

TGE maps



Total Galactic Extinction

Ronald Drimmel

Doug Marshall

Total Galactic Extinction map

- 2D extinction HEALPix map of A_0
- Tracers: giants outside the ISM layer ($|Z| > 300$ pc)
- A_0 :
 - monochromatic extinction at 541.4 nm.
 - is a parameter in the adopted extinction law (Fitzpatrick 1999).
 - A_0 measures taken from GSP-Phot 'best' (*azero_gspphot*)
- TGE A_0 = Median A_0 of selected extinction tracers

Details: [link to paper](#)

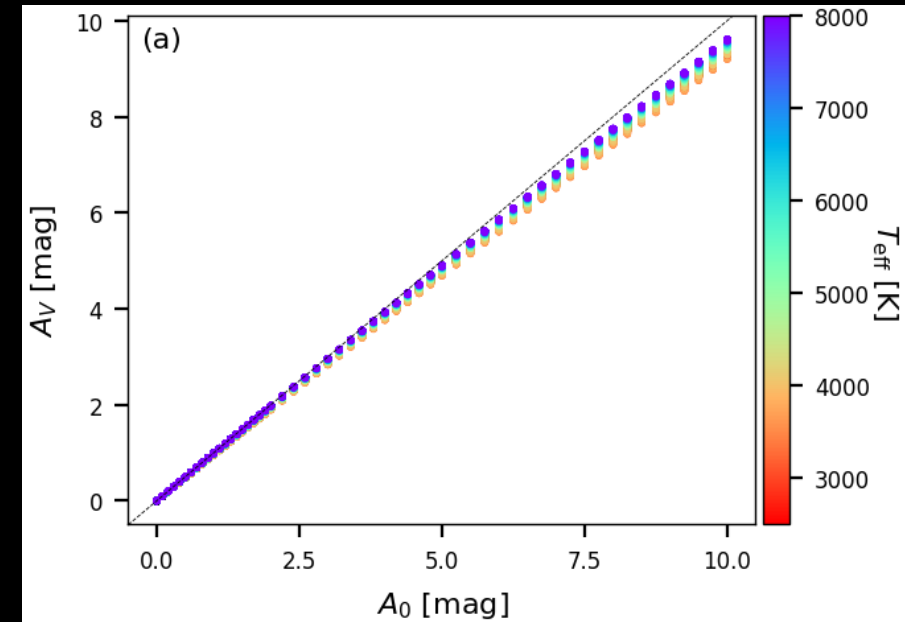
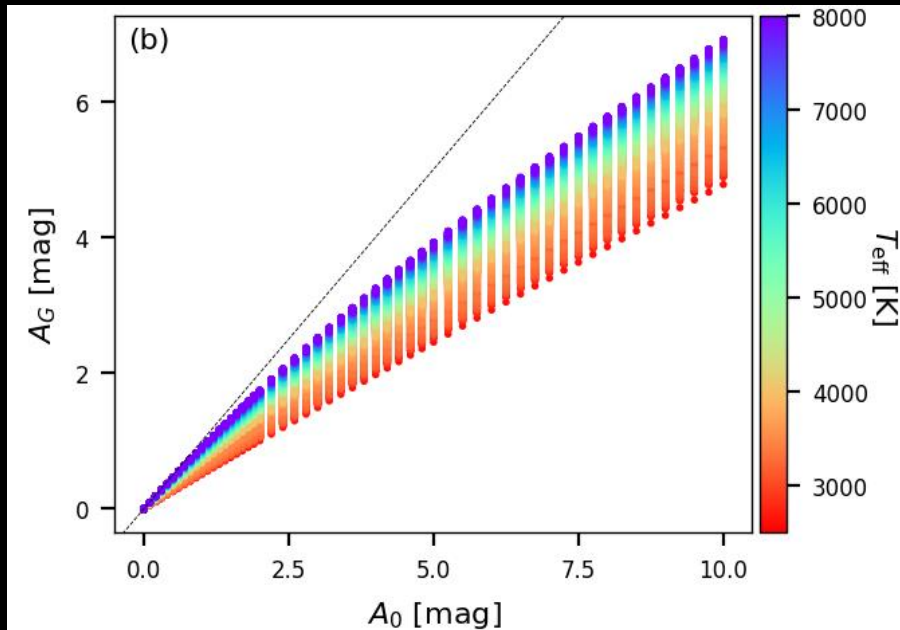
[link to online documentation](#)

Why A_0

$$f(\lambda) = F(\lambda) \cdot 10^{-0.4A(\lambda)}$$

$$f_G = \int T_G(\lambda) f(\lambda) d\lambda$$

$$A_G = 2.5 \cdot \log(F_G/f_G)$$



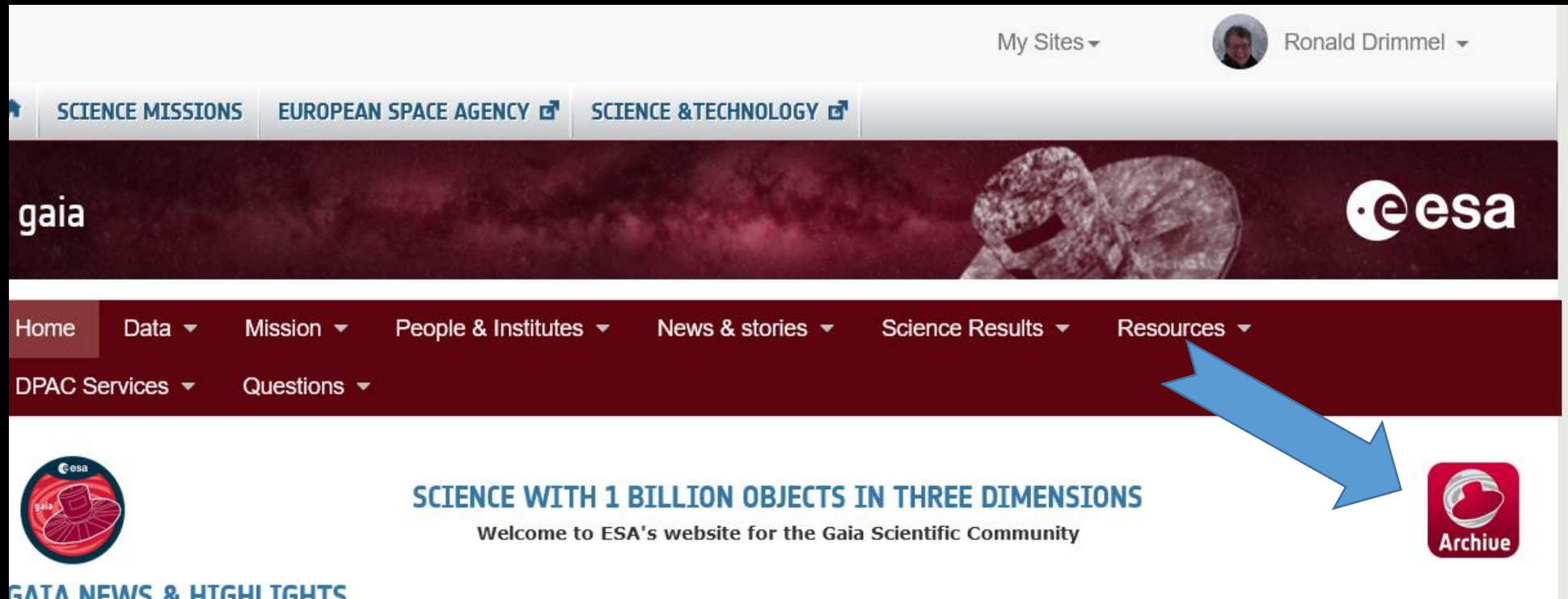
More info on extinction law is [here](#).

Where's the data?

Two tables:

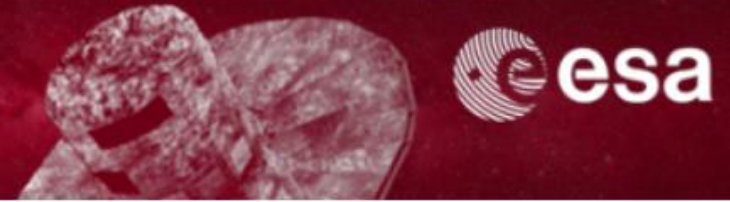
1. `total_galactic_extinction_map`: map at four different resolutions
2. `total_galactic_extinction_map_opt` : map at HEALPix level 9 based on 'optimum' resolution

Archive...



The screenshot shows the ESA Gaia website interface. At the top right, there is a user profile for Ronald Drimmel. Below the navigation bar, the word 'gaia' is displayed on the left, and the ESA logo is on the right. A dark red navigation bar contains the following menu items: Home, Data, Mission, People & Institutes, News & stories, Science Results, and Resources. Below this, there are links for DPAC Services and Questions. A large blue arrow points from the 'Resources' menu item to a red 'Archive' button located in the bottom right corner of the page. The main content area features the heading 'SCIENCE WITH 1 BILLION OBJECTS IN THREE DIMENSIONS' and a sub-heading 'Welcome to ESA's website for the Gaia Scientific Community'. A small circular logo with the Gaia satellite is visible on the left side of the main content area.

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- Basic
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gaia



- Other
- Gaia Data Release 1
- Gaia Data Release 2
- Gaia Data Release 3
 - gaiadr3.gaia_source
 - gaiadr3.gaia_source_lite
- Astrophysical parameters
- Auxiliary
- Cross match
- Extra-galactic
- Non-single stars
- Performance verification
- Reference frame



Job name:

[Query examples](#)

1

Ctrl+Space for query autocompletion

Status		Job	Creation date	Num. rows
✓	<input type="checkbox"/>	165551646133O	18-Jun-2022, 13:27:26	21717
✓	<input type="checkbox"/>	1647347758106O	15-Mar-2022, 13:35:58	37431162

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- gaidr3.gaia_source
- gaidr3.gaia_source_lite
- Astrophysical parameters**
 - gaidr3.astrophysical_parameters
 - gaidr3.astrophysical_parameters_supp
 - gaidr3.oa_neuron_information
 - gaidr3.oa_neuron_xp_spectra
 - gaidr3.total_galactic_extinction_map**
 - gaidr3.total_galactic_extinction_map_opt**
- Auxiliary
- Cross match
- Extra-galactic
- Non-single stars
- Performance verification
- Reference frame

Job name:

[Query examples](#)

```
1
```

Ctrl+Space for query autocompletion

[Reset Form](#) [Submit Query](#)

Status	Job	Creation date	Num. rows
✓ <input type="checkbox"/>	165551646133O	18-Jun-2022, 13:27:26	21717
✓ <input type="checkbox"/>	1647347758106O	15-Mar-2022, 13:35:58	37431162
✓ <input type="checkbox"/>	Upload for job results: 1647339271662O	15-Mar-2022, 12:25:20	0
✓ <input type="checkbox"/>	1647339271662O	15-Mar-2022, 11:14:31	37738236

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- gaidr3.oa_neuron_information
- gaidr3.oa_neuron_xp_spectra
- gaidr3.total_galactic_extinction_map

- solution_id
- healpix_id**
- healpix_level**
- a0
- a0_uncertainty
- a0_min
- a0_max
- num_tracers_used
- optimum_hpx_flag
- status

gaidr3.total_galactic_extinction_map_opt

Auxiliary

Cross match

Job name:

Query examples

1

Ctrl+Space for query autocompletion

Reset Form Submit Query

Status	Job	Creation date	Num. rows
✓ <input type="checkbox"/>	1655551646133O	18-Jun-2022, 13:27:26	21717
✓ <input type="checkbox"/>	1647347758106O	15-Mar-2022, 13:35:58	37431162
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✓ <input type="checkbox"/>	1647339271662O	15-Mar-2022, 11:14:31	37738236

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Apply jobs filter Select all jobs

Delete selected jobs

total_galactic_extinction_map

4 maps at 4 different resolutions: HEALPix levels 6 – 9.

One line per HEALPix:

Columns:

healpix_id : HEALPix index

healpix_level : which HEALPix level the HEALPix

a0 : median A0 of the extinction tracers

a0_uncertainty : uncertainty of the mean A0

a0_min, a0_max: min/max A0 values of tracers

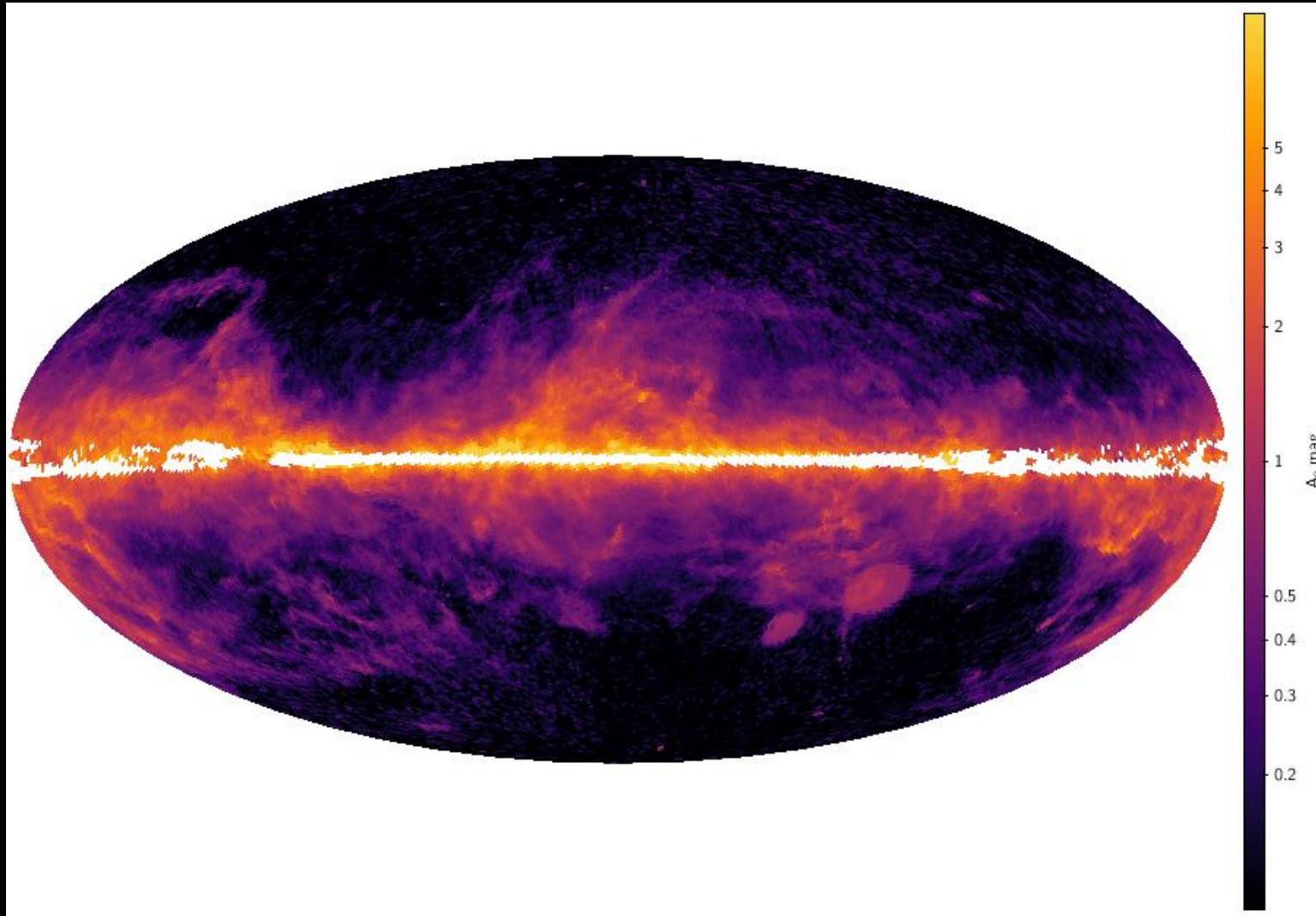
num_tracers_used: number of tracers used

optimum_hpx_flag: Healpix is optimum (highest resolution with at least 10 tracers)

status: flag = 0 if there is an a0, > 0 if a0 is null.

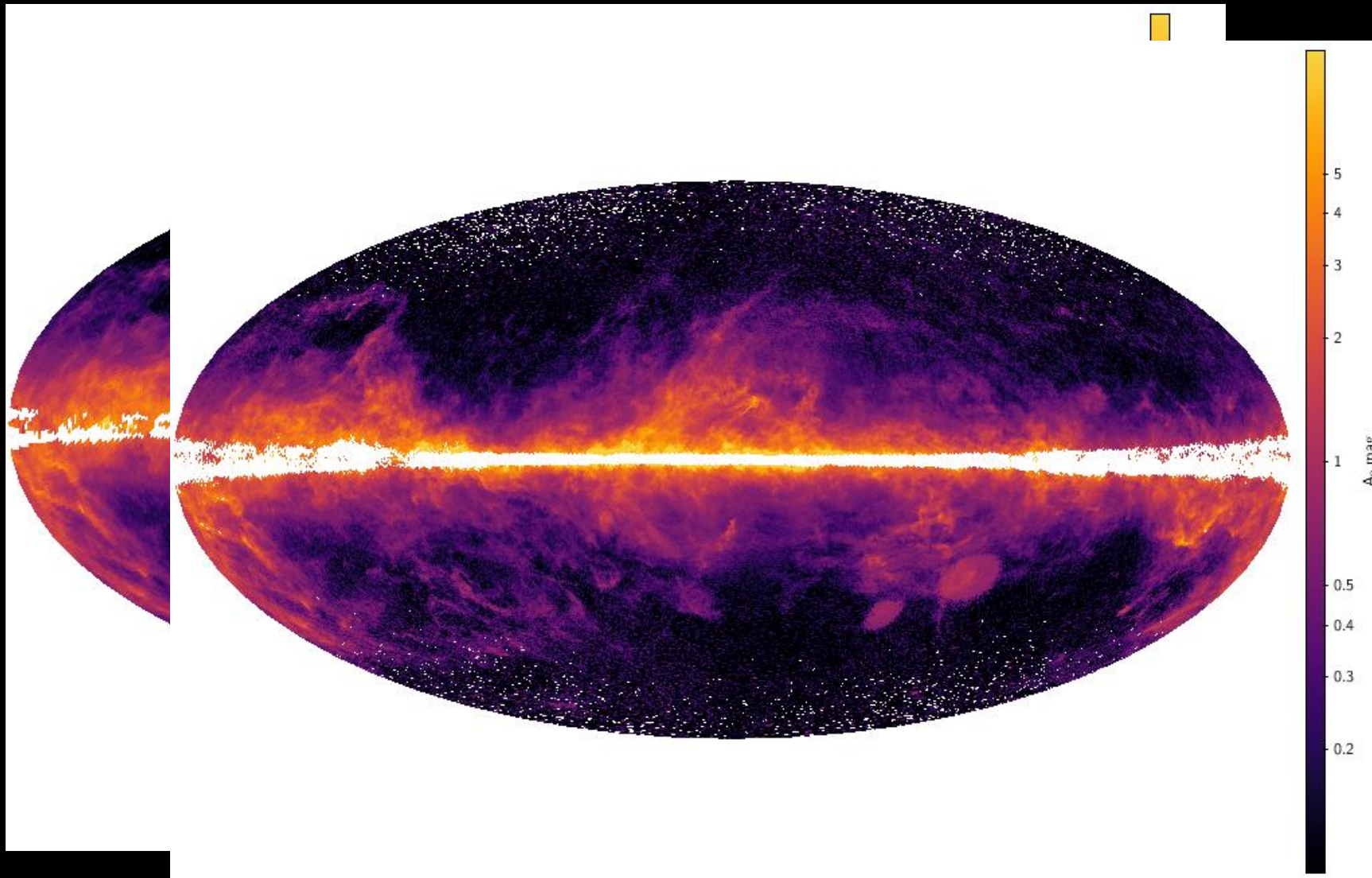
TGE maps at different resolutions

Level 6



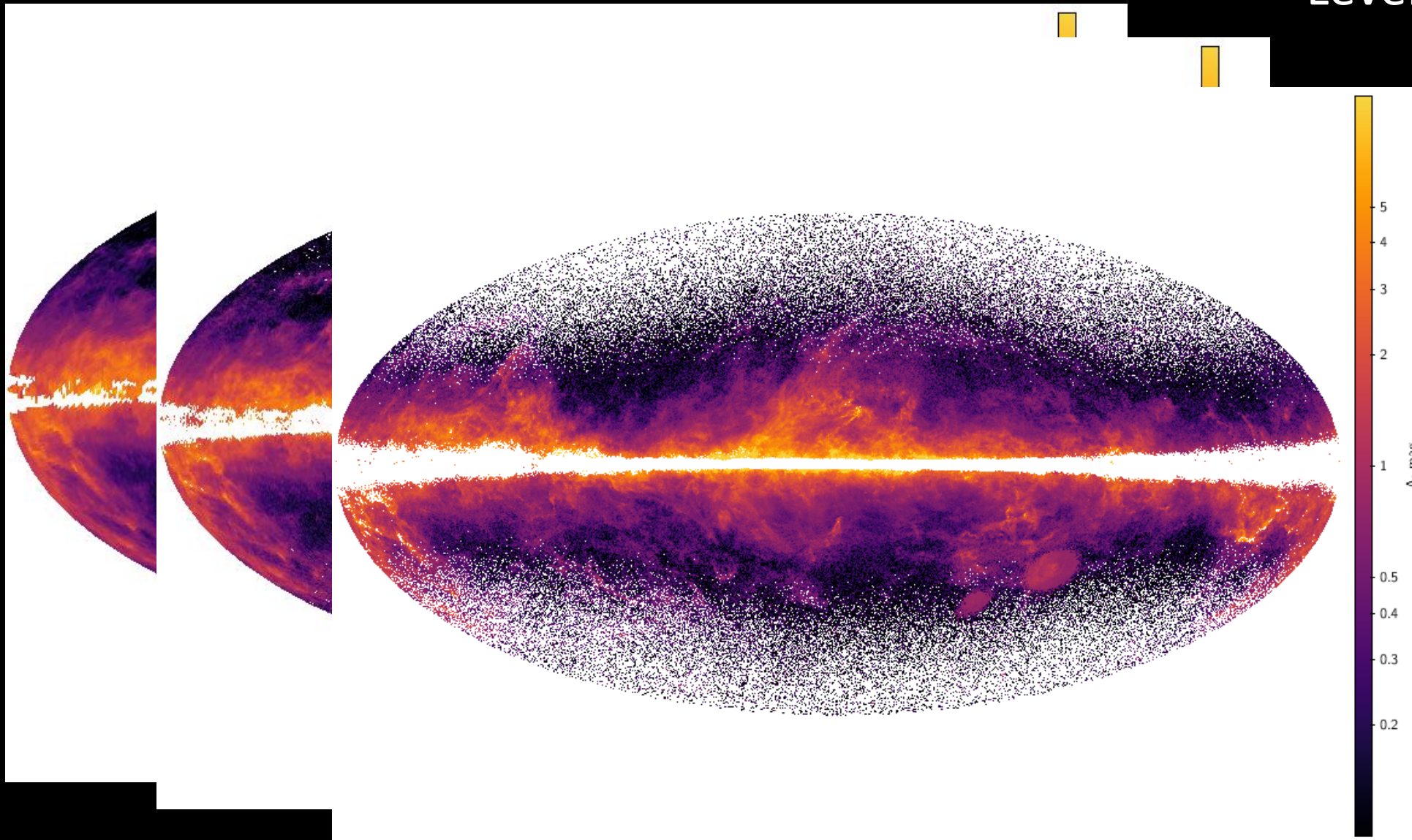
TGE maps at different resolutions

Level 7



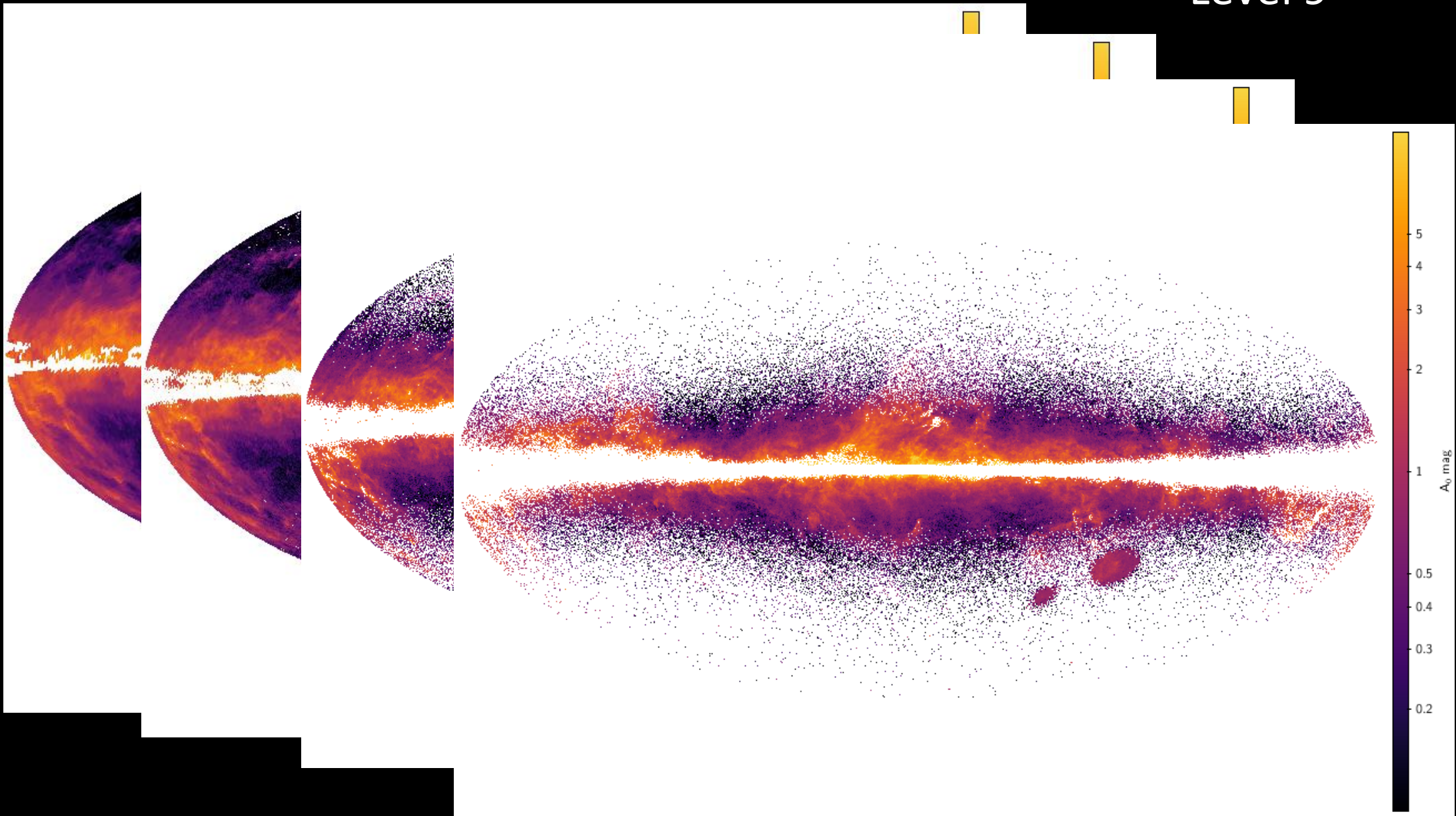
TGE maps at different resolutions

Level 8



TGE maps at different resolutions

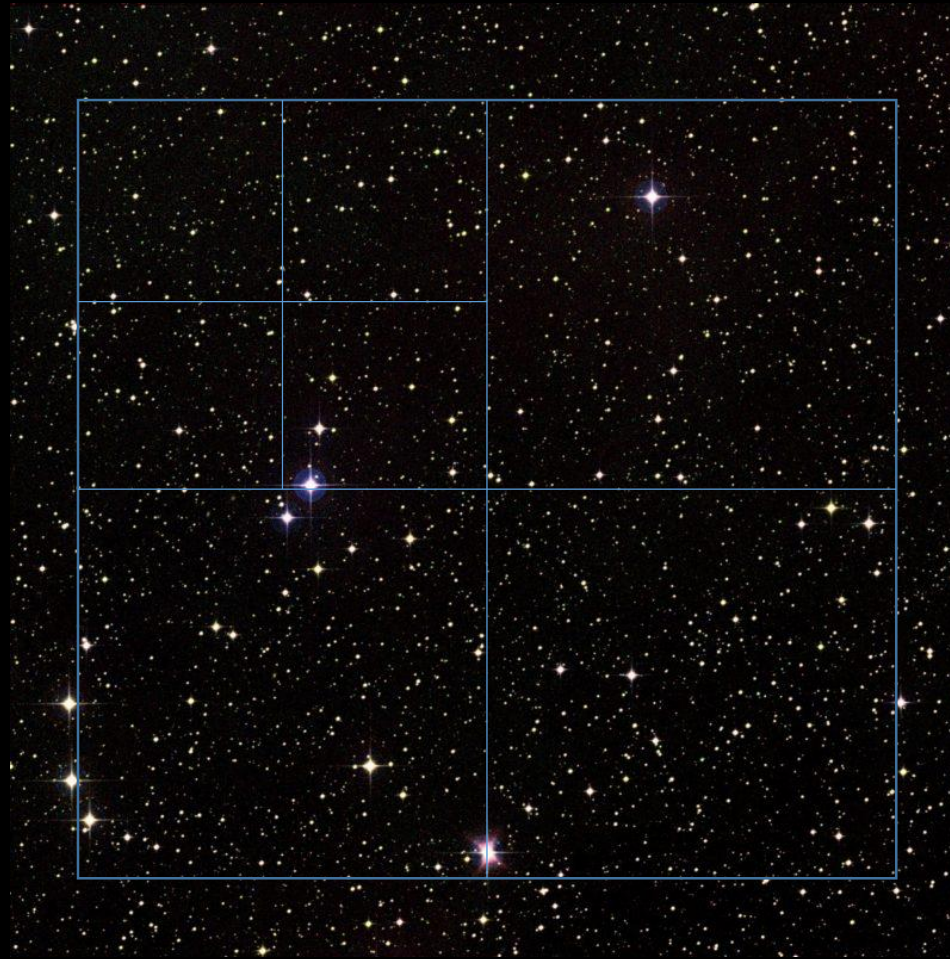
Level 9



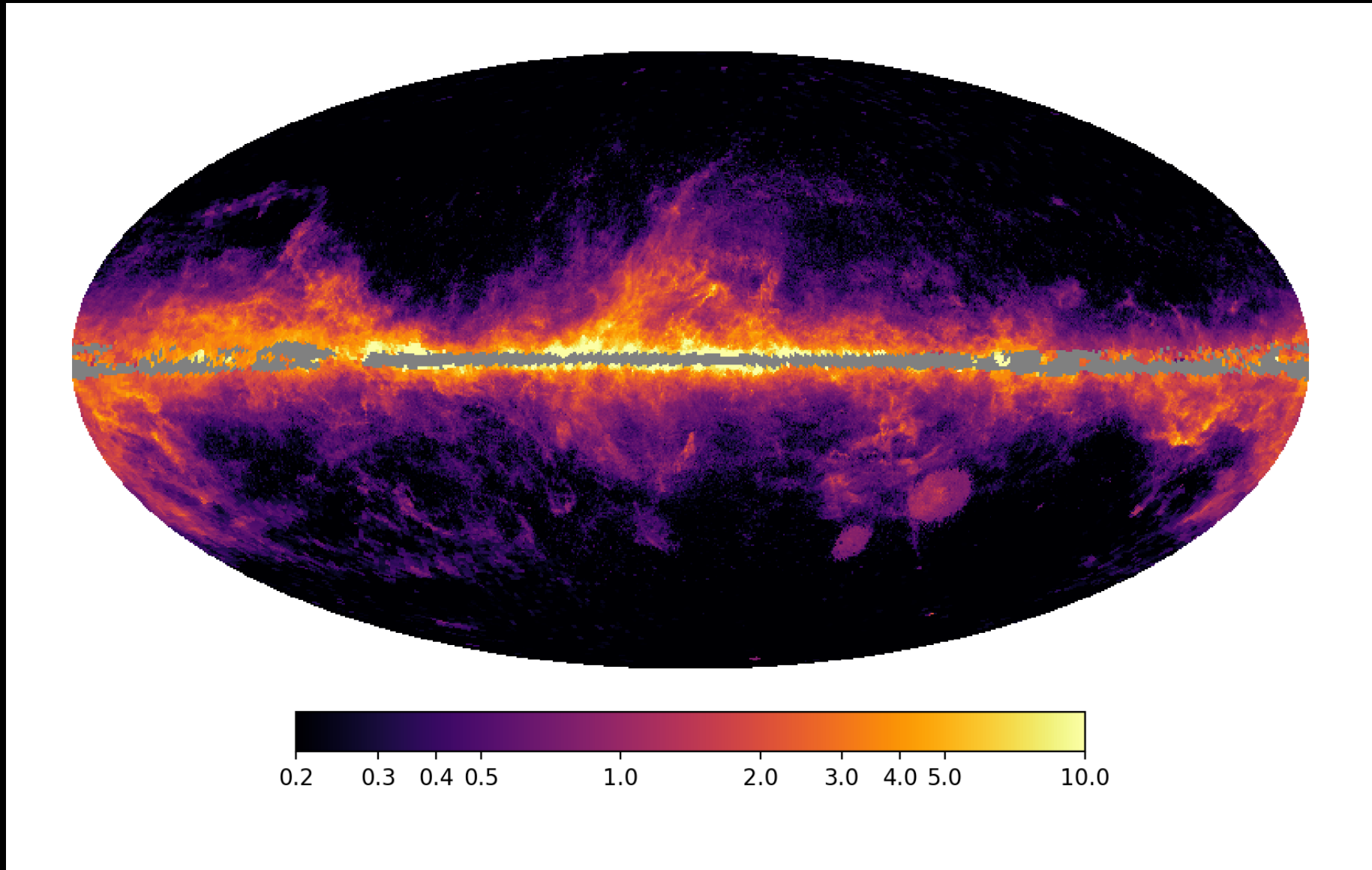
total_galactic_extinction_map_opt

Map at 'optimum' resolution: smallest pixel with at least 10 tracers.

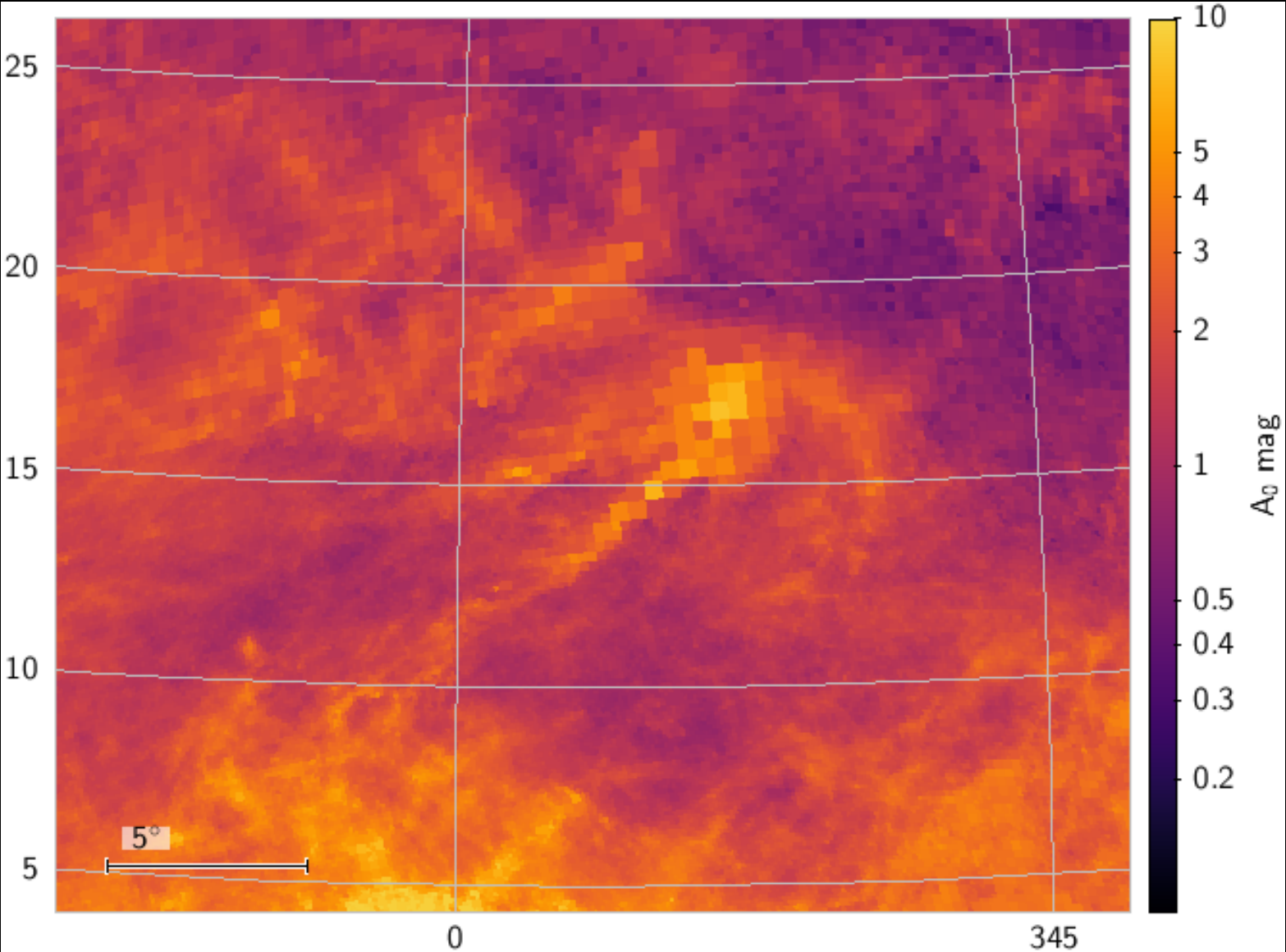
Healpix level 9: each pixel populated with values from the subset of optimum HEALPixes.



total_galactic_extinction_map_opt



Zoom in of optimum map



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EUROPEAN SPACE AGENCY ABOUT ESAC Ronald Drimmel (rdrimmel)

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Basic **Advanced (ADQL)** Query Results

gaia

















Job name:

Query examples

```
1 select * from gaiadr3.total_galactic_extinction_map
```

Ctrl+Space for query autocompletion

Reset Form Submit Query

Status	Job	Creation date	Num. rows	Size	
✓	1680172499138O	30-Mar-2023, 12:34:59	4177920	57 MB	   
✓	1655551646133O	18-Jun-2022, 13:27:26	21717	1 MB	   
✓	1647347758106O	15-Mar-2022, 13:35:58	37431162	1.2 GB	   
✓	Upload for job results: 1647339271662O	15-Mar-2022, 12:25:20	0	0 KB	   

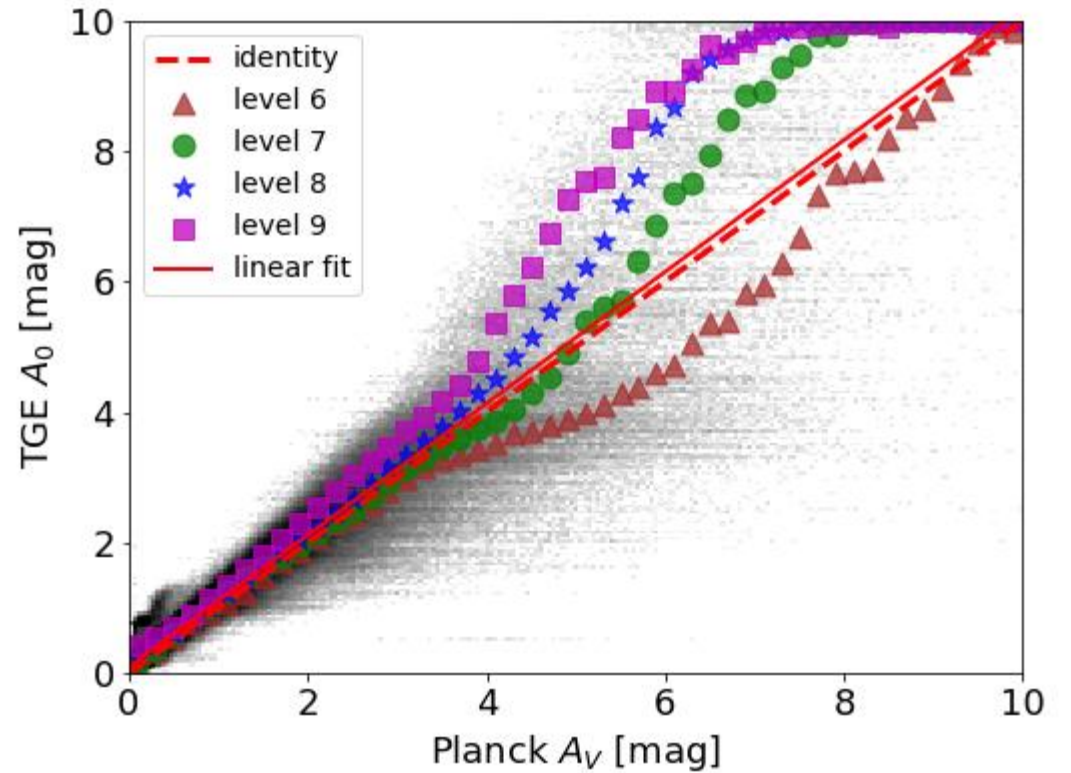
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[Cookie policy] (v3.2.1)

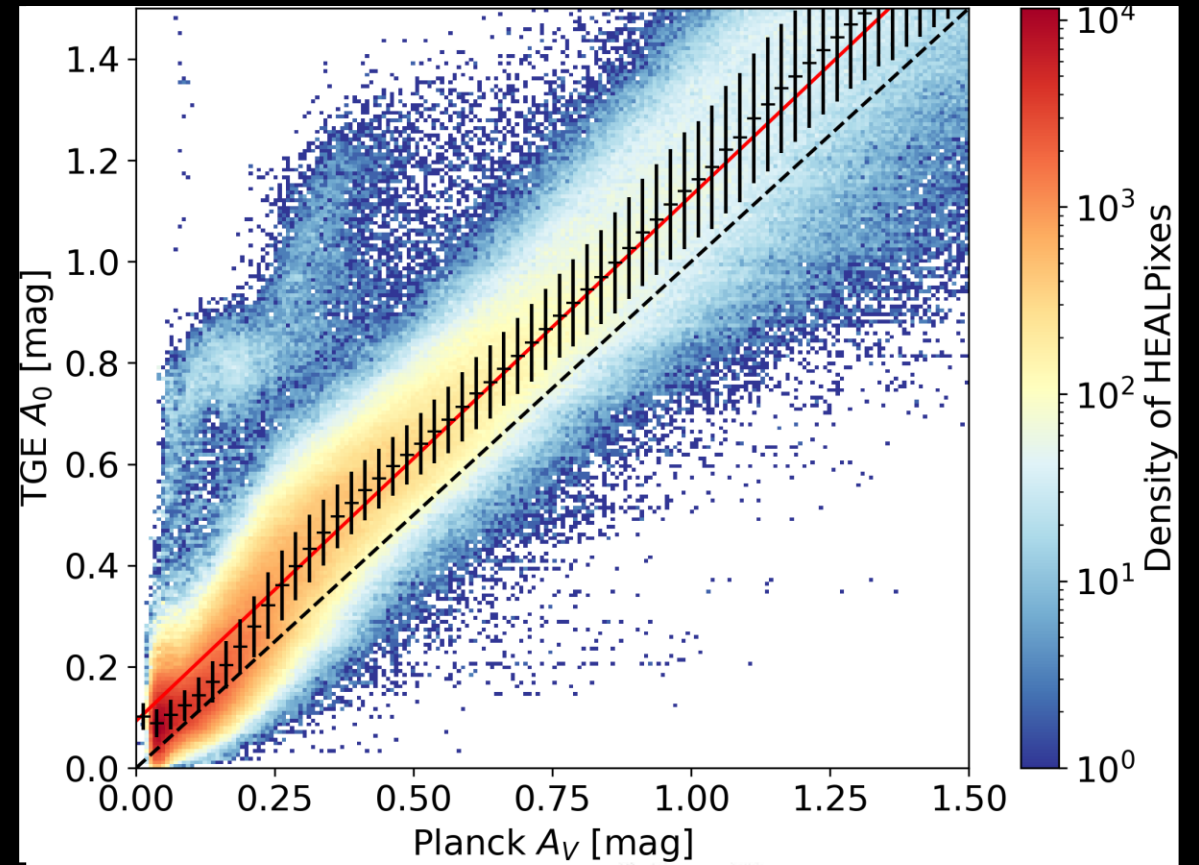
Caveats..

- Small offset of 0.09 mag with respect to Planck A_V .



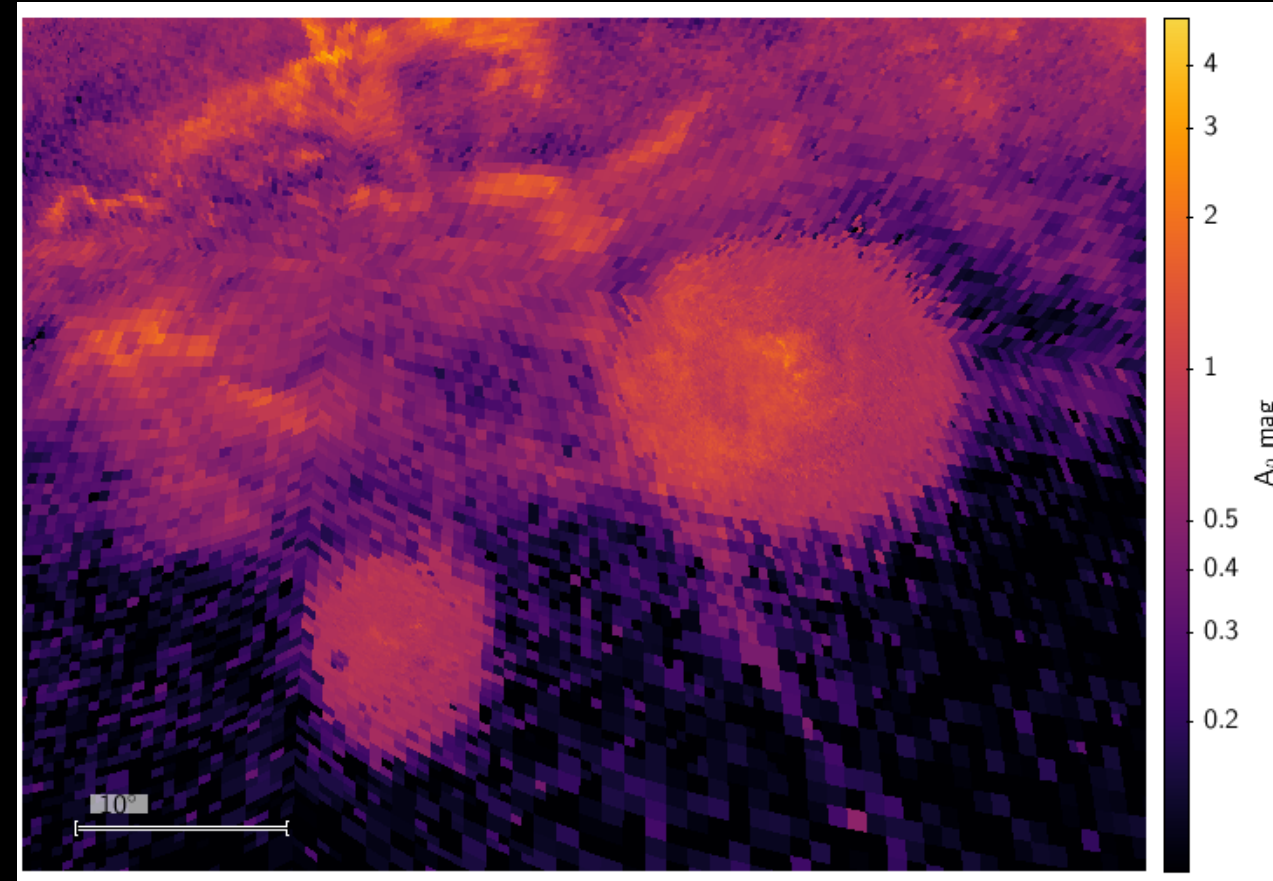
Caveats..

- Small offset of 0.09 mag with respect to Planck A_V .



Caveats..

- Small offset of 0.09 mag with respect to Planck A_V .
- A_0 values biased toward LMC and SMC on order of 0.6mag.
- TGE map should not be used for $|b| < 5^\circ$
- $A_0 < 10$ mag



Online tools..

- Presented by Doug Marshall. See accompanying Jupyter notebook.