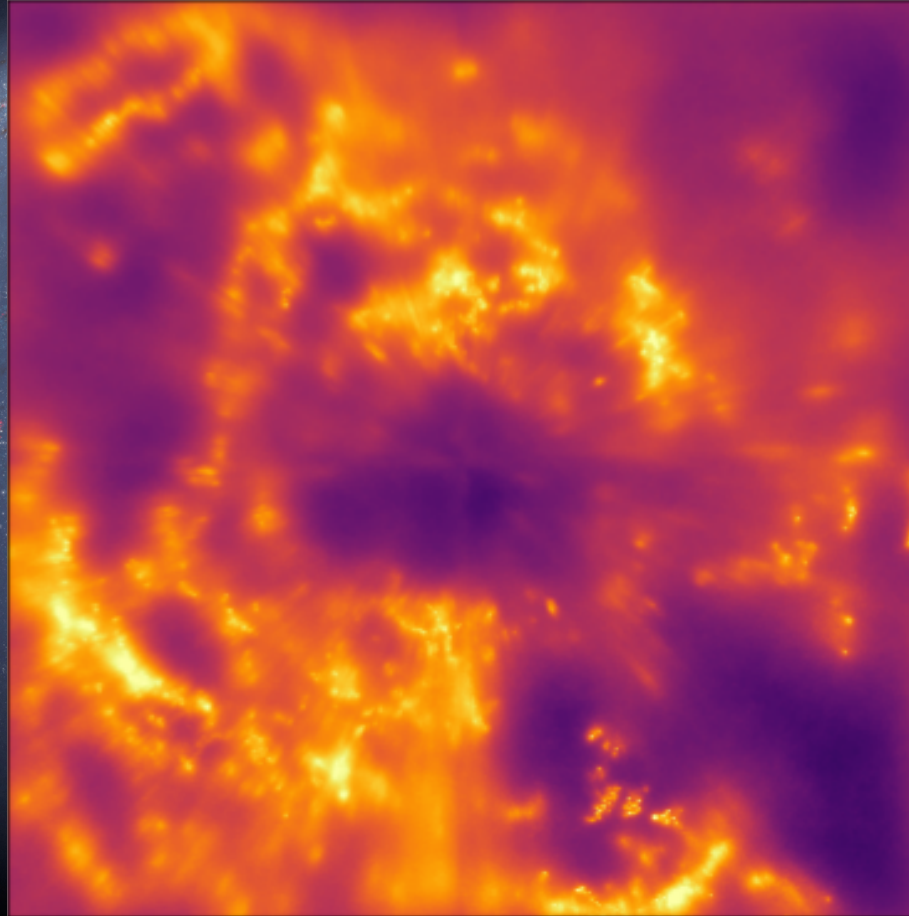


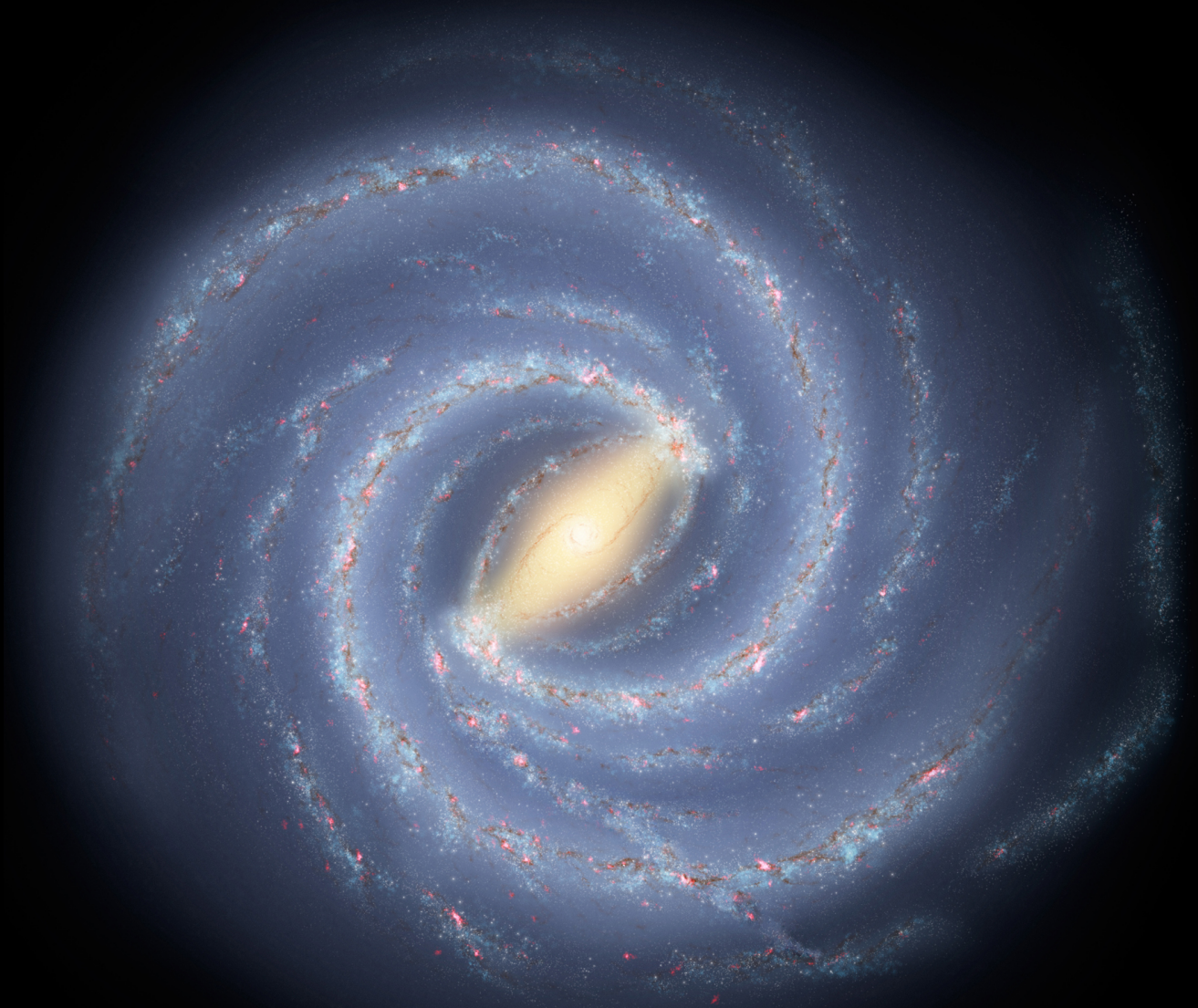




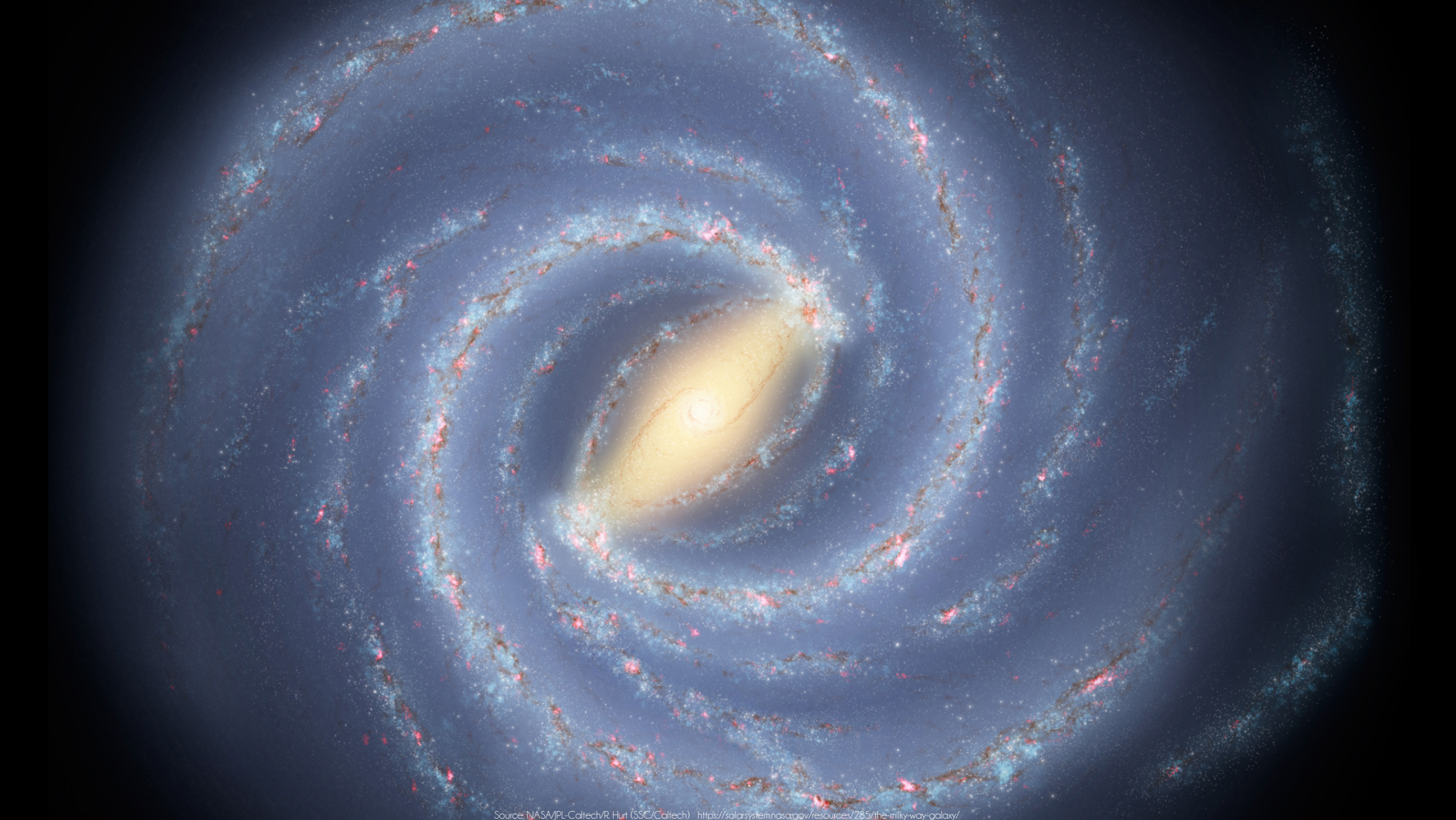


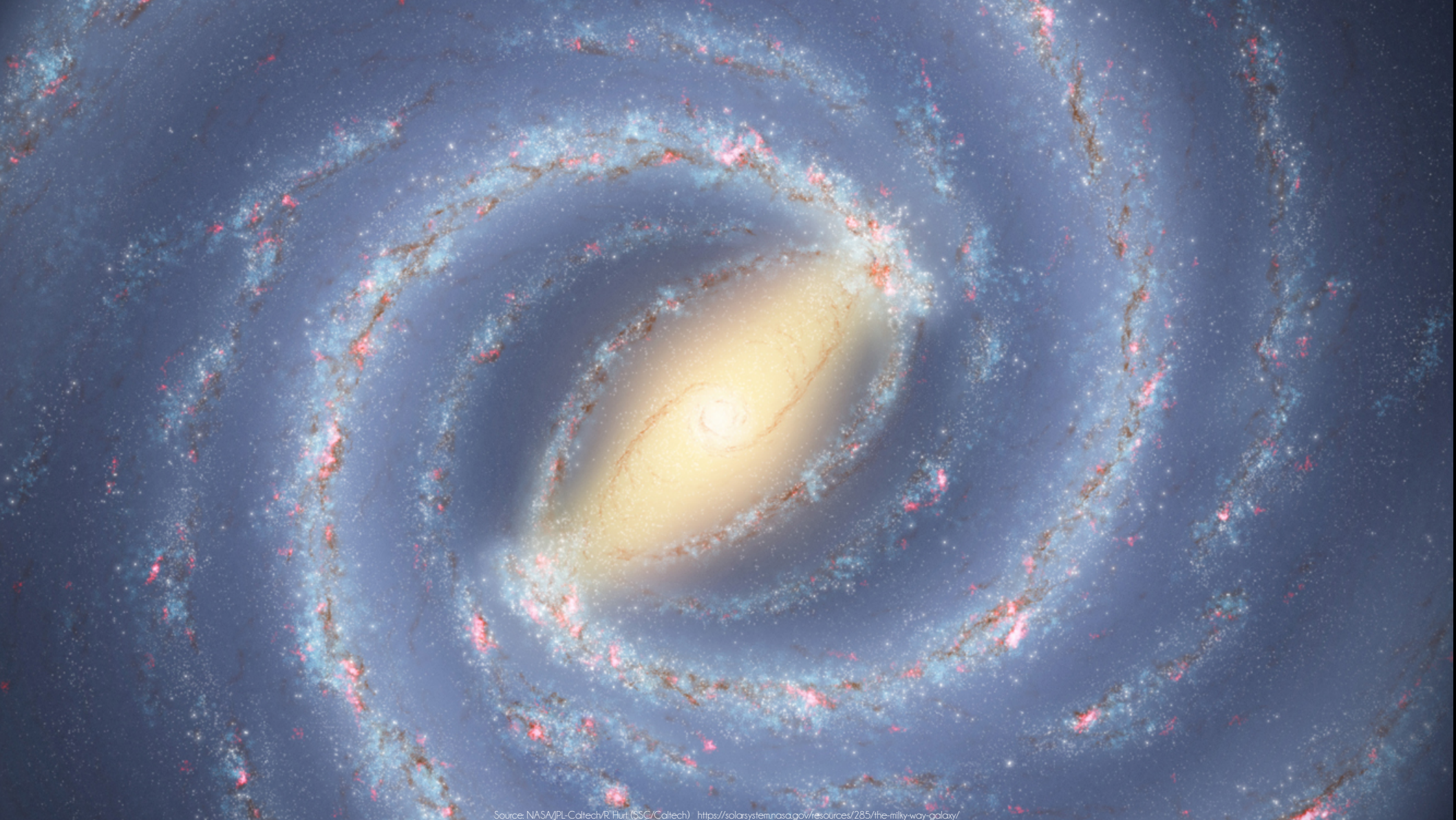


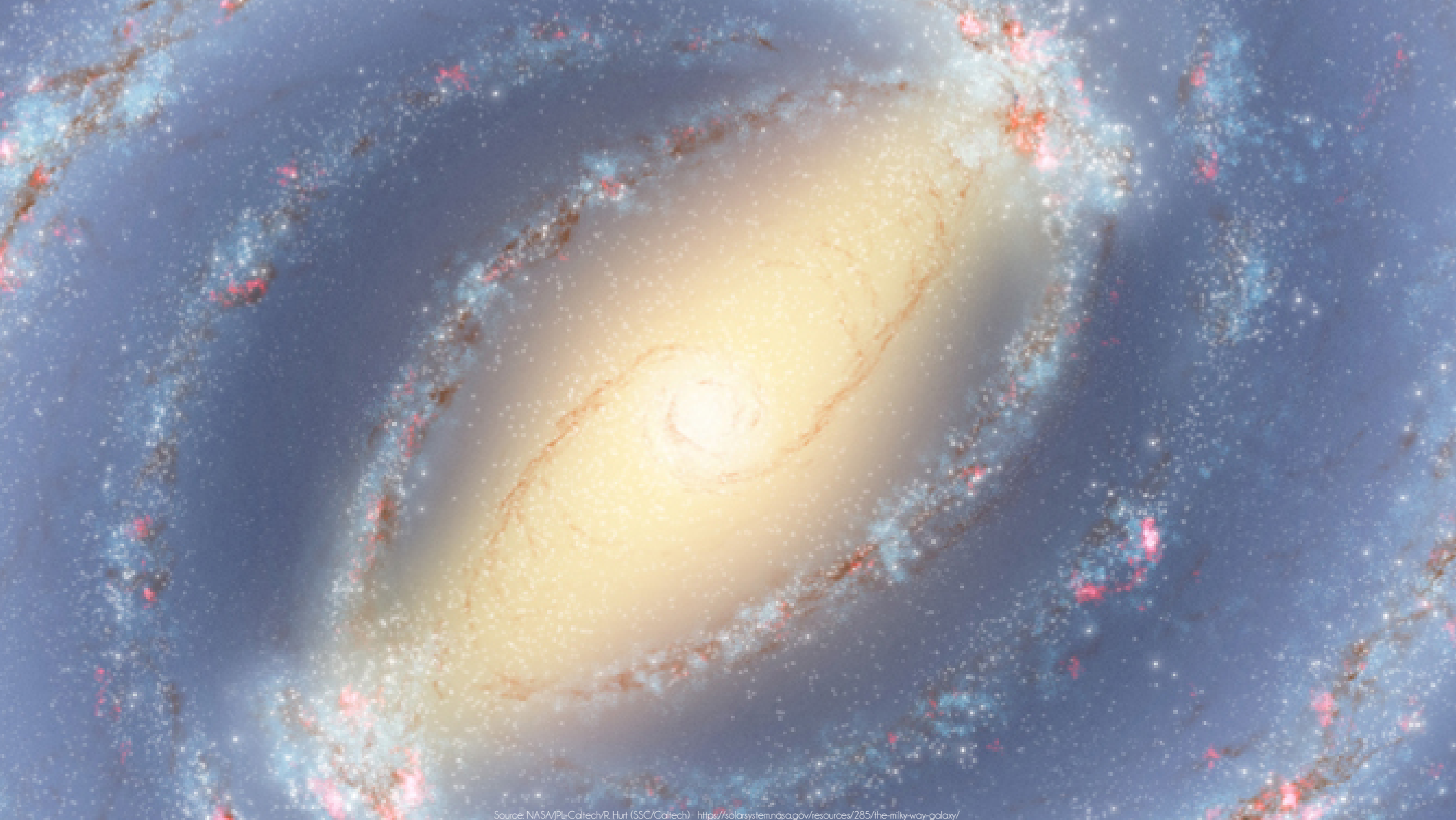


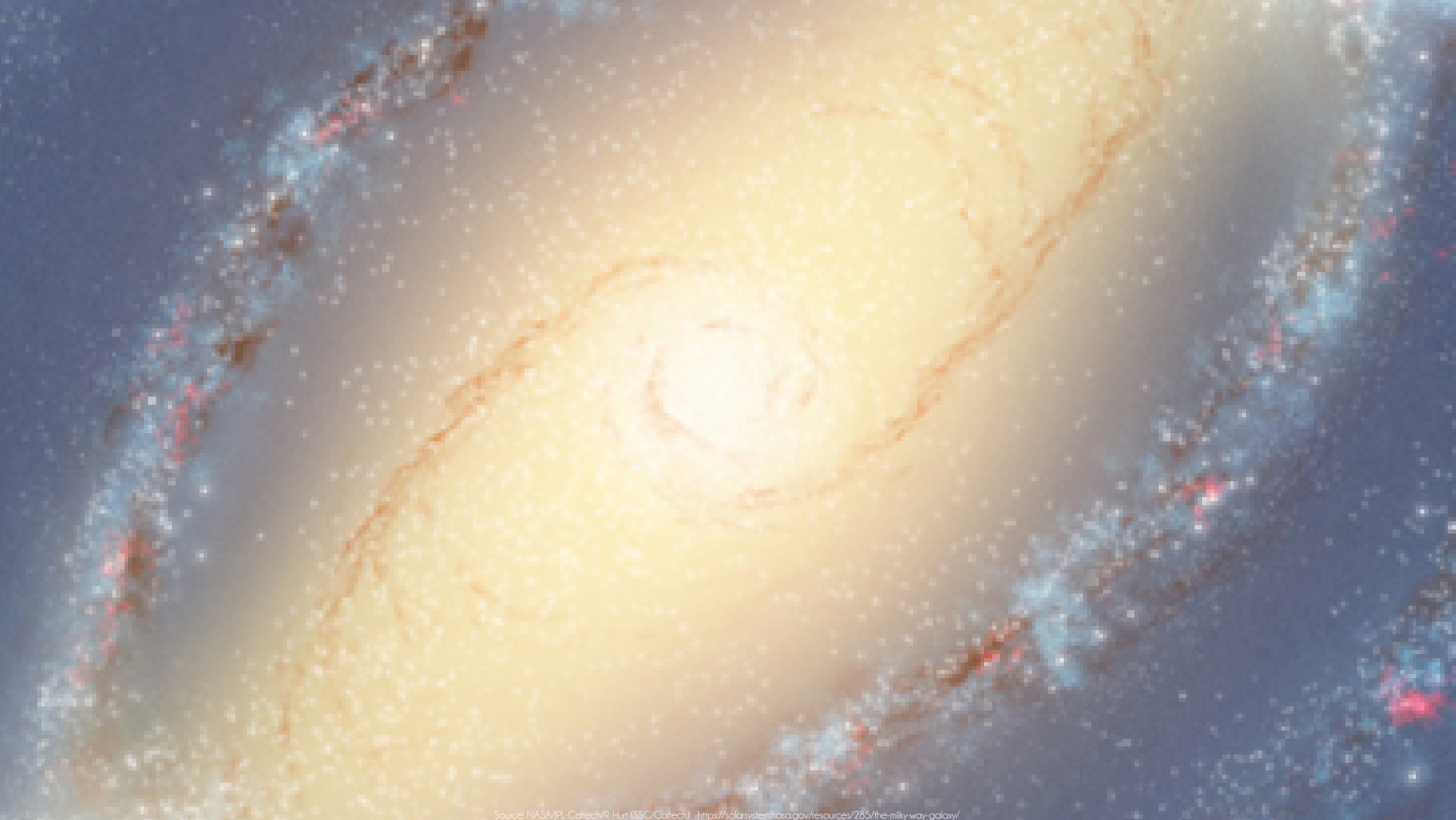














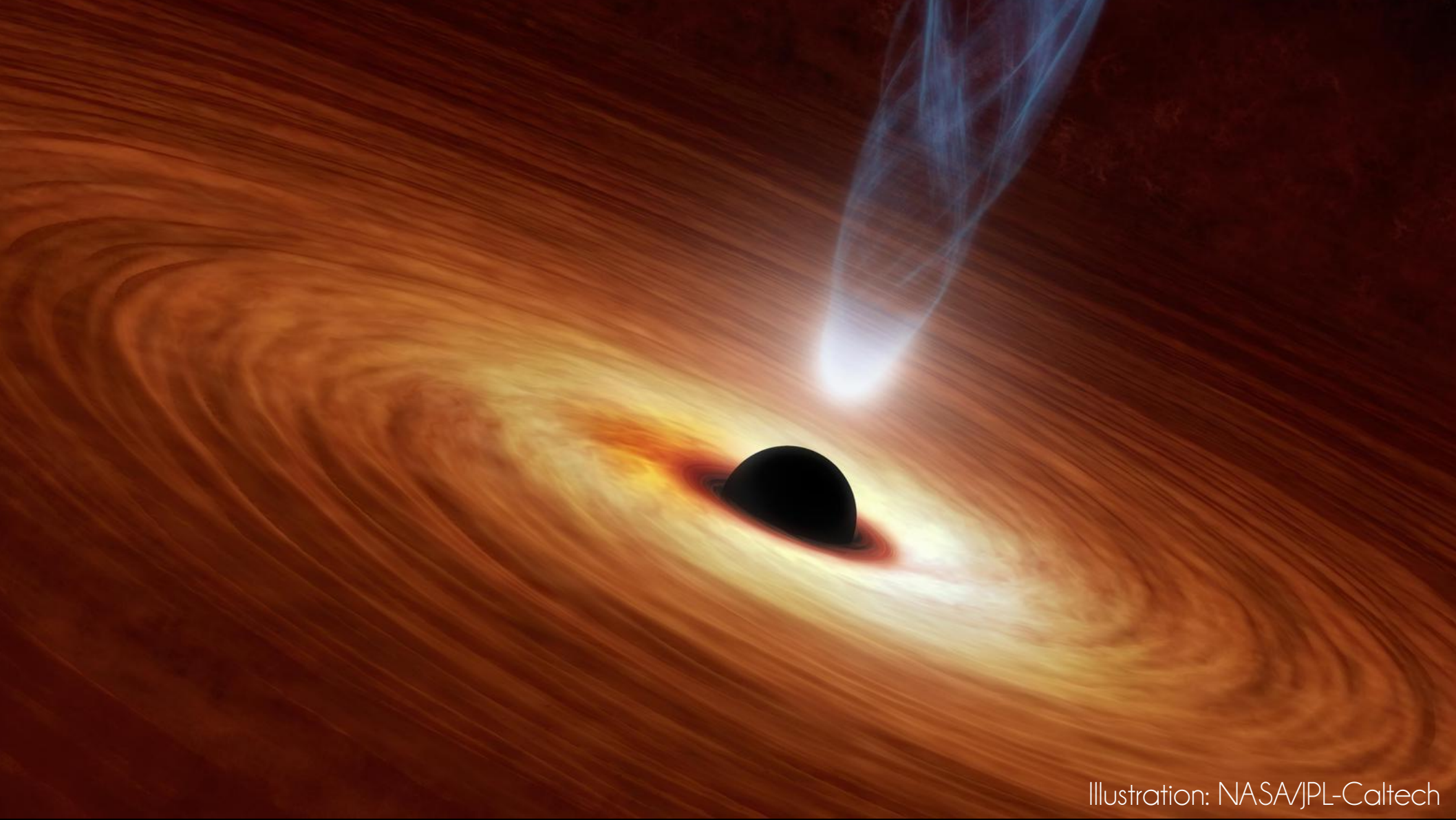
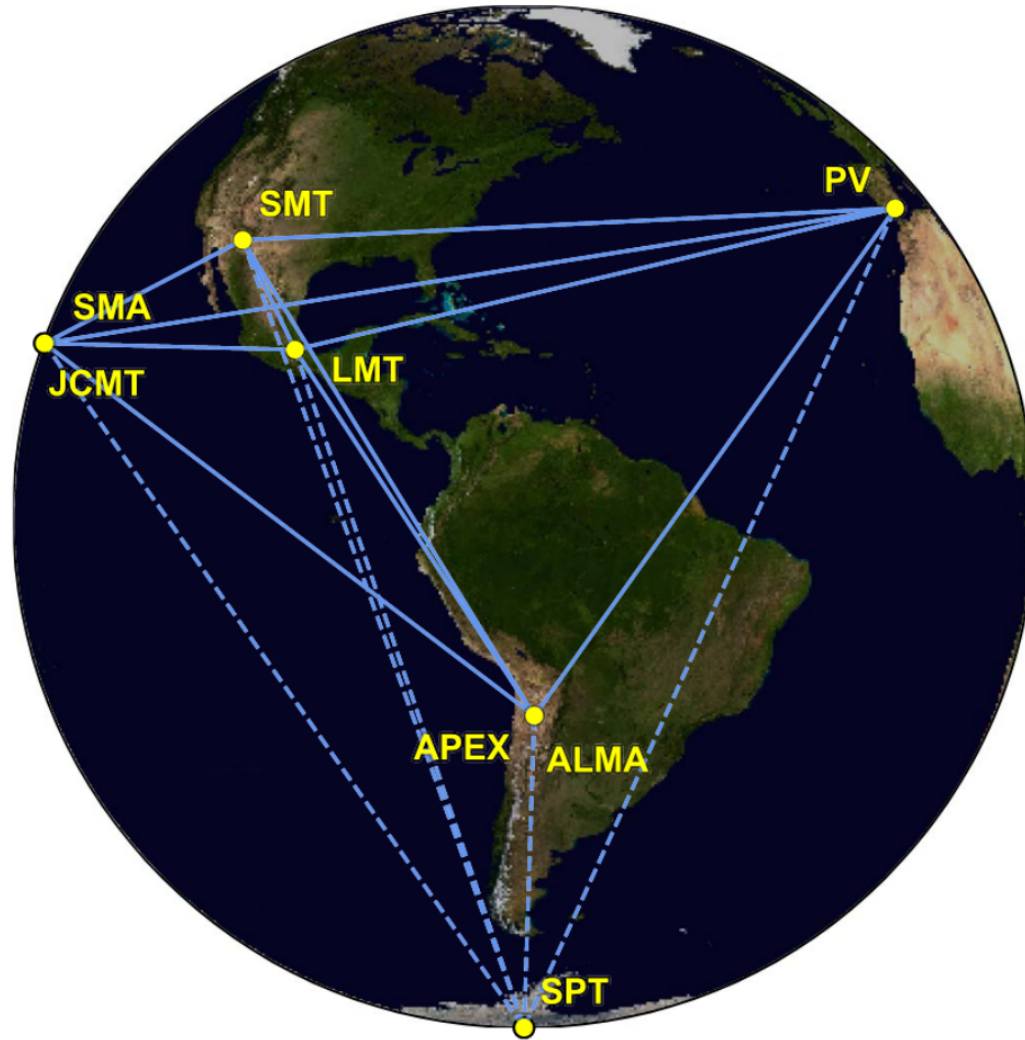
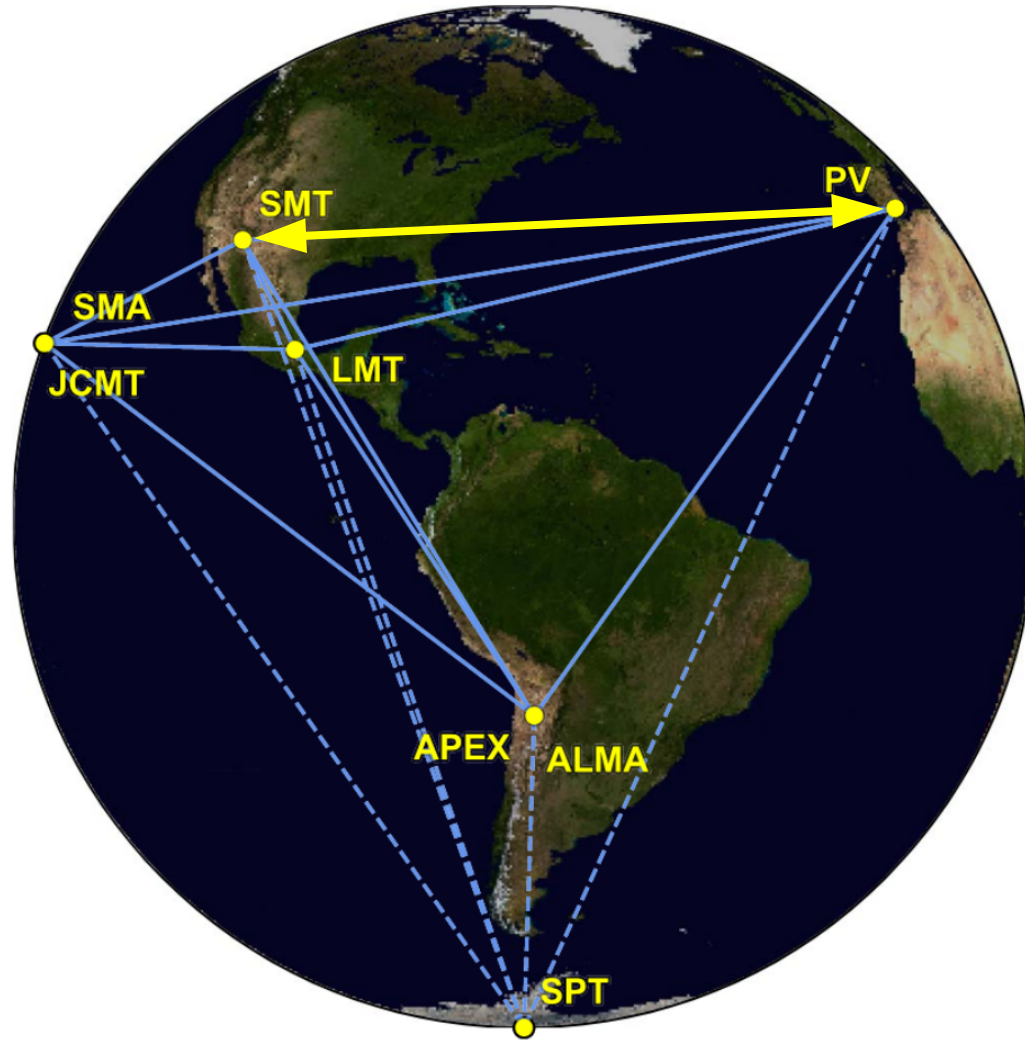


Illustration: NASA/JPL-Caltech

# Event Horizon Telescope

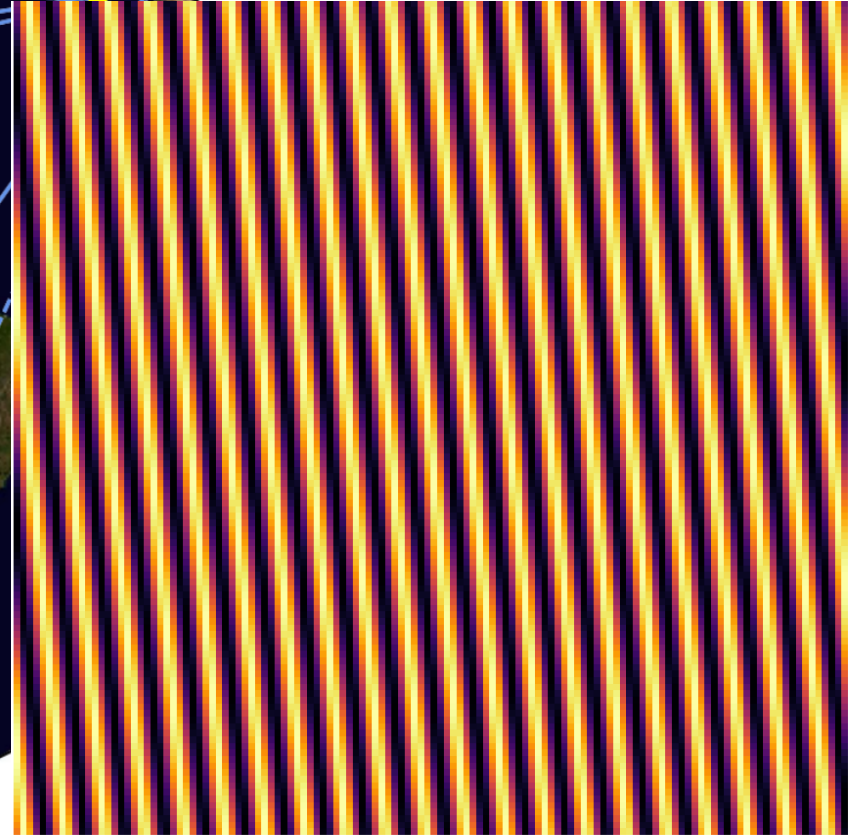
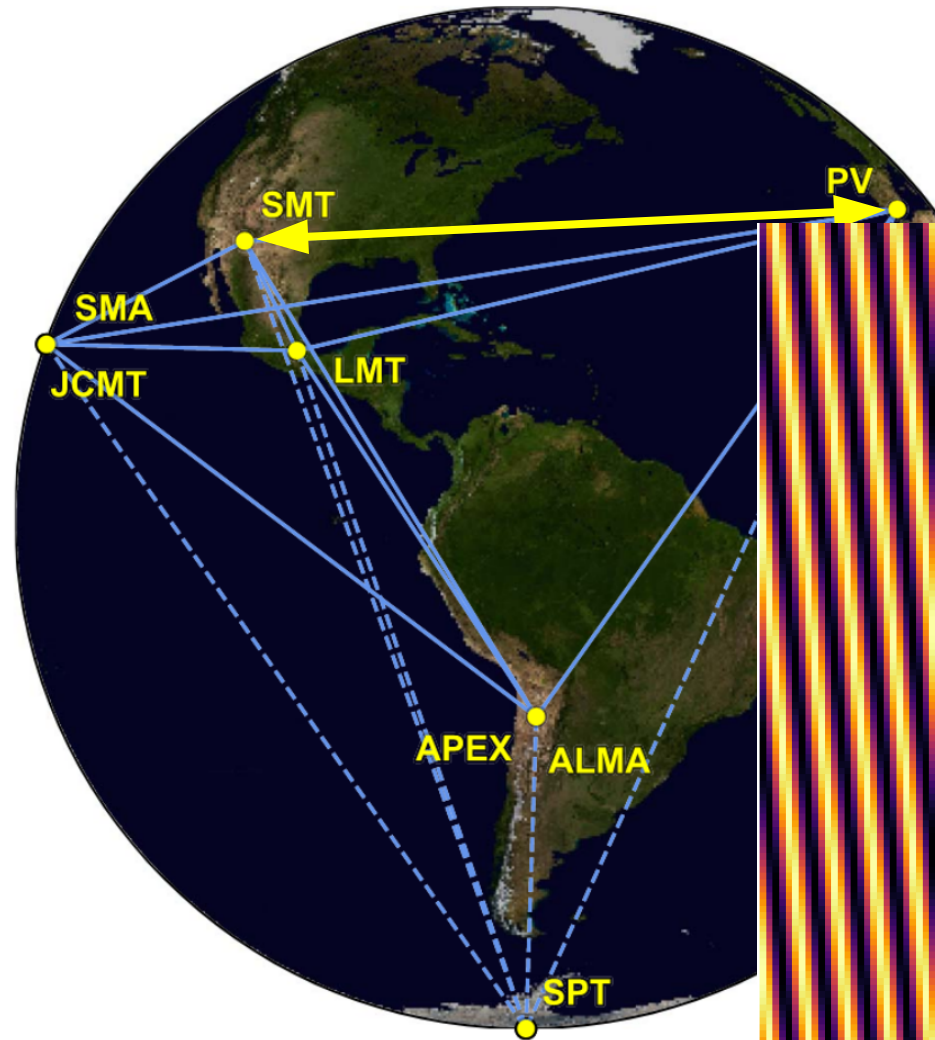


# Event Horizon Telescope

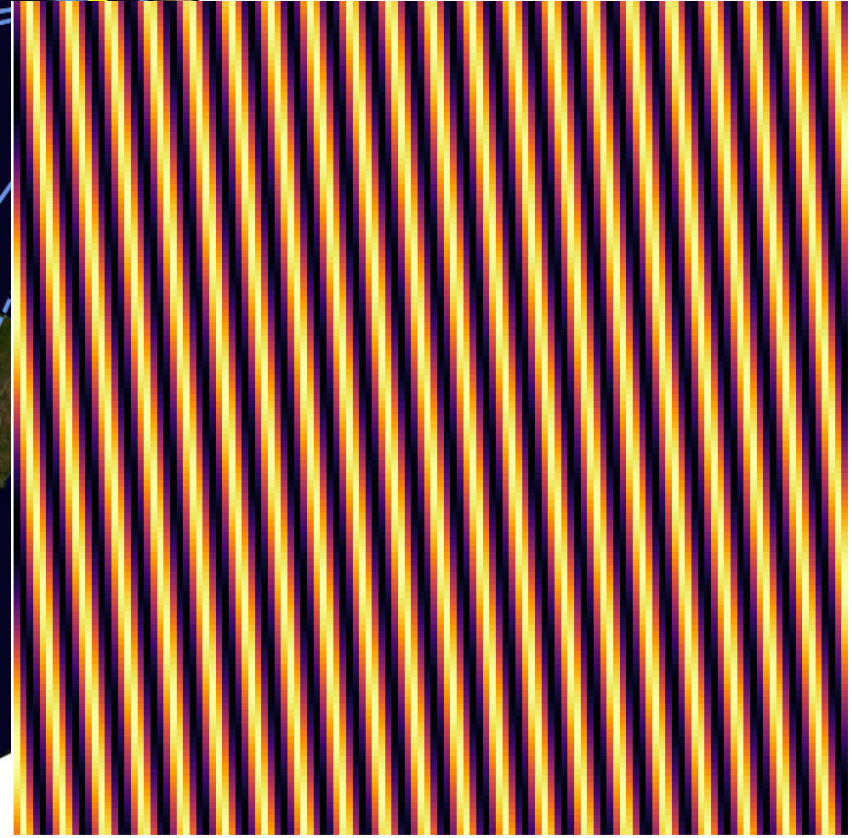
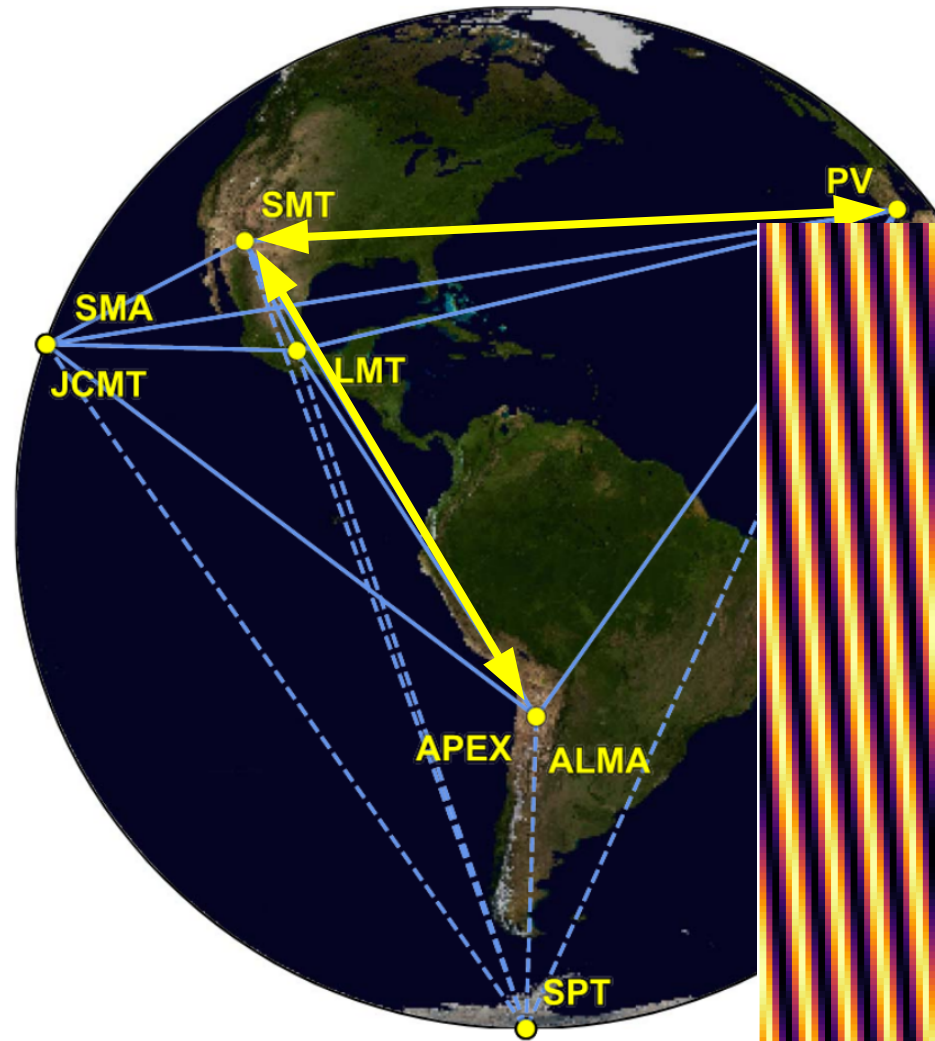




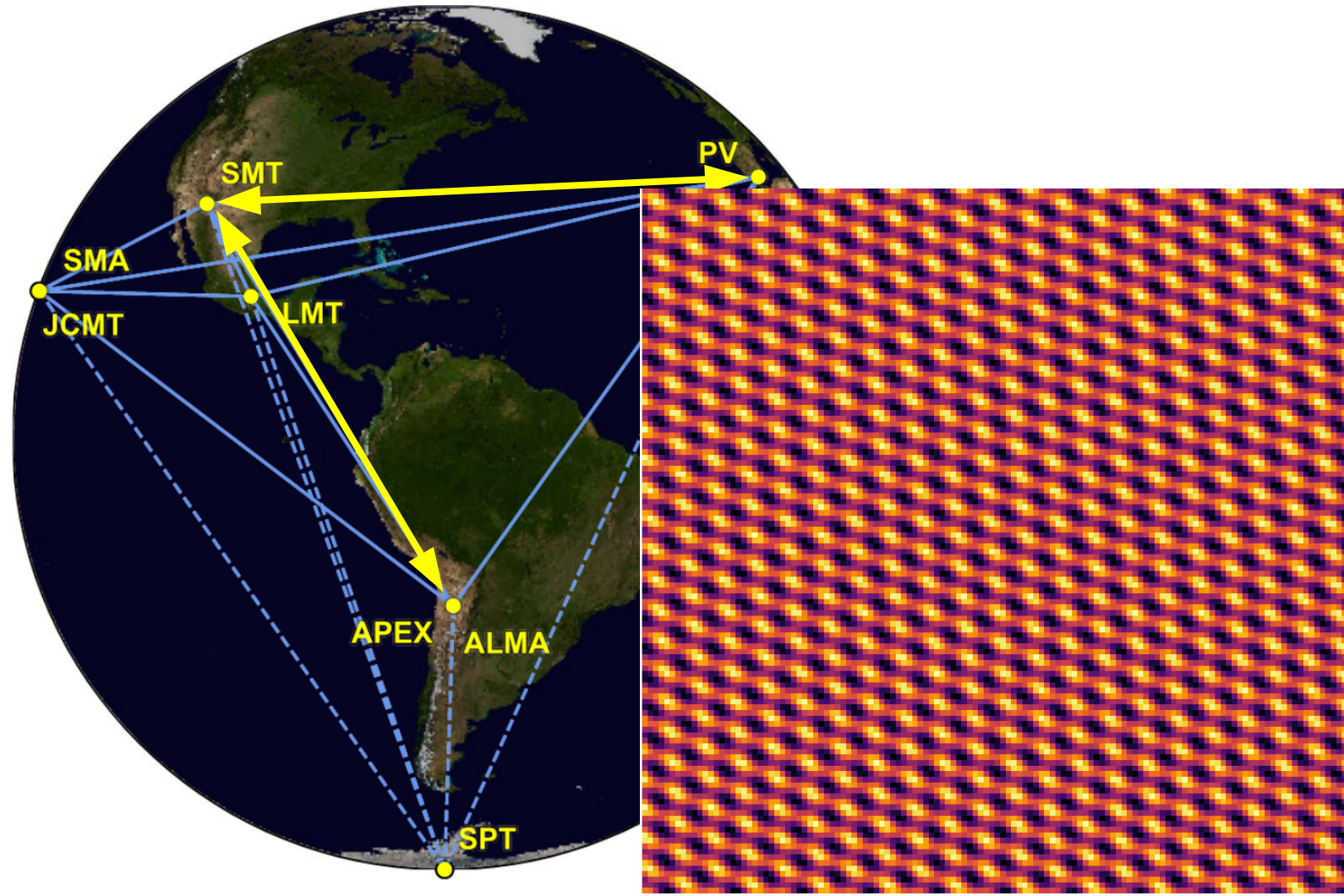
# Event Horizon Telescope



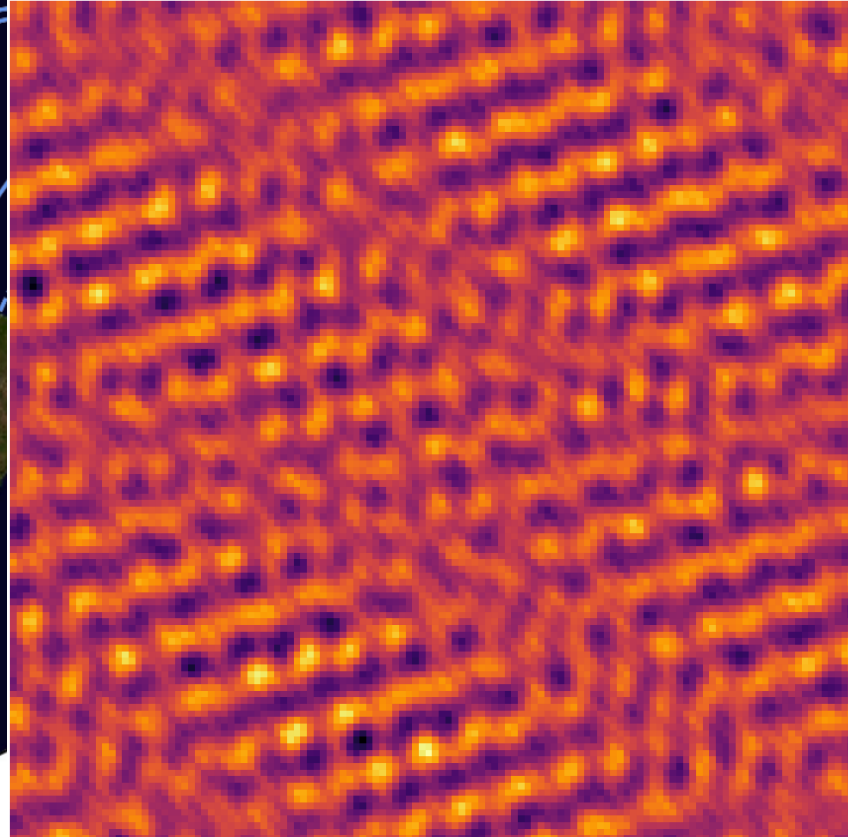
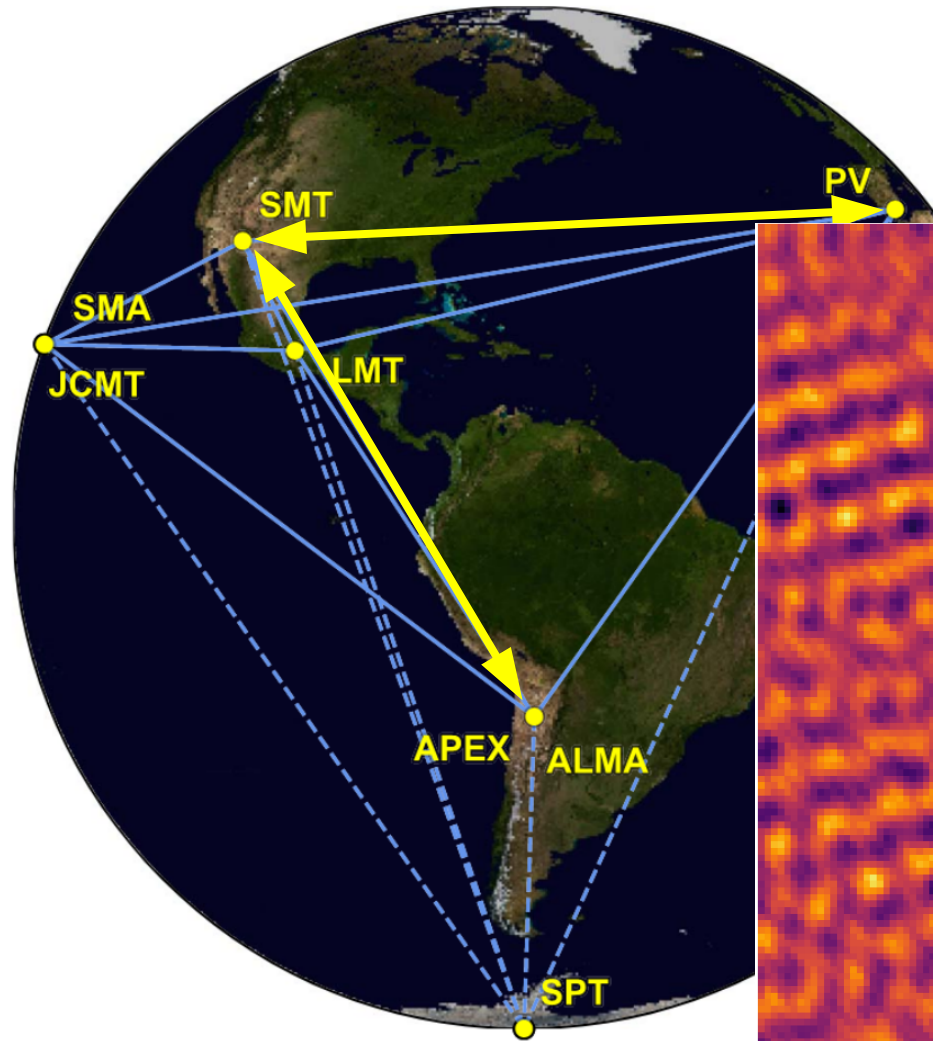
# Event Horizon Telescope



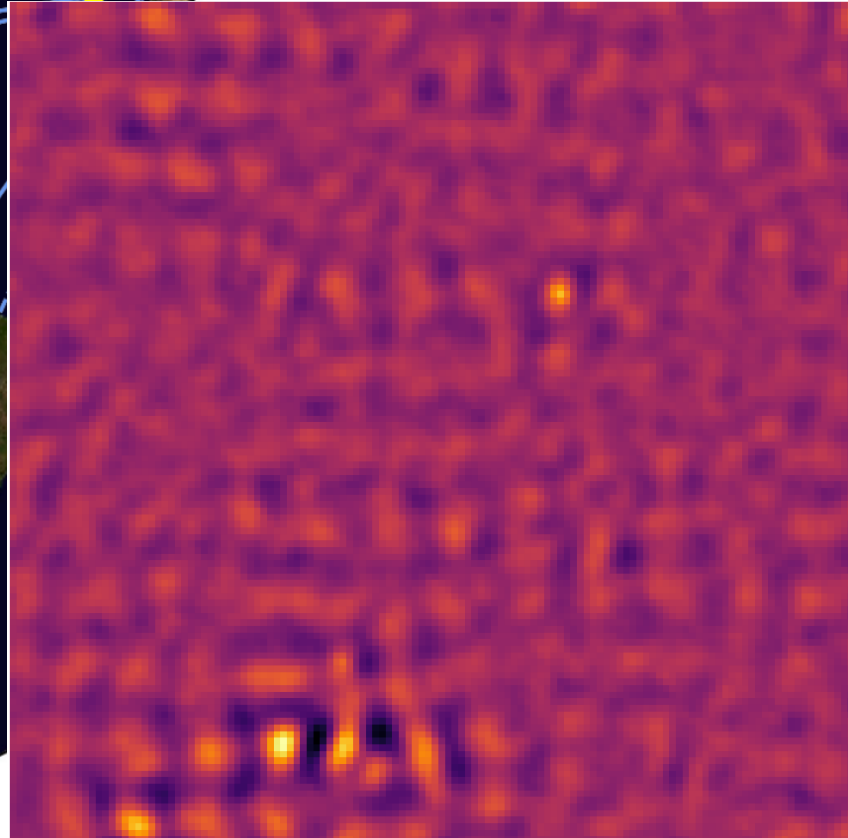
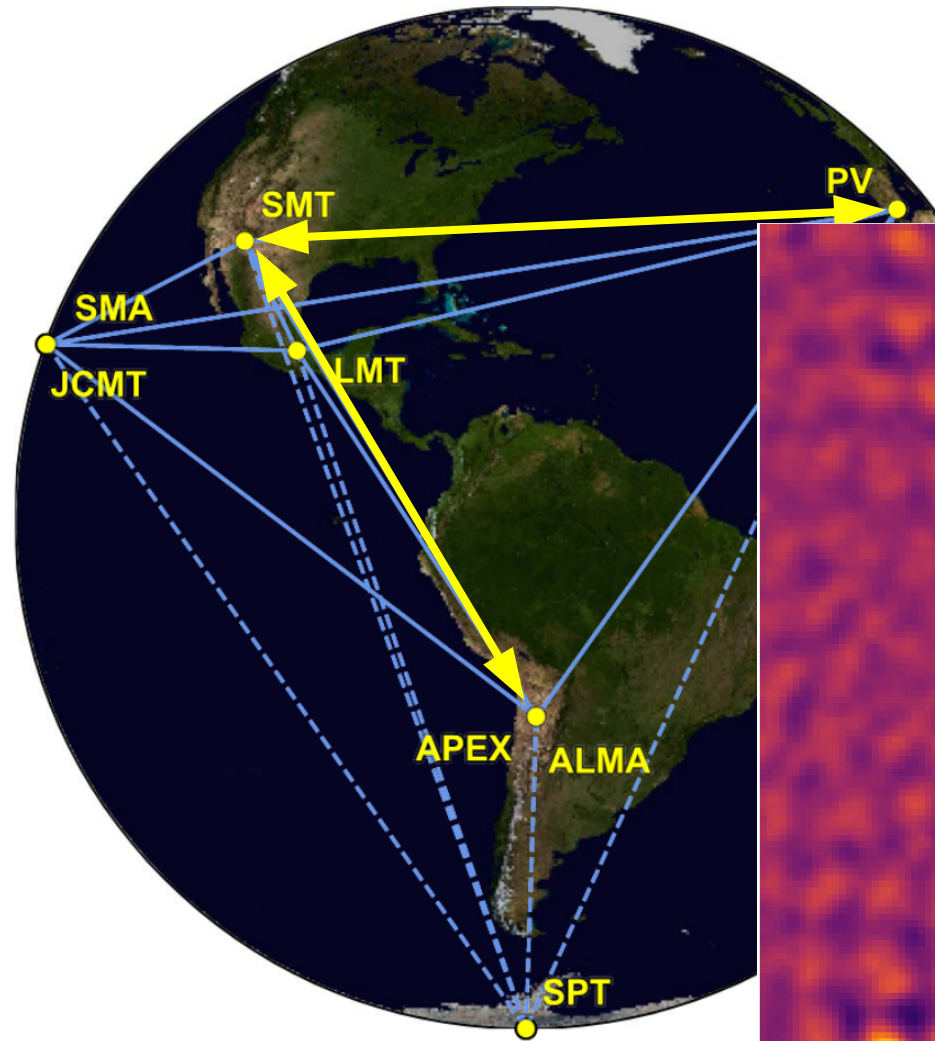
# Event Horizon Telescope

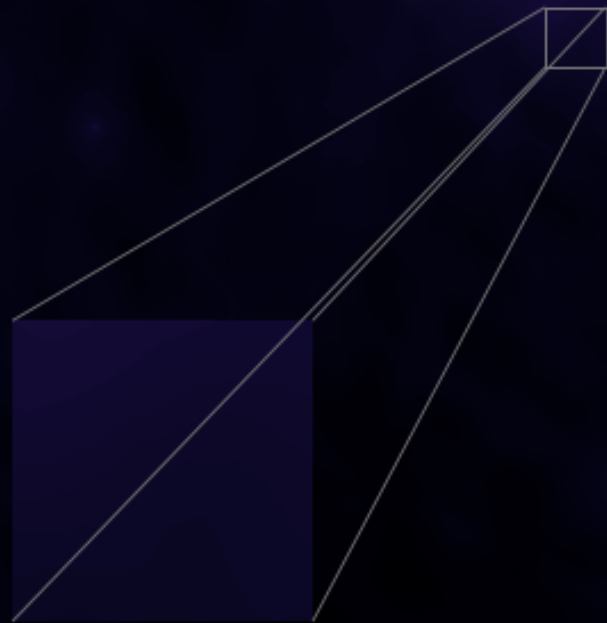
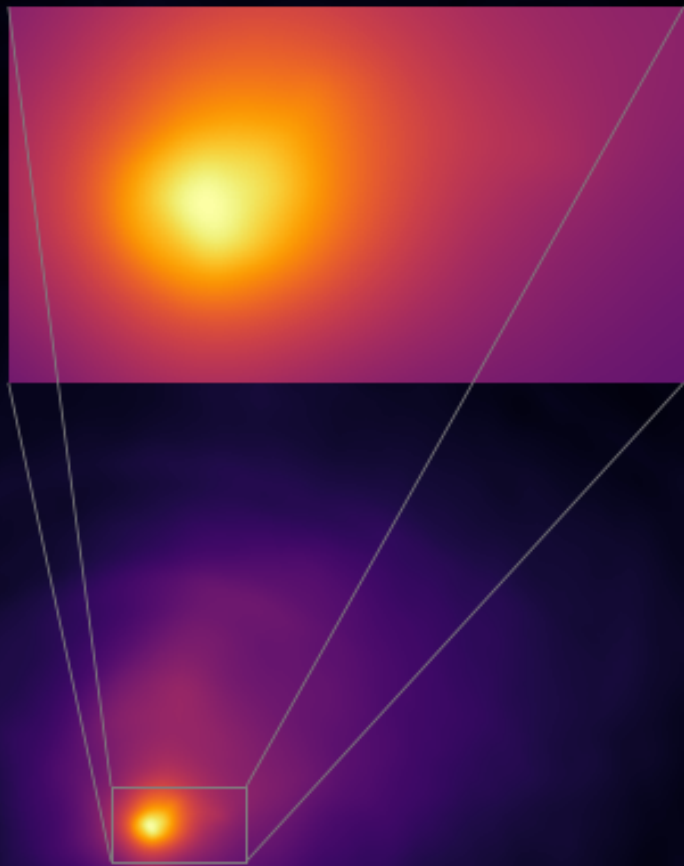


# Event Horizon Telescope

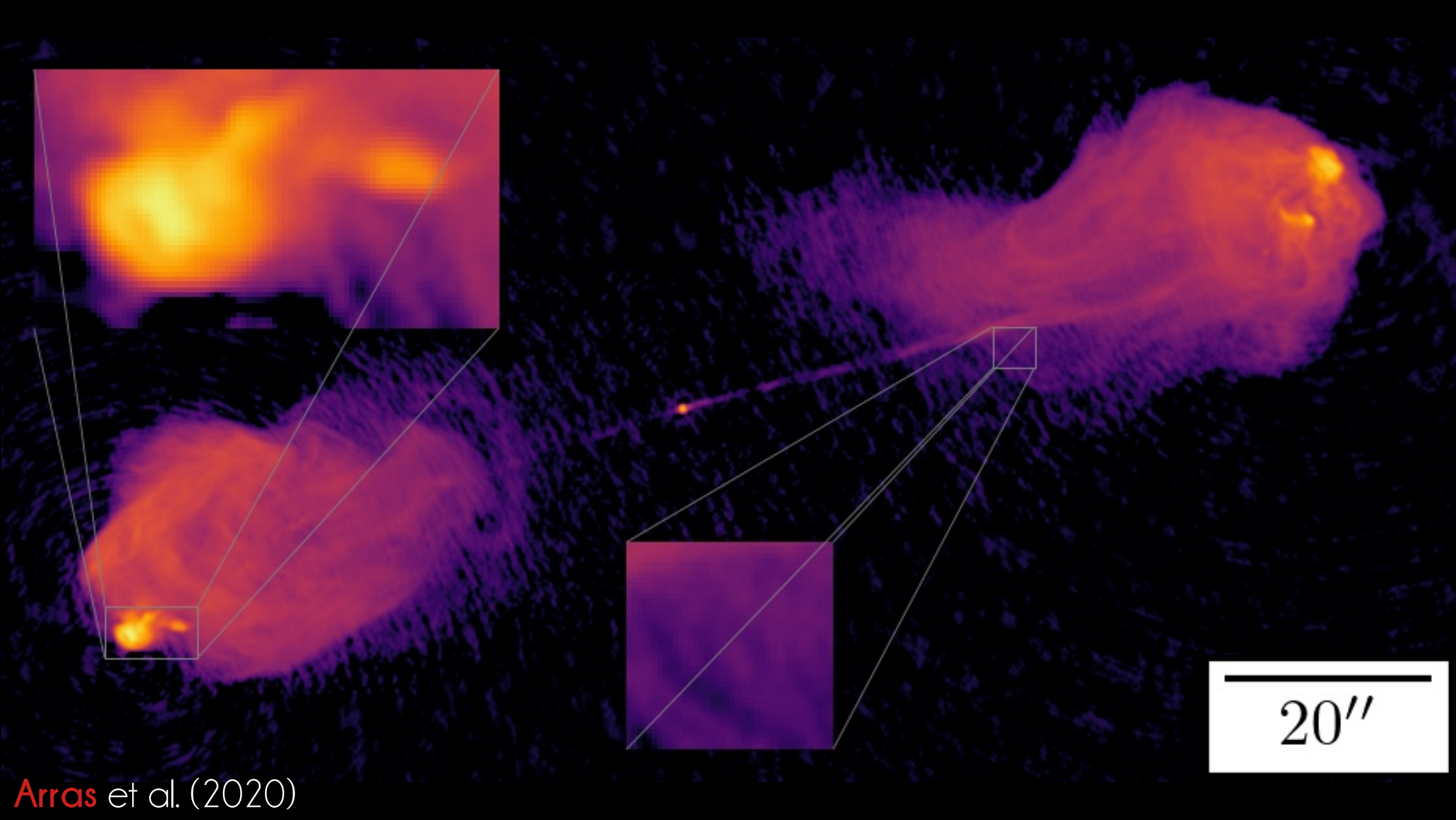


# Event Horizon Telescope

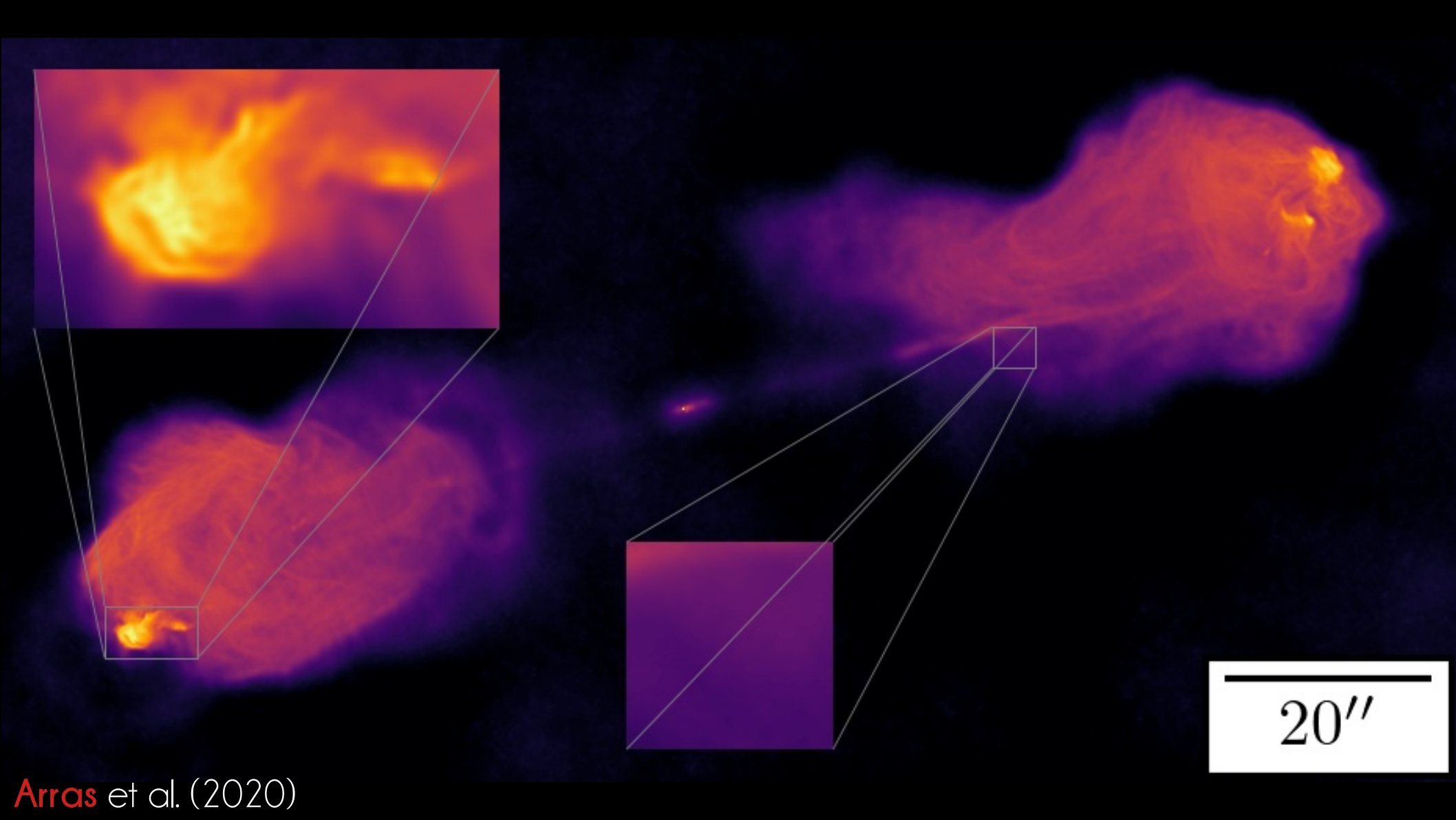




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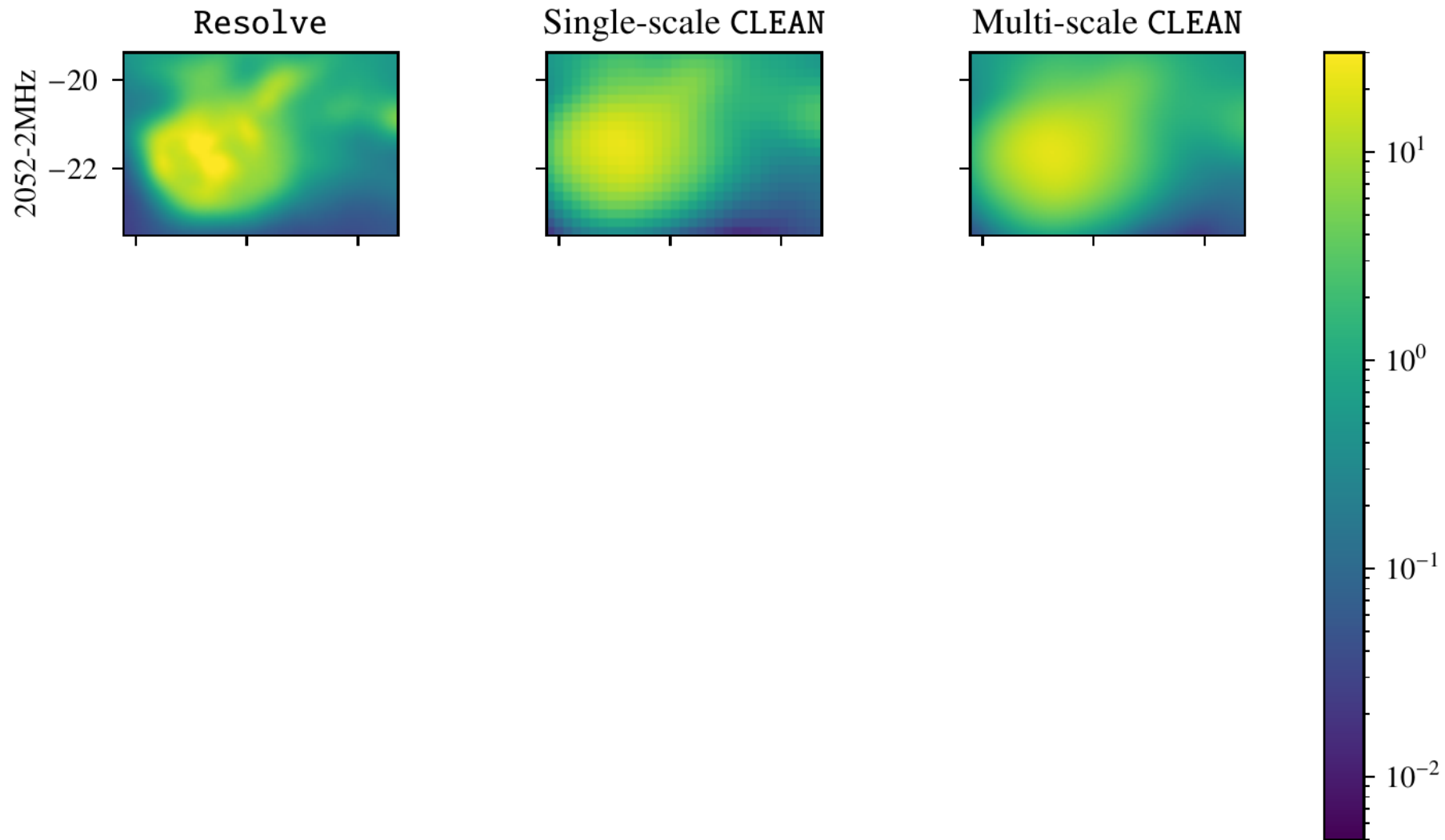


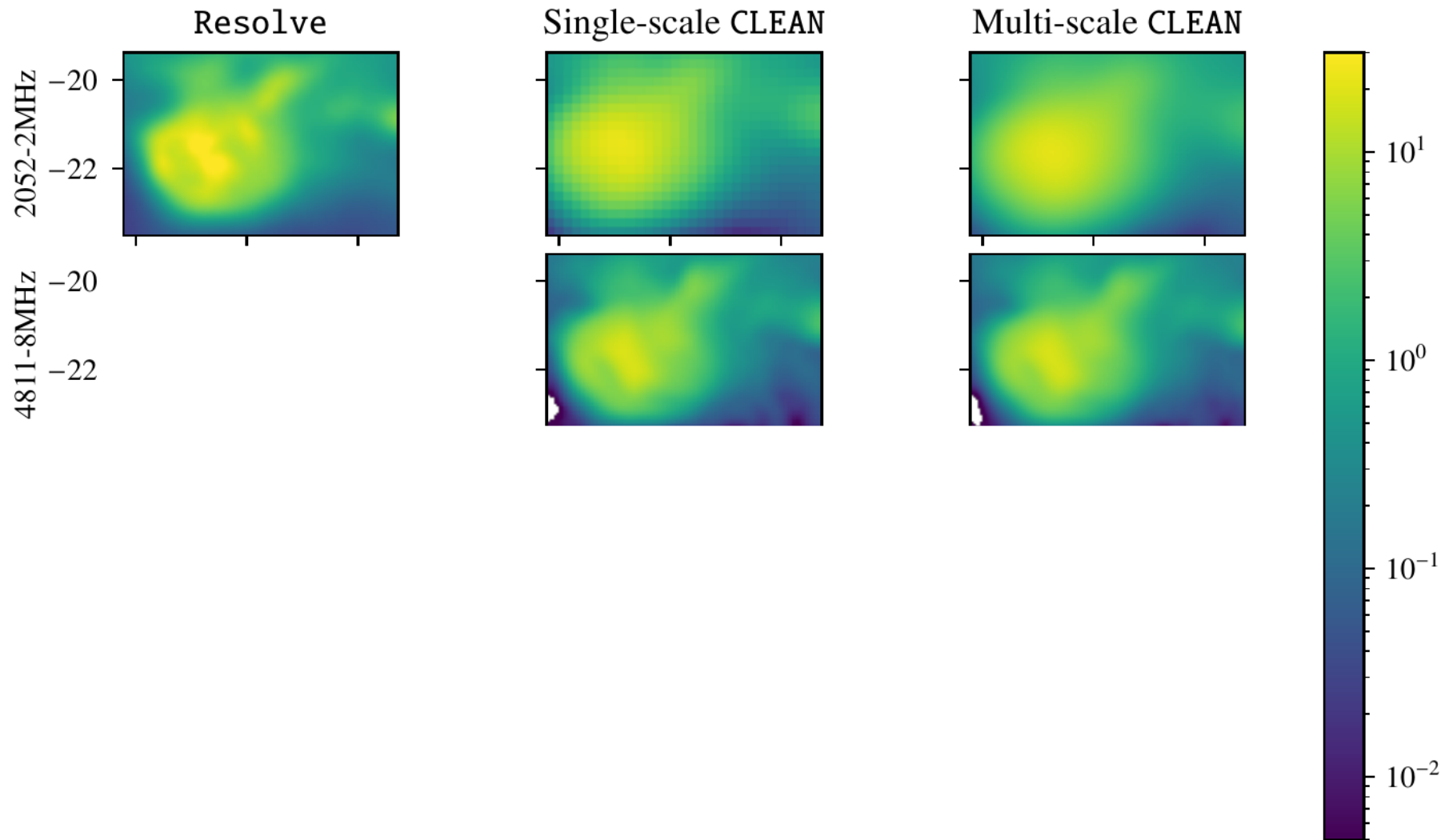
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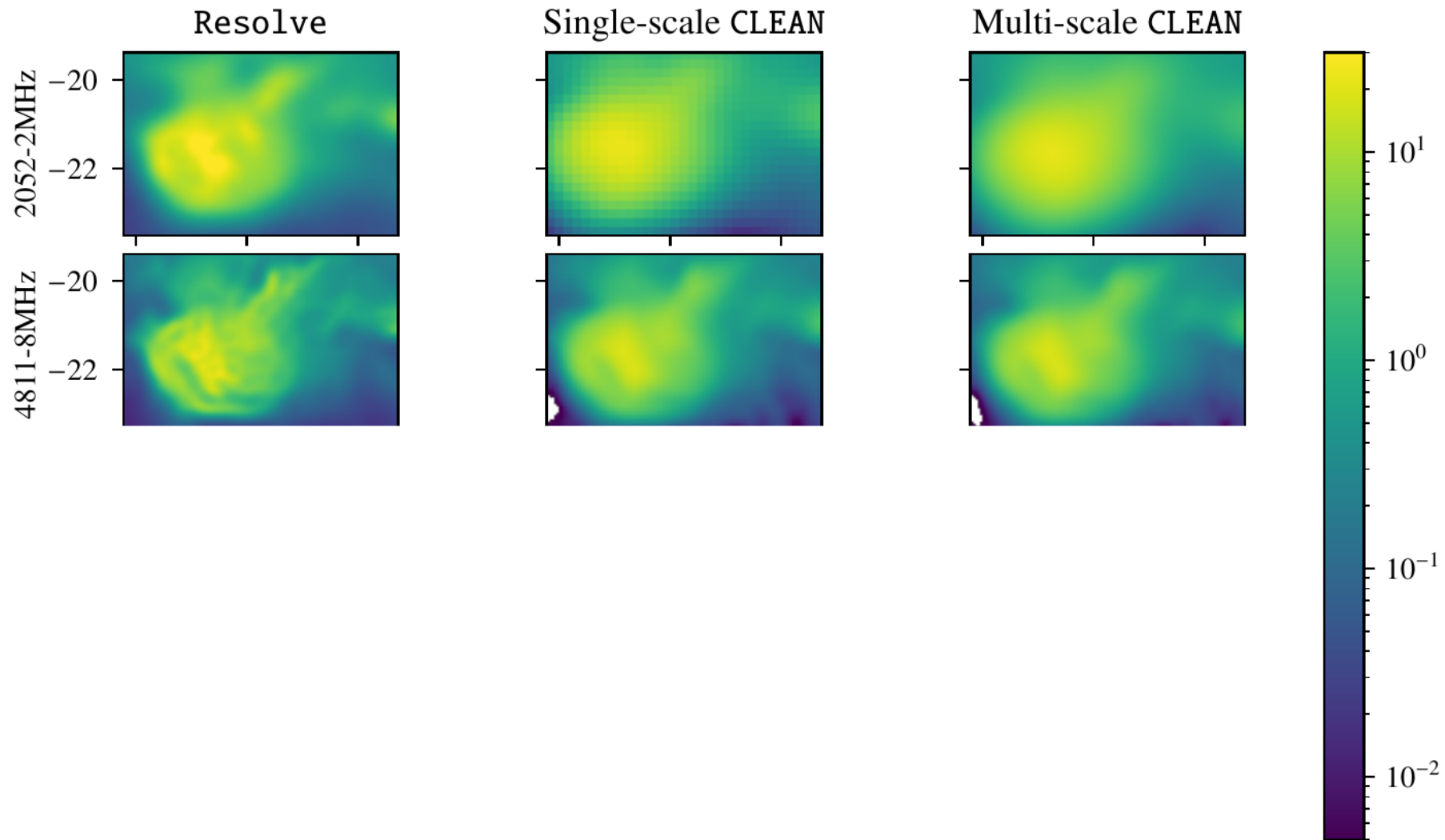


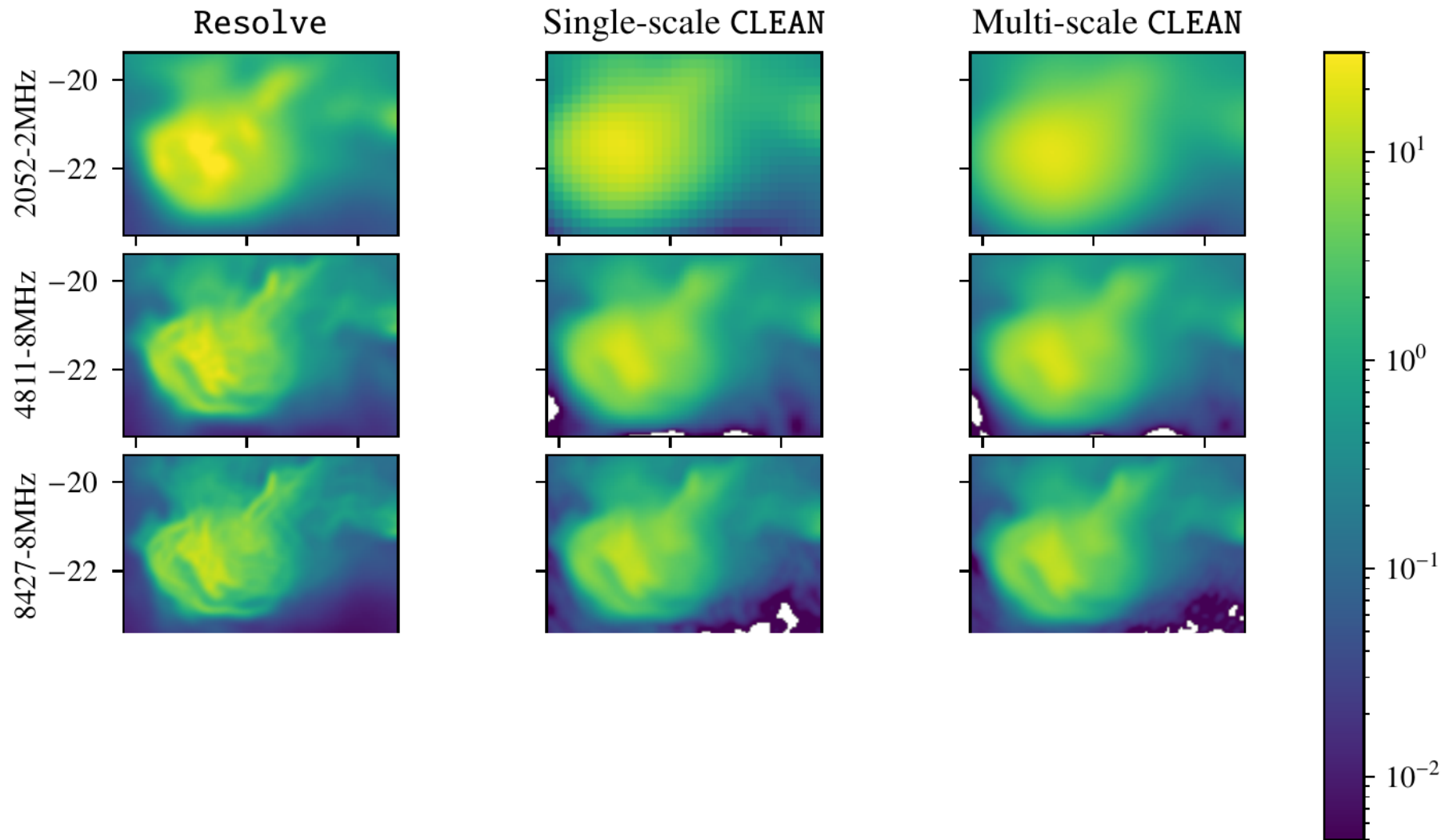
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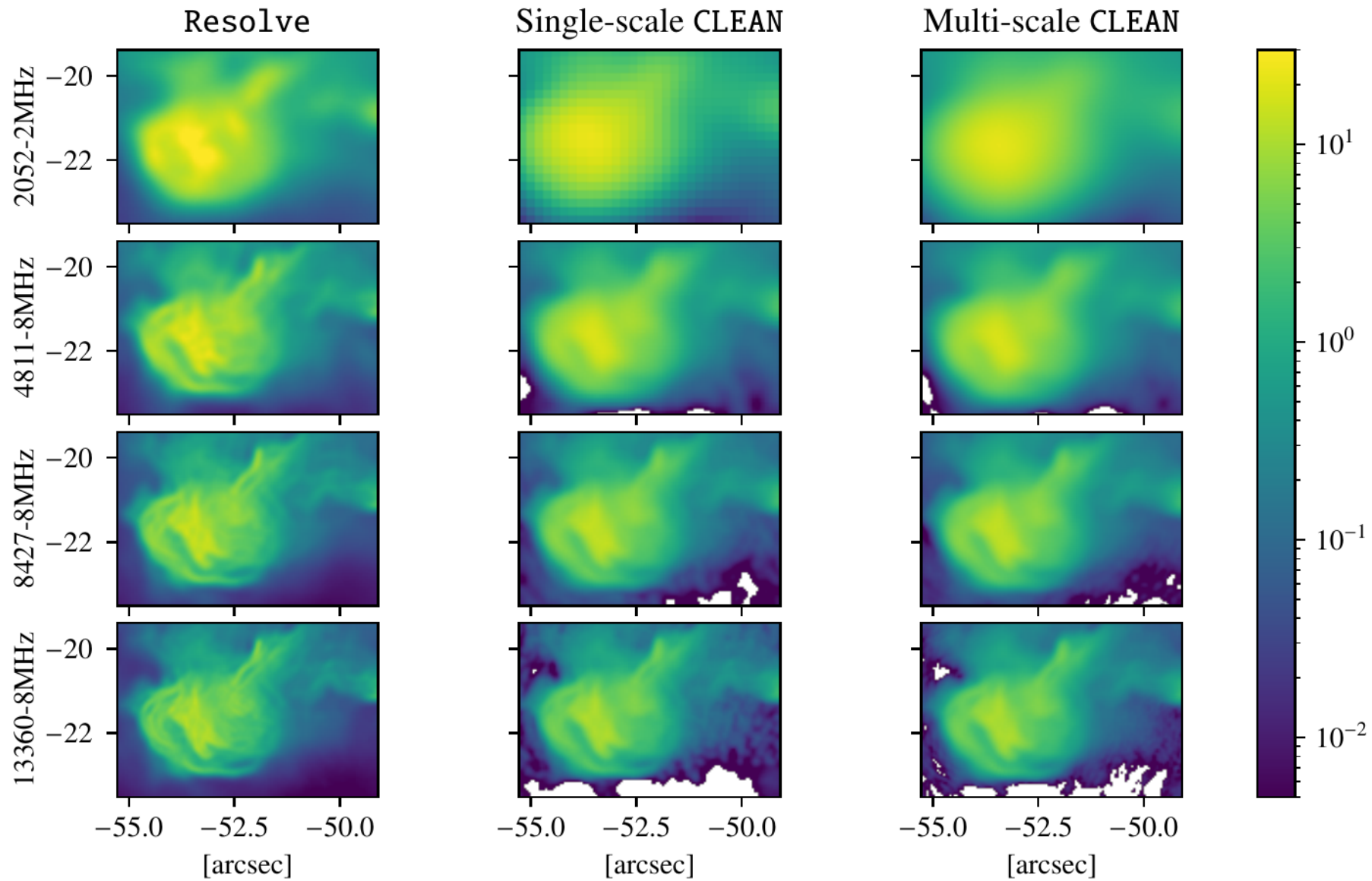


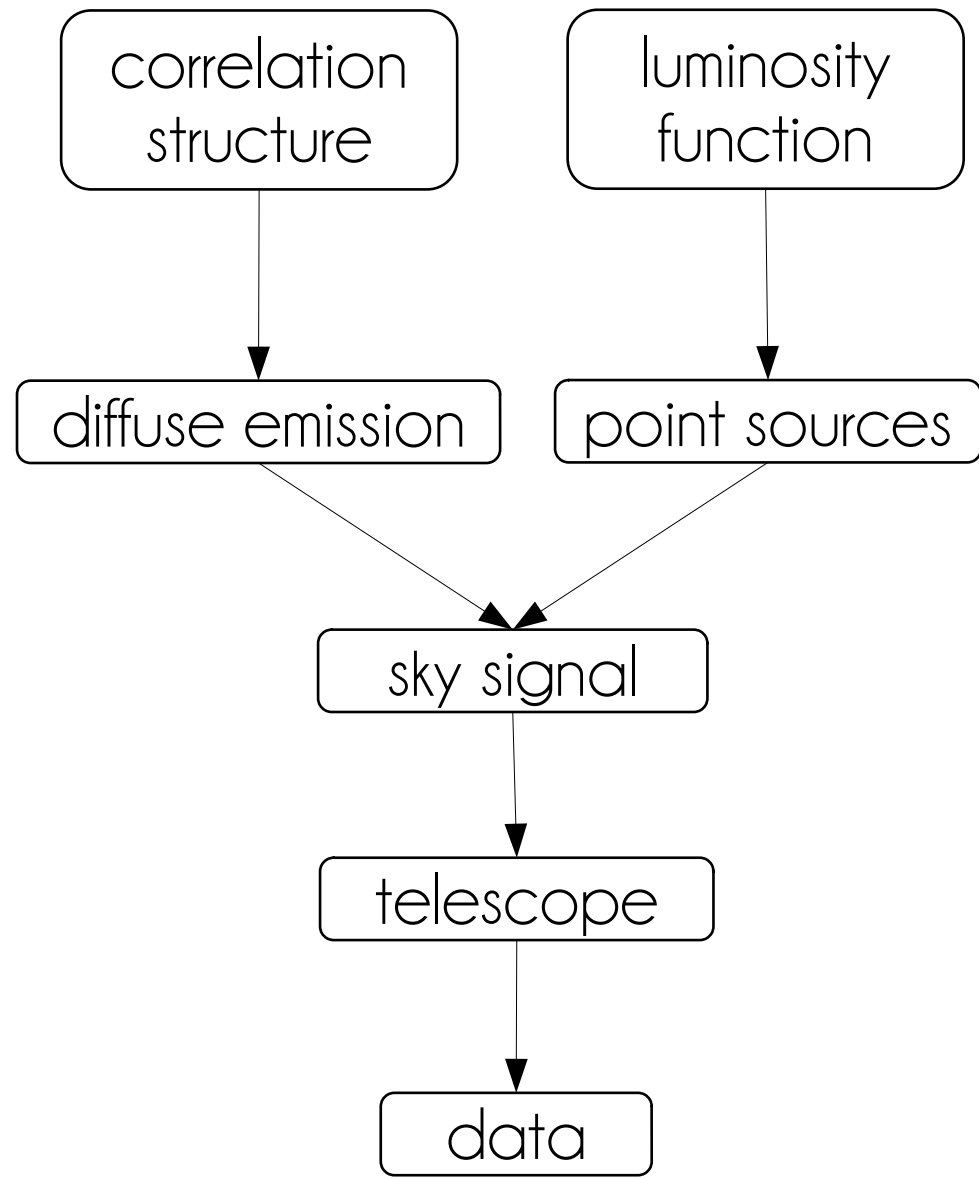


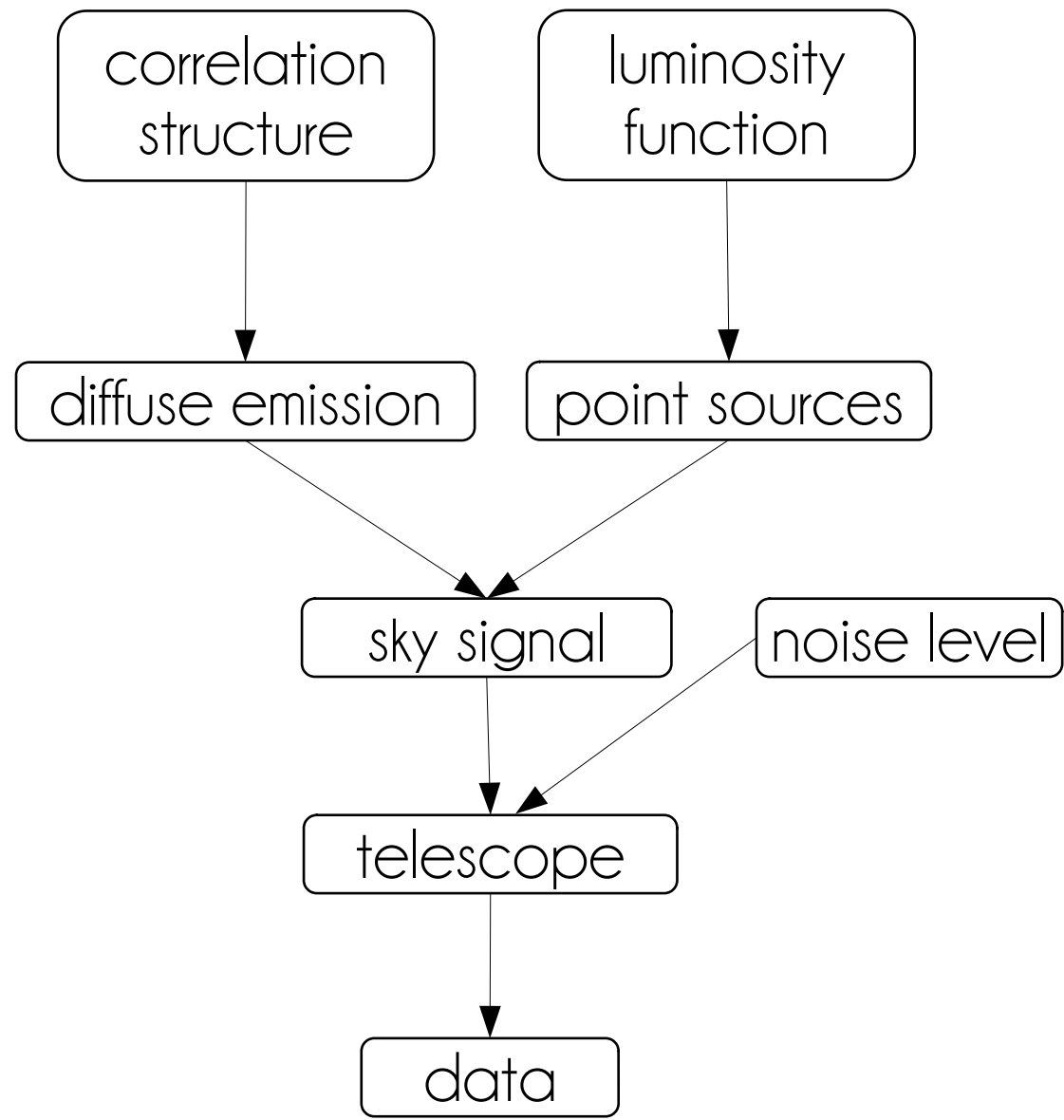


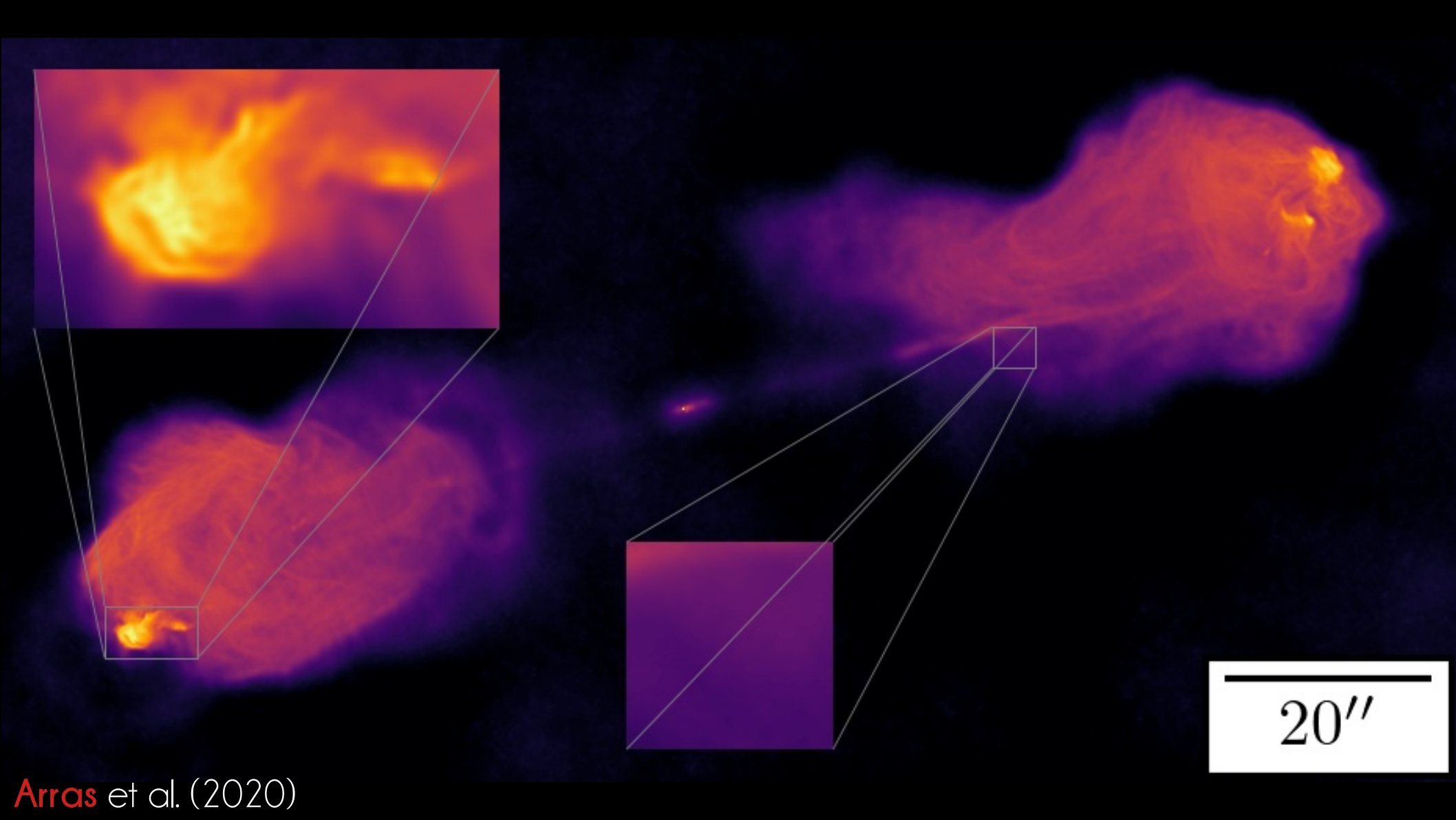




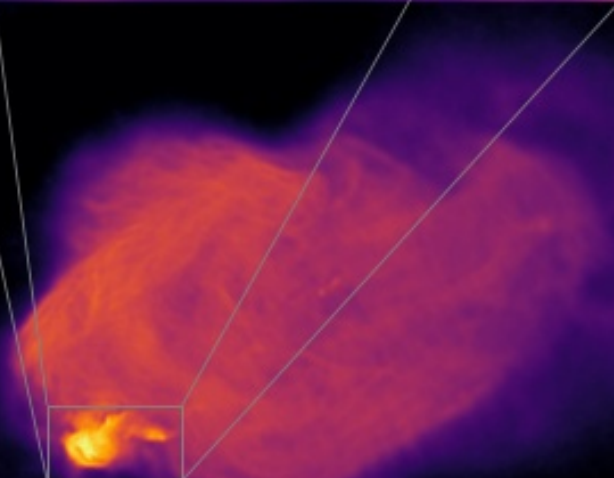
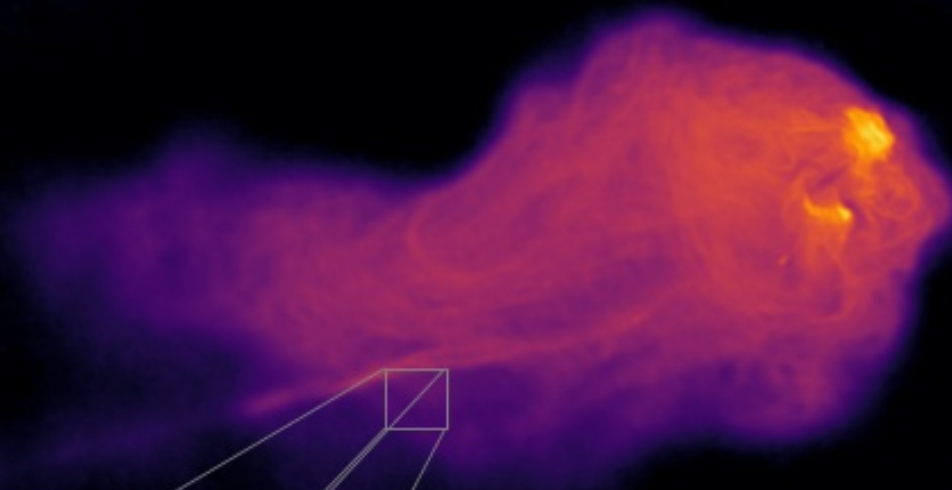
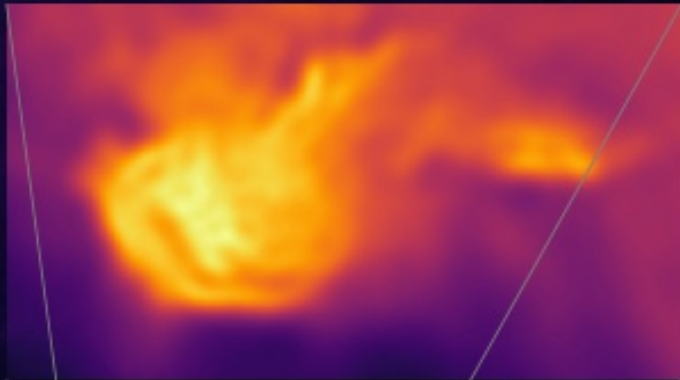












20''

M87\*



Event Horizon  
Telescope  
Collaboration  
(2019)

M87\*



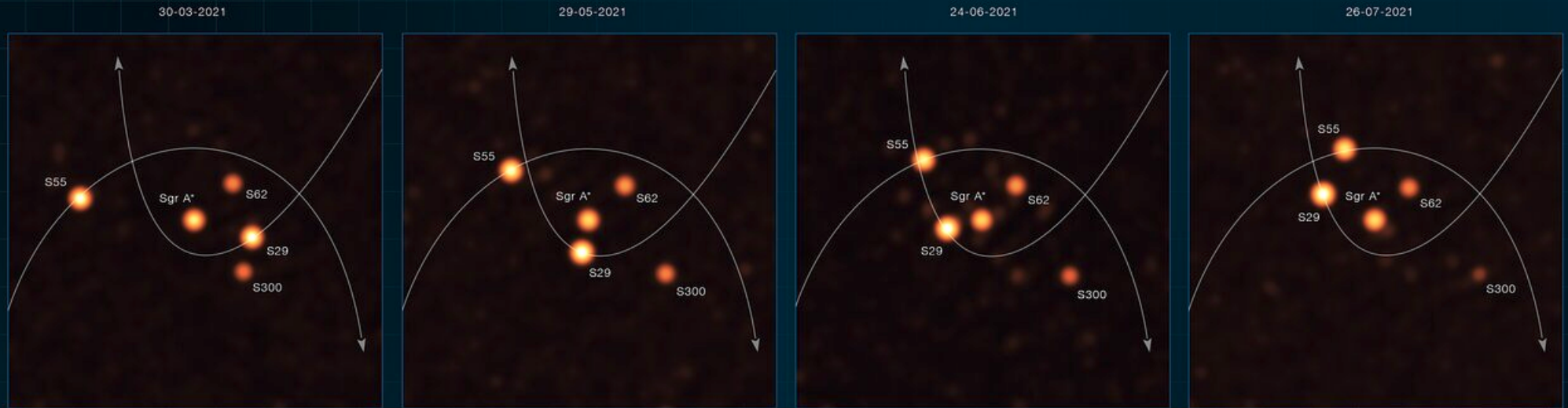
Arras, Frank, Haim,  
Knollmüller, Leike,  
Reinecke, Enßlin  
(2020)

# Watch stars move around the Milky Way's supermassive black hole in deepest images yet

14 December 2021

# Watch stars move around the Milky Way's supermassive black hole in deepest images yet

14 December 2021

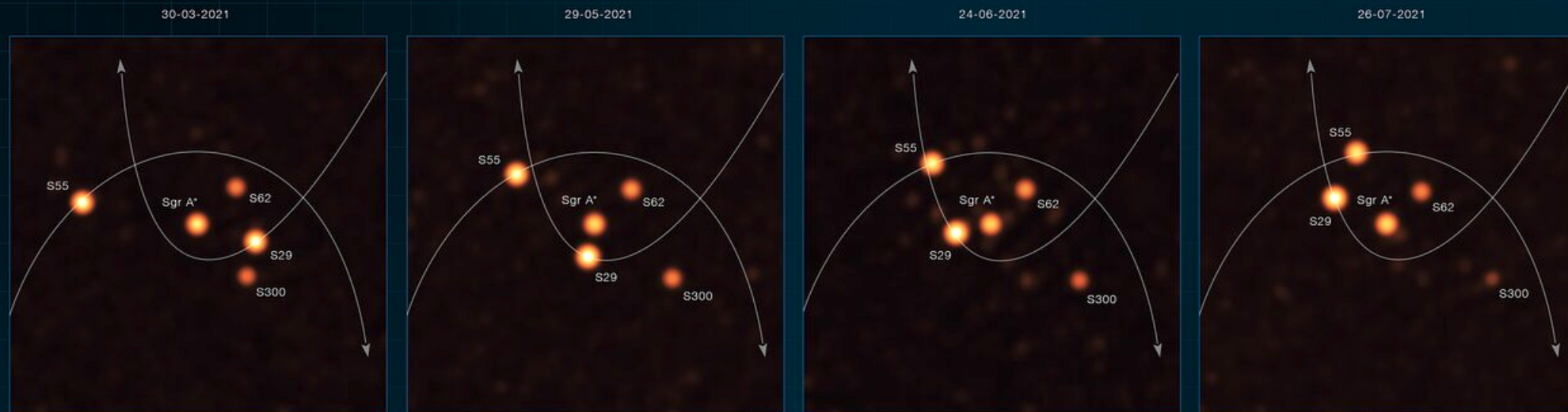


Neptune's orbit



# Watch stars move around the Milky Way's supermassive black hole in deepest images yet

14 December 2021



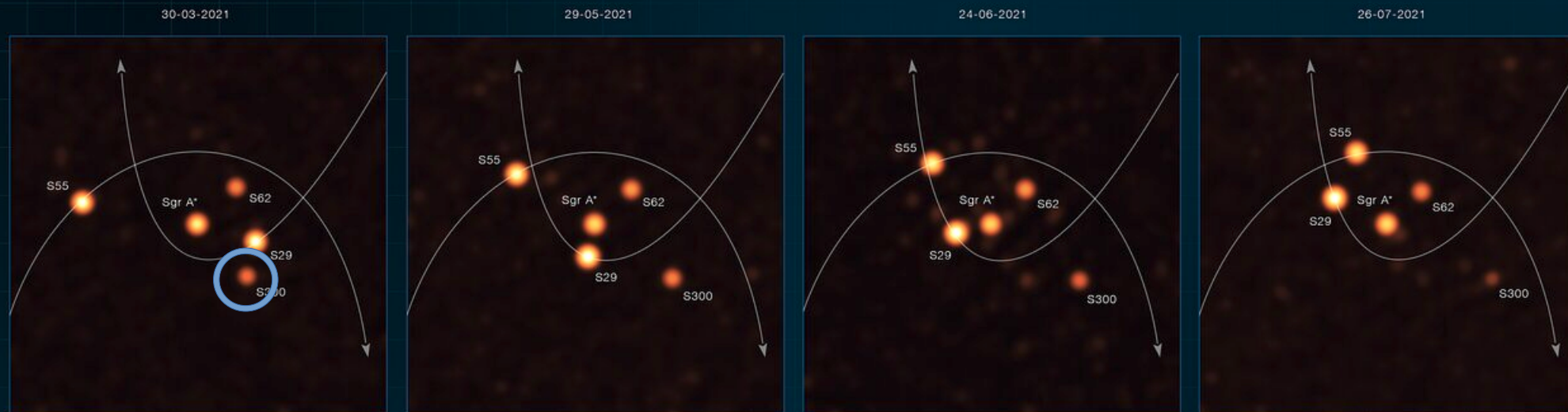
Deep images of the Galactic Center with GRAVITY

[doi:10.1051/0004-6361/202142459](https://doi.org/10.1051/0004-6361/202142459)

GRAVITY collaboration incl. Julia Stadler (2021)

# Watch stars move around the Milky Way's supermassive black hole in deepest images yet

14 December 2021



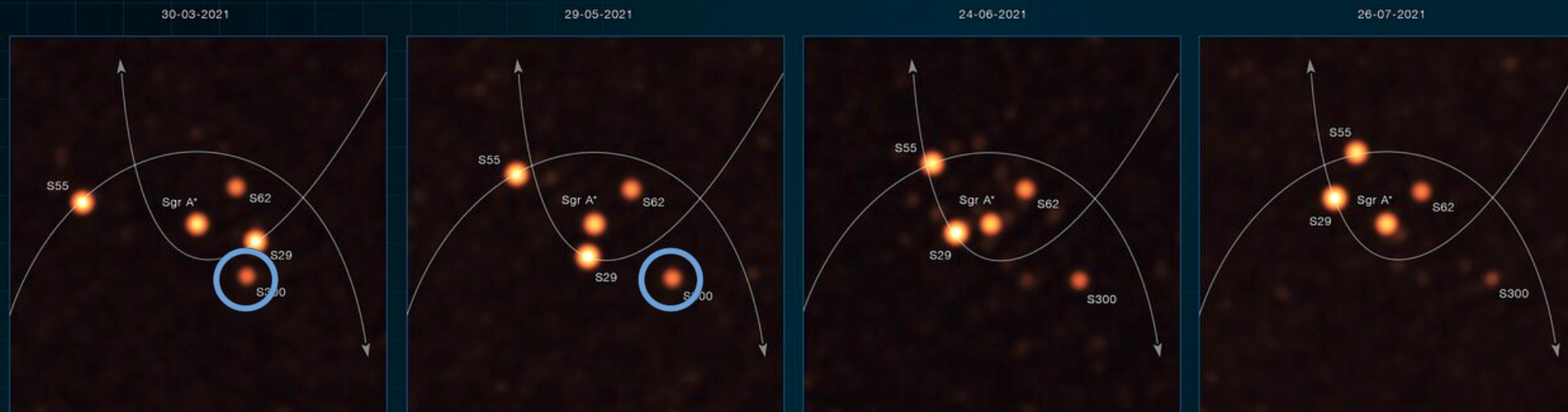
Deep images of the Galactic Center with GRAVITY

[doi:10.1051/0004-6361/202142459](https://doi.org/10.1051/0004-6361/202142459)

GRAVITY collaboration incl. Julia Stadler (2021)

# Watch stars move around the Milky Way's supermassive black hole in deepest images yet

14 December 2021



Deep images of the Galactic Center with GRAVITY

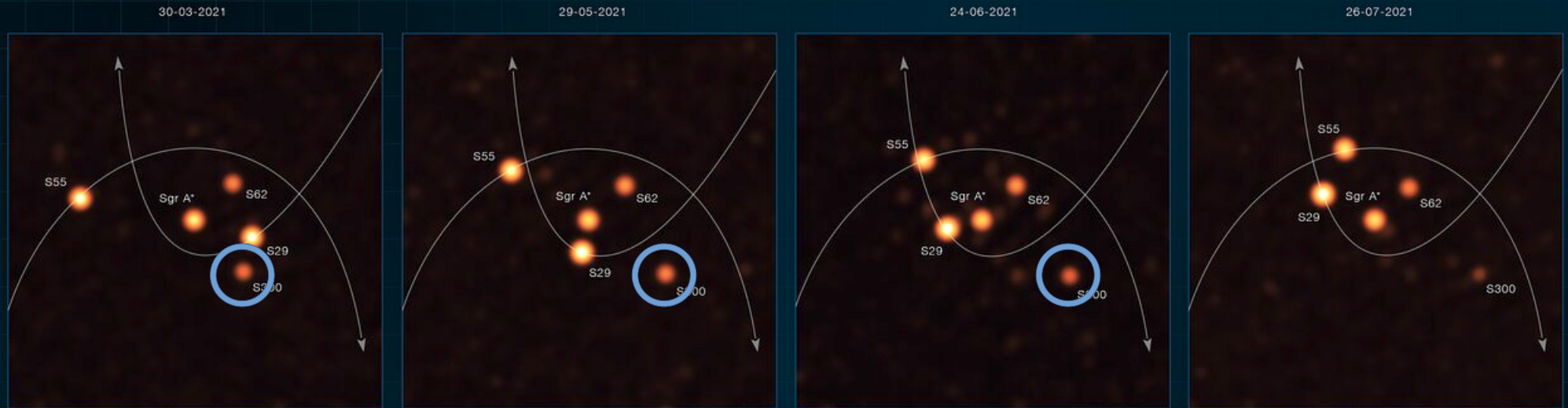
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14 December 2021



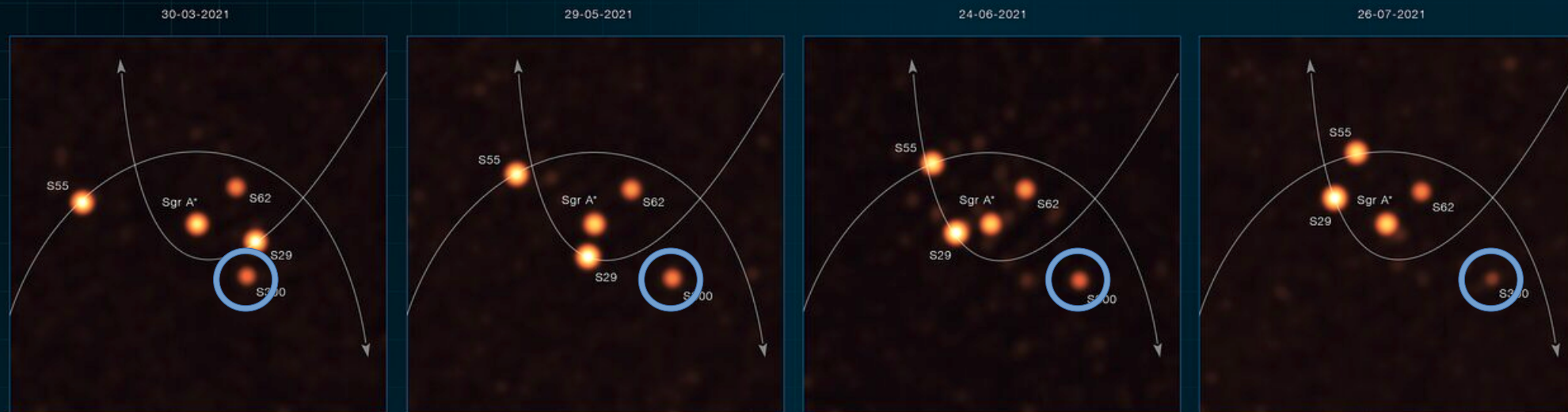
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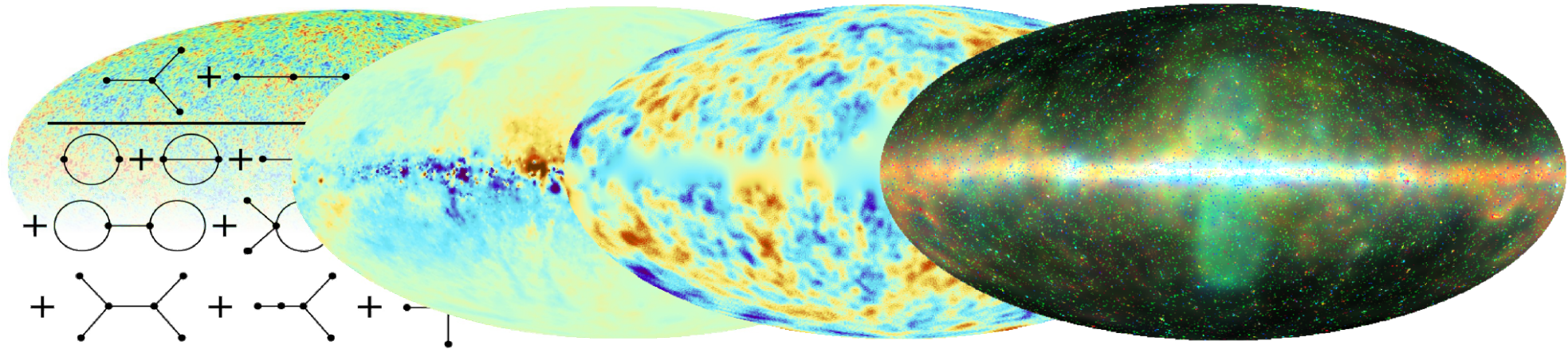
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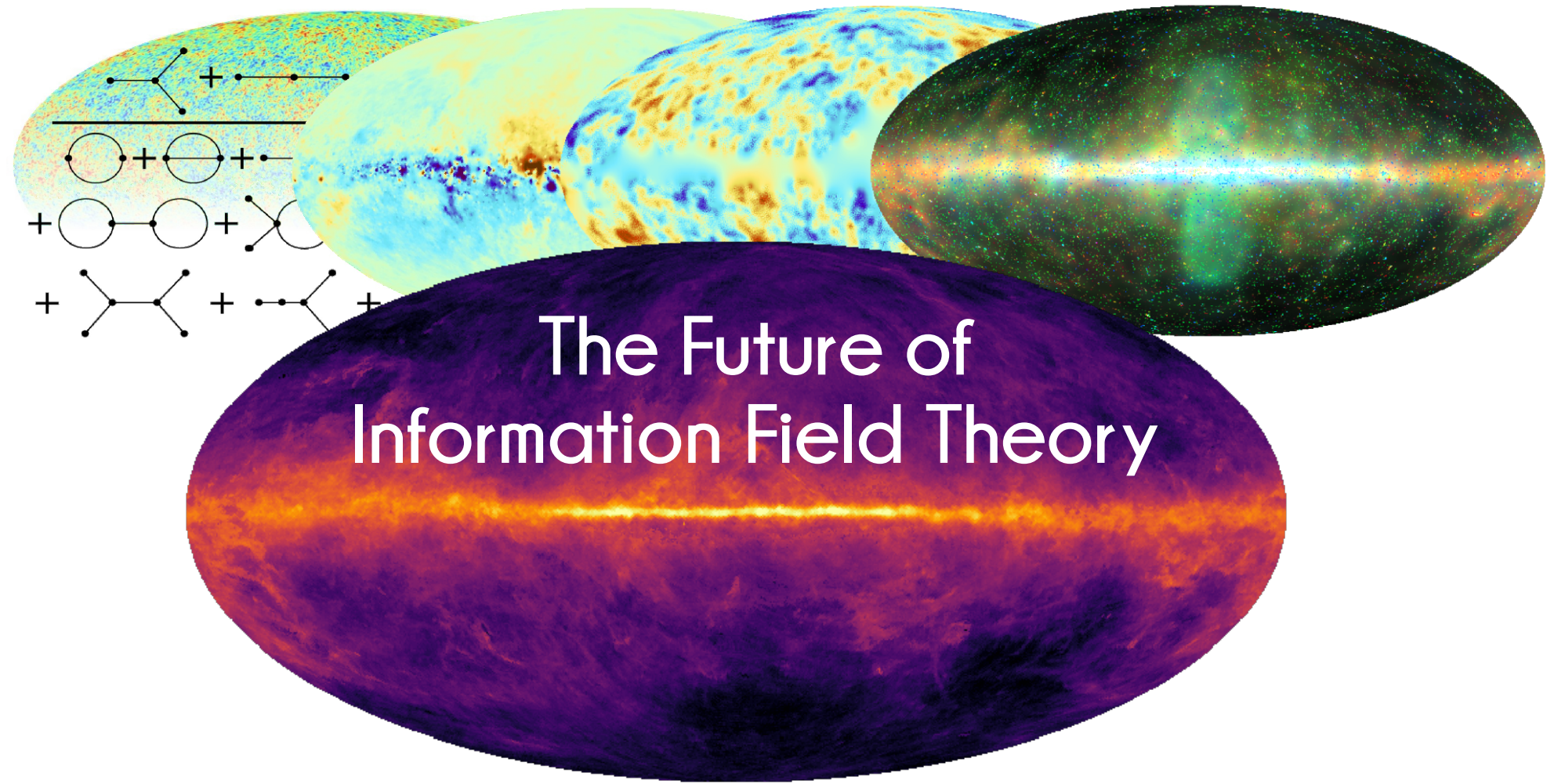


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GRAVITY collaboration incl. Julia Stadler (2021)





# The Future of Information Field Theory

ErUM-IFT

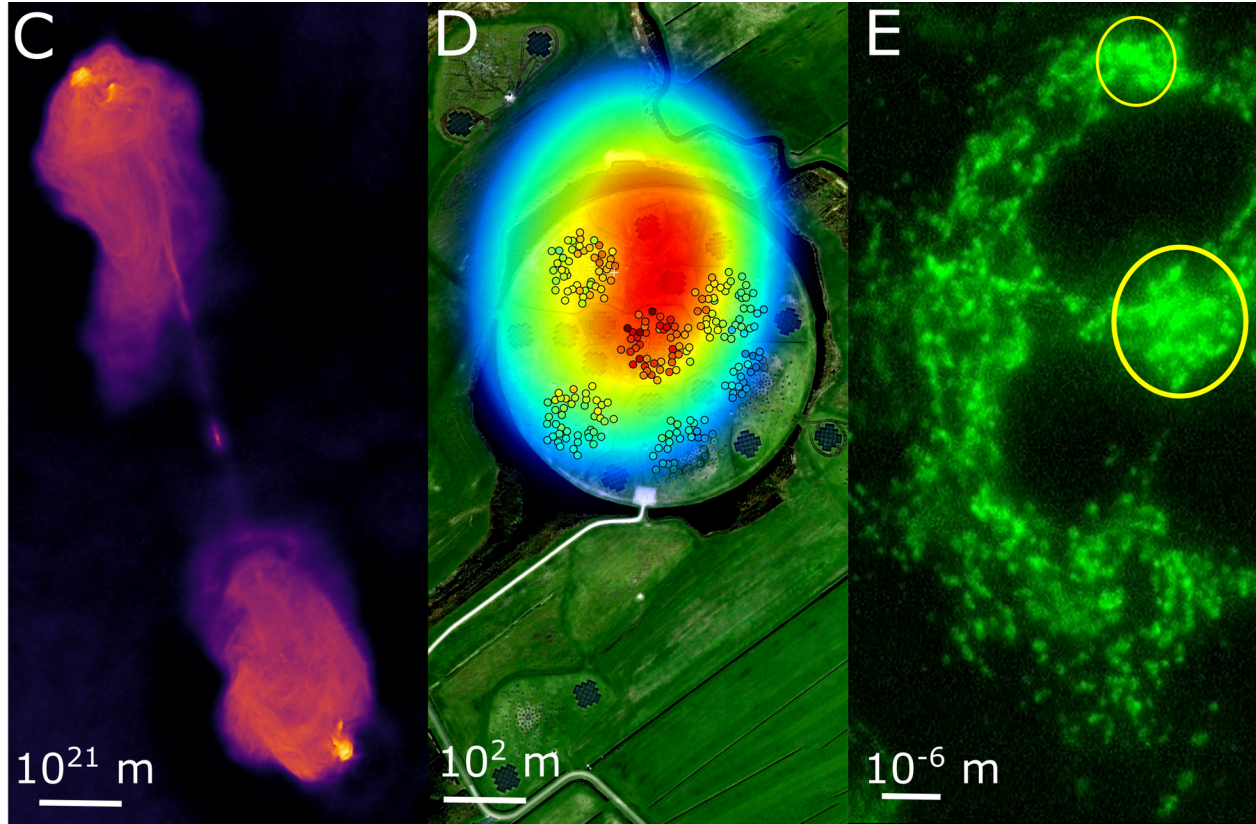
ErUM-IFT

Information Field Theory

for Experiments at Large Research Facilities

ErUM-IFT

# Information Field Theory for Experiments at Large Research Facilities



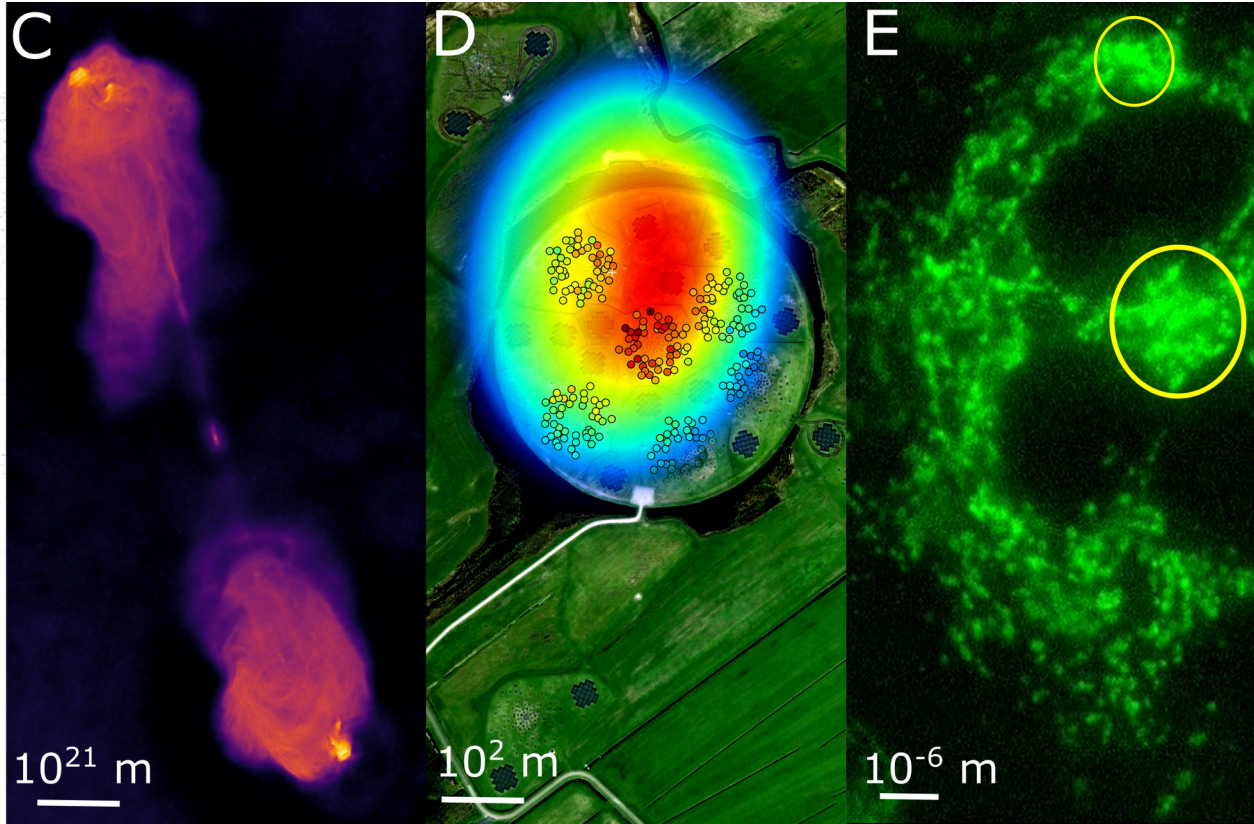
ErUM-IFT

# Information Field Theory

## for Experiments at Large Research Facilities



PD Dr. Torsten Enßlin  
MPI f. Astrophysics



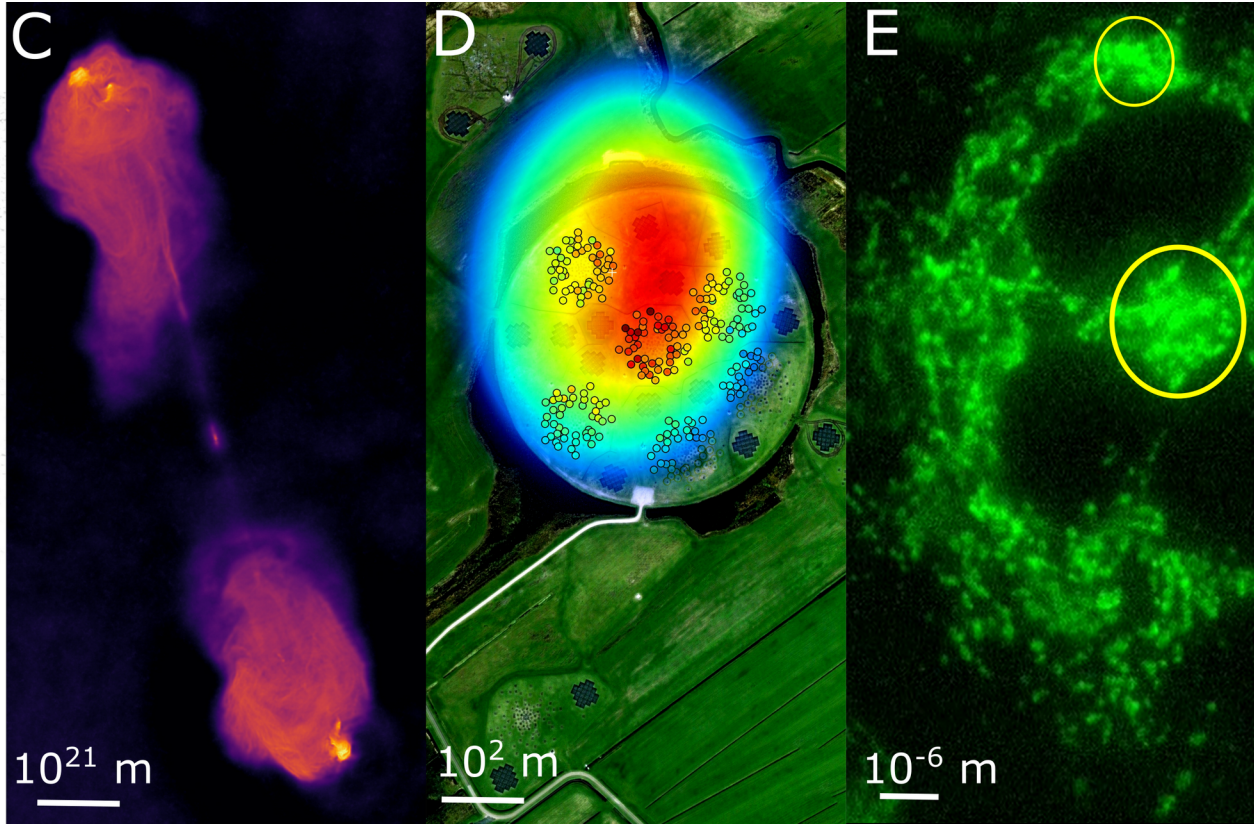


ErUM-IFT

# Information Field Theory for Experiments at Large Research Facilities



PD Dr. Torsten Enßlin  
MPI f. Astrophysics



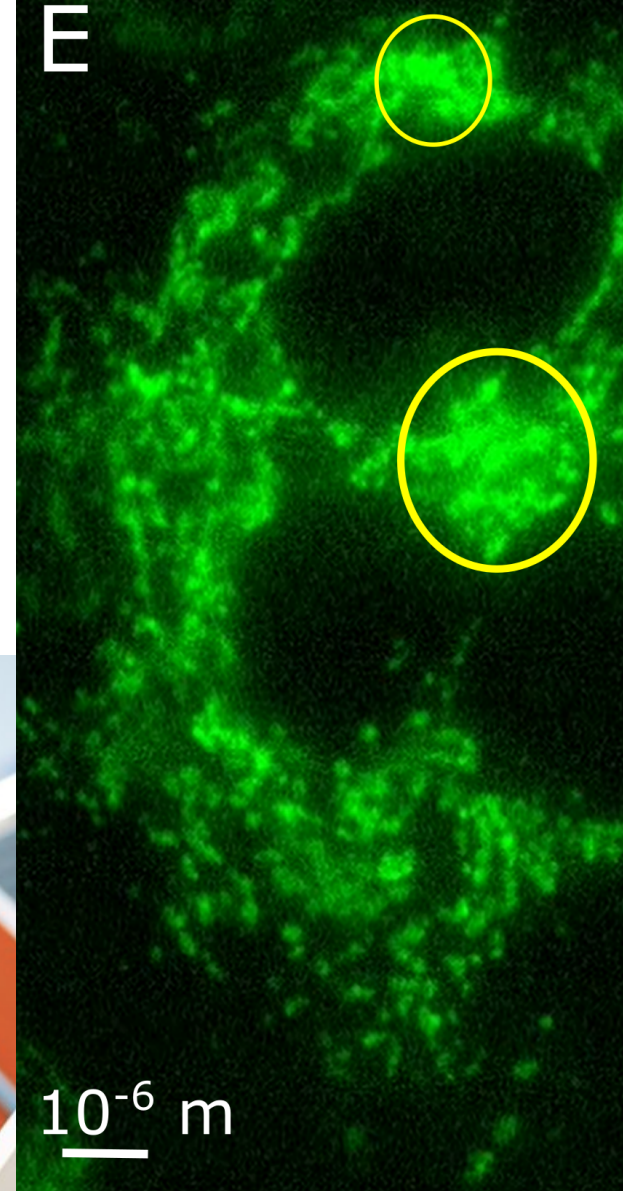
Dr. Philipp Frank  
MPI f. Astrophysics

# Biological Microscopy:

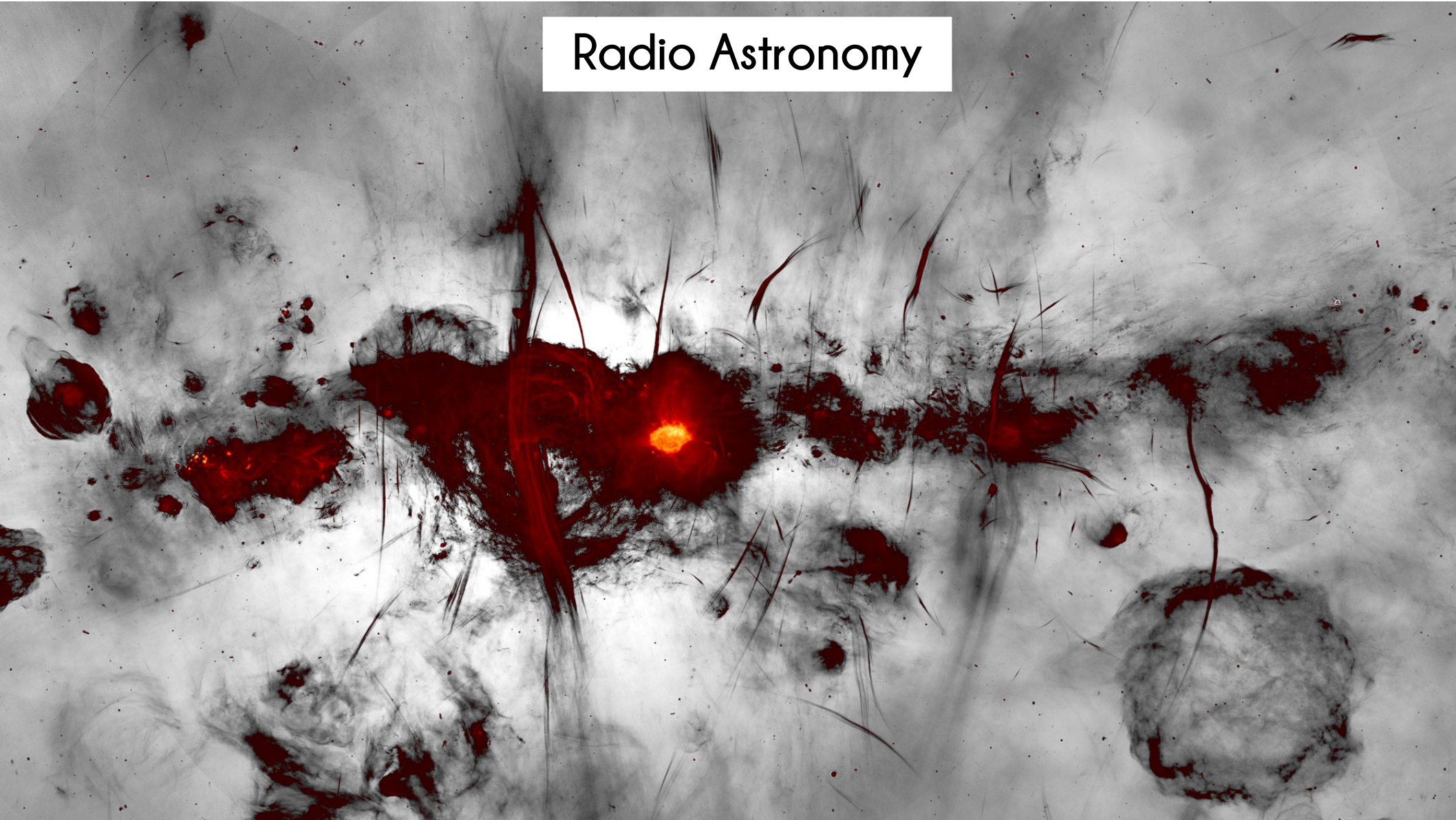
Beyond the Abbé-Limit -

Signal reconstruction in 3D optical microscopy

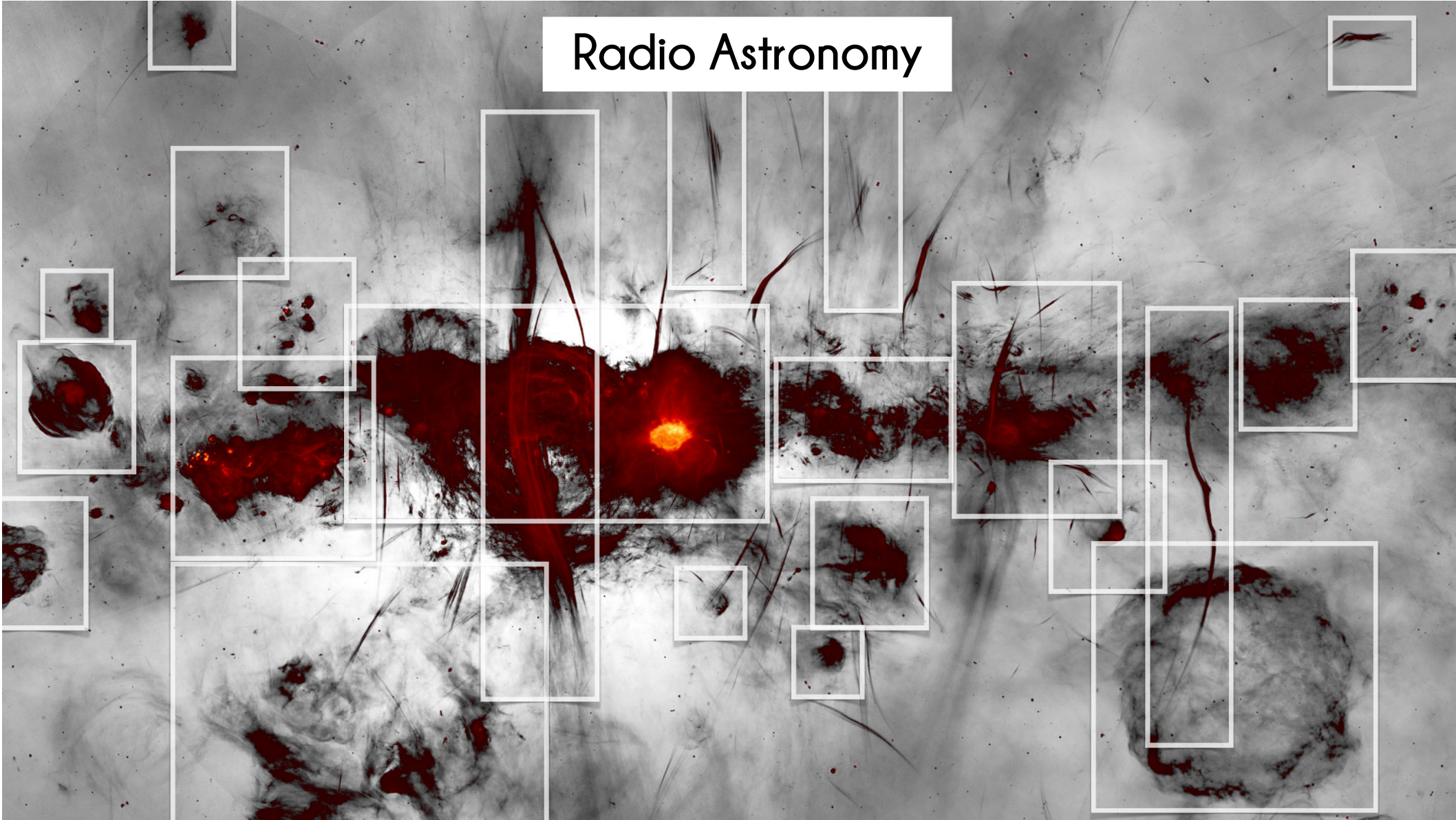
**Prof. Dr. Judith Reindl**, Universität der  
Bundeswehr München (UniBw M),  
judith.reindl@unibw.de



# Radio Astronomy



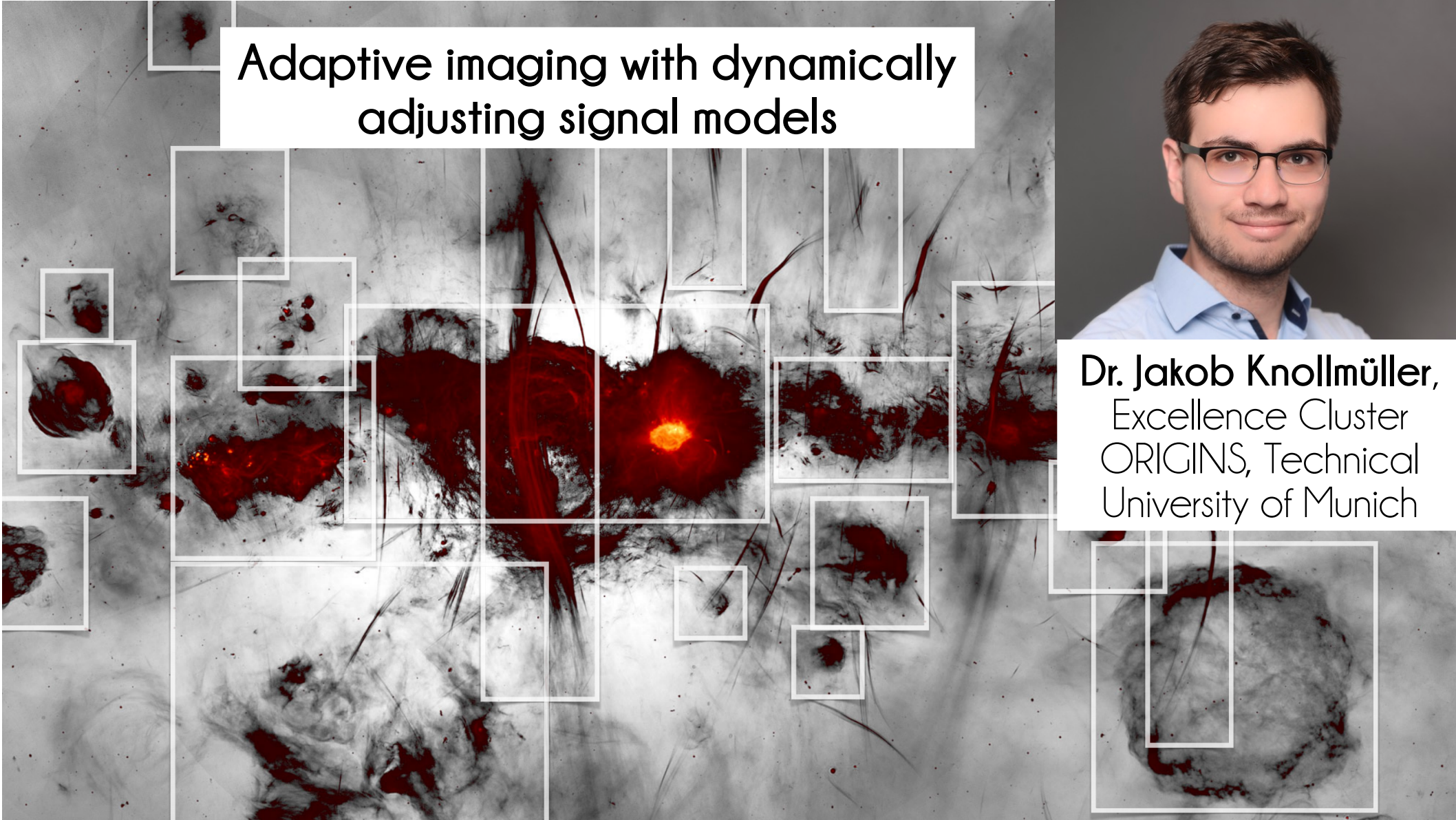
# Radio Astronomy



# Adaptive imaging with dynamically adjusting signal models



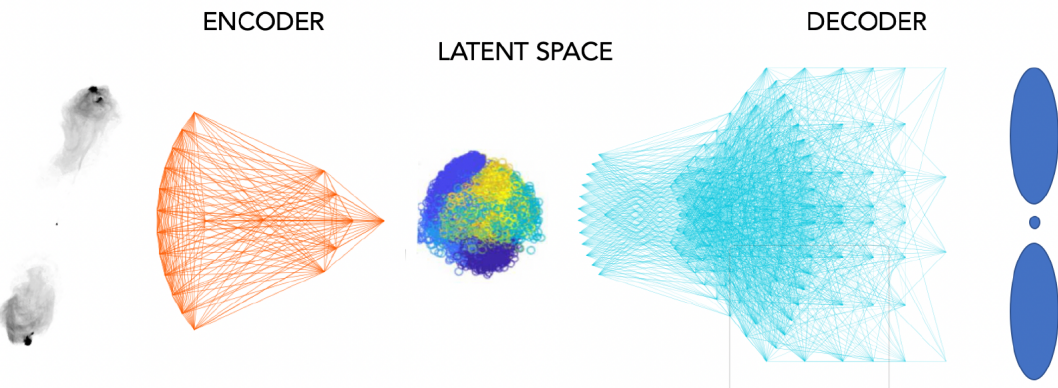
**Dr. Jakob Knollmüller,**  
Excellence Cluster  
ORIGINS, Technical  
University of Munich





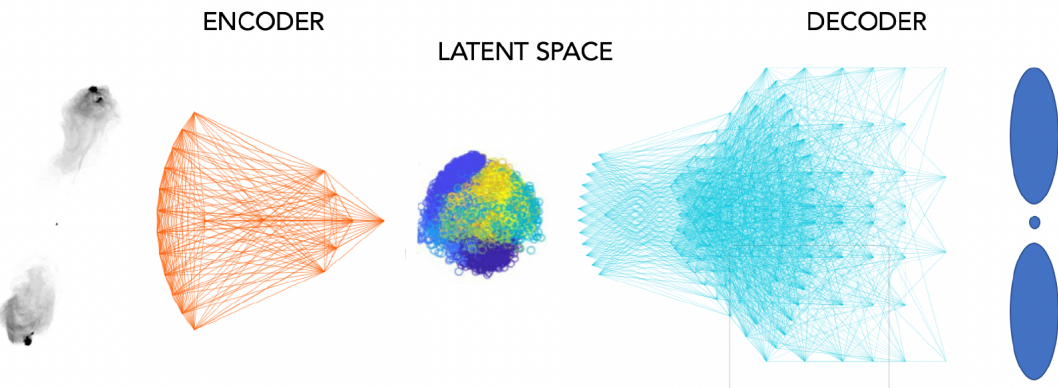
# Radio Astronomy

Prof. Dr. Marcus Brüggemann Universität Hamburg  
ANN accelerator for IFT in radio astronomy

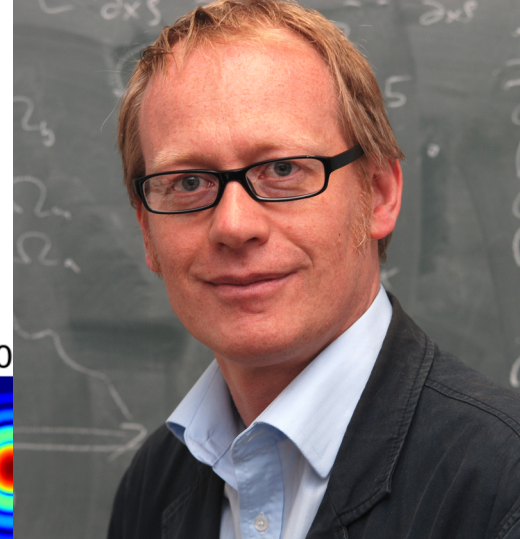




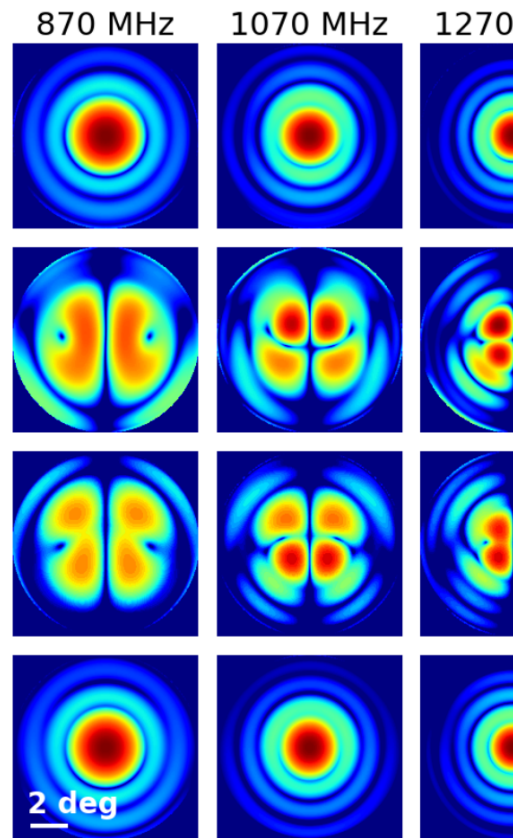
Prof. Dr. Marcus Brüggemann Universität Hamburg  
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# Radio Astronomy

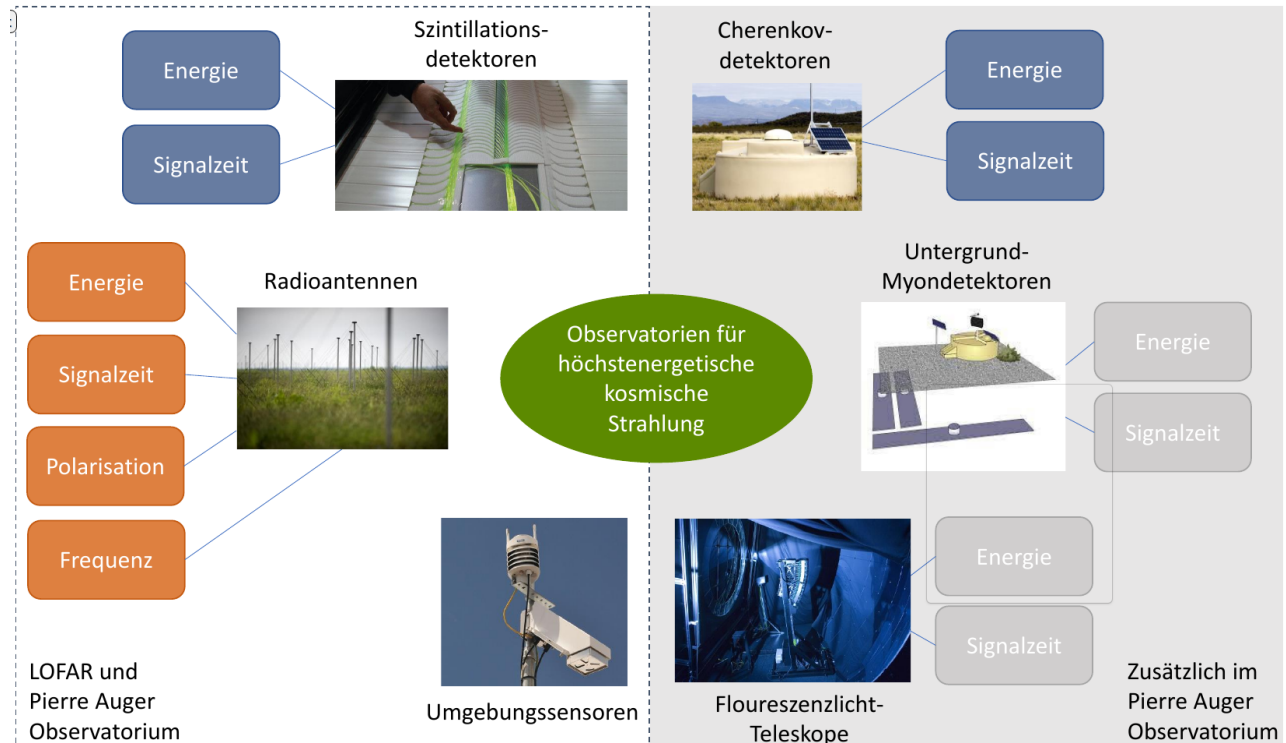


Prof. Dr. Dominik Schwarz  
Universität Bielefeld



Primary beam reconstruction  
of radio antenna with IFT

# Astroparticle Airshower

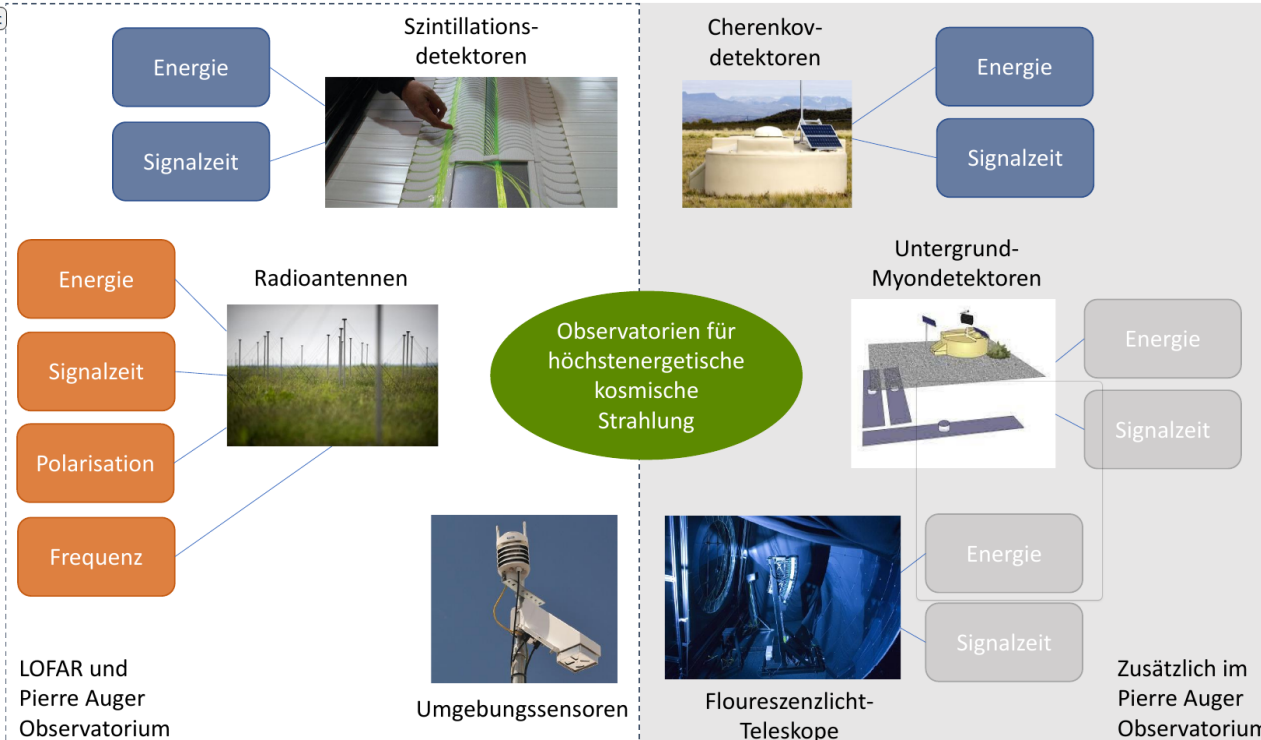




# Astroparticle Airshower



Prof. Dr. Martin Erdmann  
RWTH Aachen University



LOFAR und  
Pierre Auger  
Observatorium

Umgebungssensoren

Fluoreszenzlicht-  
Teleskope

Zusätzlich im  
Pierre Auger  
Observatorium



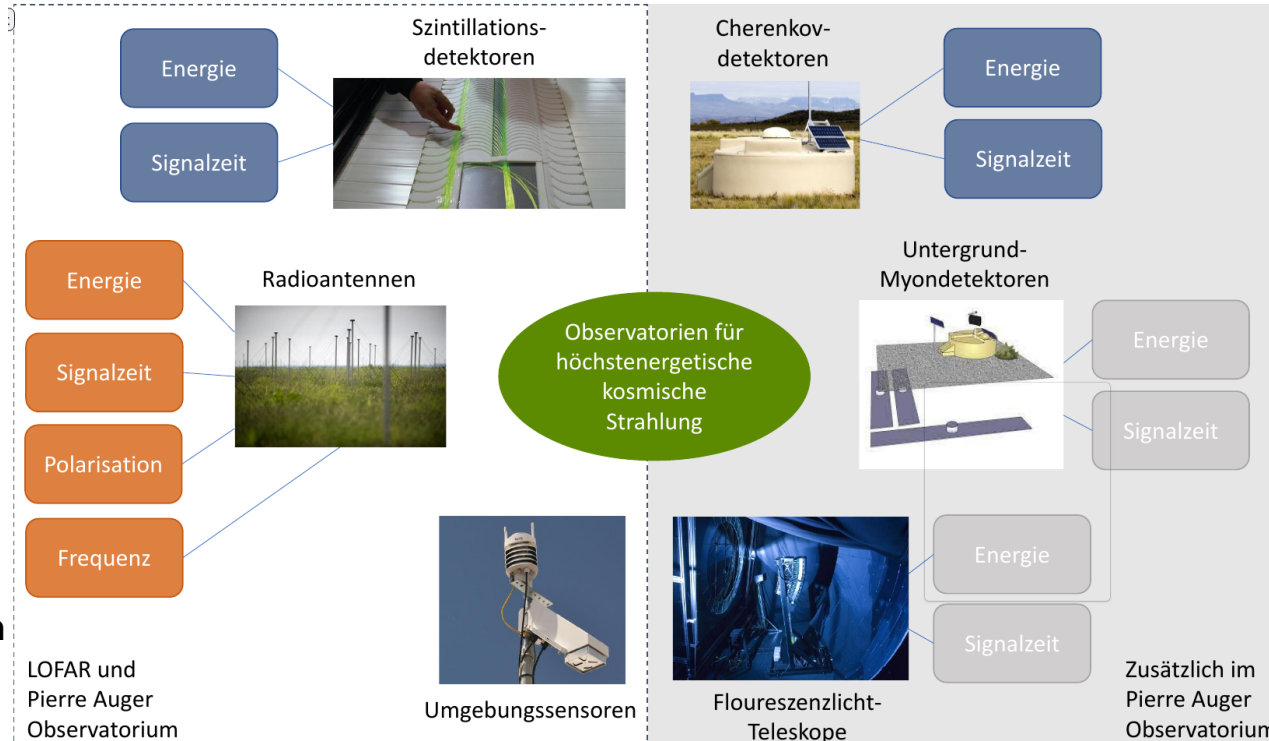
Prof. Dr. Tim Huege  
Karlsruhe Institute of  
Technology

# Astroparticle Airshower

## Radio instrument response functions for the Pierre Auger Observatory & IFT analysis

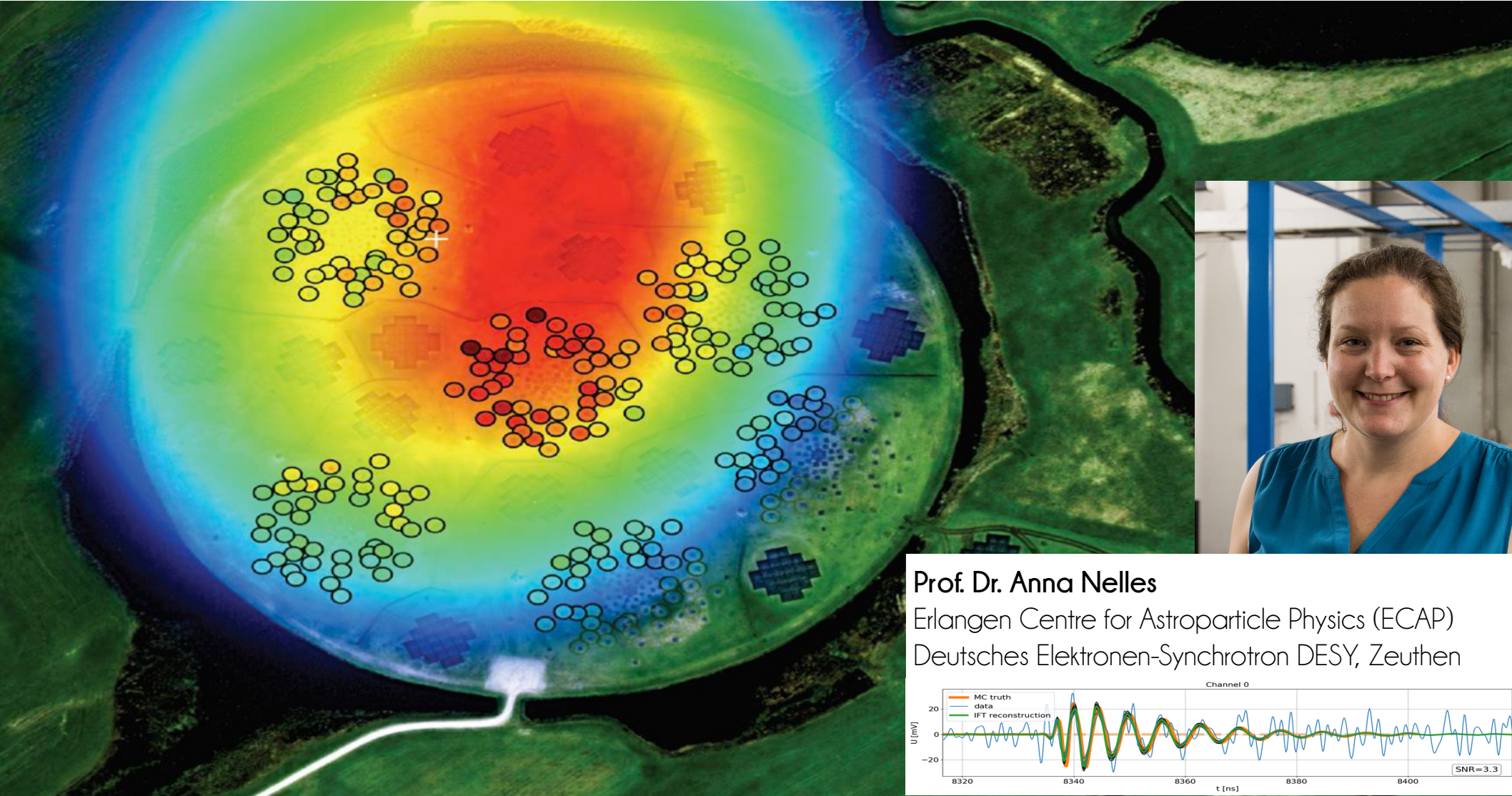


Prof. Dr. Martin Erdmann  
RWTH Aachen University



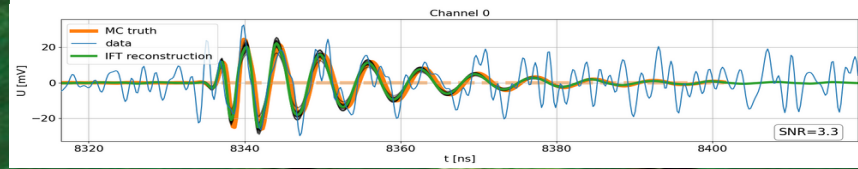
Prof. Dr. Tim Huege  
Karlsruhe Institute of  
Technology

# Holistic air shower reconstruction for LOFAR



**Prof. Dr. Anna Nelles**

Erlangen Centre for Astroparticle Physics (ECAP)  
Deutsches Elektronen-Synchrotron DESY, Zeuthen





## Associated Partner

Prof. Dr. Rüdiger Westermann,  
Chair of Computer Graphics and Visualization  
Technische Universität München

# Associated Company

Dr. Maksim Greiner  
Founder & CTO Erium



Dr. Theo Steiniger  
Founder & CEO Erium





# Associated Company

WISSEN UND KOMMUNIKATION  
SIND DAS FUNDAMENT IHRES ERFOLGS.  
ERIU IST DER KATALYSATOR.

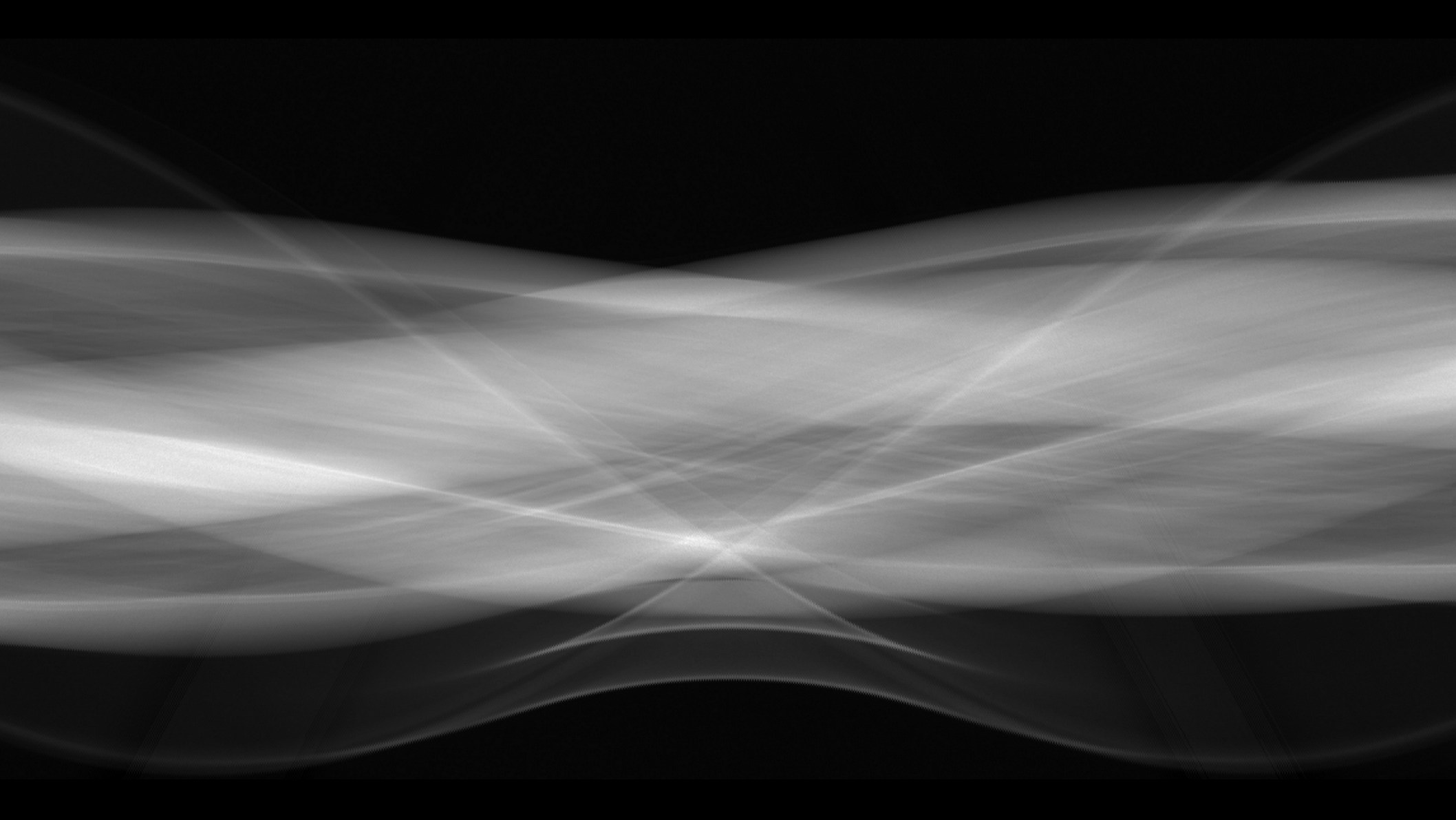
HALerium 2.0

Dr. Maksim Greiner  
Founder & CTO Erium

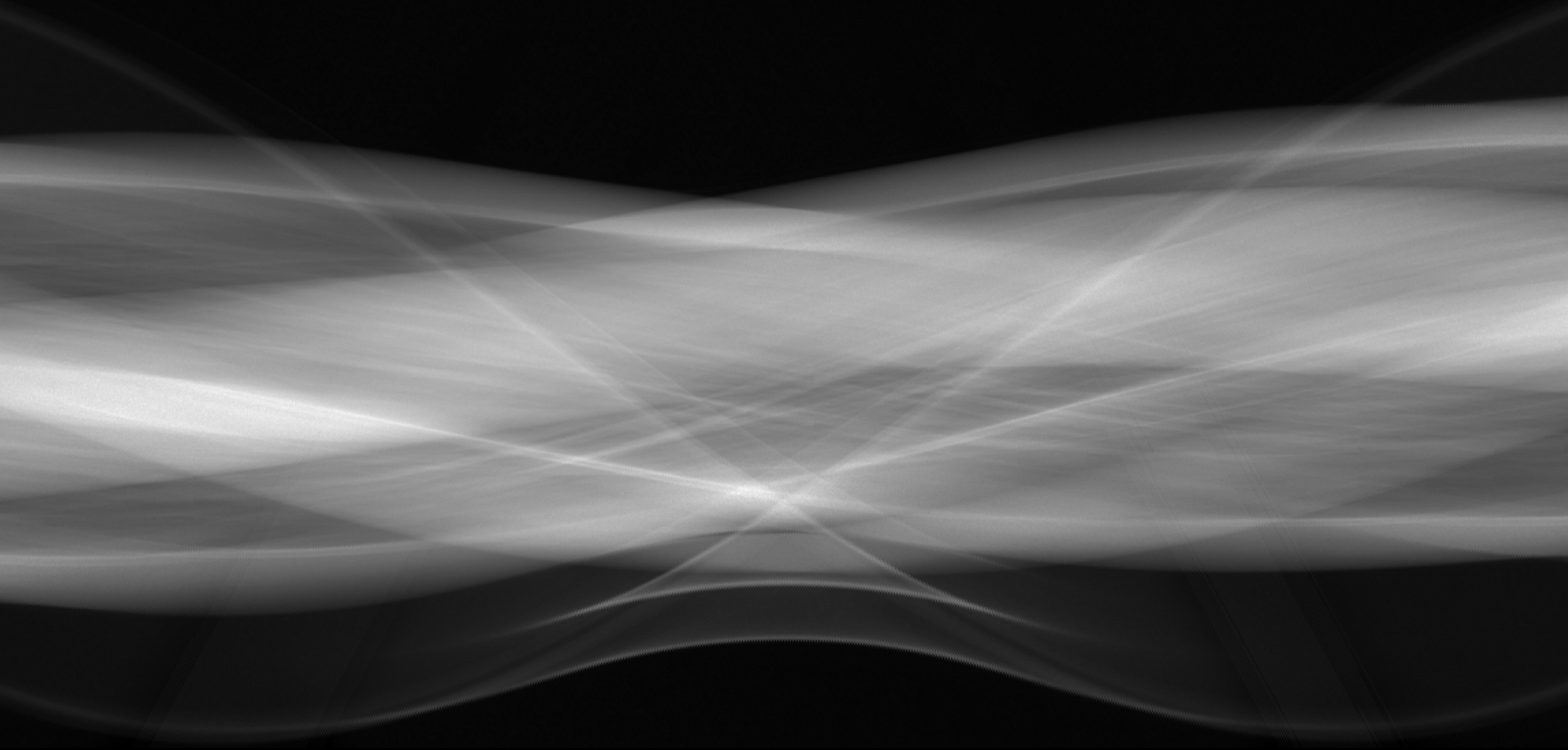


Dr. Theo Steiniger  
Founder & CEO Erium



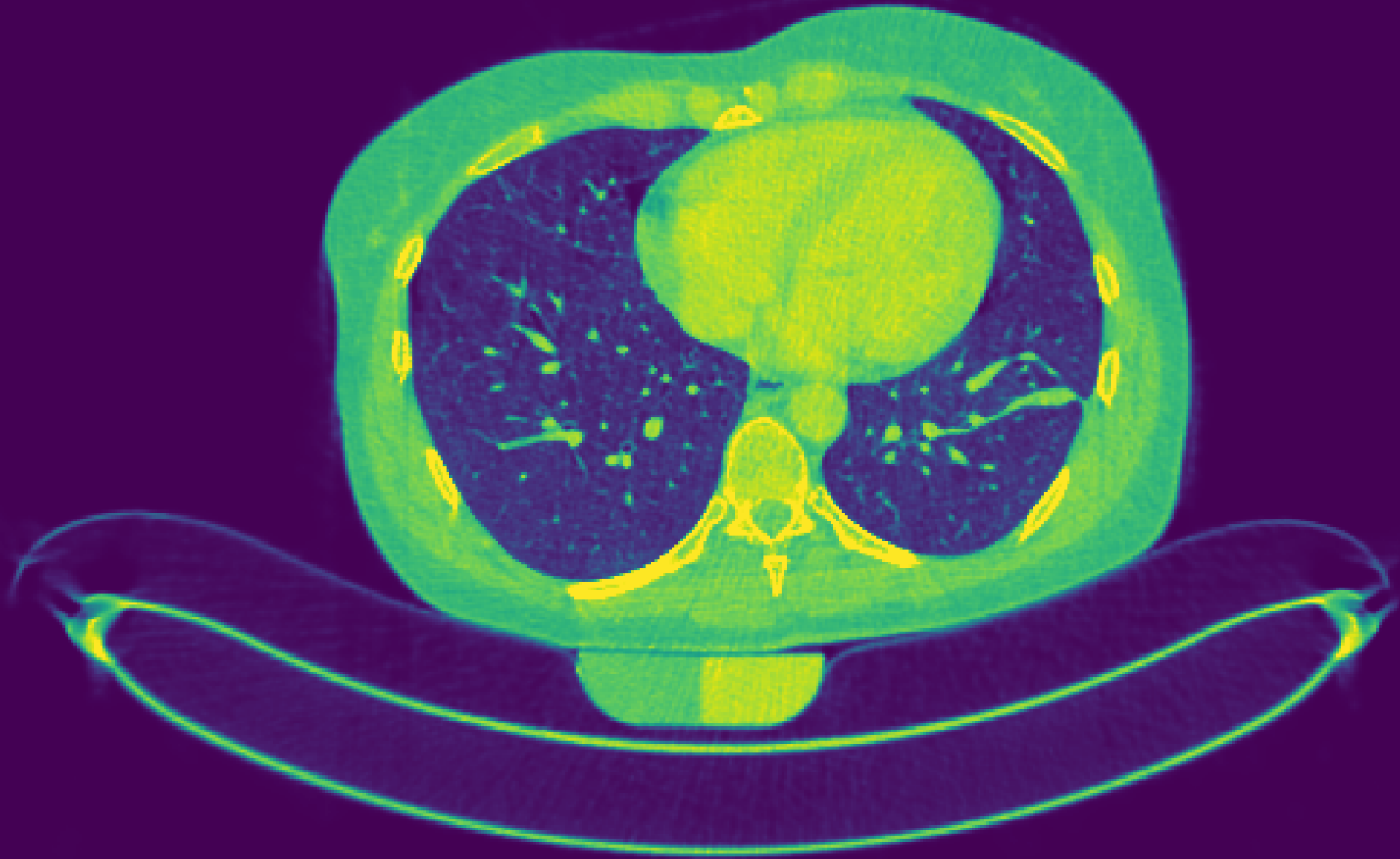


# Computed Tomography





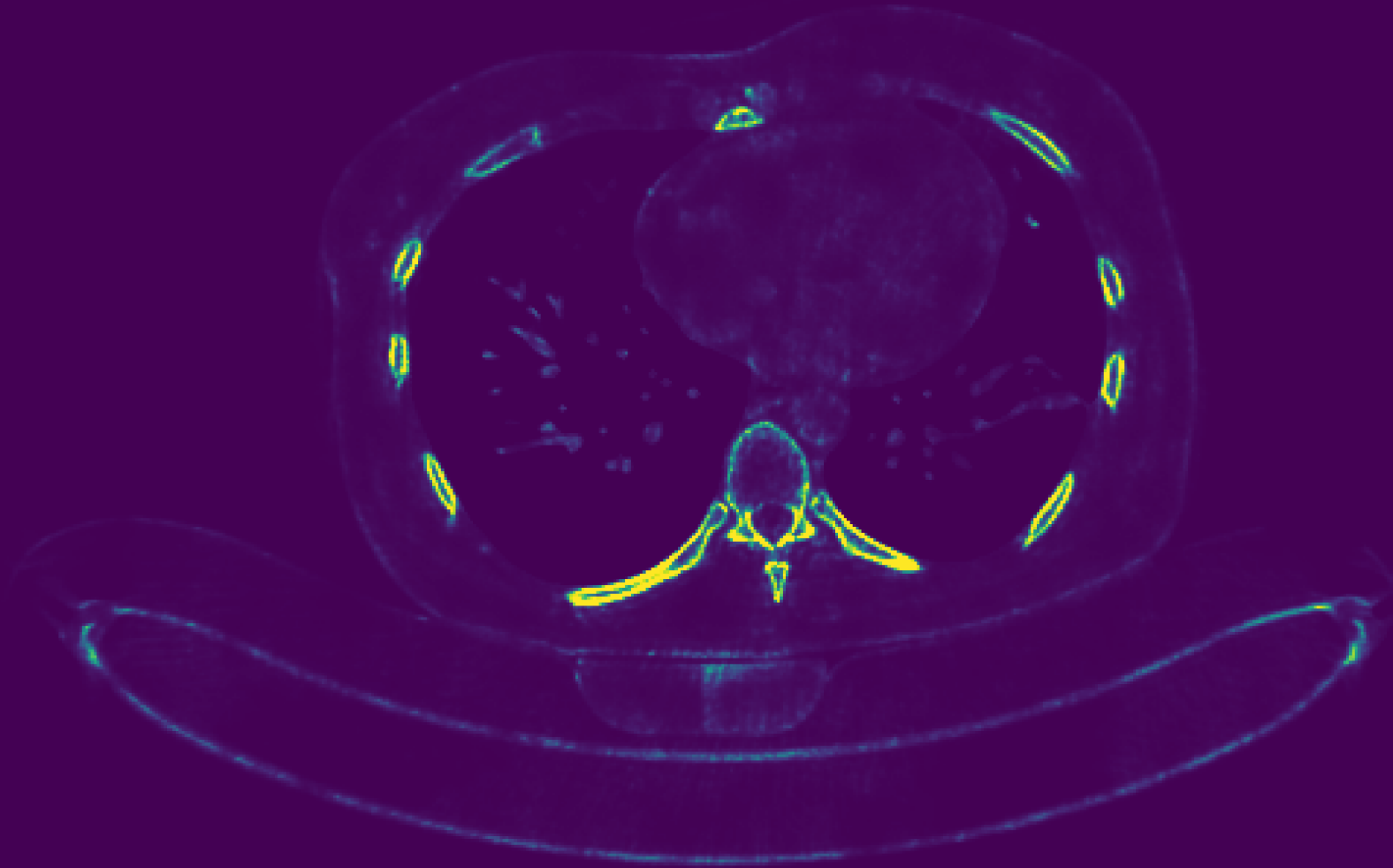
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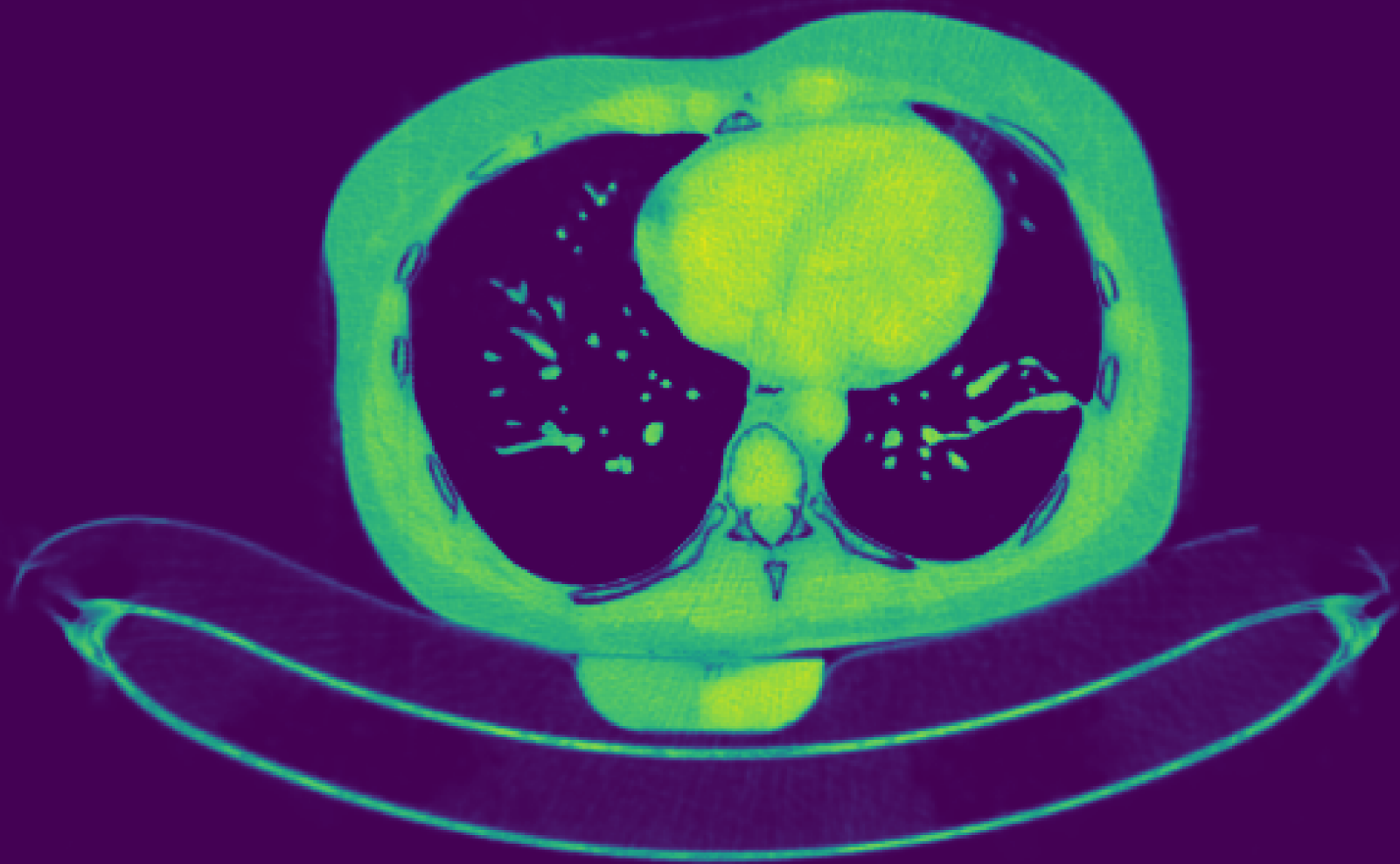
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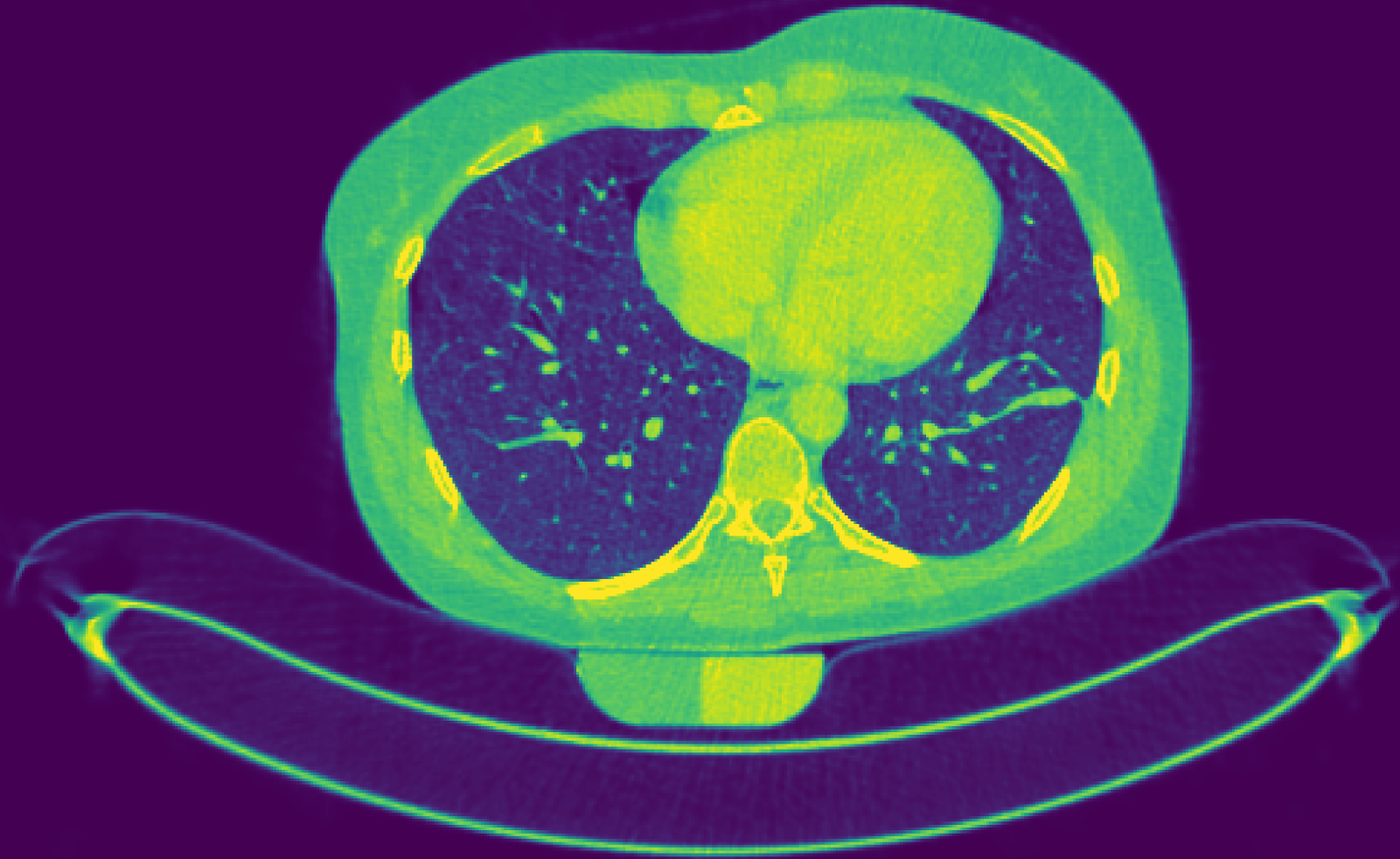
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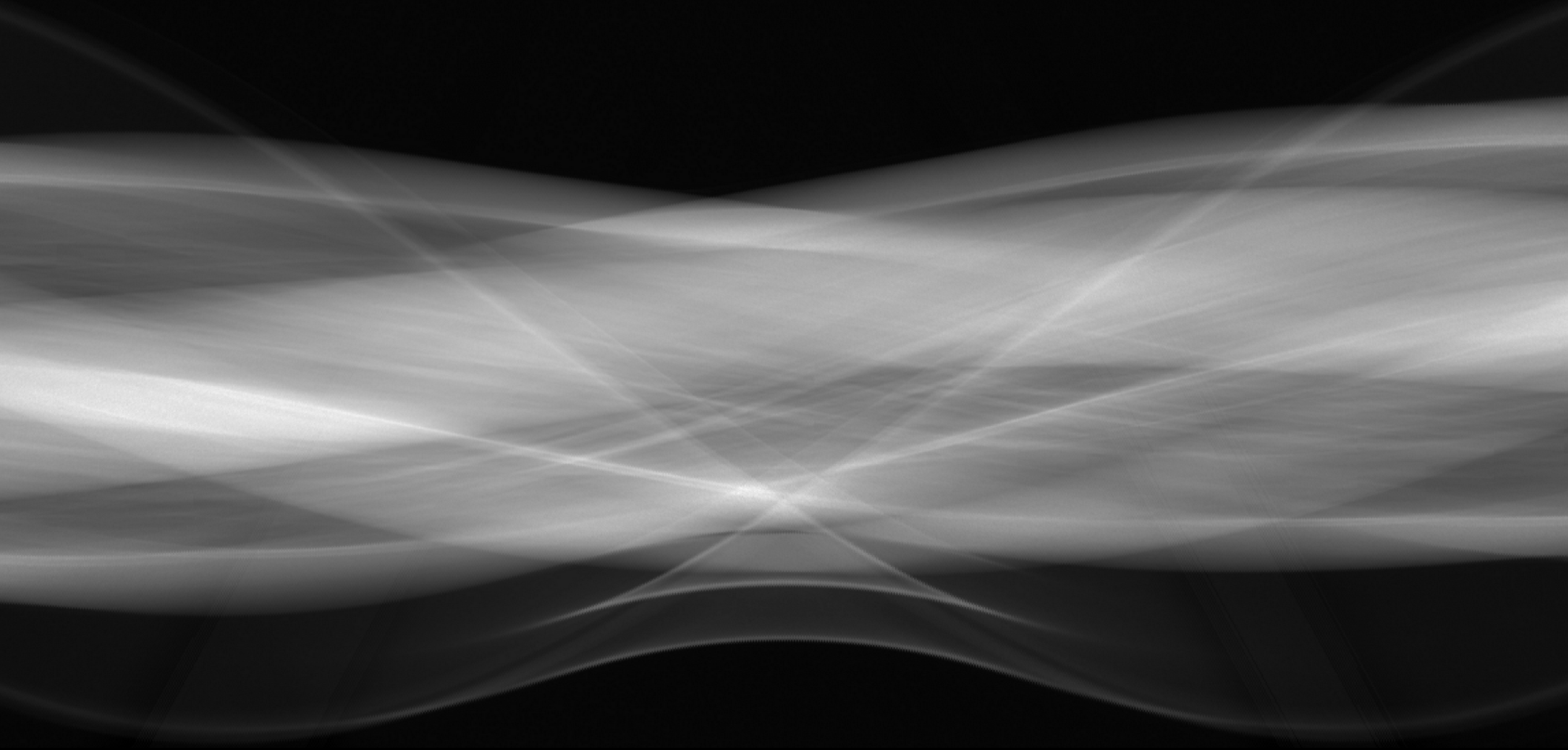
# Tissue



# Computed Tomography

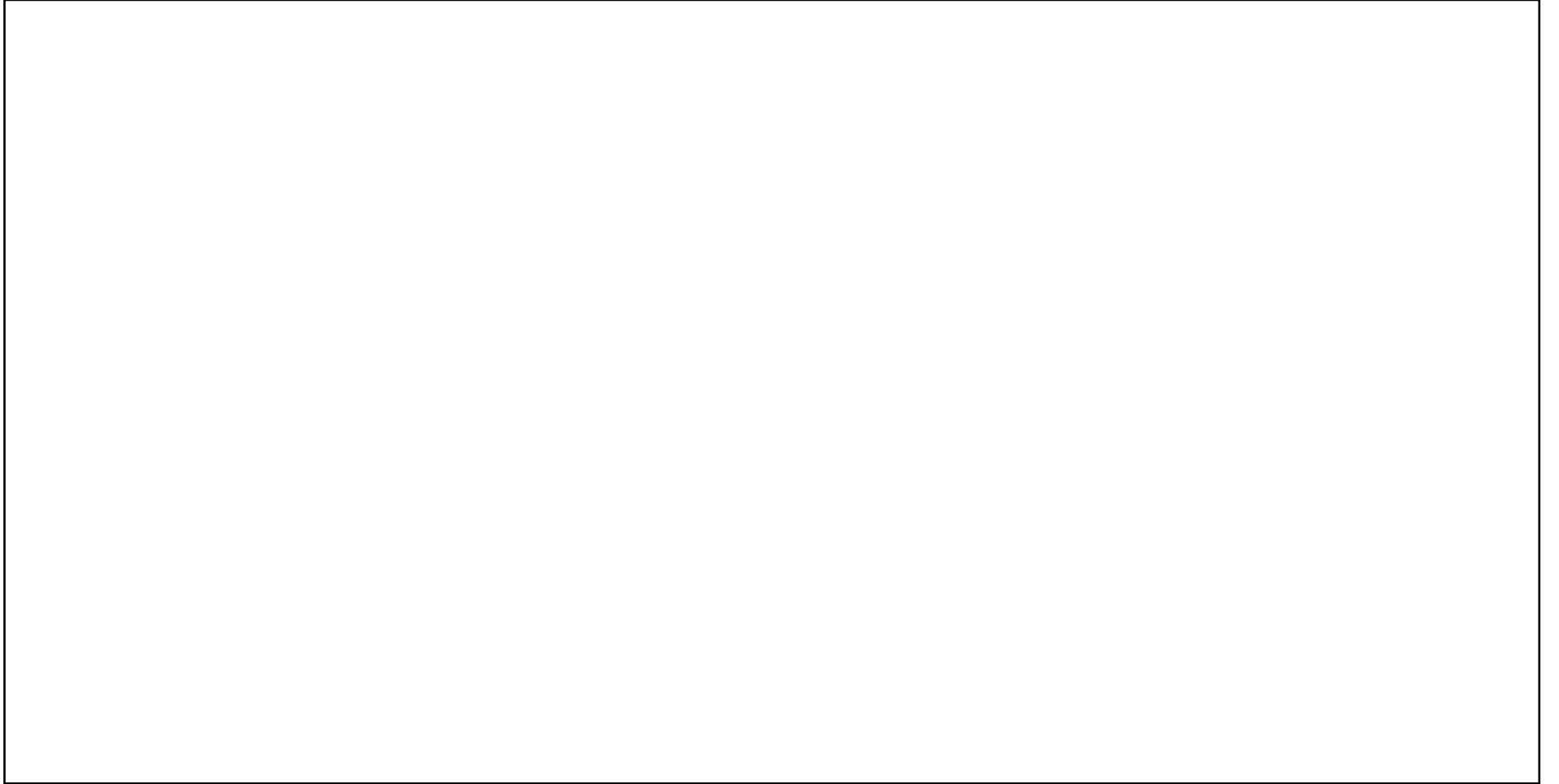


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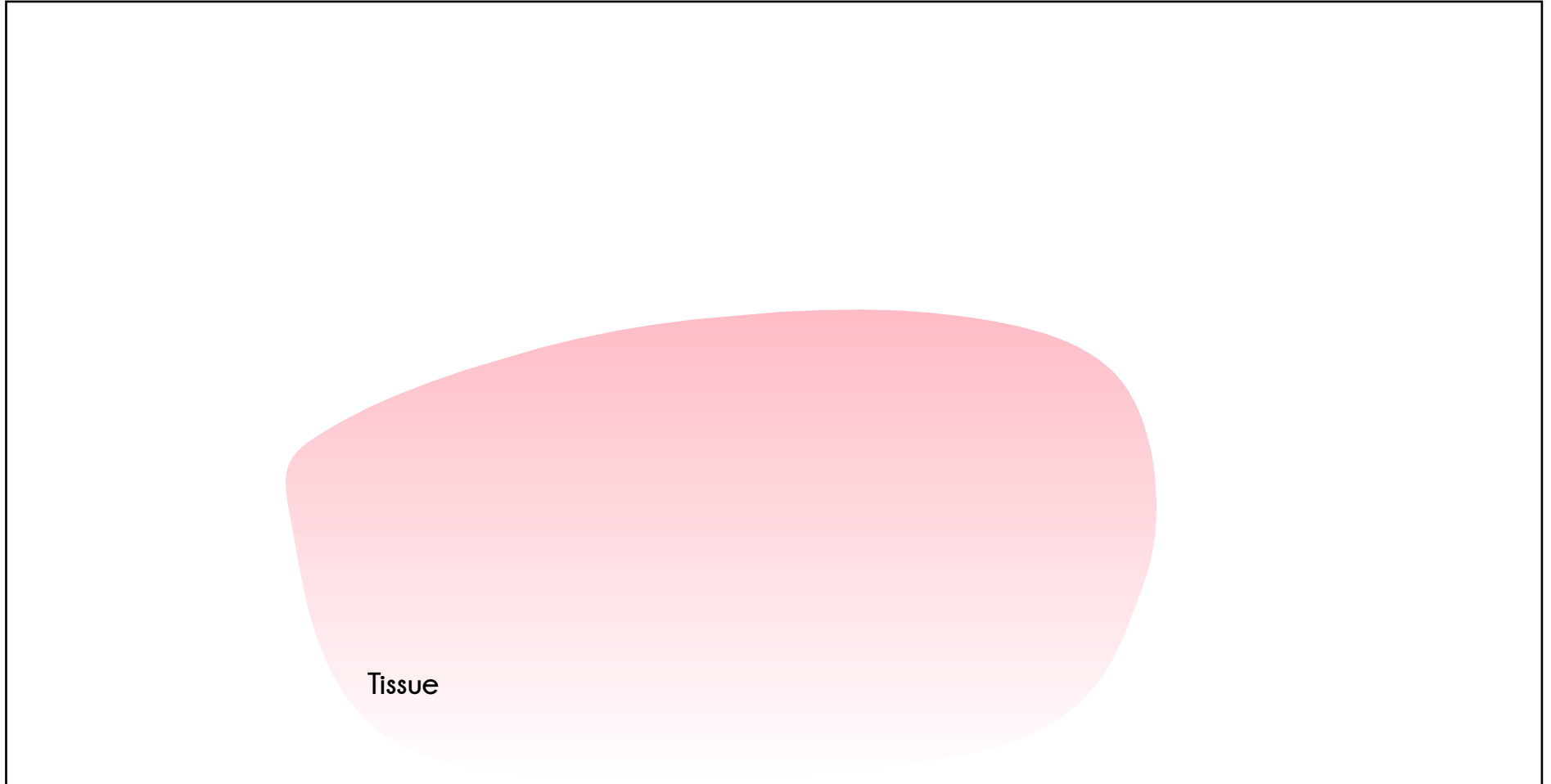
# Optoacoustic Tomography

Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel



# Optoacoustic Tomography

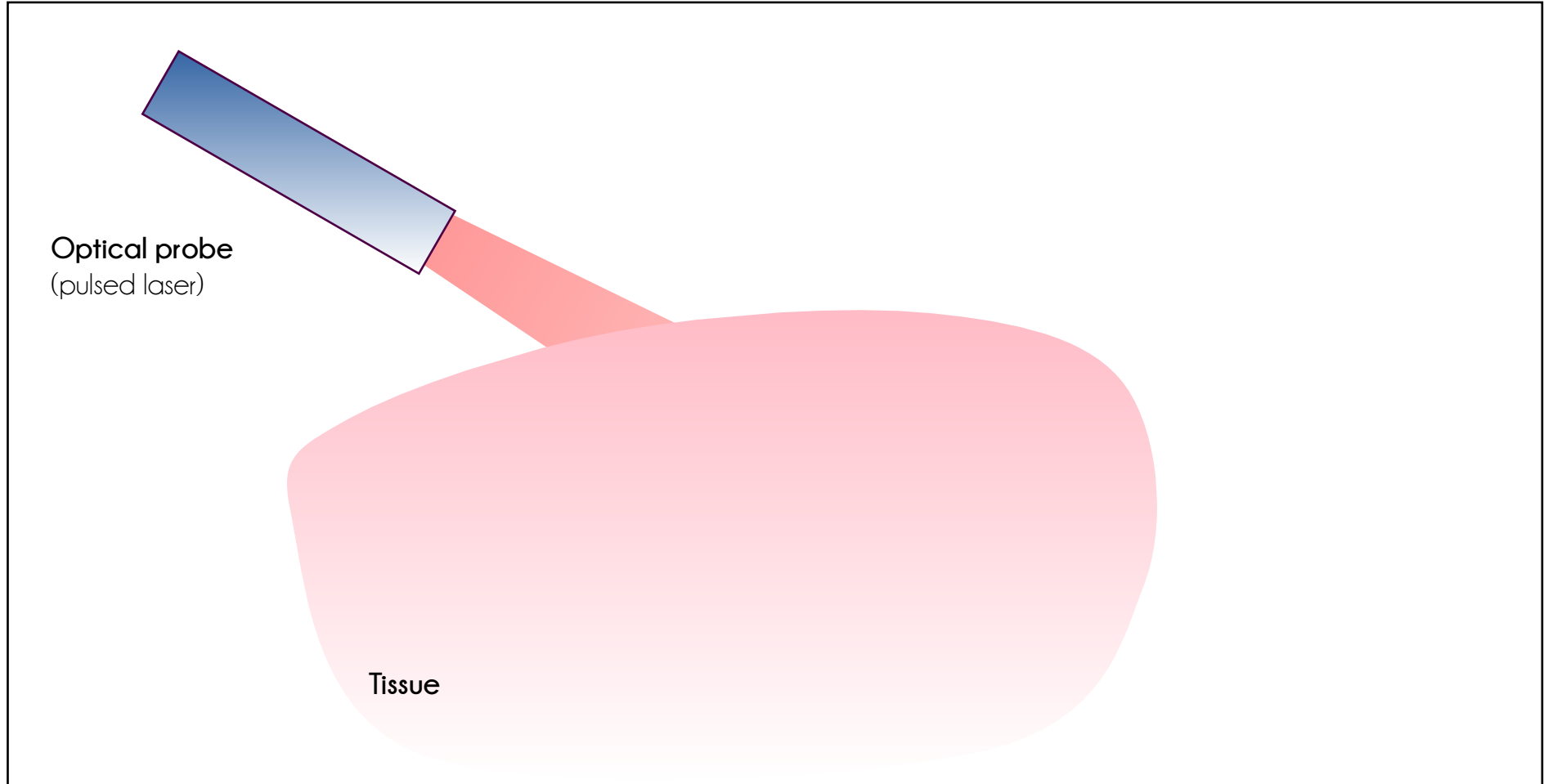
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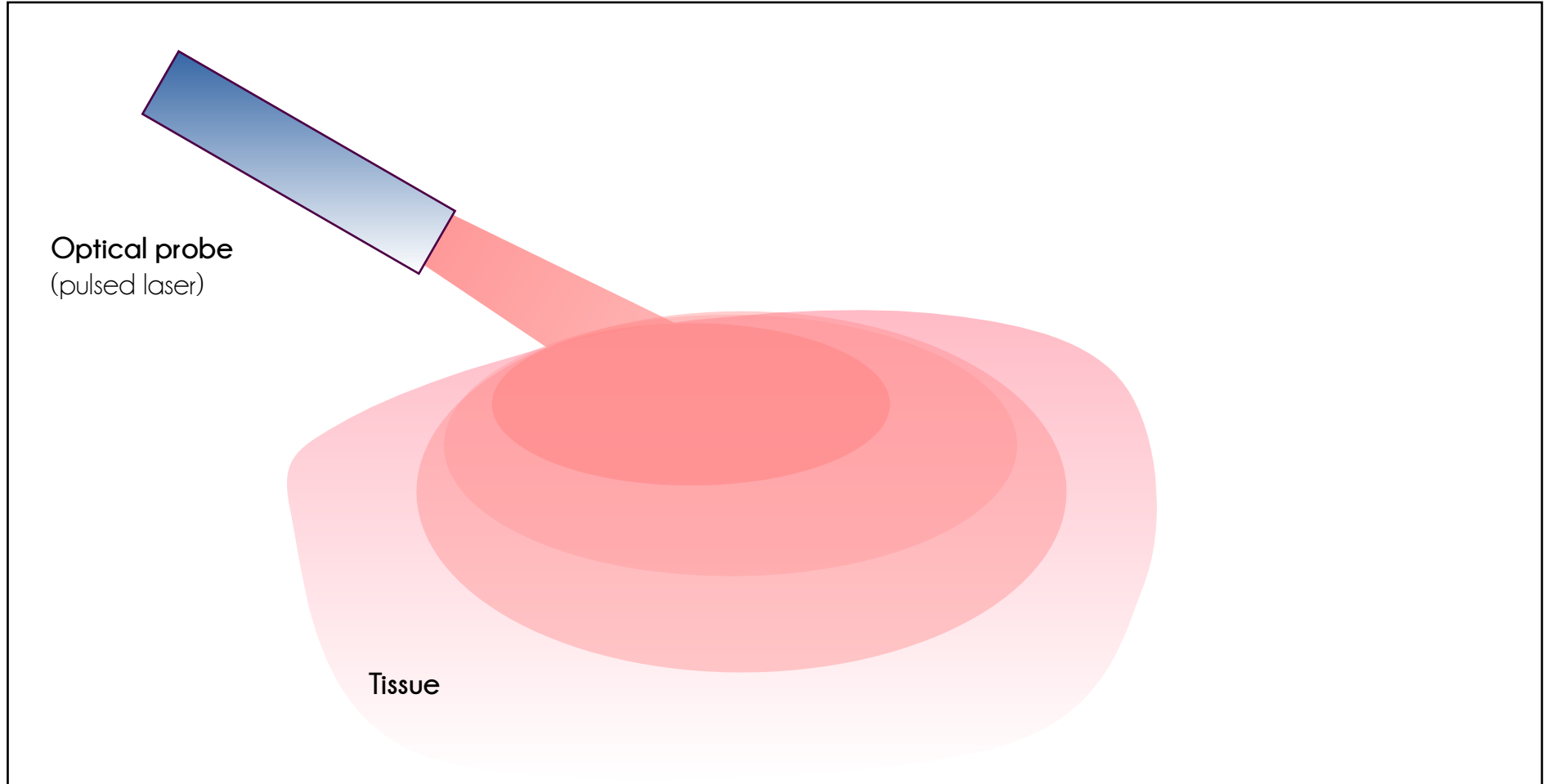
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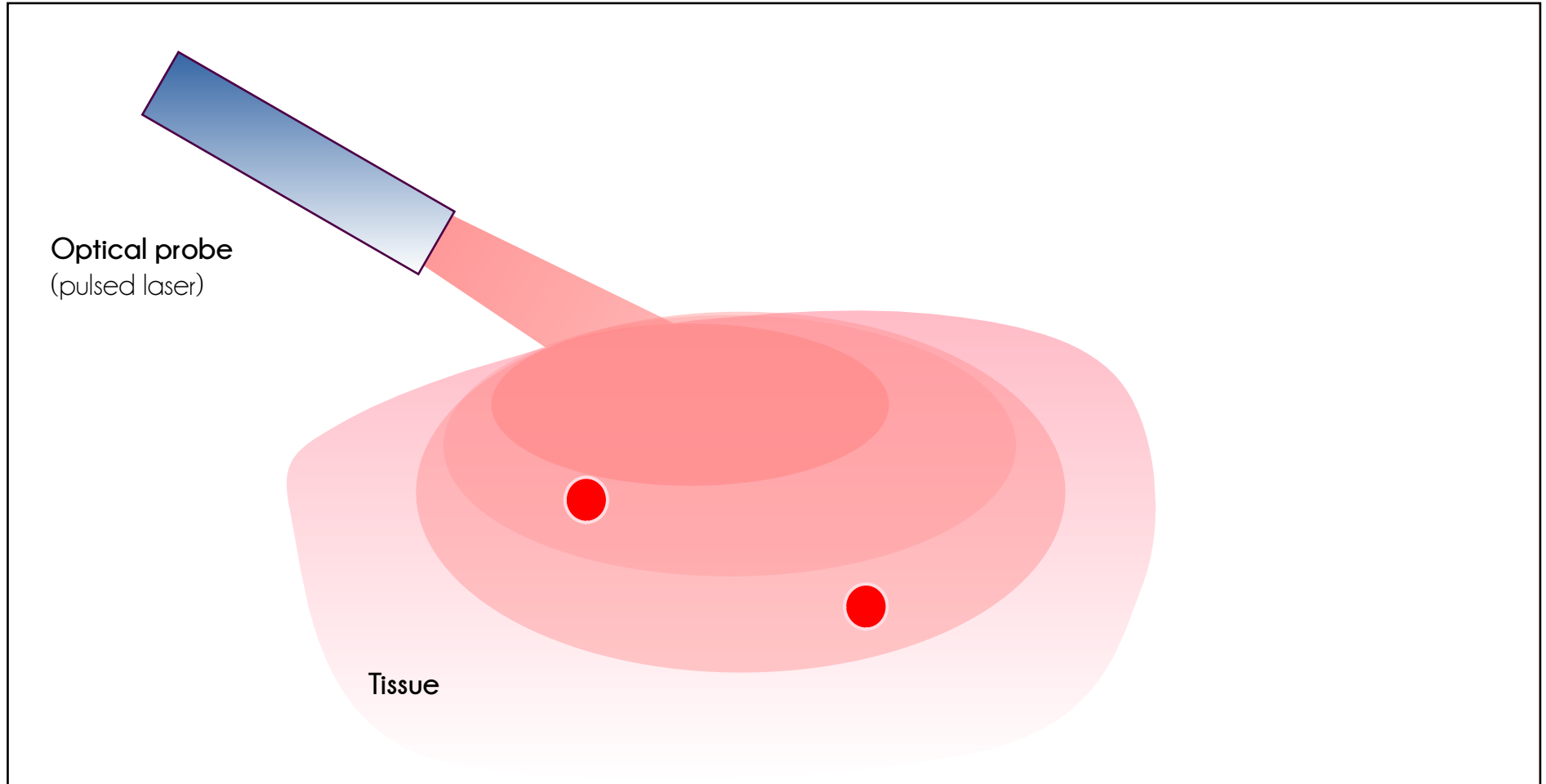
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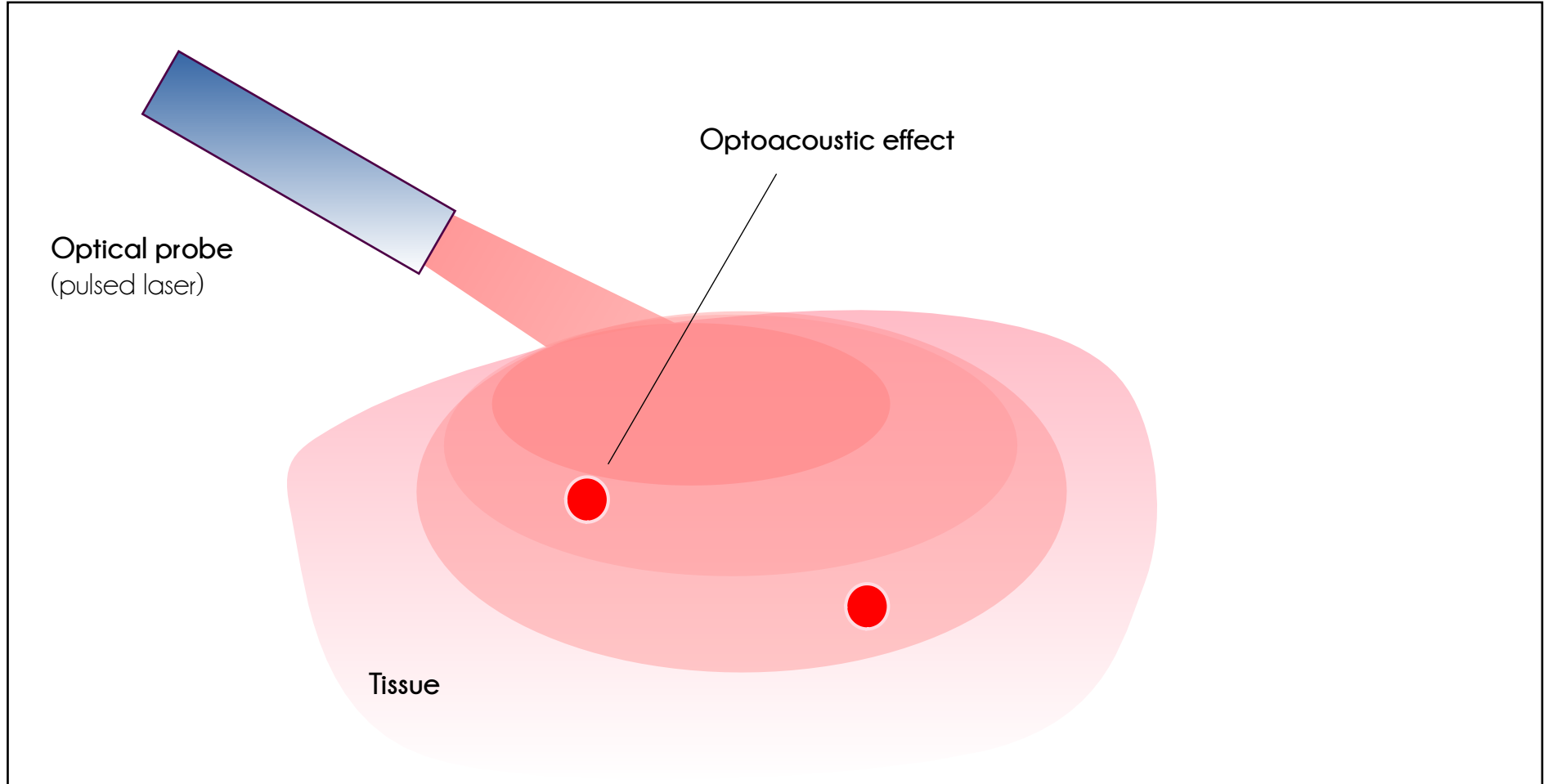
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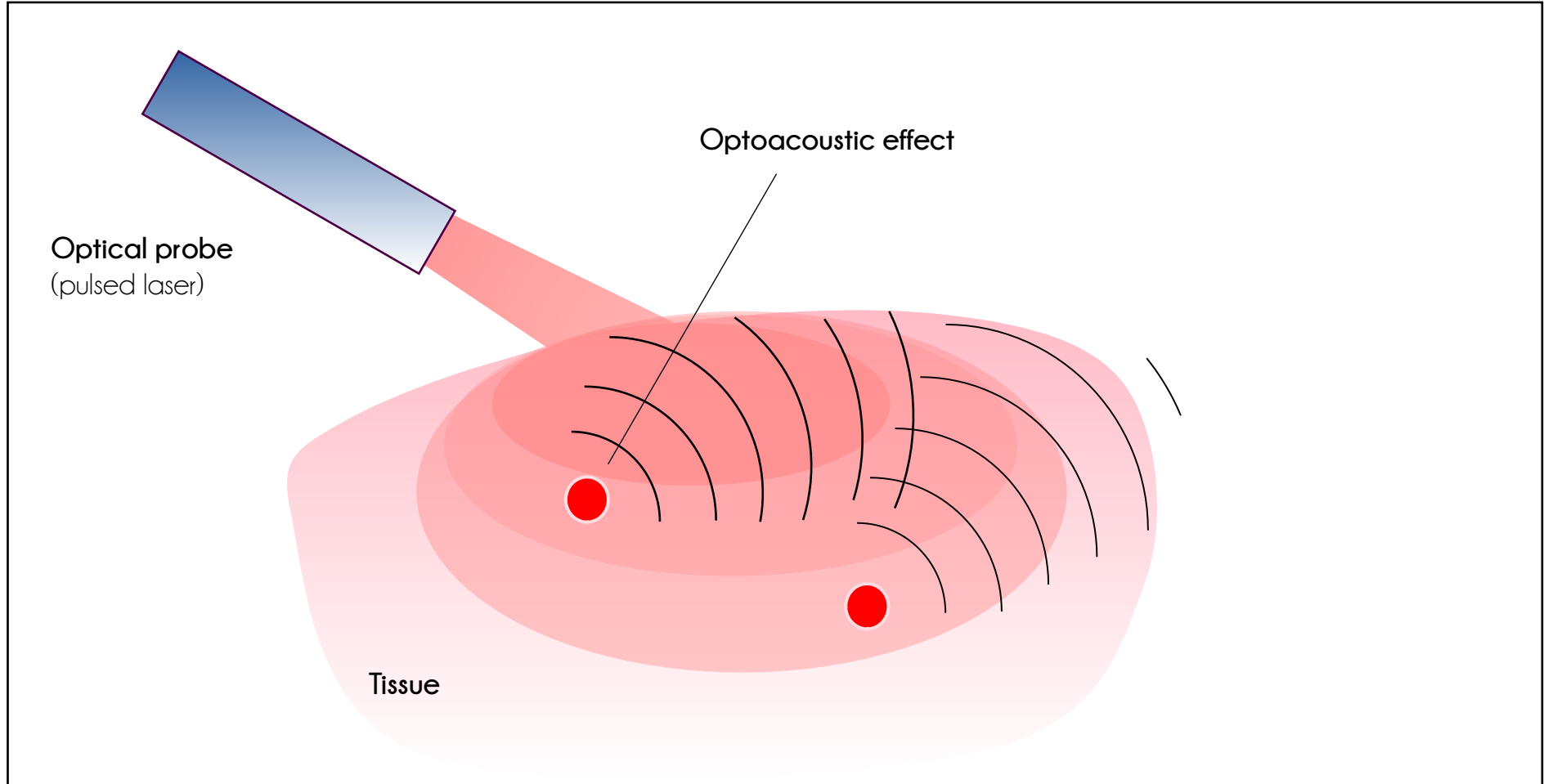
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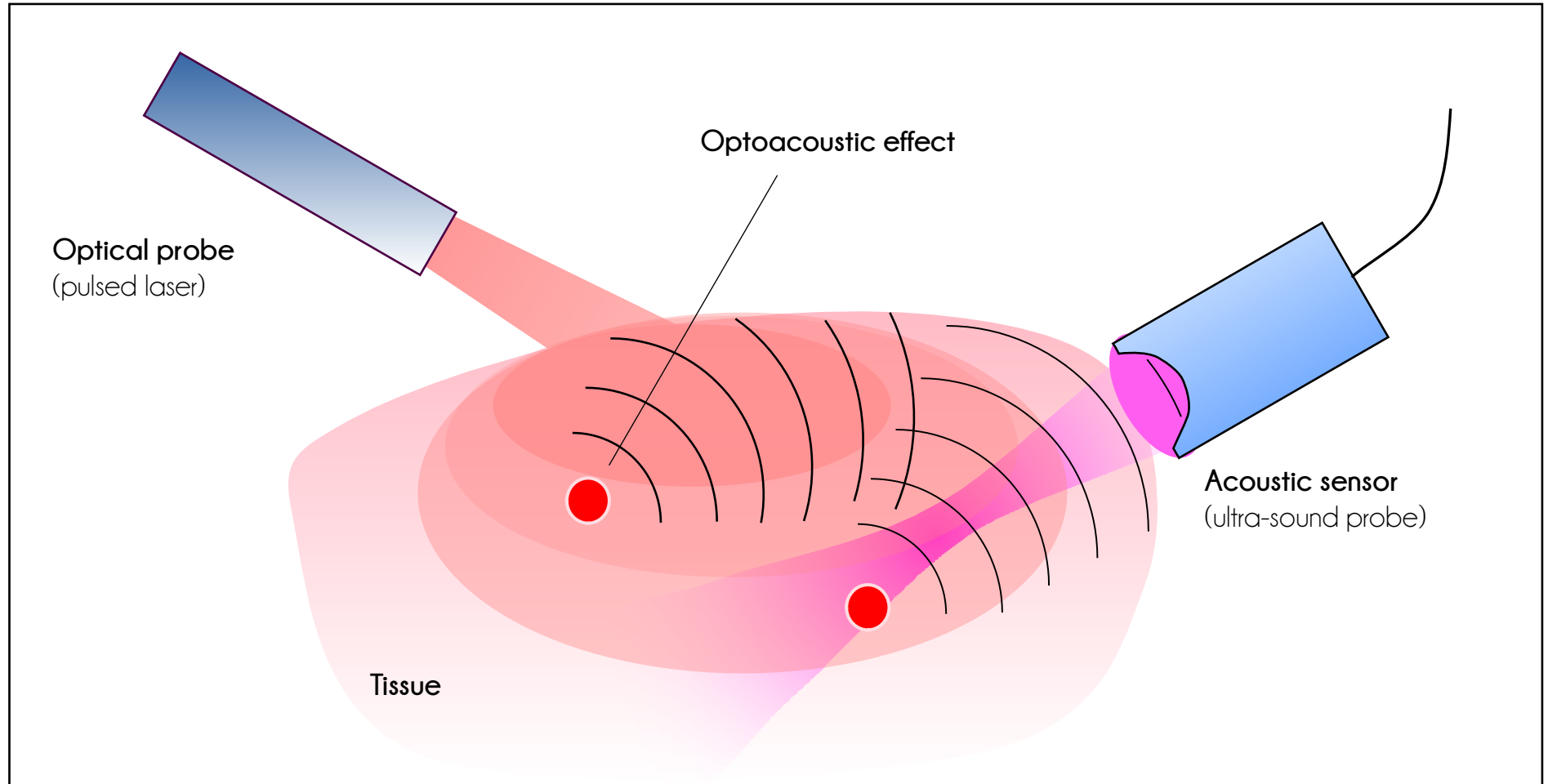
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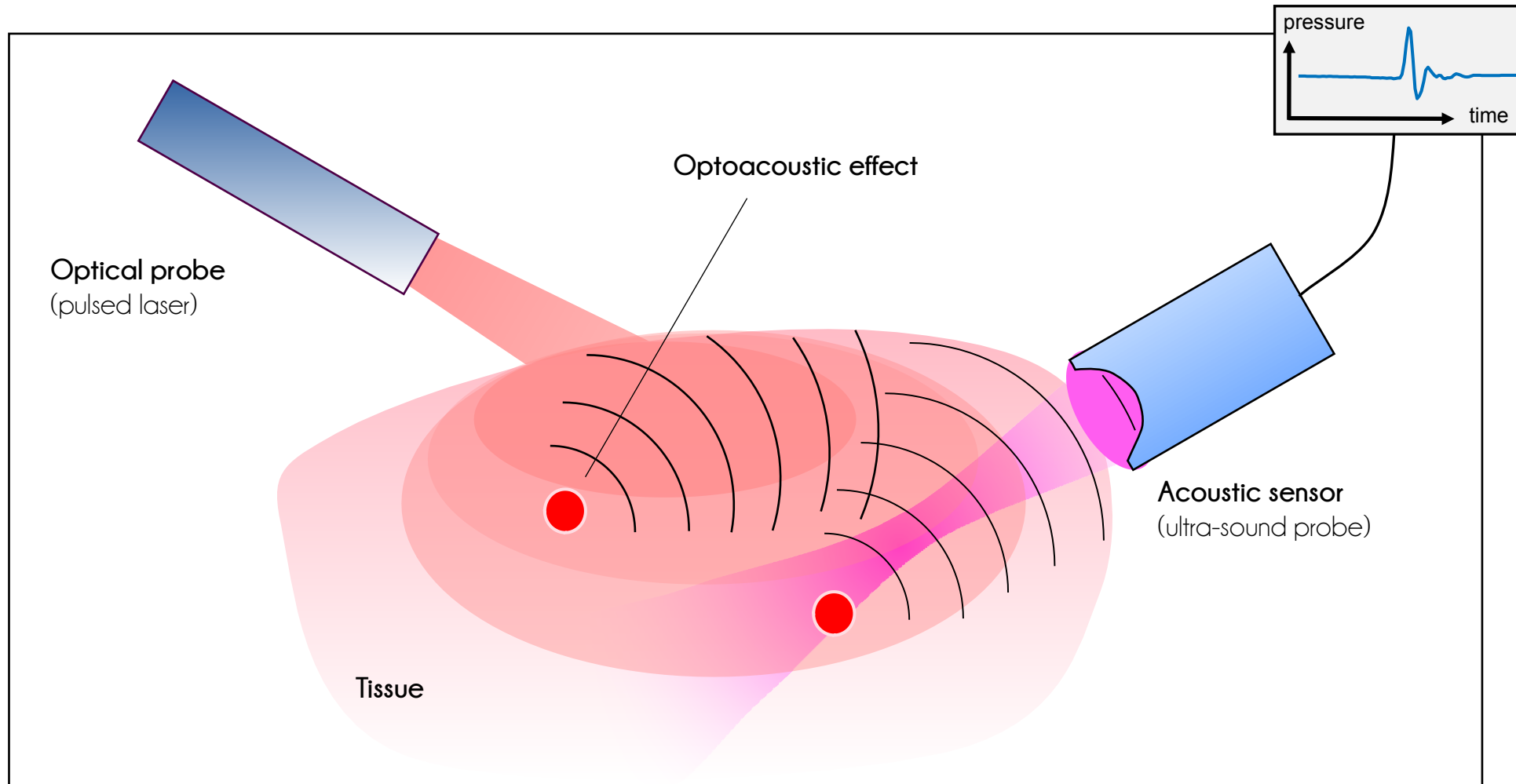
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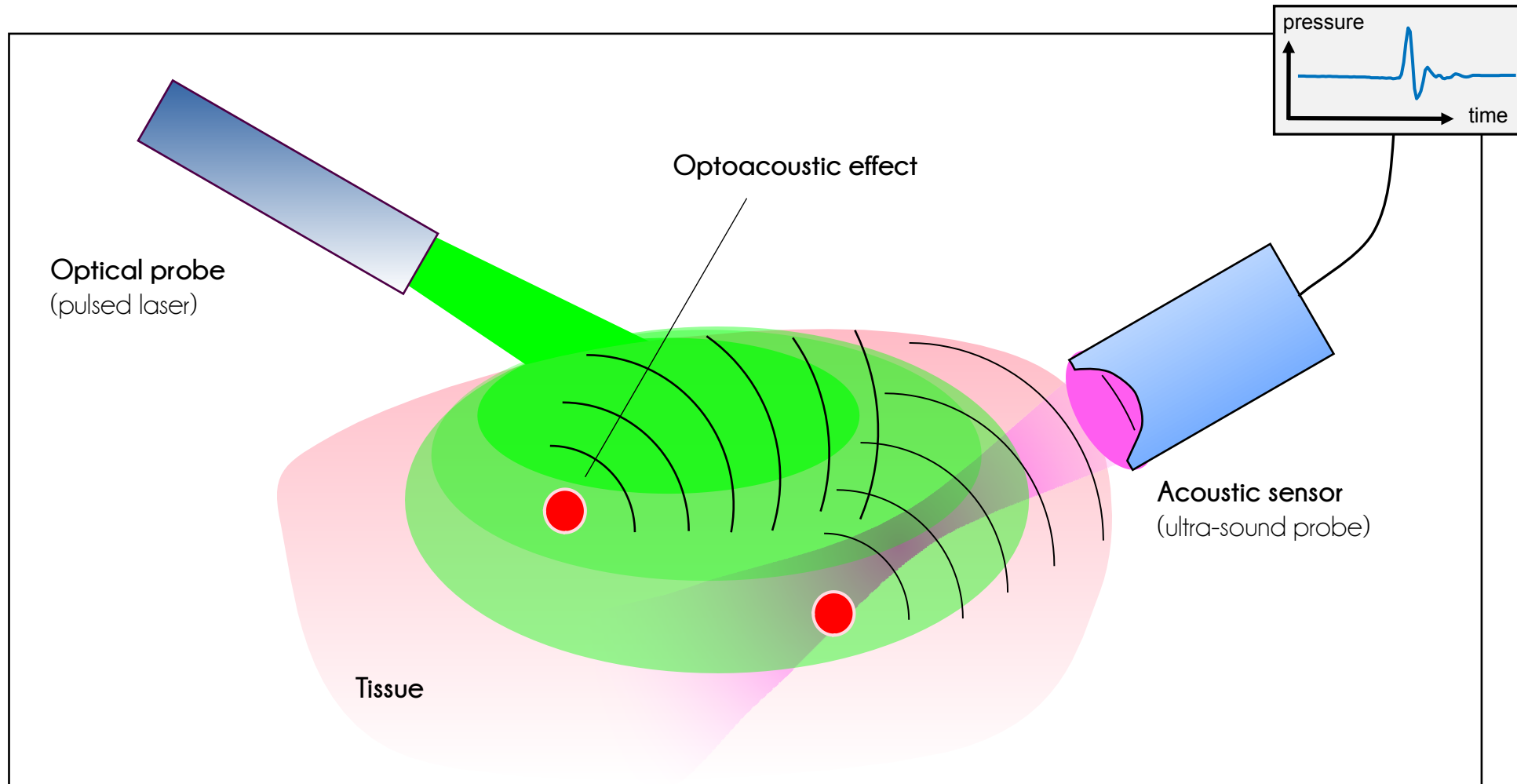
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Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel



# Optoacoustic Tomography

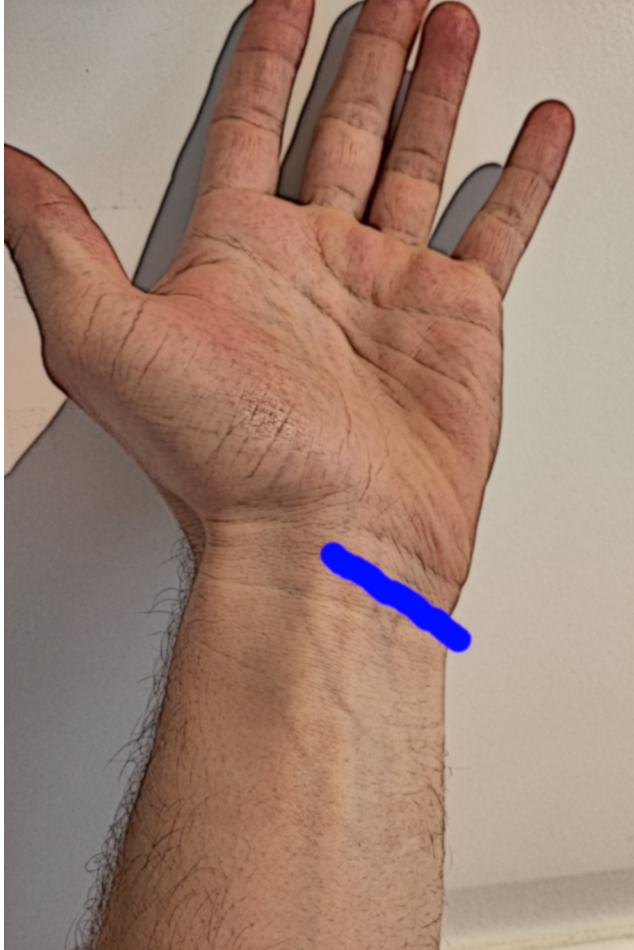
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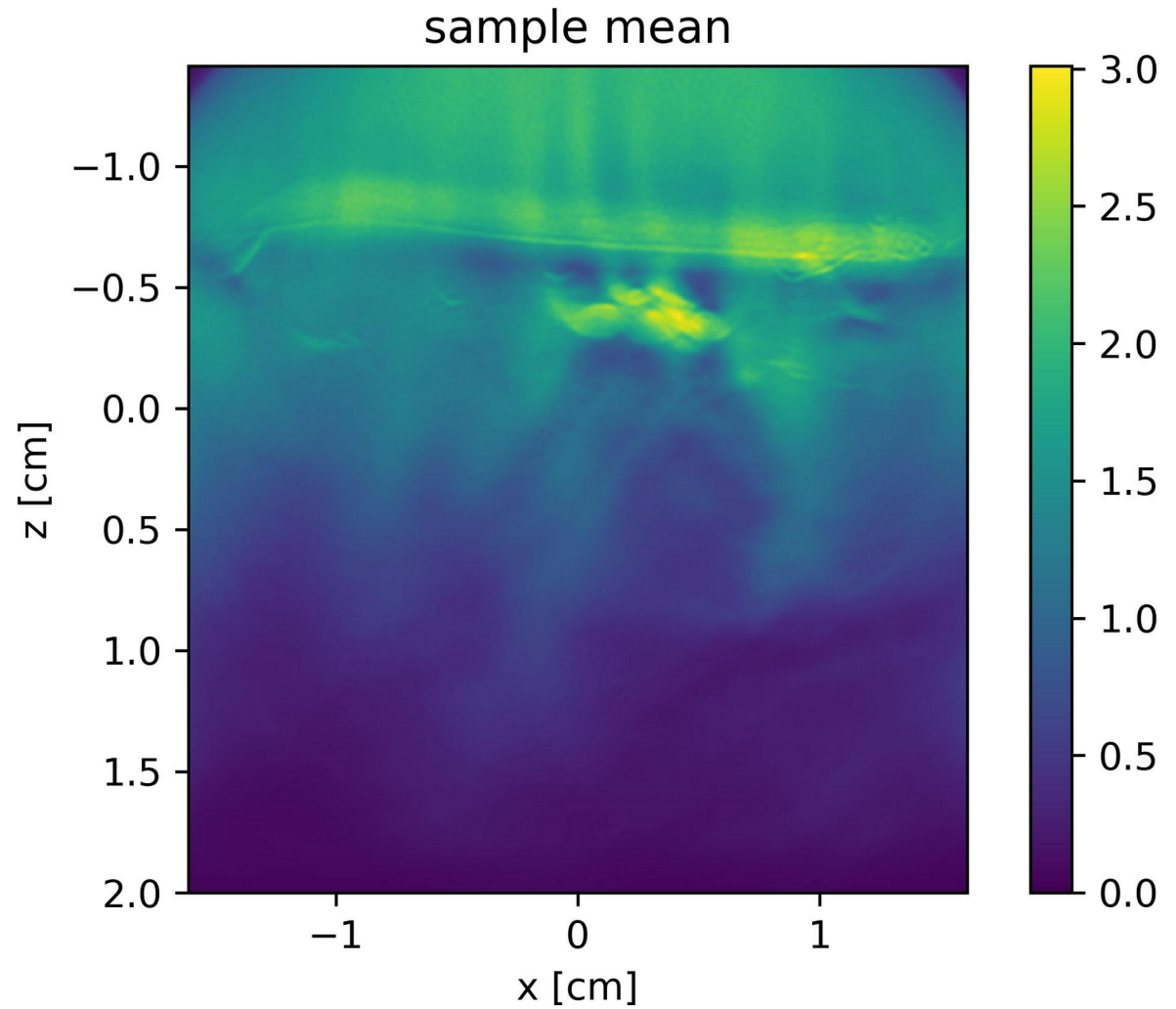
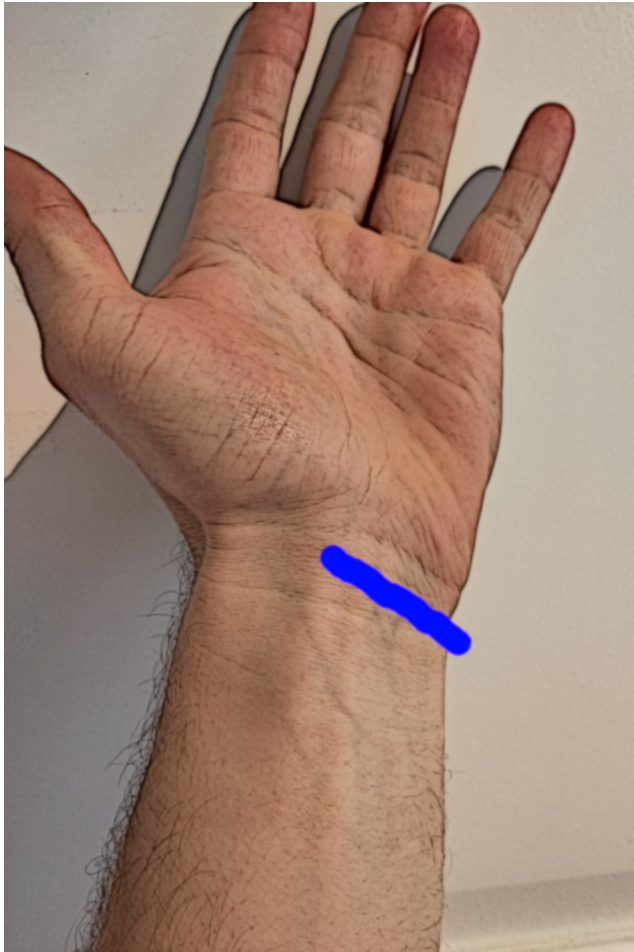
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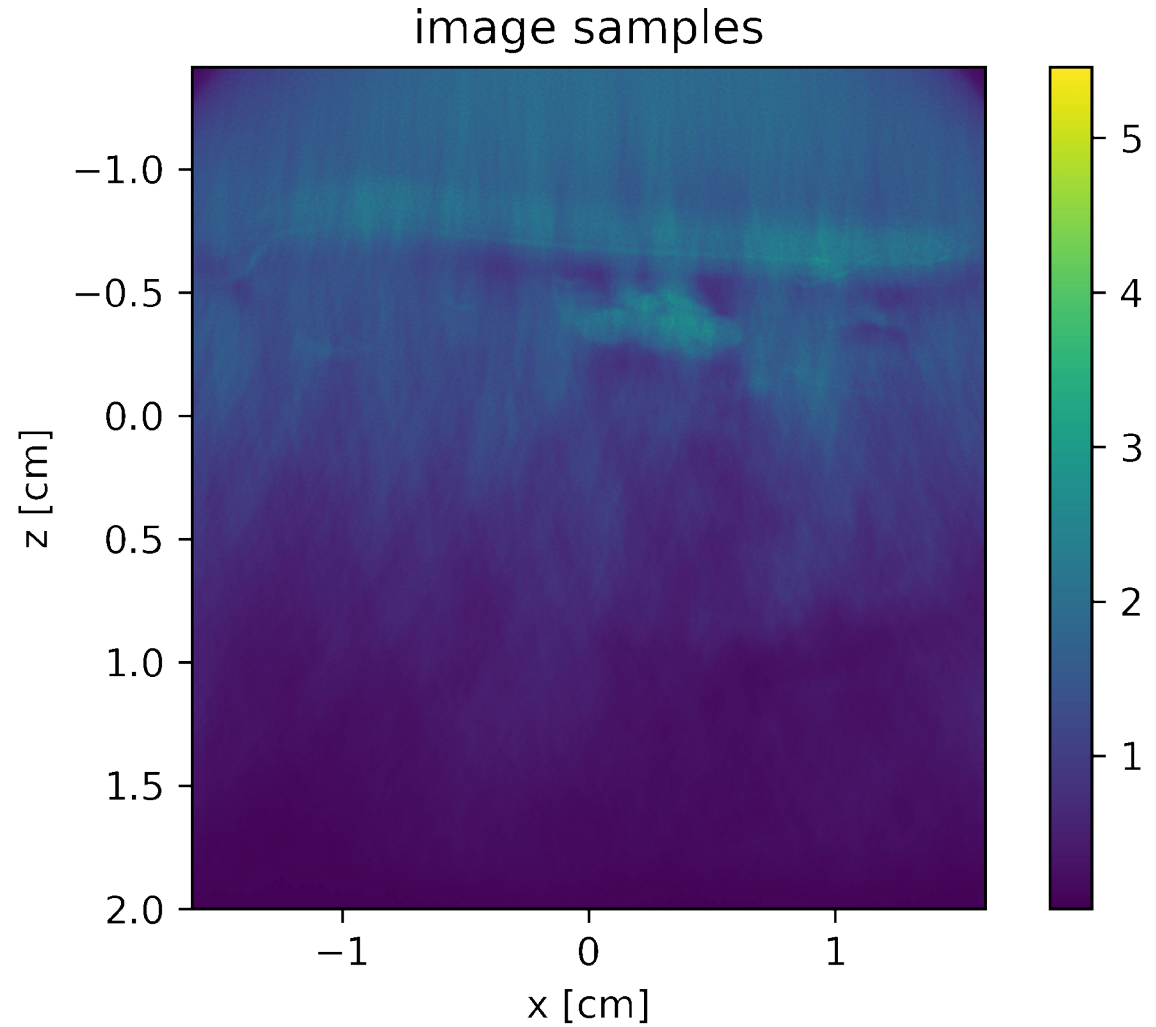
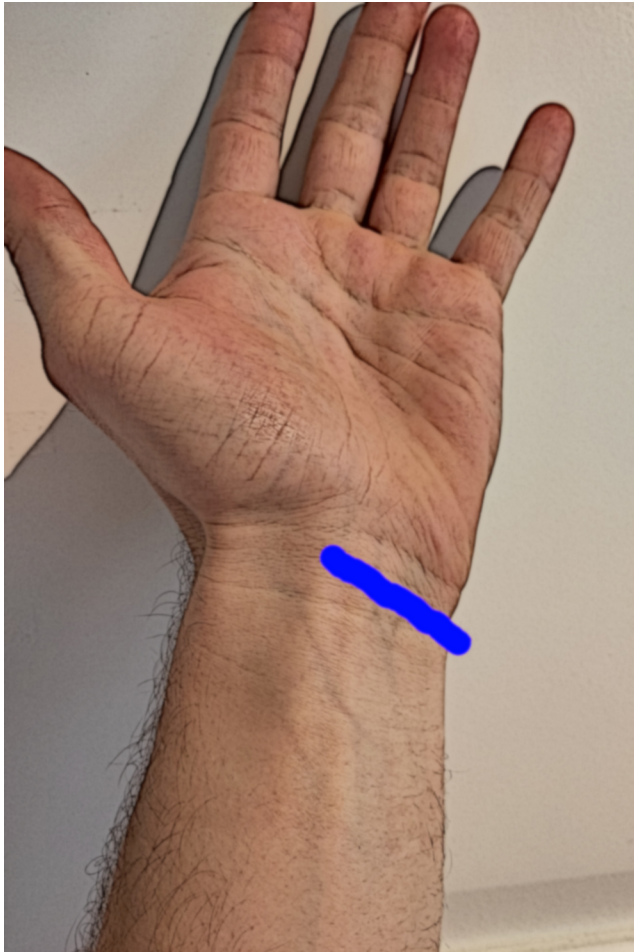
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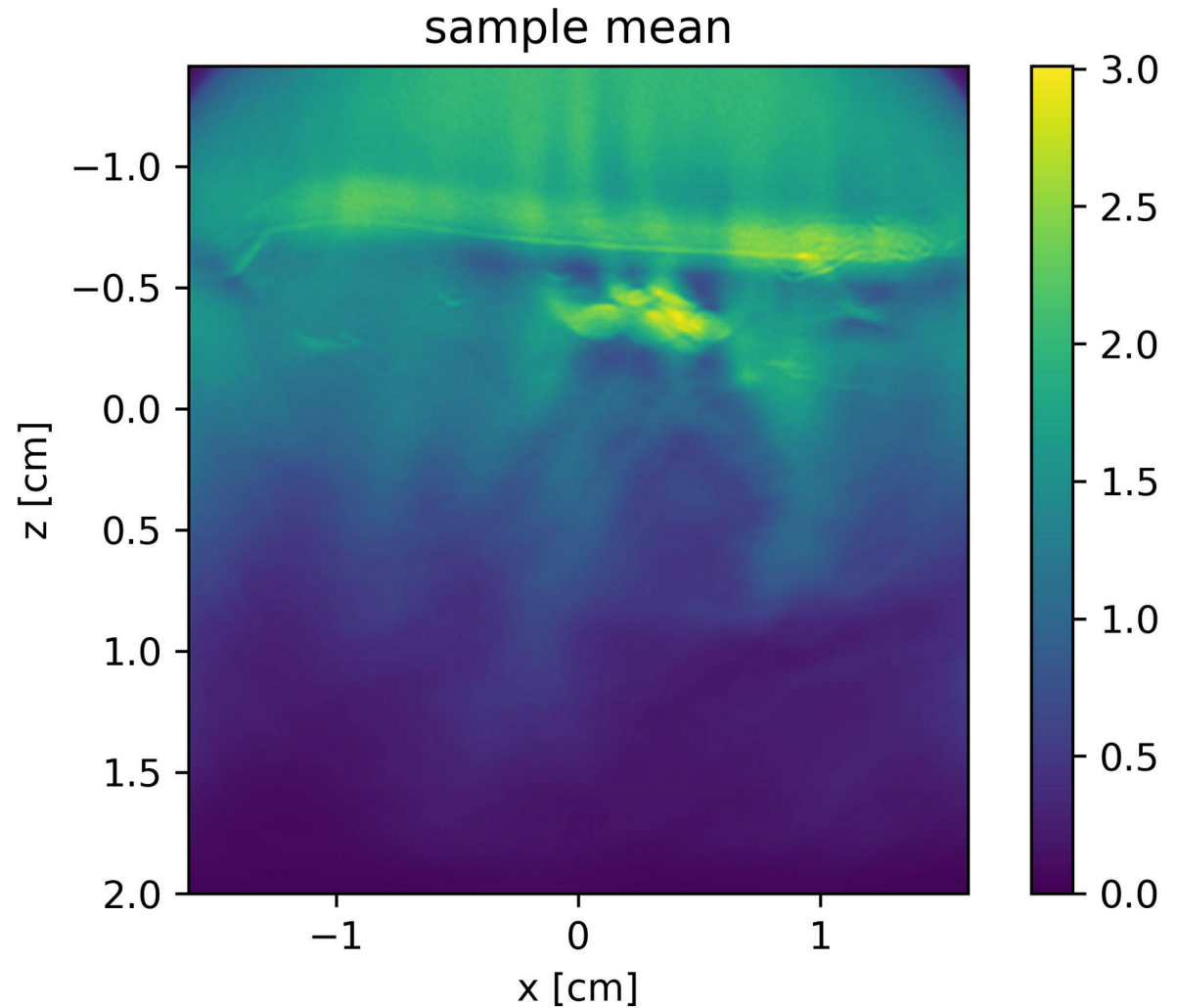
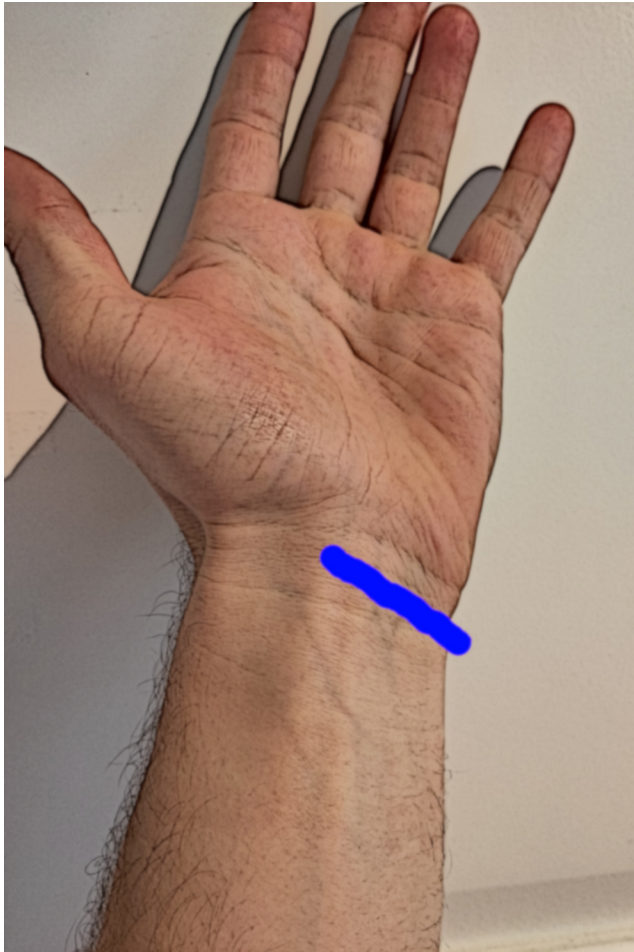
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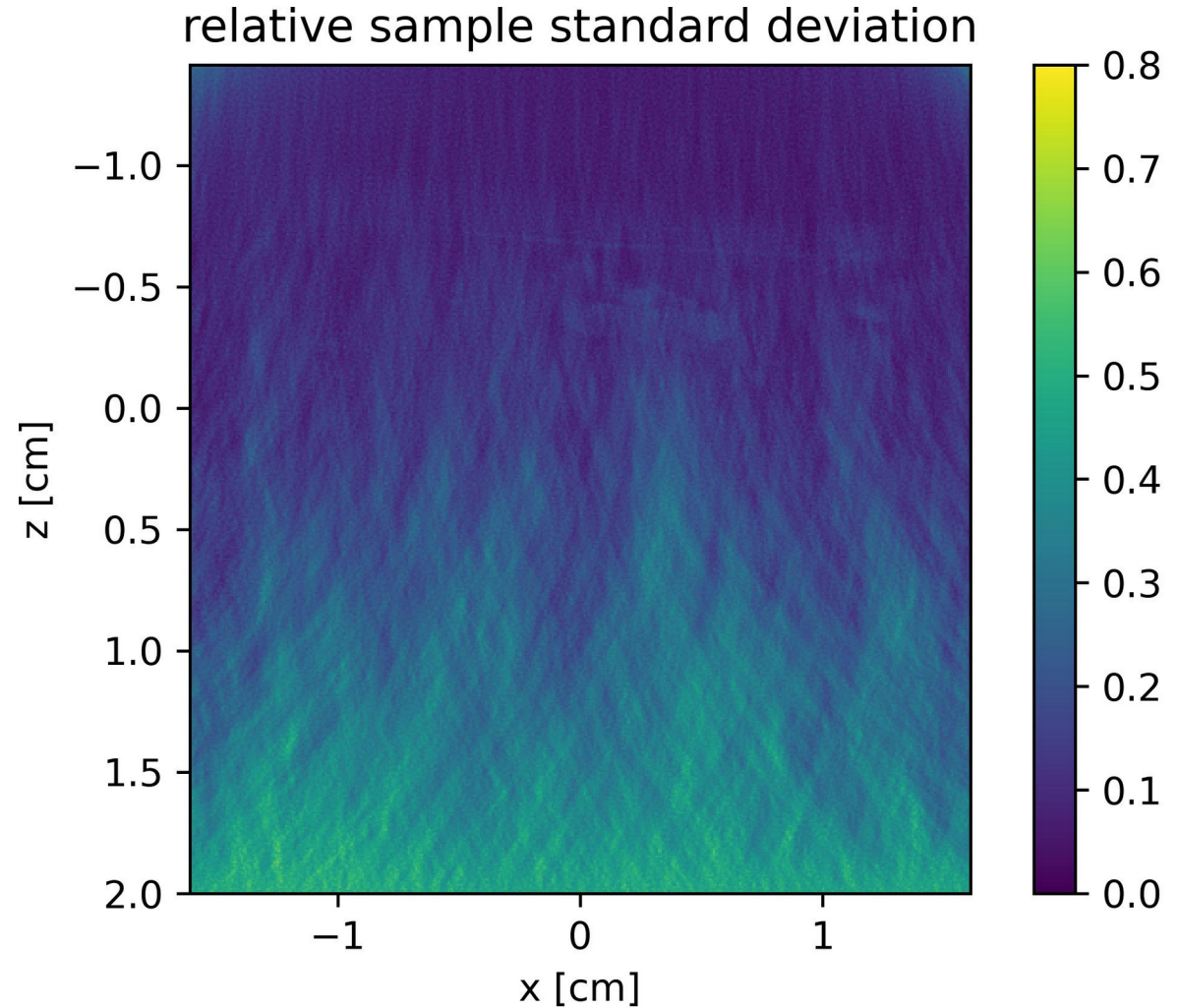
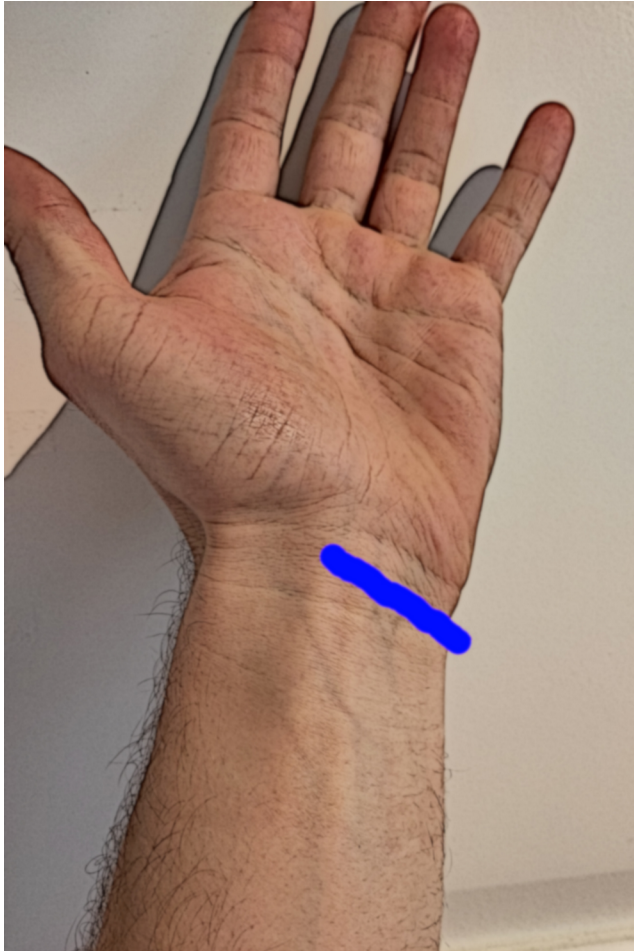
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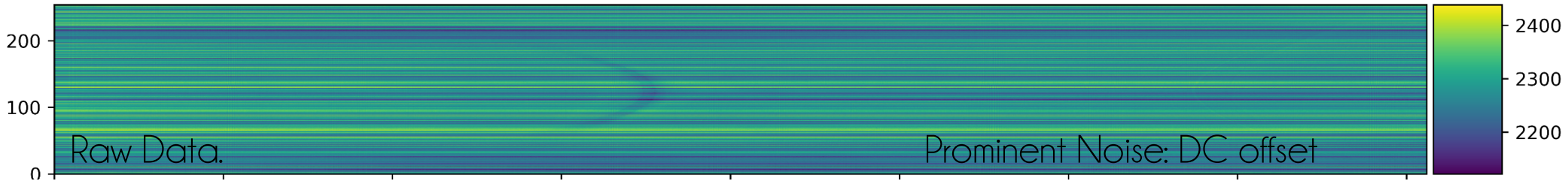
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Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel



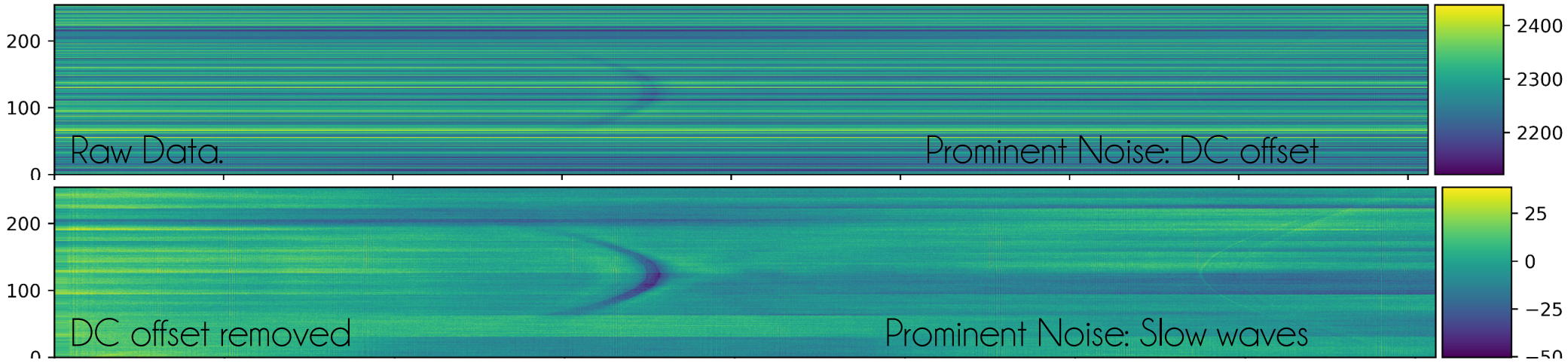
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Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel



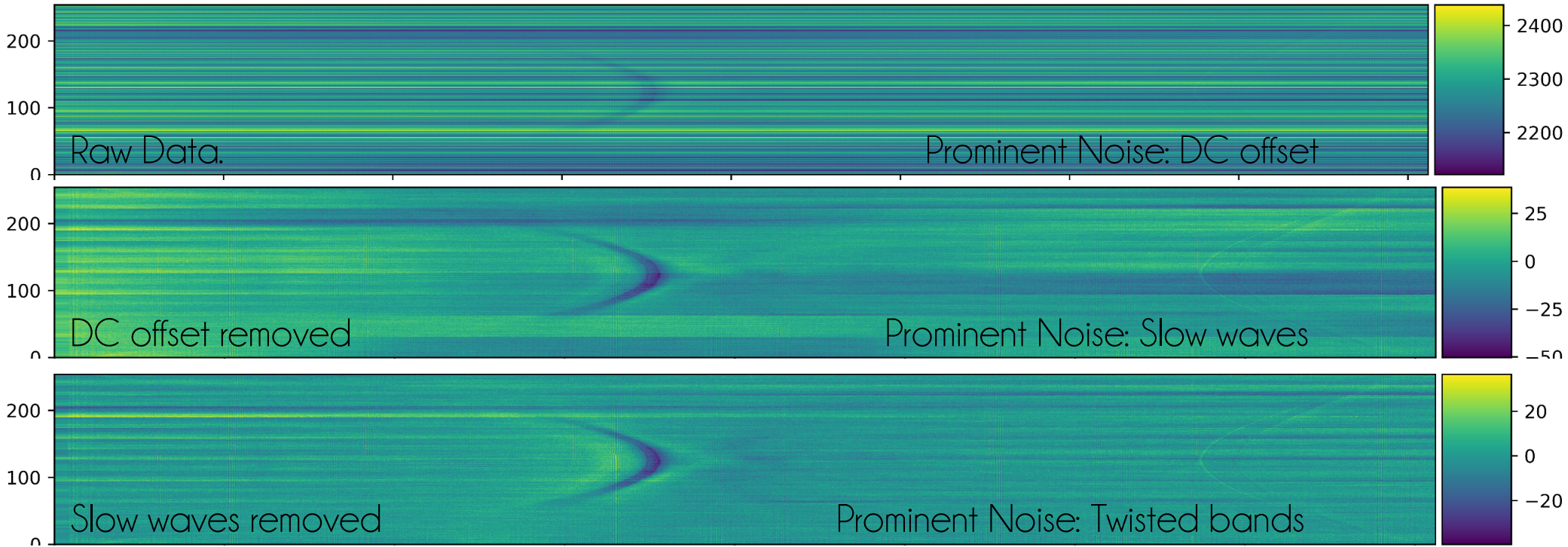
# Optoacoustic Tomography

Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel



# Optoacoustic Tomography

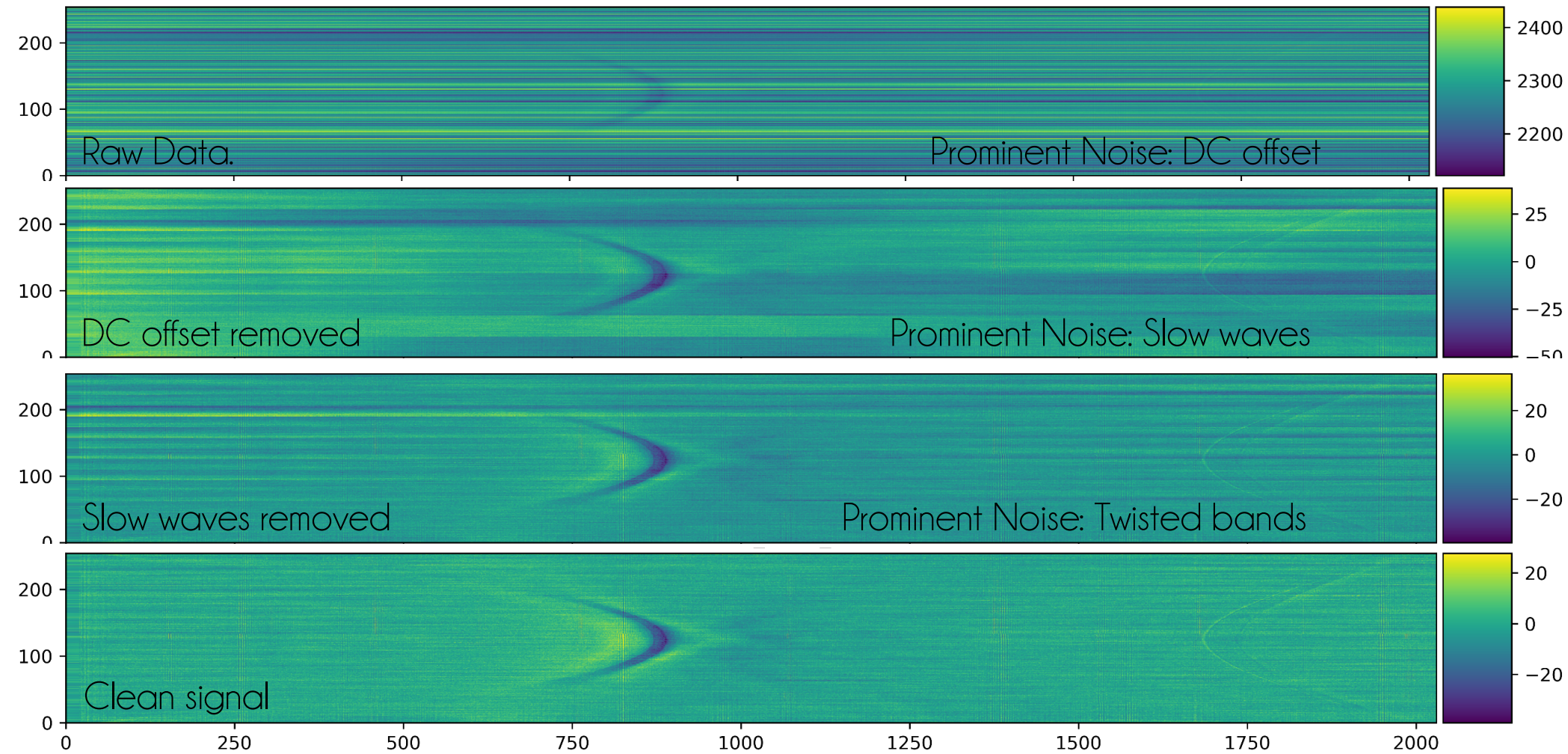
Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel





# Optoacoustic Tomography

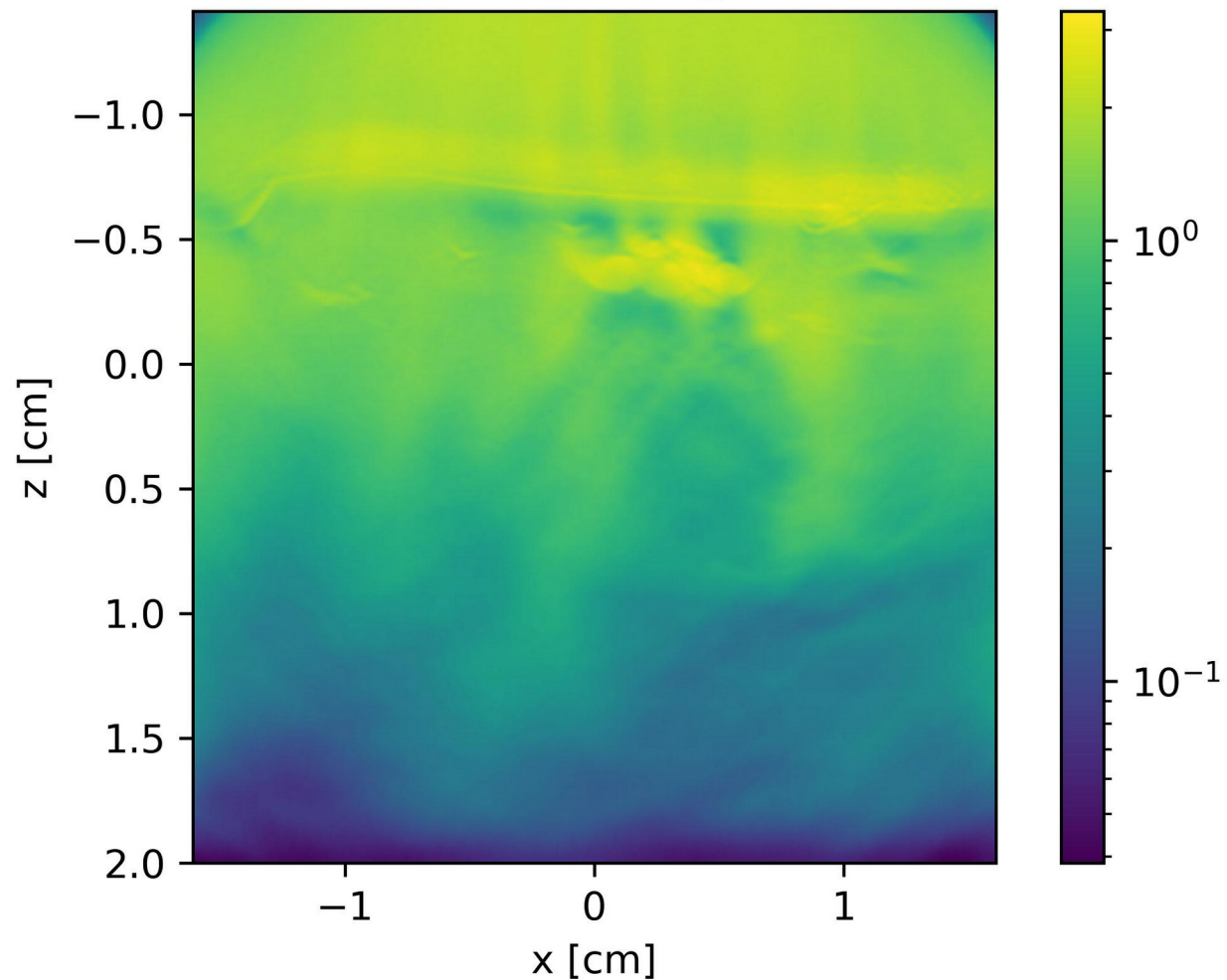
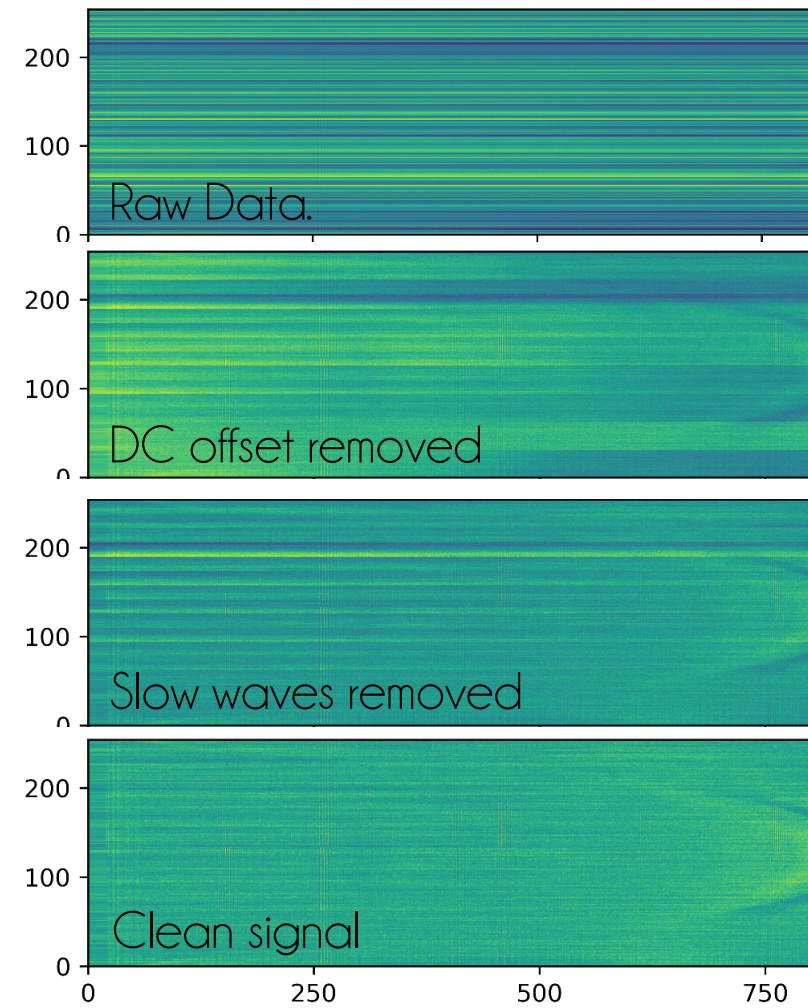
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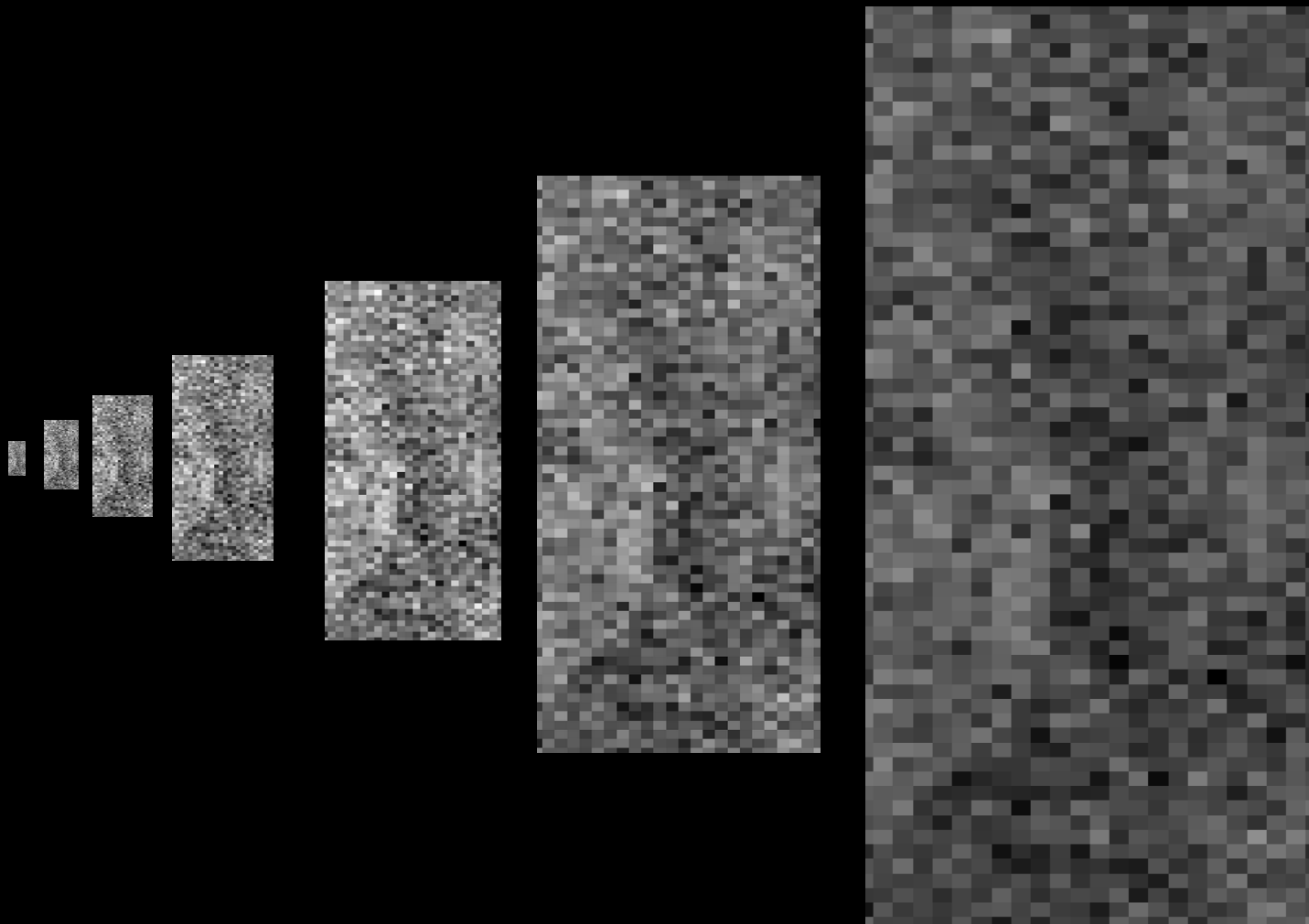
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Lukas Platz, Maximilian Bader, Philipp Haim, Dominik Jüstel

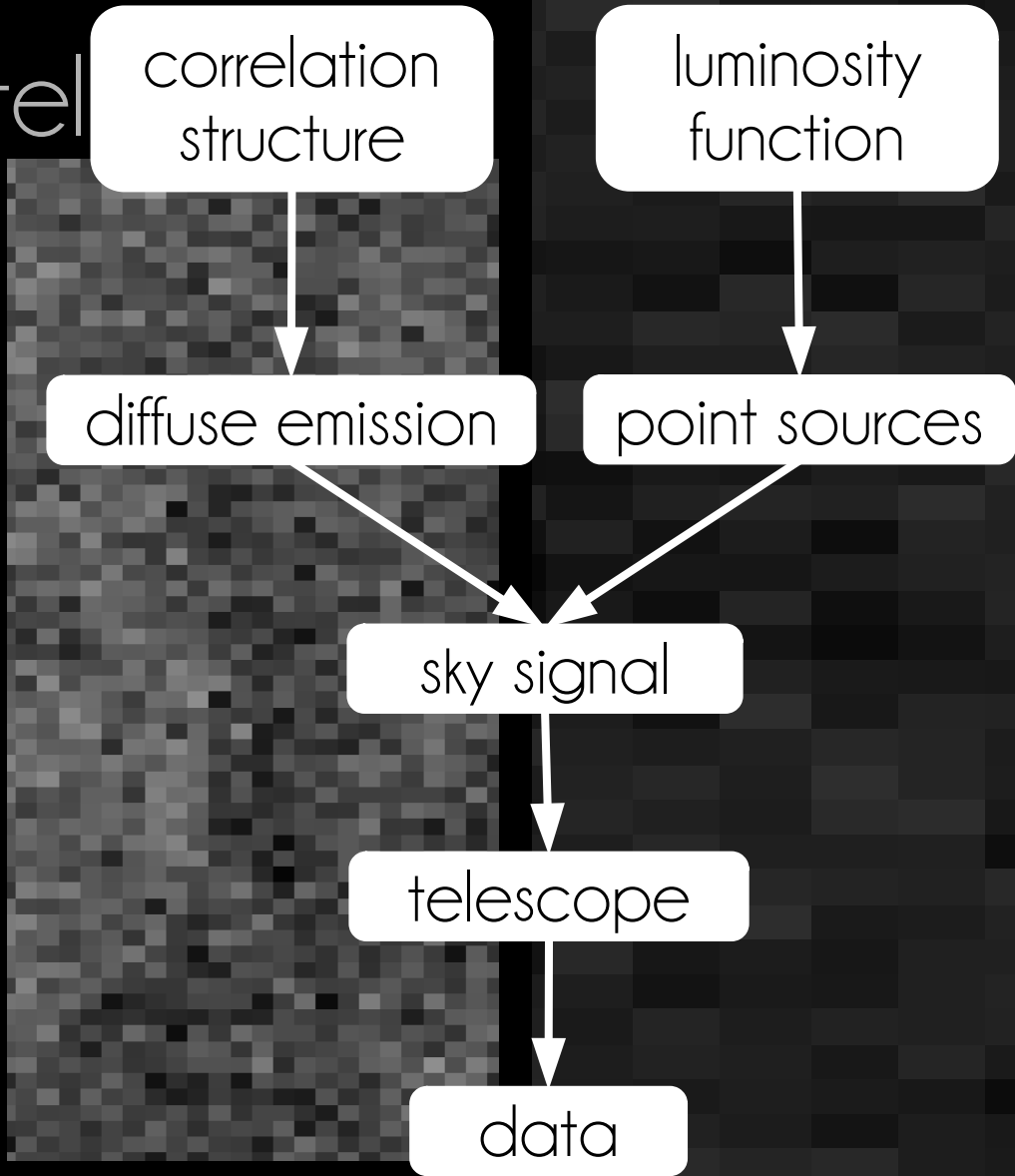
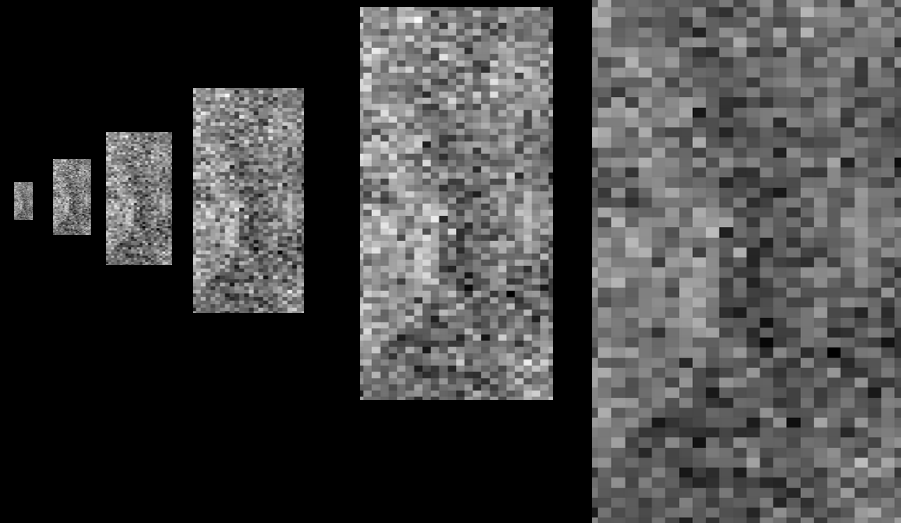
sample mean (log scale)



# Artificial Intelligence



# Artificial Intel



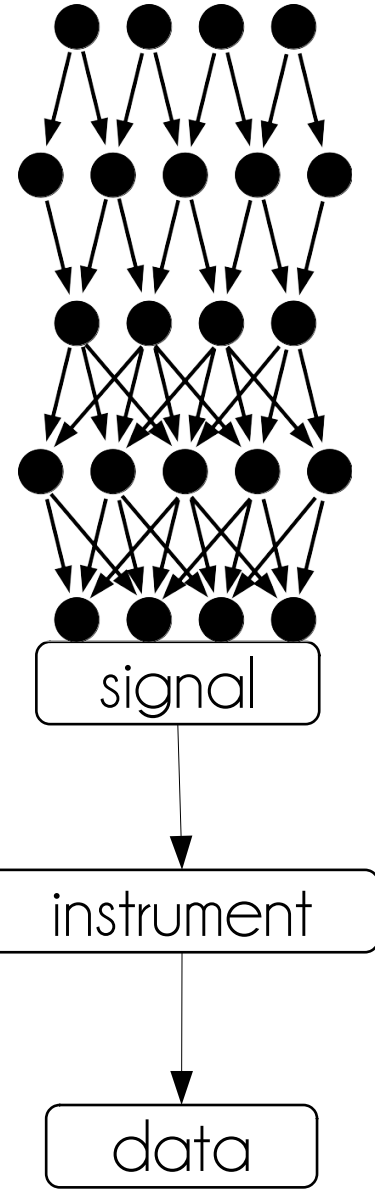
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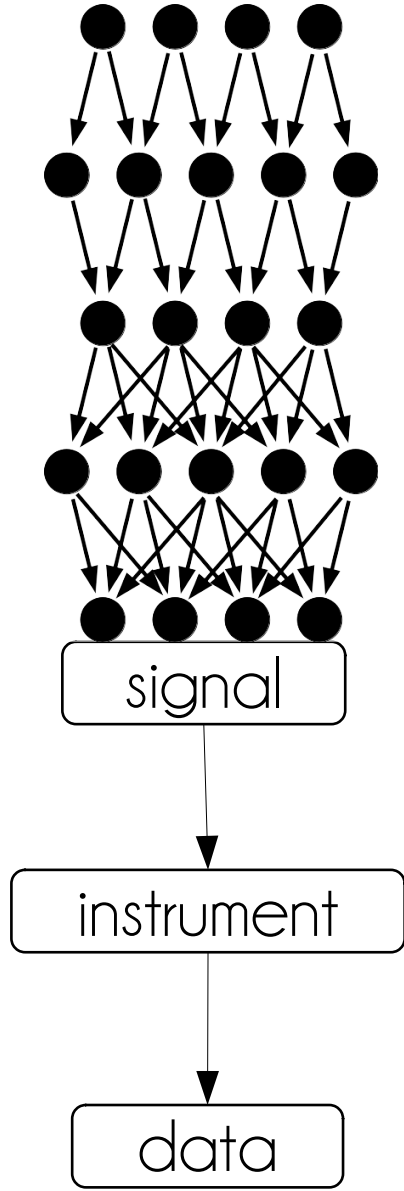
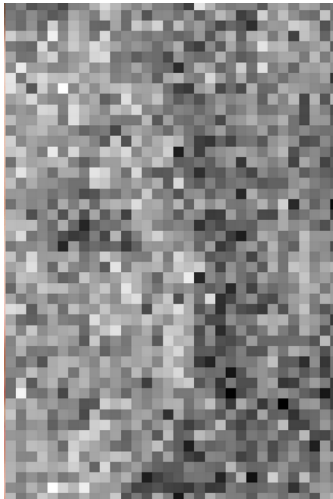
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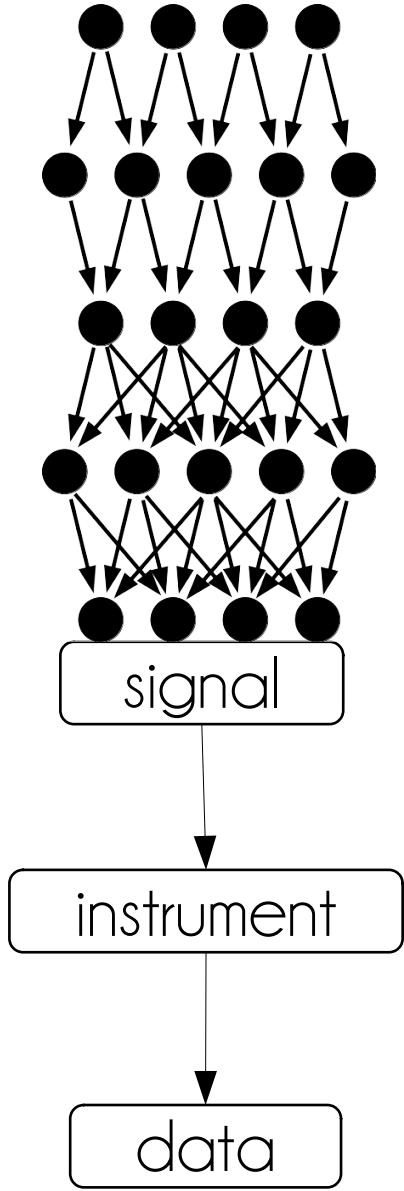
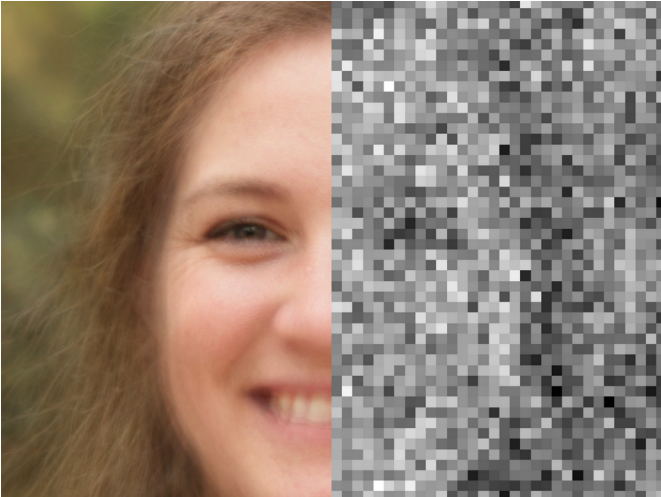
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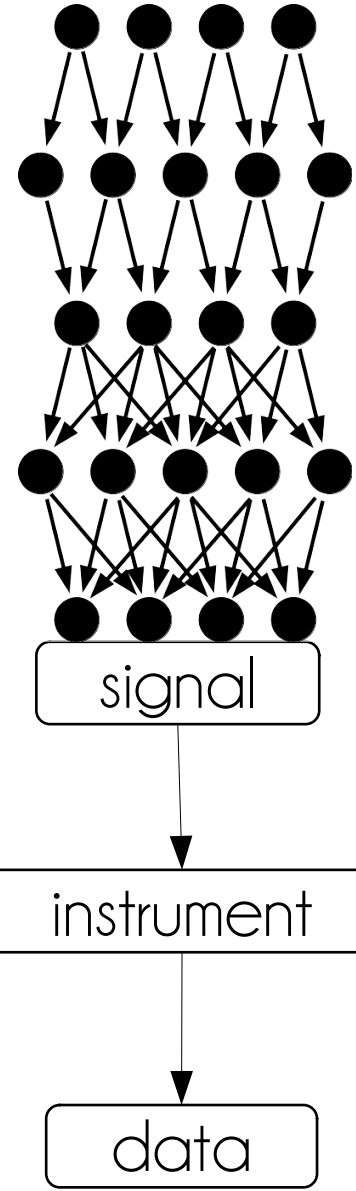
Knollmüller & Enßlin (2021)



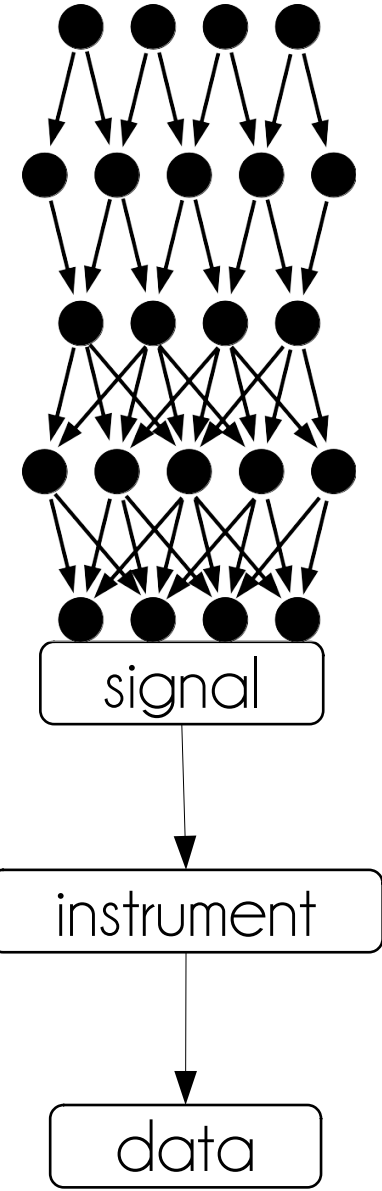
Knollmüller & Enßlin (2021)





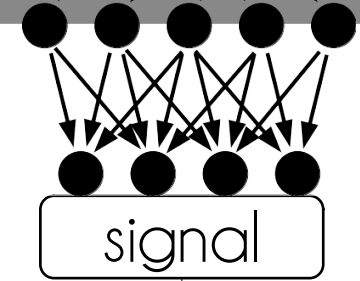


Knollmüller & Enßlin (2021)



Knollmüller & Enßlin (2021)

# Information field theory



instrument

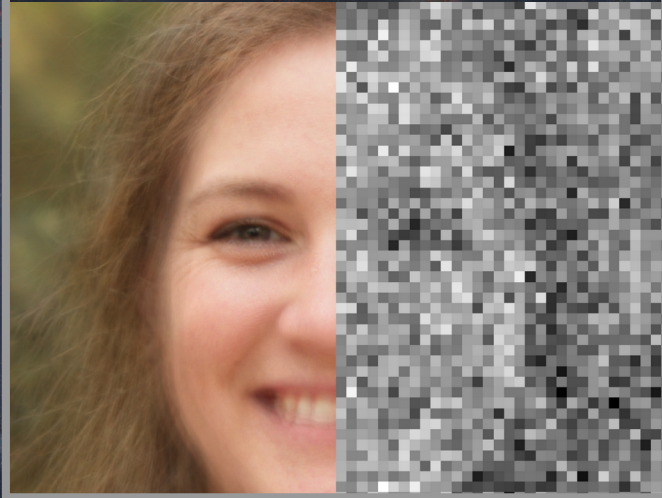
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Knollmüller & Enßlin (2021)

# Information field theory



IFT is AI

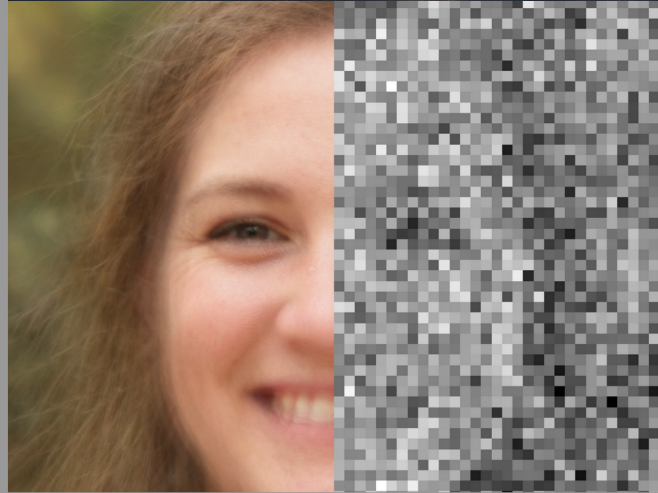


# Information field theory

IFT is big data



IFT is AI

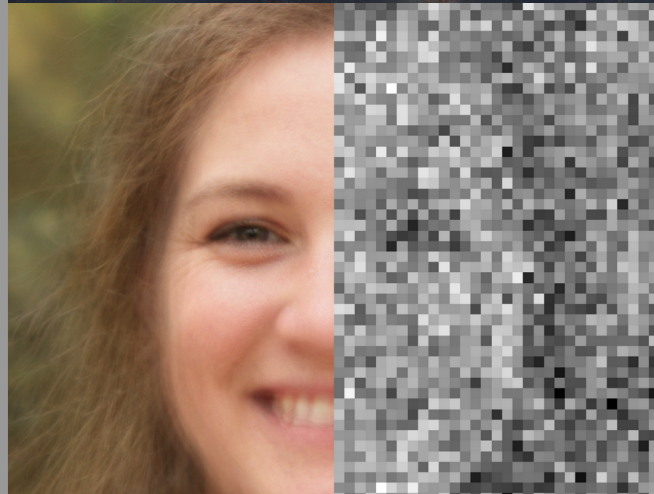


# Information field theory

IFT is big data



IFT is AI



IFT is for you

NIFTy software package:  
[ift.pages.mpcdf.de/nifty](http://ift.pages.mpcdf.de/nifty)

IFT resource page:  
[www.mpa-garching.mpg.de/ift](http://www.mpa-garching.mpg.de/ift)