

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](#)

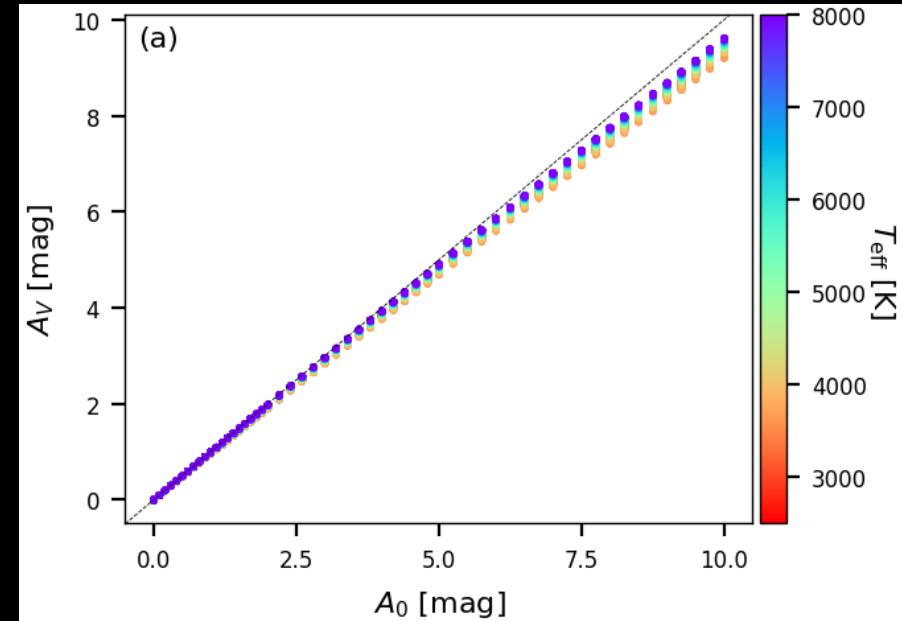
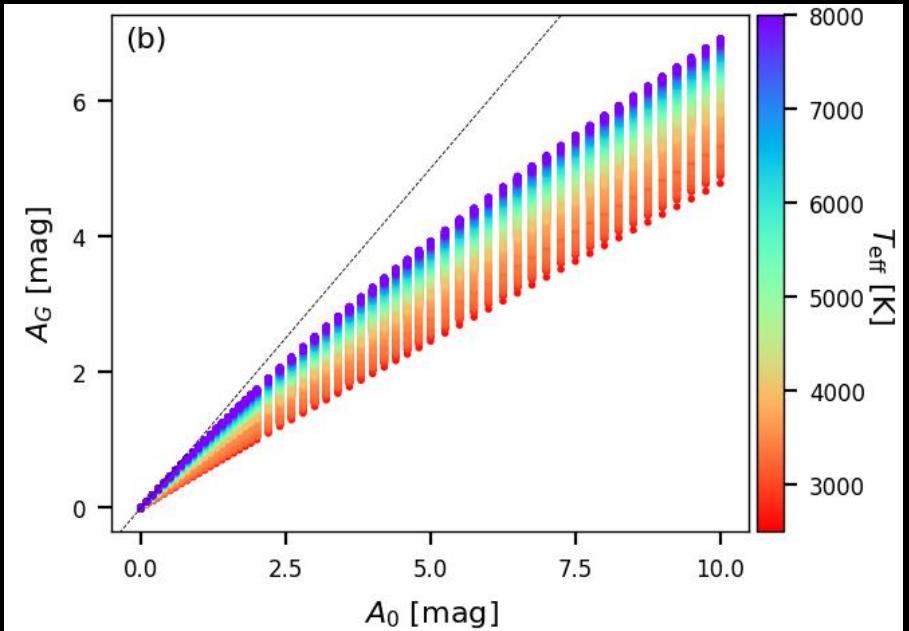
[link to online documentation](#)

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 official website for the Gaia mission. At the top, there is a navigation bar with links for "SCIENCE MISSIONS", "EUROPEAN SPACE AGENCY", and "SCIENCE & TECHNOLOGY". On the right side of the header, there is a user profile for "Ronald Drimmel". Below the header, the word "gaia" is displayed next to an image of a satellite. The main menu includes "Home", "Data", "Mission", "People & Institutes", "News & stories", "Science Results", "Resources", "DPAC Services", and "Questions". A large blue arrow points from the text "Archive..." in the previous slide to the "Archive" link in the bottom right corner of the website footer. The footer also features the "esa" logo and the text "SCIENCE WITH 1 BILLION OBJECTS IN THREE DIMENSIONS" and "Welcome to ESA's website for the Gaia Scientific Community".

gaia archive

[HOME](#) [SEARCH](#) [SINGLE OBJECT](#) [VISUALISATION](#) [HELP](#) [VOSPACE](#) [SHARE](#)[Basic](#) [Advanced \(ADQL\)](#) [Query Results](#) ▼[+ 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 autocomplete

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

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

1-20 of 83

Download format:
VOTableApply jobs filter
Select all jobs
Delete selected jobs

gaia archive

[HOME](#) [SEARCH](#) [SINGLE OBJECT](#) [VISUALISATION](#) [HELP](#) [VOSPACE](#) [SHARE](#)[Basic](#) [Advanced \(ADQL\)](#) [Query Results](#) 

- [!\[\]\(661ad2fdbe8fa1392f2b194cfa45d124_img.jpg\) gaiadr3.gaia_source](#)
- [!\[\]\(4193cdf1061c98ac39c3073e7f9019f2_img.jpg\) gaiadr3.gaia_source_lite](#)

Astrophysical parameters

- [!\[\]\(3168ddc4389f6b417dd71f084513be9c_img.jpg\) gaiadr3.astrophysical_parameters](#)
- [!\[\]\(17332056424eb04f01463711418ba65a_img.jpg\) gaiadr3.astrophysical_parameters_supp](#)
- [!\[\]\(4bb72d34295215b367c2a8fe4ff5b637_img.jpg\) gaiadr3.oa_neuron_information](#)
- [!\[\]\(37e0a546ebe55ca4a497b5baea1c9b32_img.jpg\) gaiadr3.oa_neuron_xp_spectra](#)

- [!\[\]\(c580b67c7cd5c9e9e19f04ff6d5093e0_img.jpg\) gaiadr3.total_galactic_extinction_map](#)
- [!\[\]\(81f7c93ea32d9f7160f5d63859611838_img.jpg\) gaiadr3.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 autocomplete



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
✓	<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

1-20 of 83   Download format: Select all jobs

gaia archive

[HOME](#) [SEARCH](#) [SINGLE OBJECT](#) [VISUALISATION](#) [HELP](#) [VOSPACE](#) [SHARE](#)[Basic](#) [Advanced \(ADQL\)](#) [Query Results](#) 

-   gaiadr3.oa_neuron_information
-   gaiadr3.oa_neuron_xp_spectra
-   gaiadr3.total_galactic_extinction_map

- [solution_id](#)
- [healpix_id](#)
- [healpix_level](#)
- [a0](#)
- [a0_uncertainty](#)
- [a0_min](#)
- [a0_max](#)
- [num_tracers_used](#)
- [optimum_hpx_flag](#)
- [status](#)

-   gaiadr3.total_galactic_extinction_map_opt

-  [Auxiliary](#)

-  [Cross match](#)

Job name:

Query examples

1

Ctrl+Space for query autocomplete



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
✓	<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

1-20 of 83  Download format: 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 extenction tracers

a0_uncertainty : uncertainty of the mean A0

a0_min, a0_max: min/max A0 values of tracers

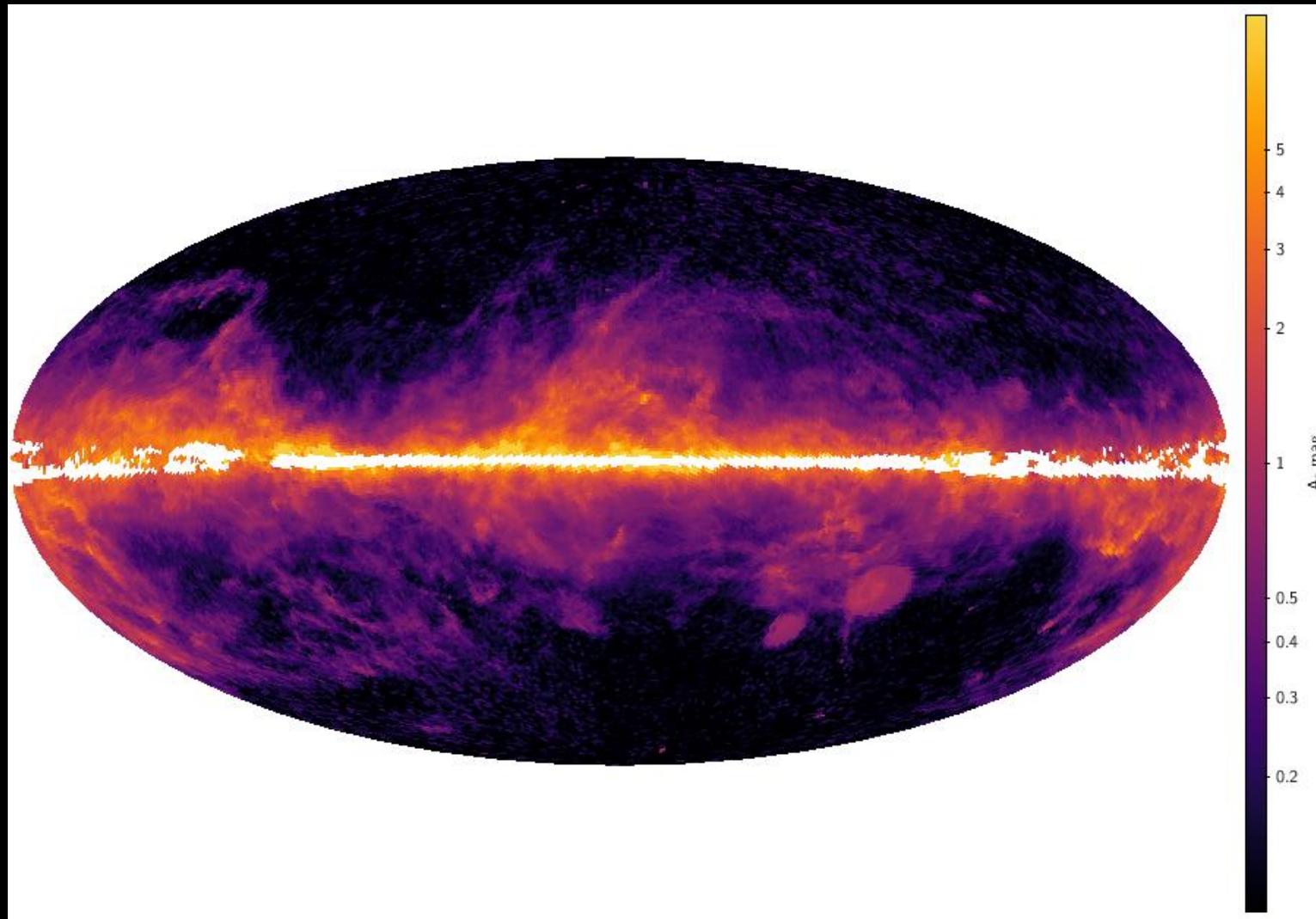
num_tracers_used: number of tracers used

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.

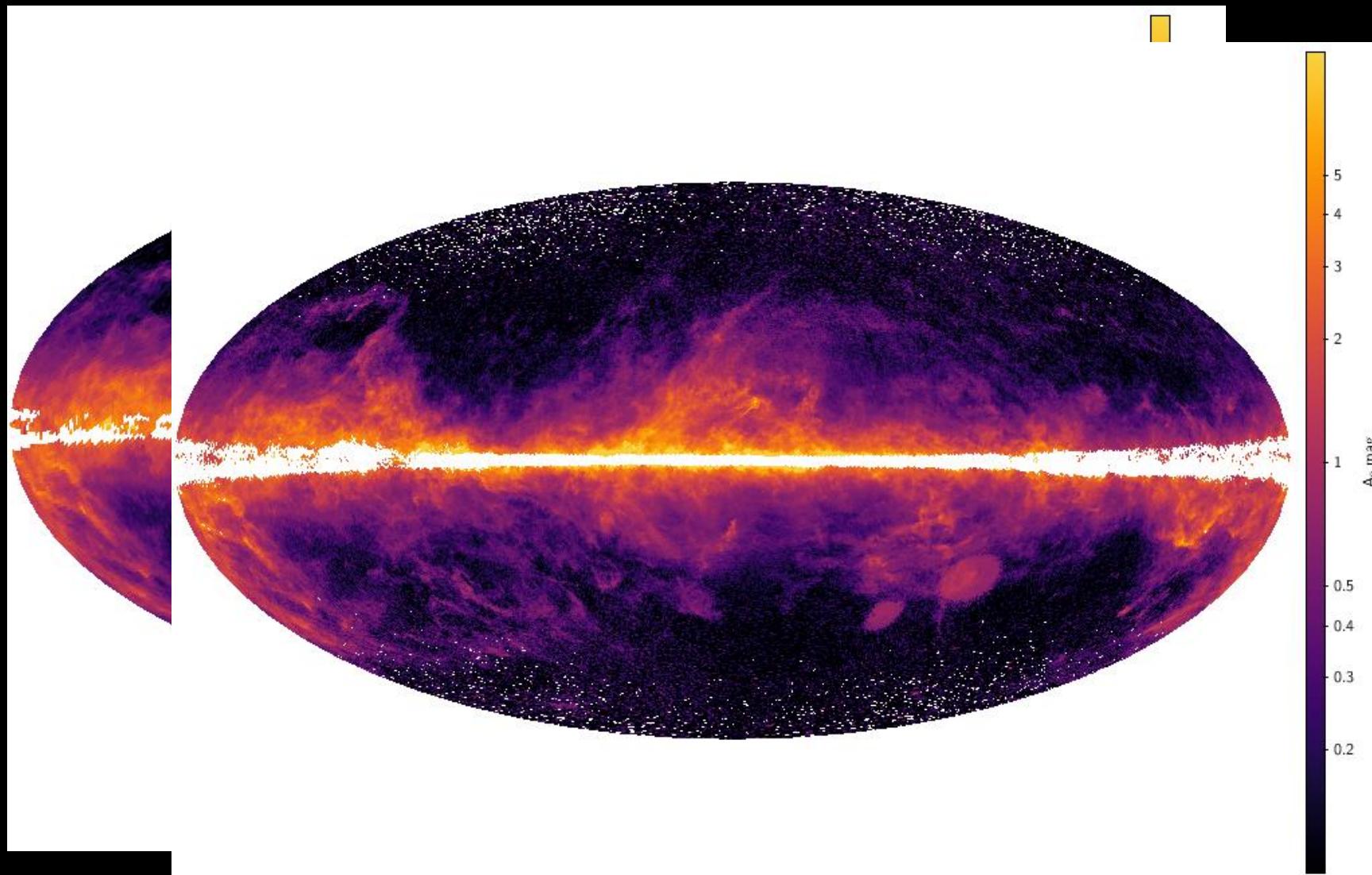
TGE maps at different resolutions

Level 6



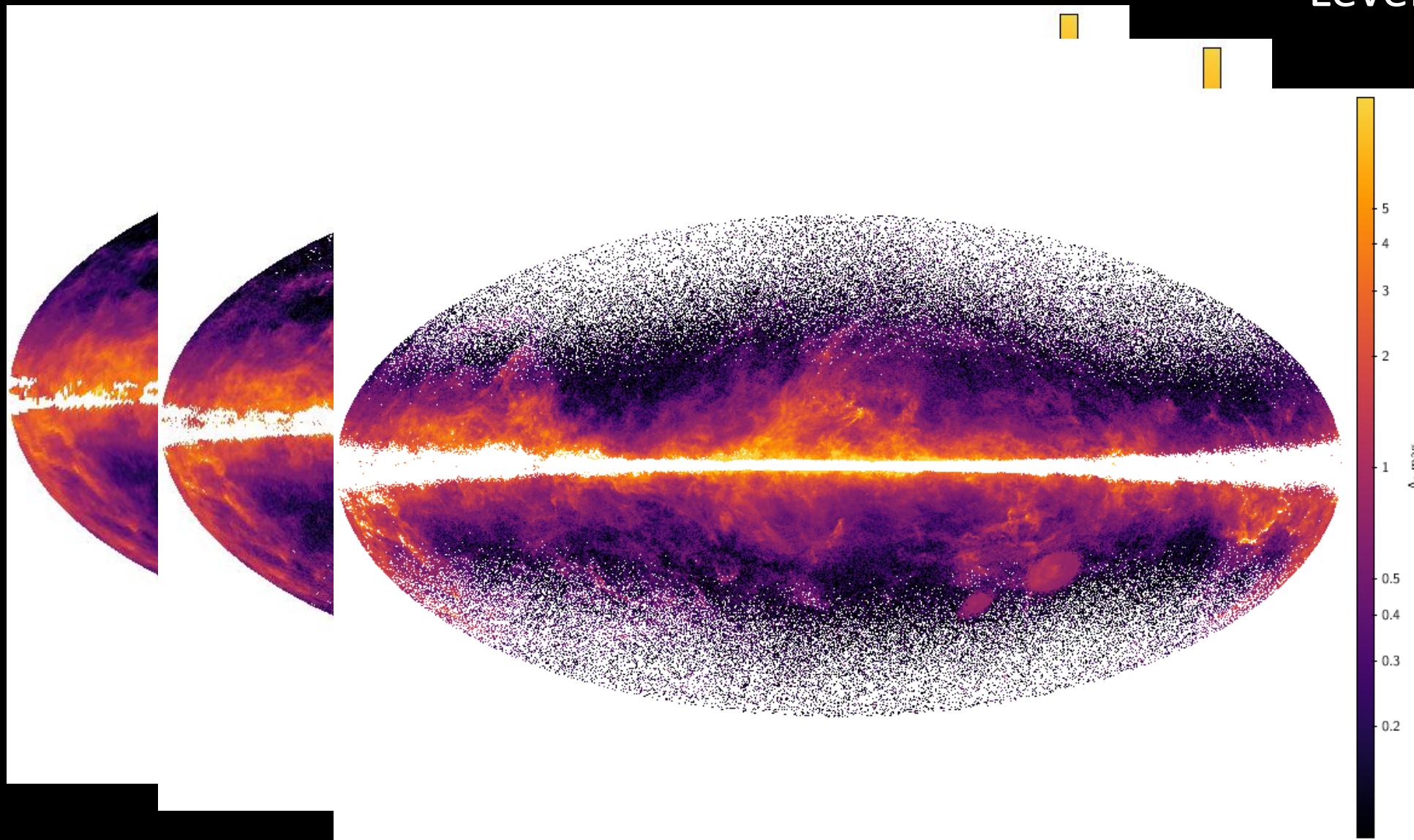
TGE maps at different resolutions

Level 7



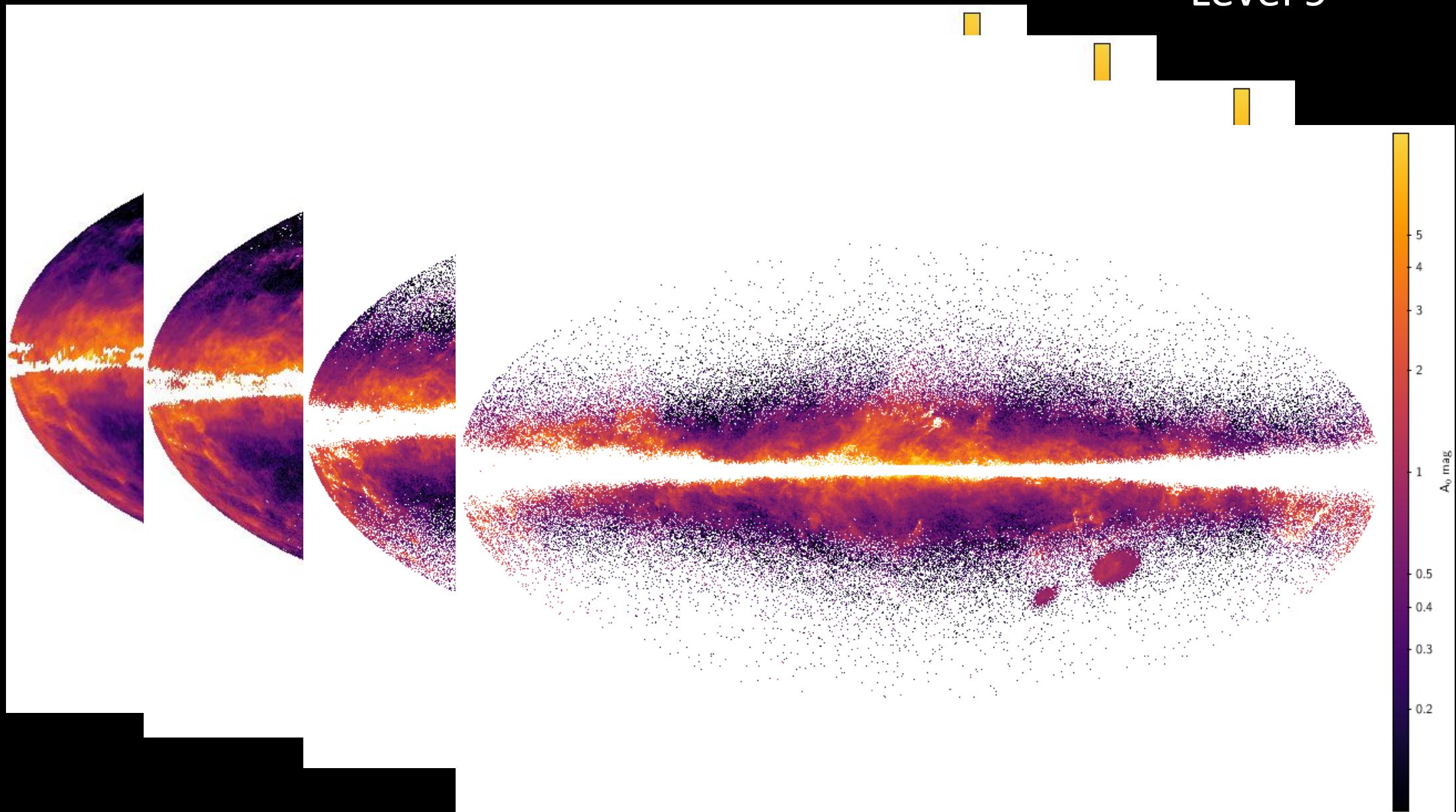
TGE maps at different resolutions

Level 8



TGE maps at different resolutions

Level 9



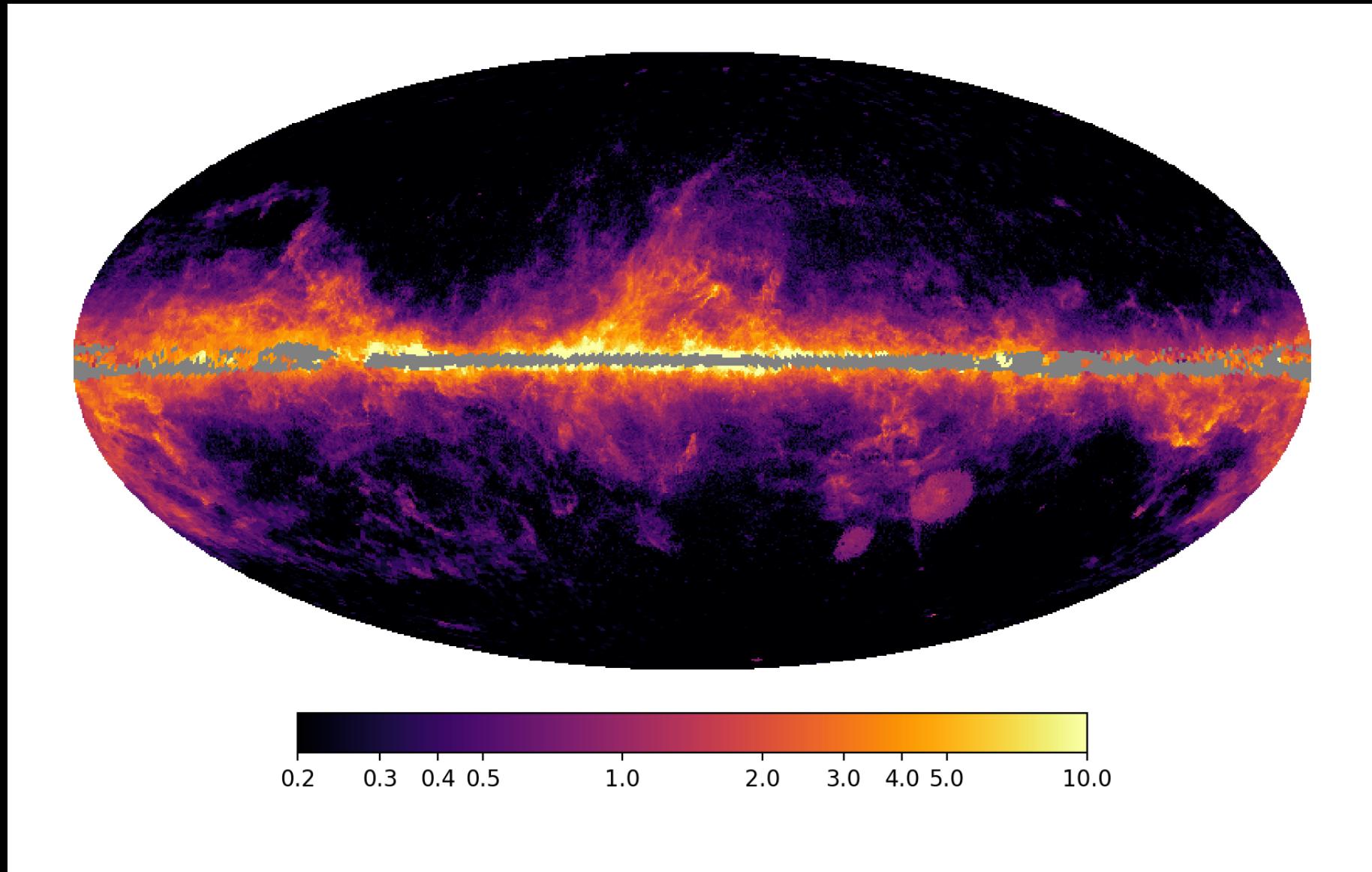
total_galactic_extinction_map_opt

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

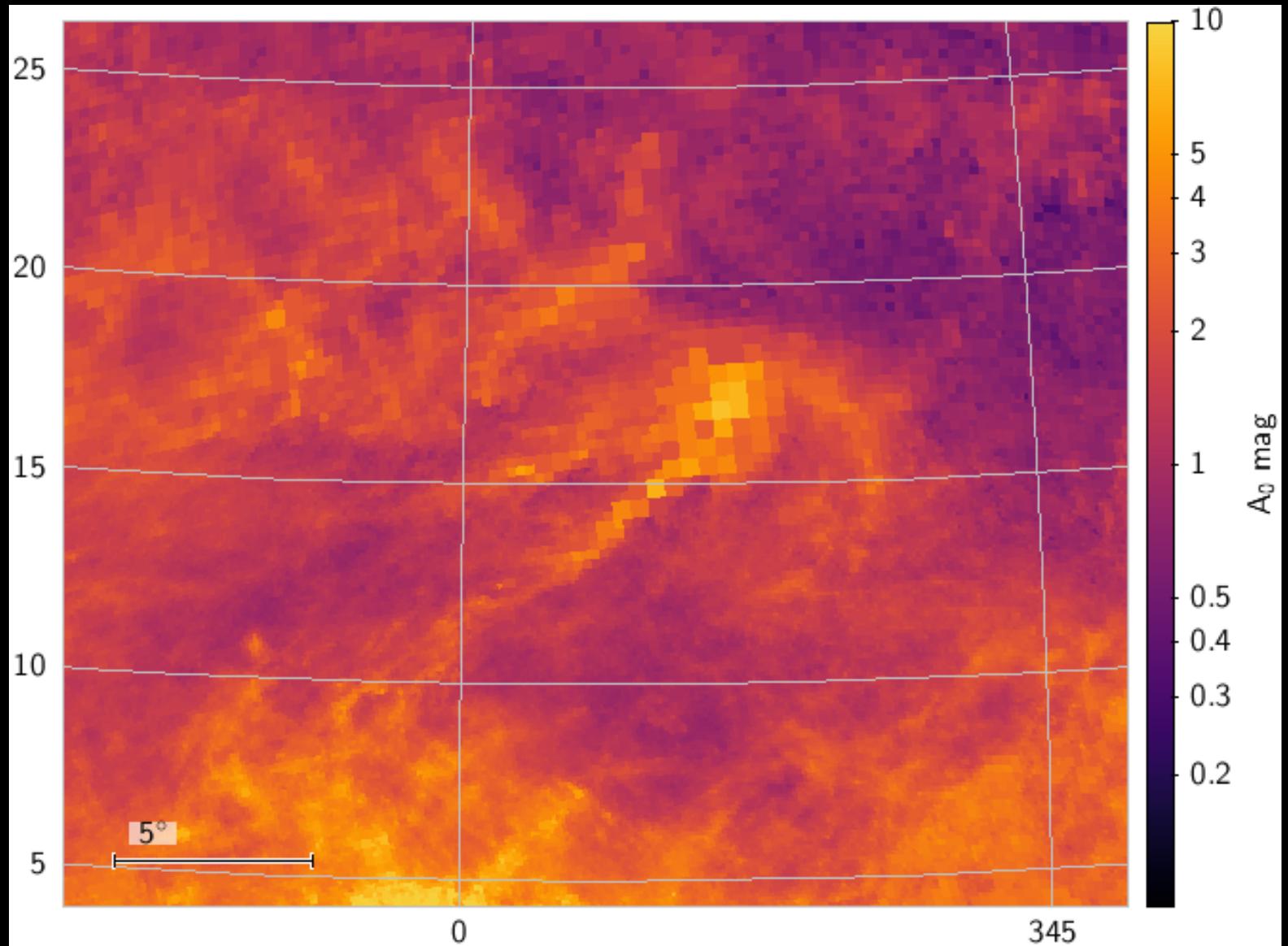
Healpix level 9: each pixel populated with values from the subset of optimum HEALPixels.



total_galactic_extinction_map_opt



Zoom in of optimum map



How to download

The screenshot shows the Gaia Archive search interface. At the top, there are links for "EUROPEAN SPACE AGENCY" and "ABOUT ESAC". On the right, it shows a user profile for "Ronald Drimmel (rdrimmel)" with a notification icon. The main header says "gaia archive" and features the ESA logo.

The navigation bar includes "HOME", "SEARCH" (which is selected), "SINGLE OBJECT", "VISUALISATION", "HELP", "VOSPACE", and "SHARE". Below the navigation bar, there are tabs for "Basic", "Advanced (ADQL)" (which is selected), and "Query Results".

The left sidebar has a search input field with "gaia" typed in. It also contains a list of datasets and parameters:

- Other
- Gaia Data Release 1
- Gaia Data Release 2
- Gaia Data Release 3
 - gaiadr3.gaia_source
 - gaiadr3.gaia_source
- Astrophysical parameters
 - gaiadr3.astrophys
 - gaiadr3.astrophys
 - gaiadr3.oa_neuro
 - gaiadr3.oa_neuro
 - gaiadr3.total_gala
 - gaiadr3.total_gala
- Auxiliary
- Create match

The main area contains a query editor with the following text:

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

Below the query editor is a note: "Ctrl+Space for query autocompletion". There are "Reset Form" and "Submit Query" buttons.

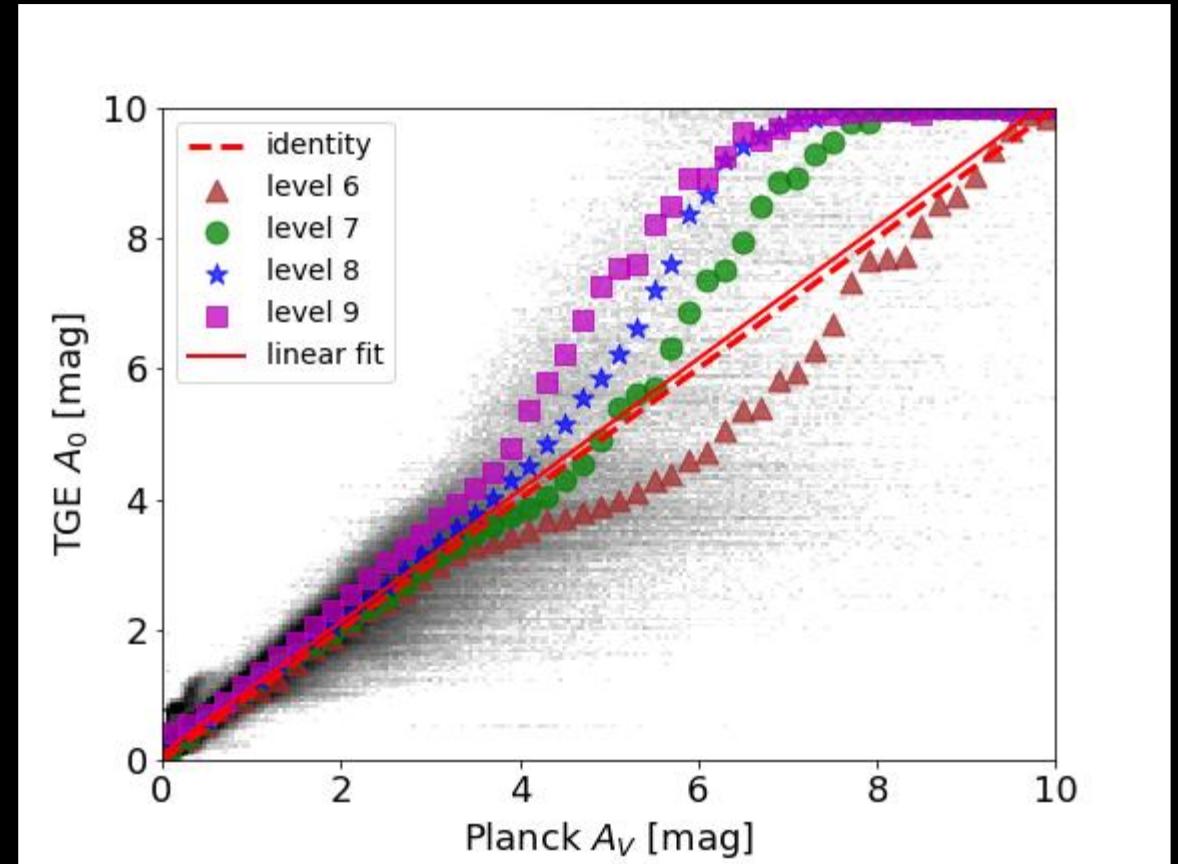
The results table lists the following jobs:

Status	Job	Creation date	Num. rows	Size	Actions
✓	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	

At the bottom, there are navigation buttons for "1-20 of 84", a "Download format" dropdown set to "FITS", a "Select all jobs" checkbox, and a "Delete selected jobs" button. There is also a link "[Cookie policy] (v3.2.1)".

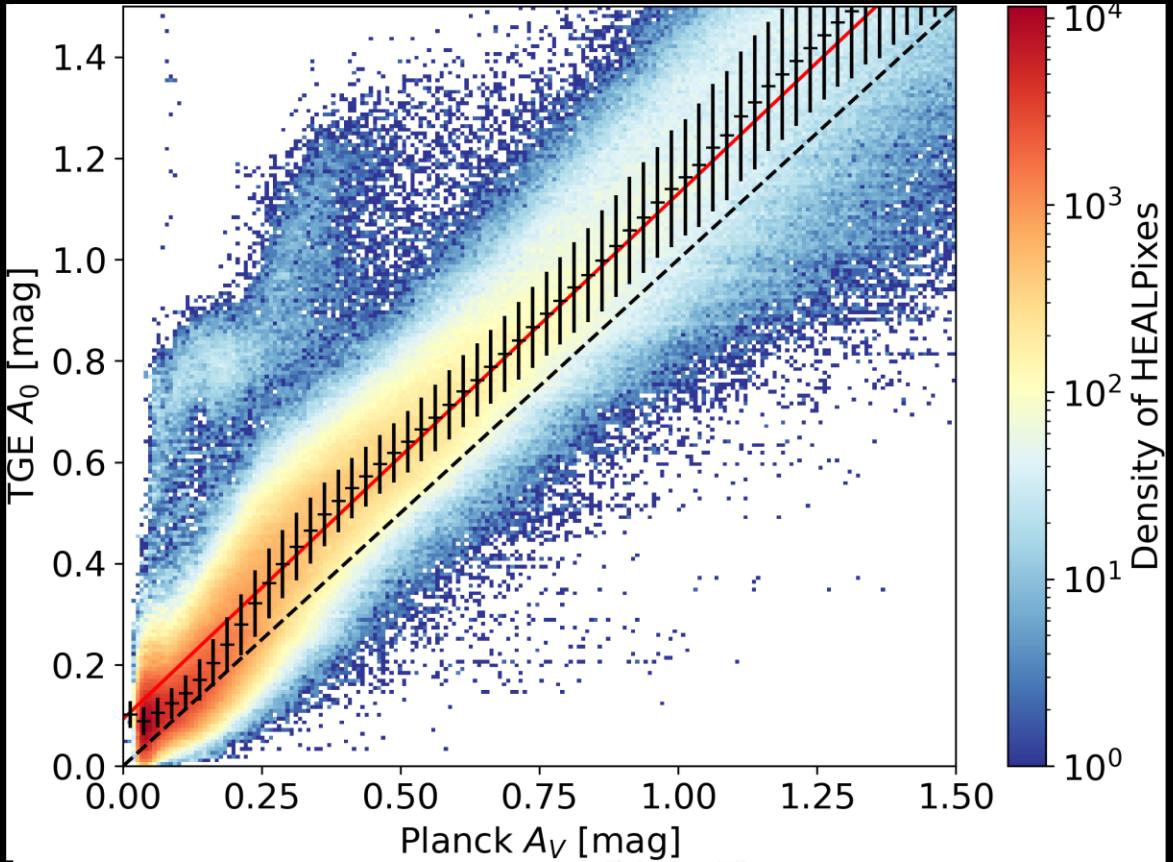
Caveats..

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



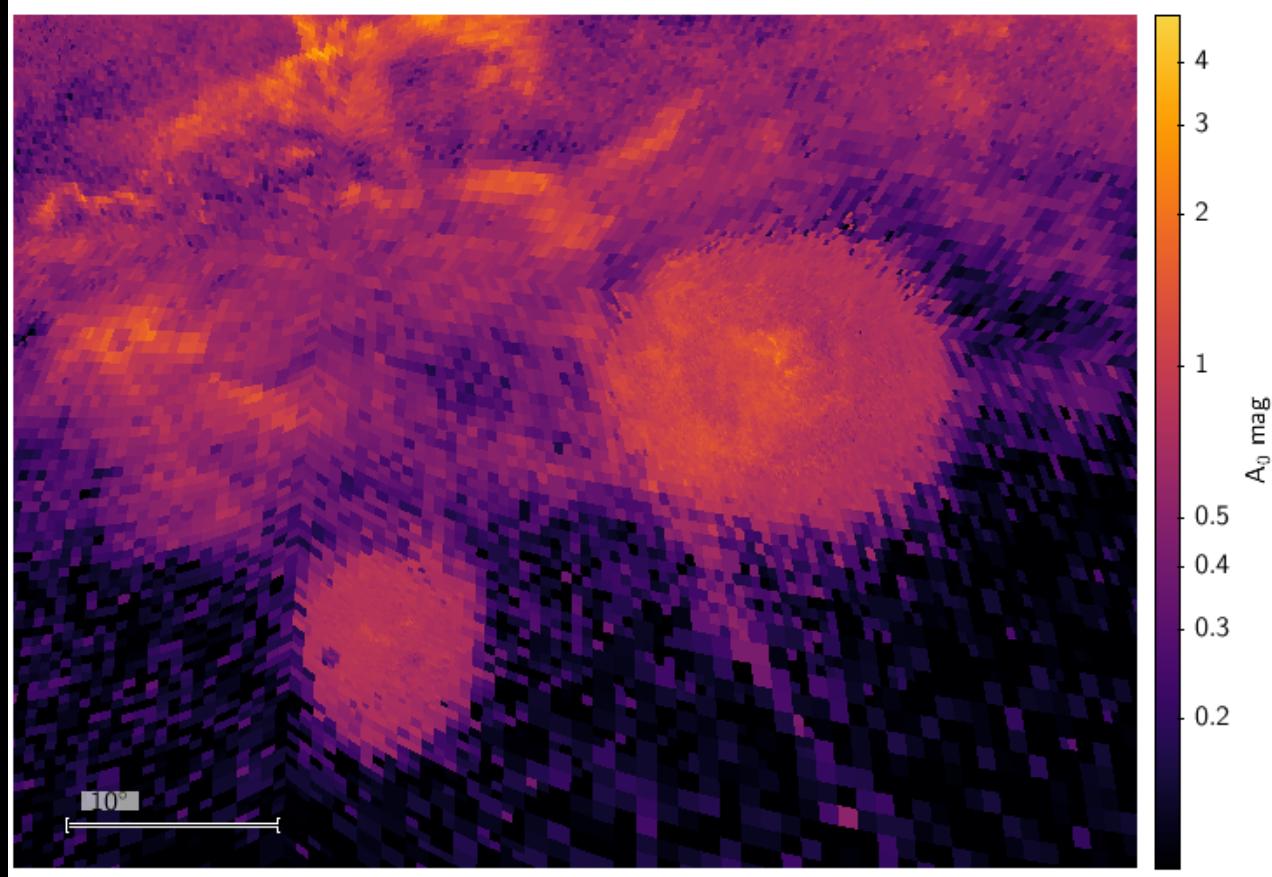
Caveats..

- 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.