Mapping young stellar populations towards Orion with Gaia DR1

Eleonora Zari[1]

Anthony Brown[1], Carlo Manara[2], Jos de Bruijne[2]

[1]Leiden Observatory, [2]ESA, ESTEC

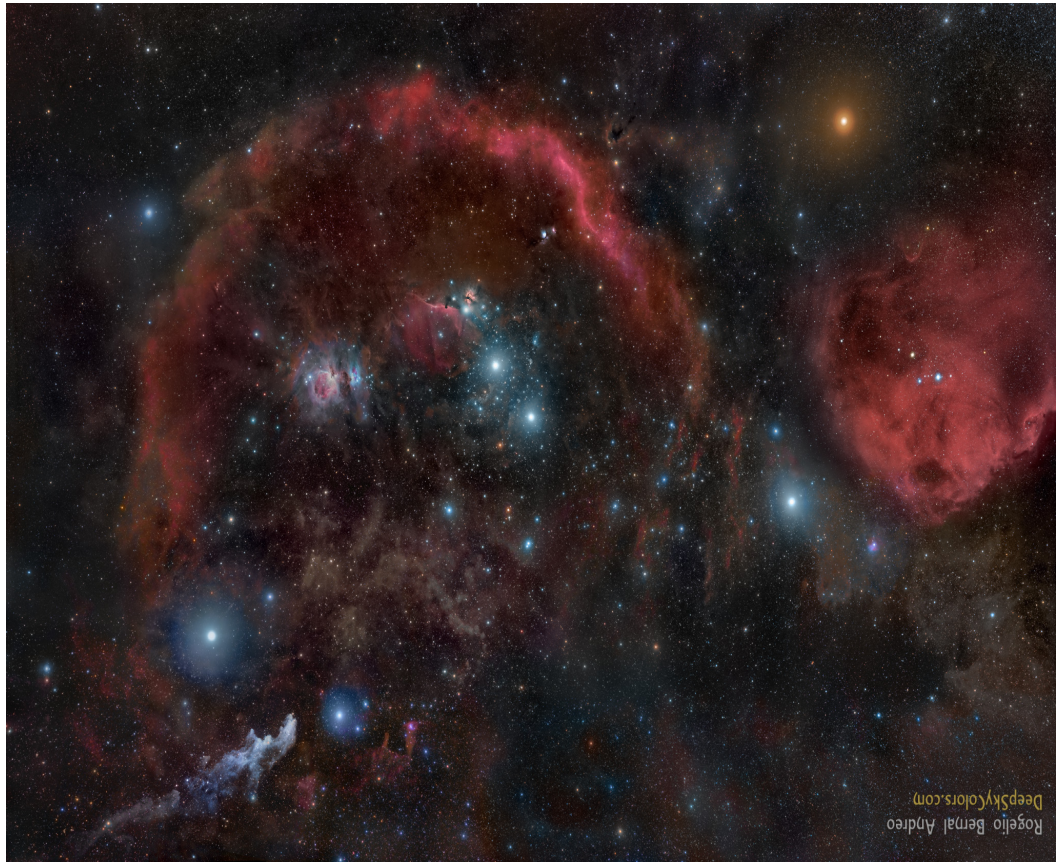
OB associations

- Loose groups of OB stars, not gravitationally bound (Blaauw, 1964);
- Located near star-forming regions $\rightarrow$ prime sites for:

  1) large scale studies of star formation processes;
  2) interaction between early-type stars with the interstellar medium.

Orion

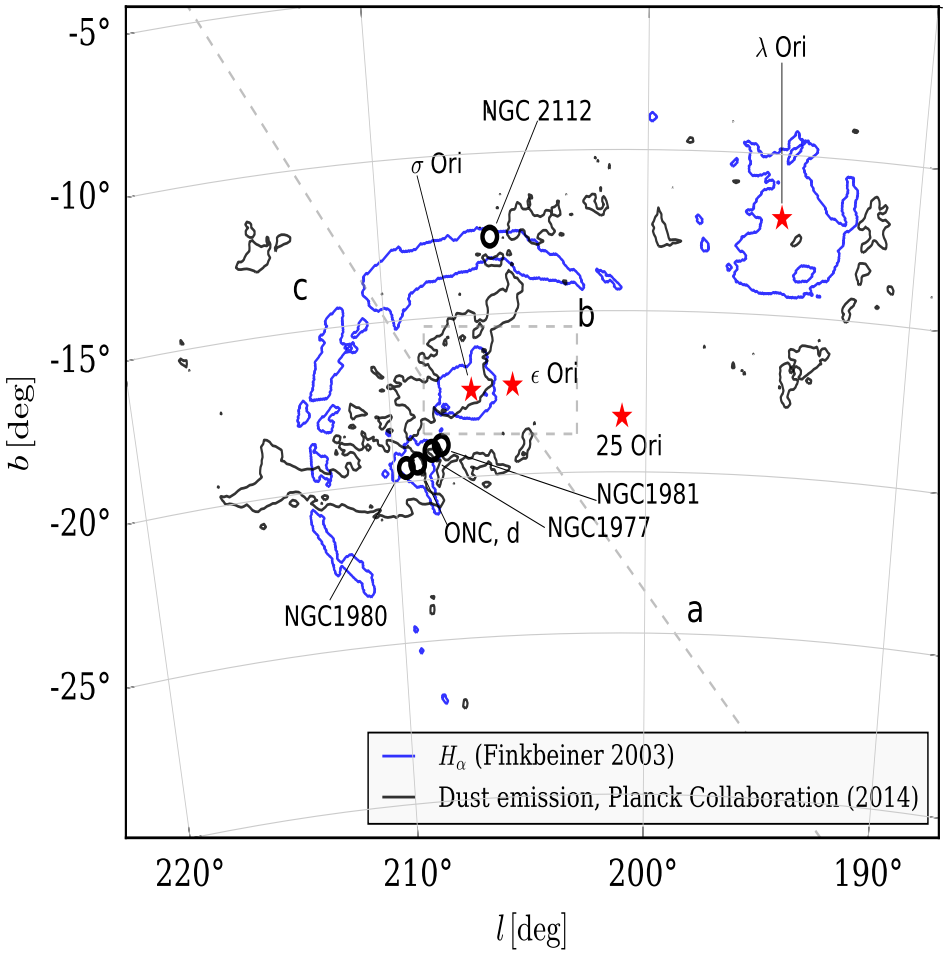
- Nearest giant molecular cloud complex;
- Site of active star formation;
- Different stages of star formation: from deeply embedded protoclusters, to fully exposed OB associations;
  (Brown+94; Bally08; Briceno08; Muench+08; Da Rio+14)
- Effects of young, massive stars on the surrounding ISM.
  (Ochsendorf+15; Schlafly+15)



Credits: Rogelio Bernal Andreo, DeepSkyColors.com

Orion

- Nearest giant molecular cloud complex;
- Site of active star formation;
- Different stages of star formation: from deeply embedded protoclusters, to fully exposed OB associations;
  (Brown+94; Bally08; Briceno08; Muench+08; Da Rio+14)
- Effects of young, massive stars on the surrounding ISM.
  (Ochsendorf+15; Schlafly+15)



Goals

What is the stellar content and the structure of the Orion OB association?

What are the characteristics of the stellar populations?

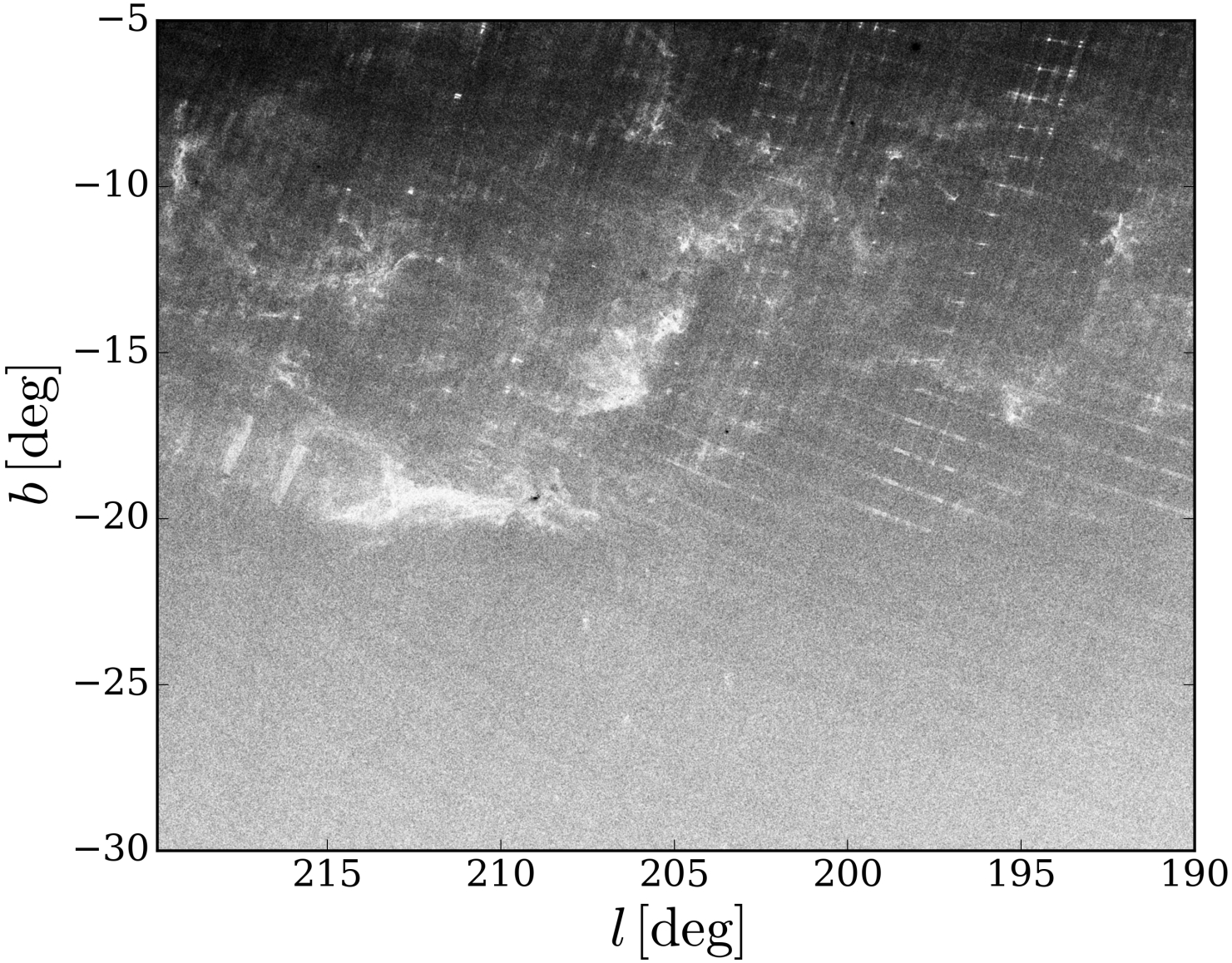
Goals

What is the stellar content and the structure of the Orion OB association?

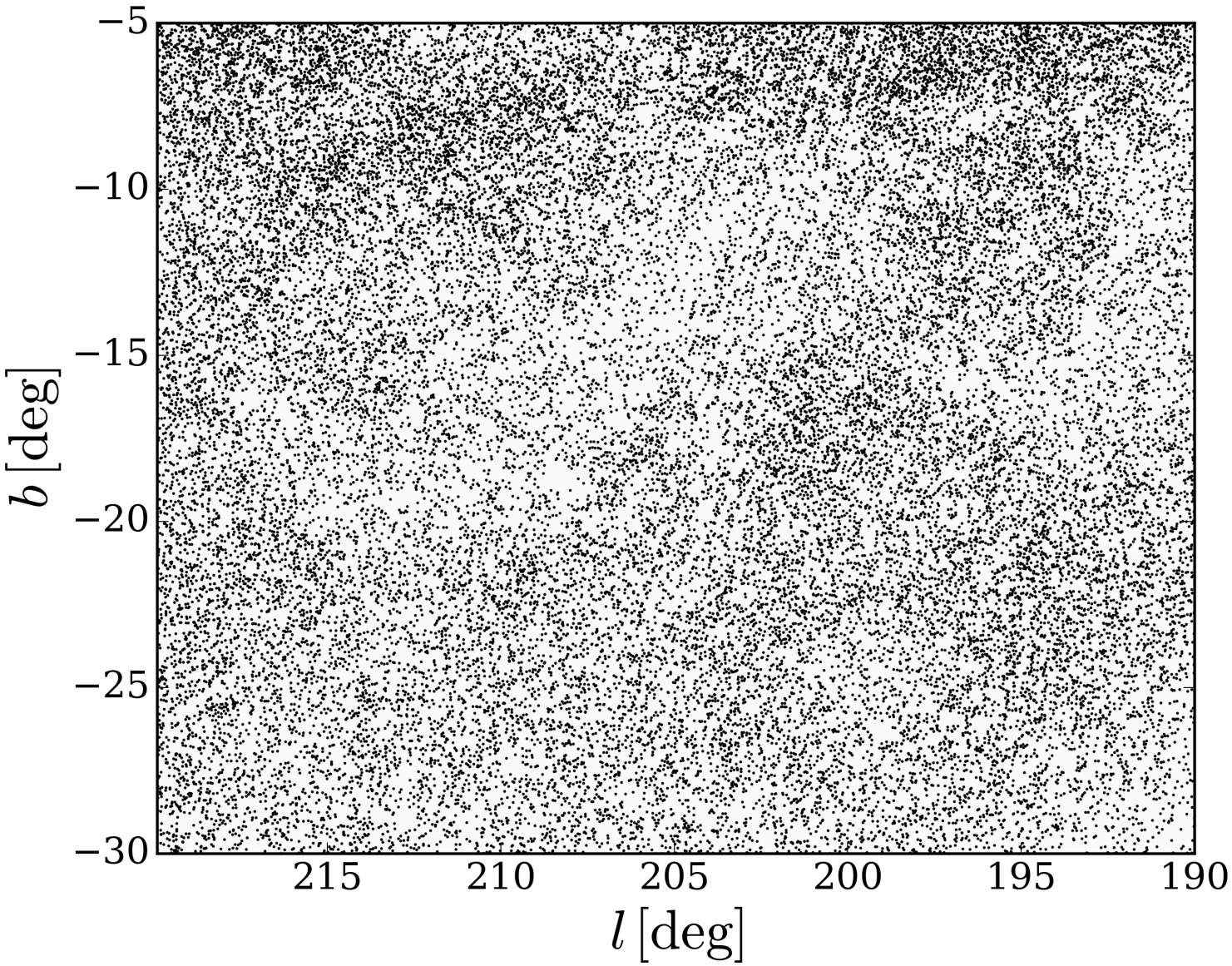
What are the characteristics of the stellar populations?

- Initial Mass Function?
- Binaries?
- Star formation history?
- Difference between open clusters and OB associations?
- Properties of the ensamble of OB associations?
- Structure and evolution of the Galaxy?

Gaia DR1

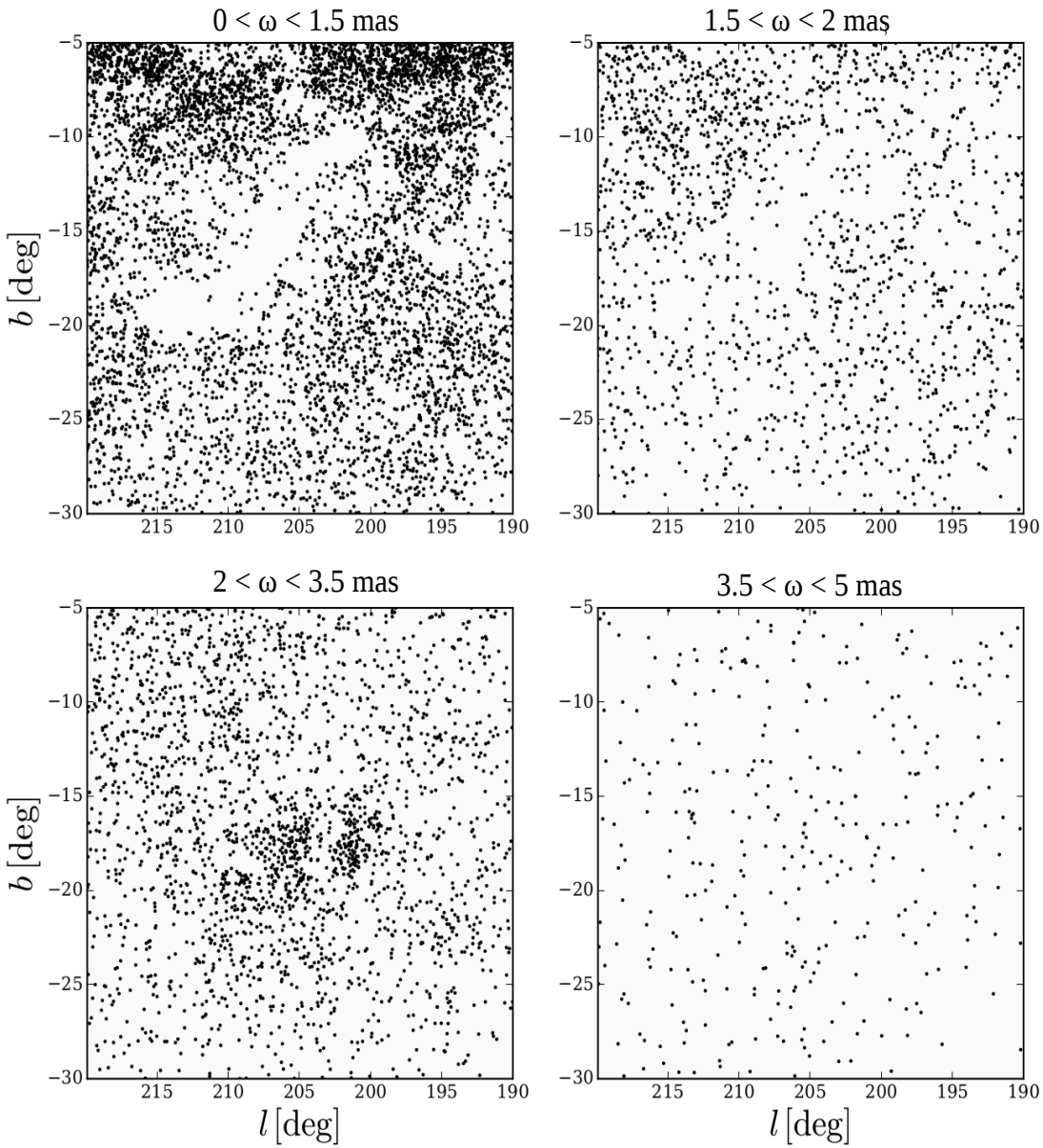


TGAS



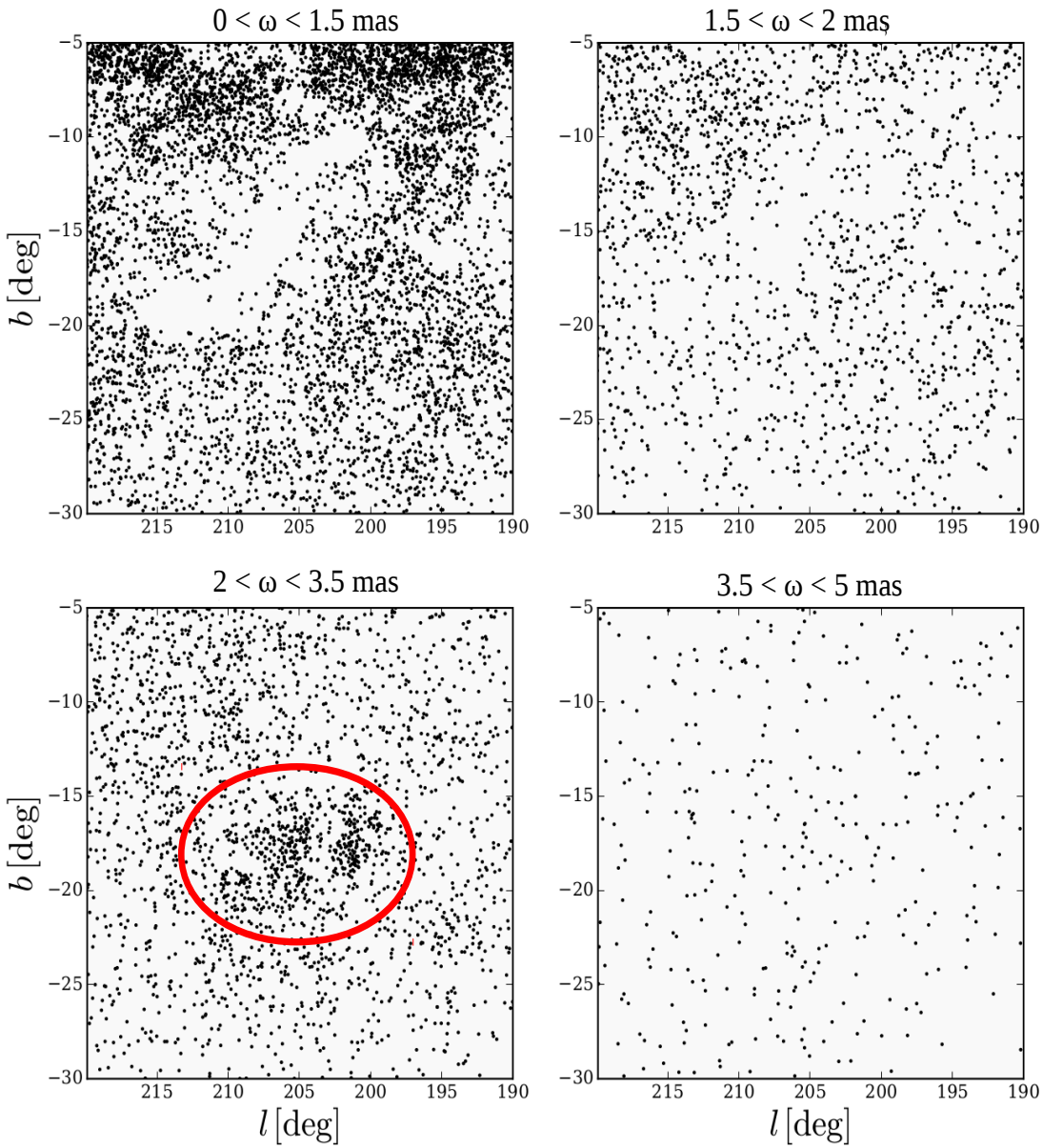
Parallax of the sources with $\mu < 5\,\mathrm{mas/yr}$

The motion of Orion OB1 is mostly directed **radially away from the Sun**
$\Rightarrow$ the observed proper motions are small.

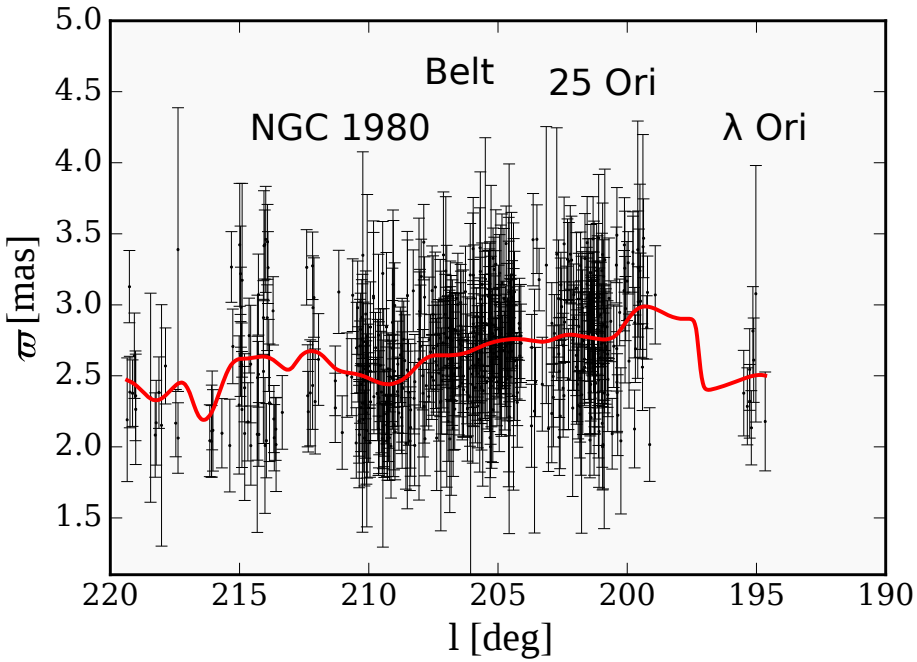


Parallax of the sources with $\mu < 5\,\mathrm{mas/yr}$

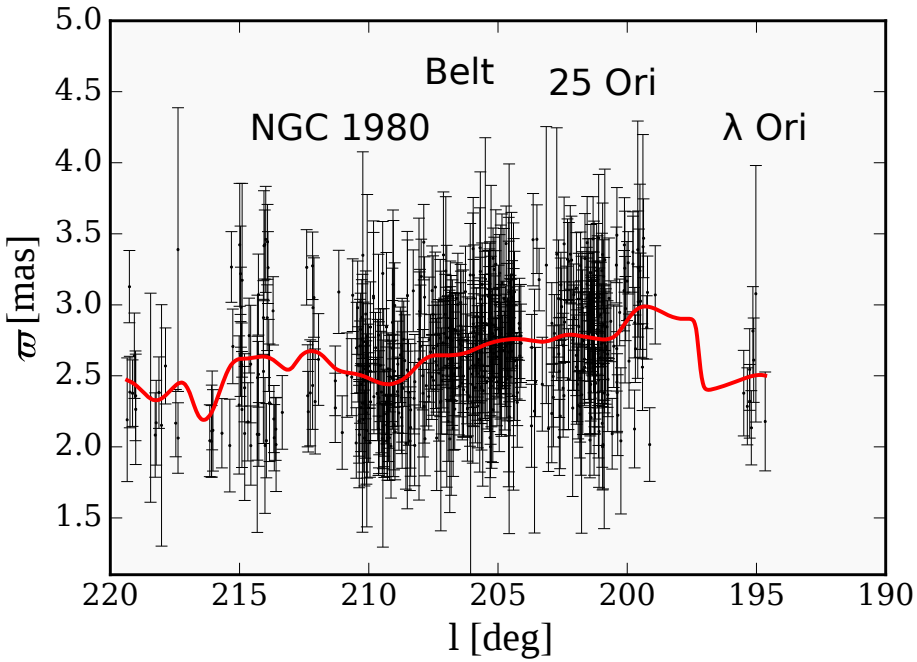
The motion of Orion OB1 is mostly directed **radially away from the Sun**
$\Rightarrow$ the observed proper motions are small.

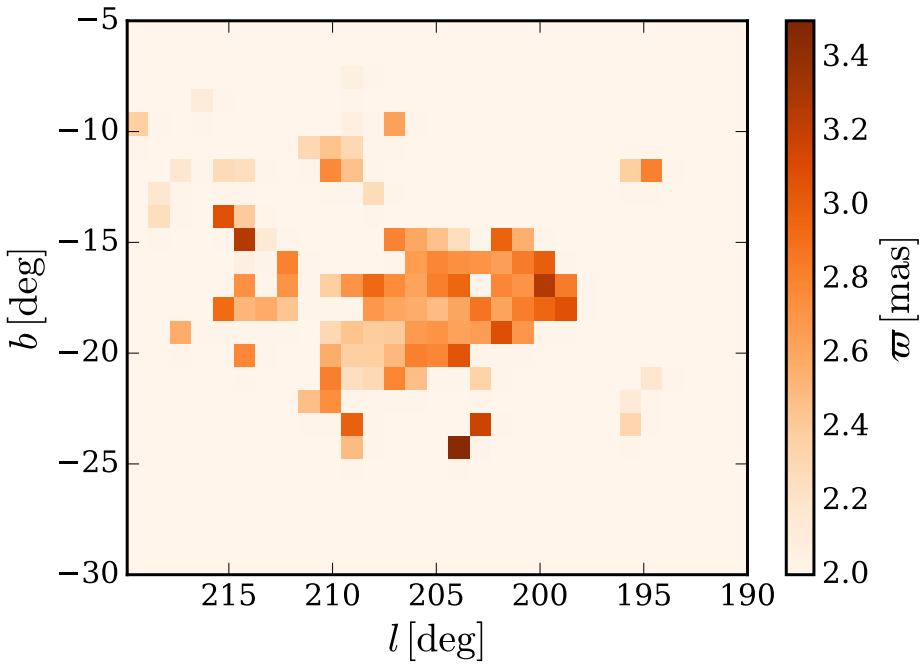


Sources with $2 < \varpi < 3.5\,\mathrm{mas}$

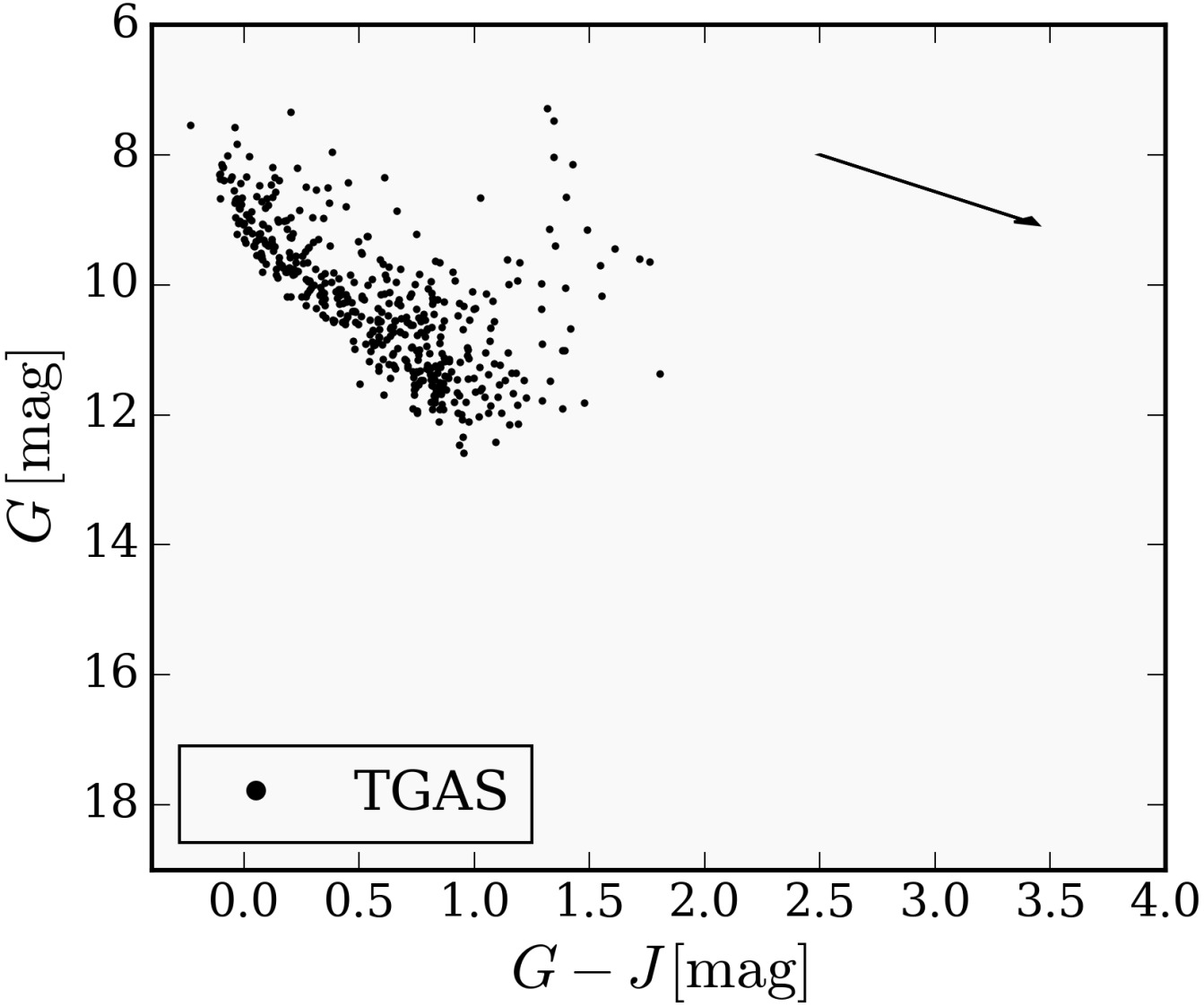


Sources with $2 < \varpi < 3.5$ mas

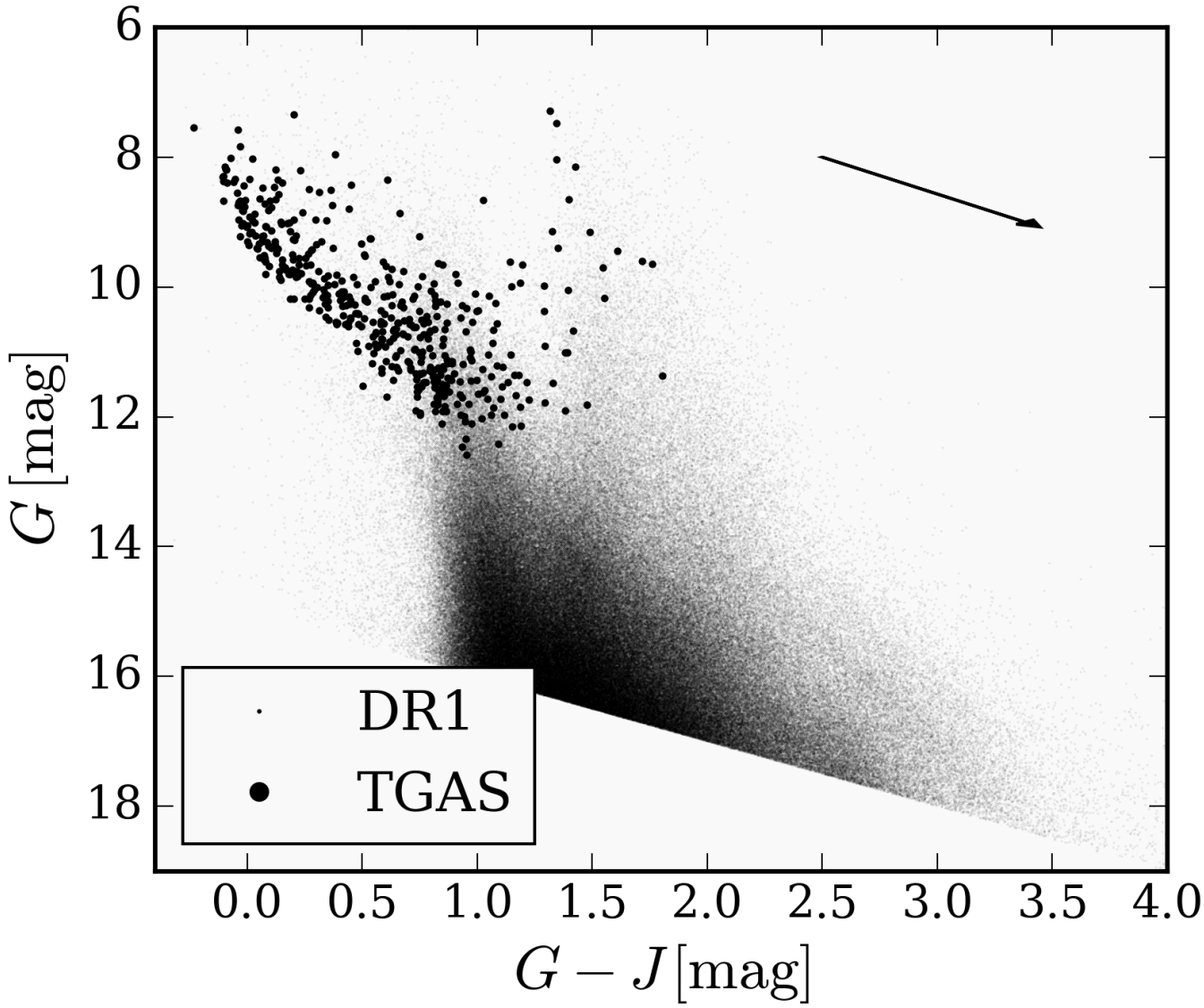




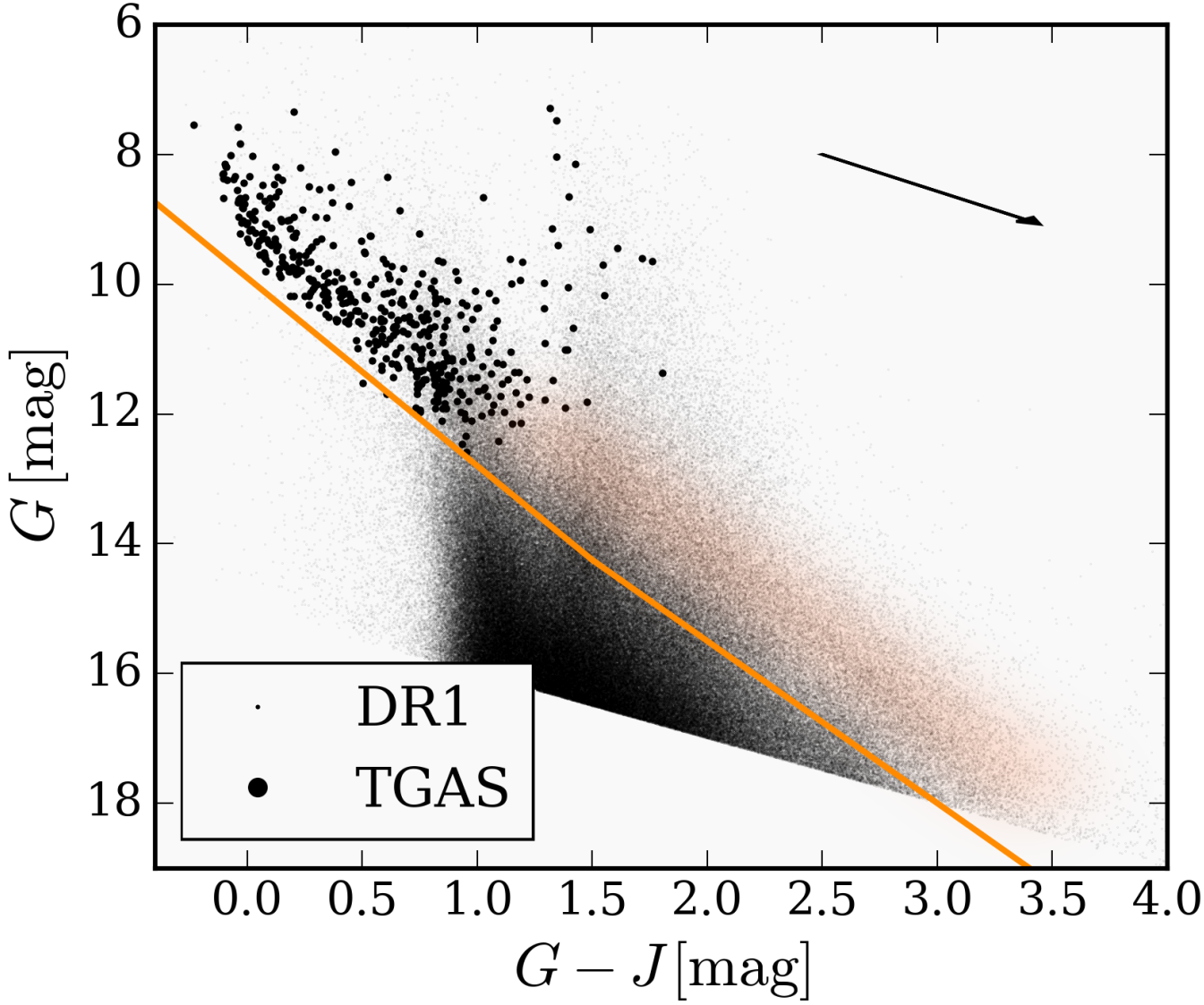
Color Magnitude diagrams



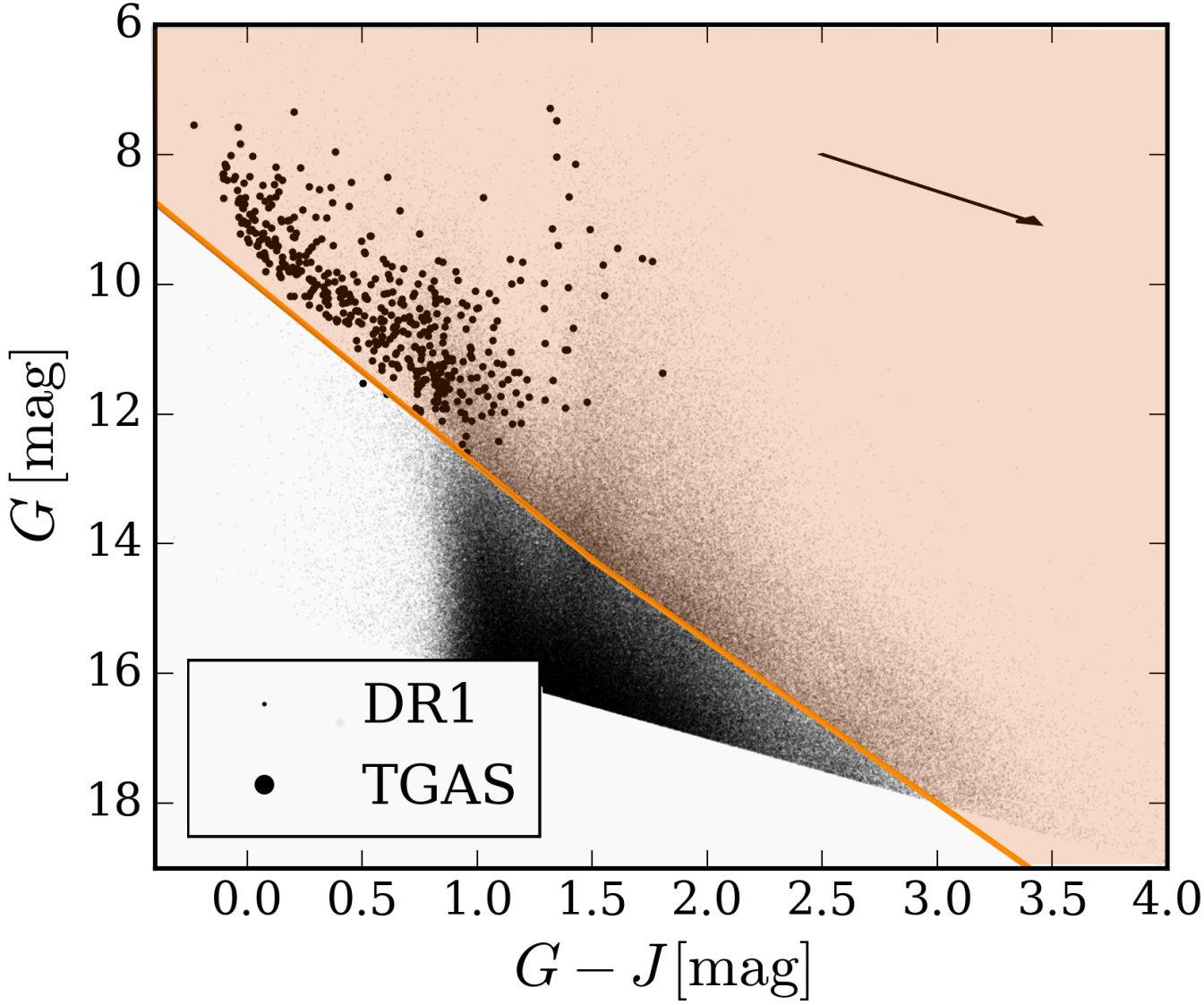
Color Magnitude diagrams



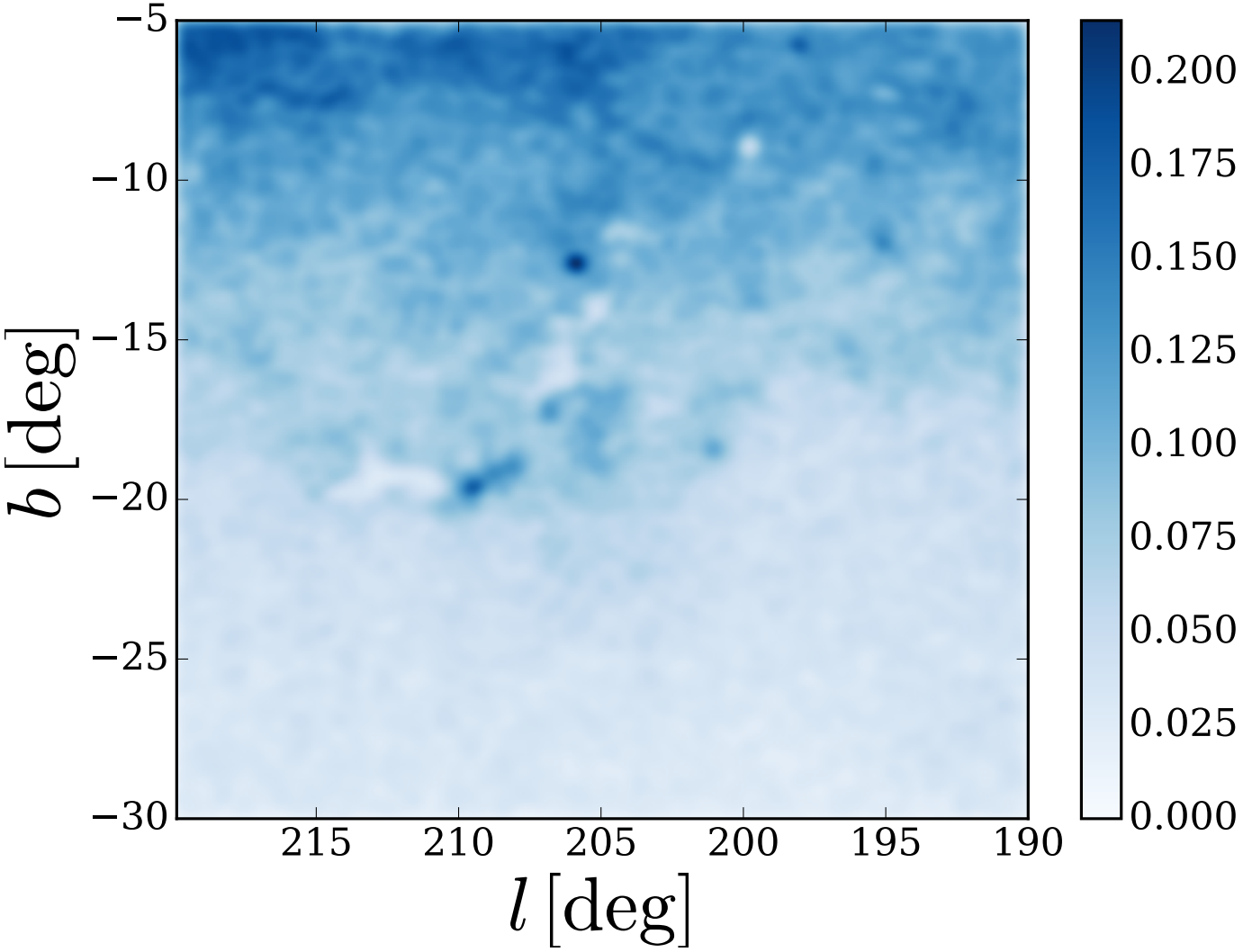
Color Magnitude diagrams



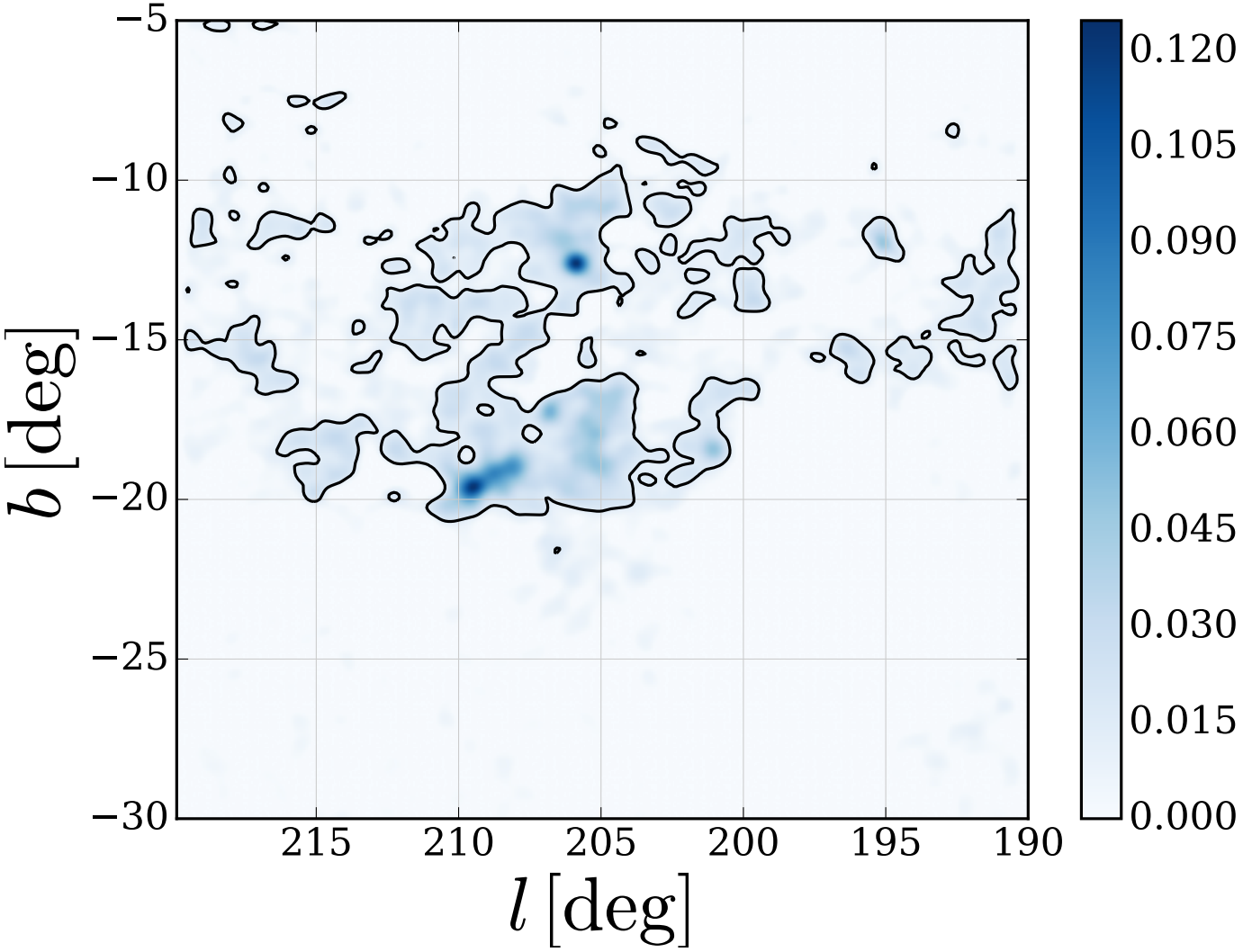
Color Magnitude diagrams



Distribution in the sky



Distribution in the sky

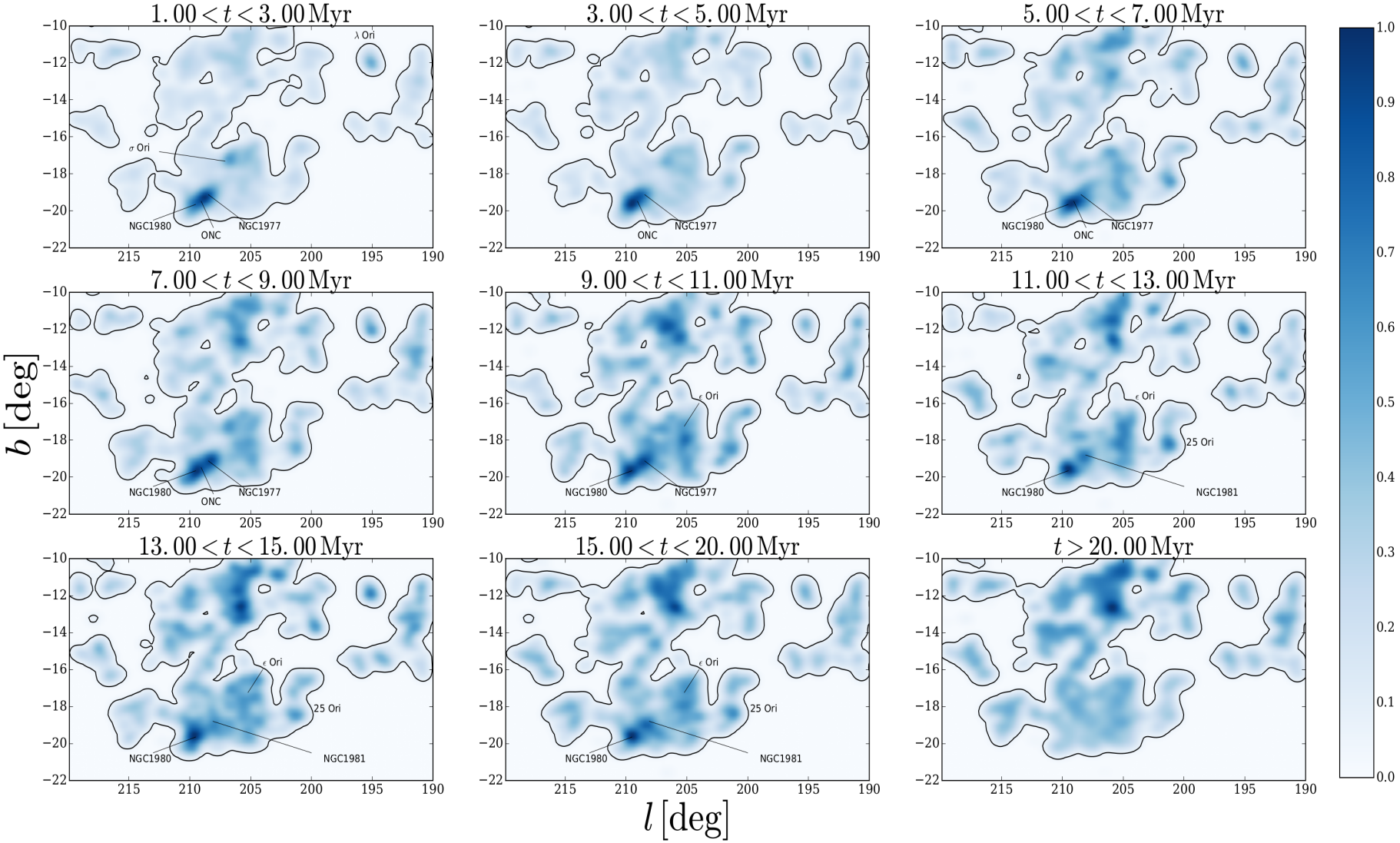


Age Maps with $\varpi = 2.65\,\mathrm{mas}$

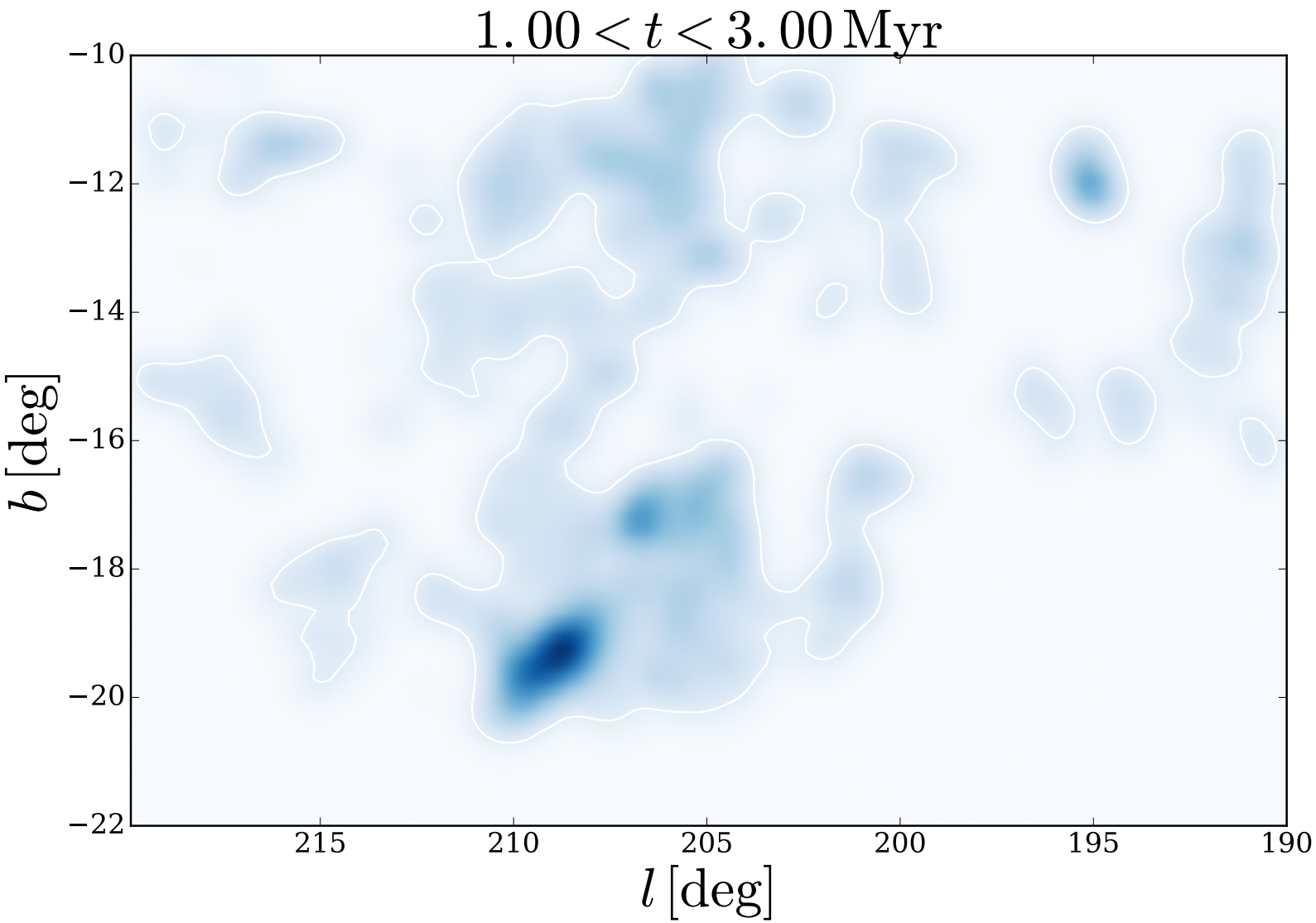
$\Rightarrow$ Bayesian Isochrone Fit (Jorgensen & Lindegren (2005)):
Padova Isochrones with Z = 0.02.

Age Maps with $\varpi = 2.65\,\mathrm{mas}$

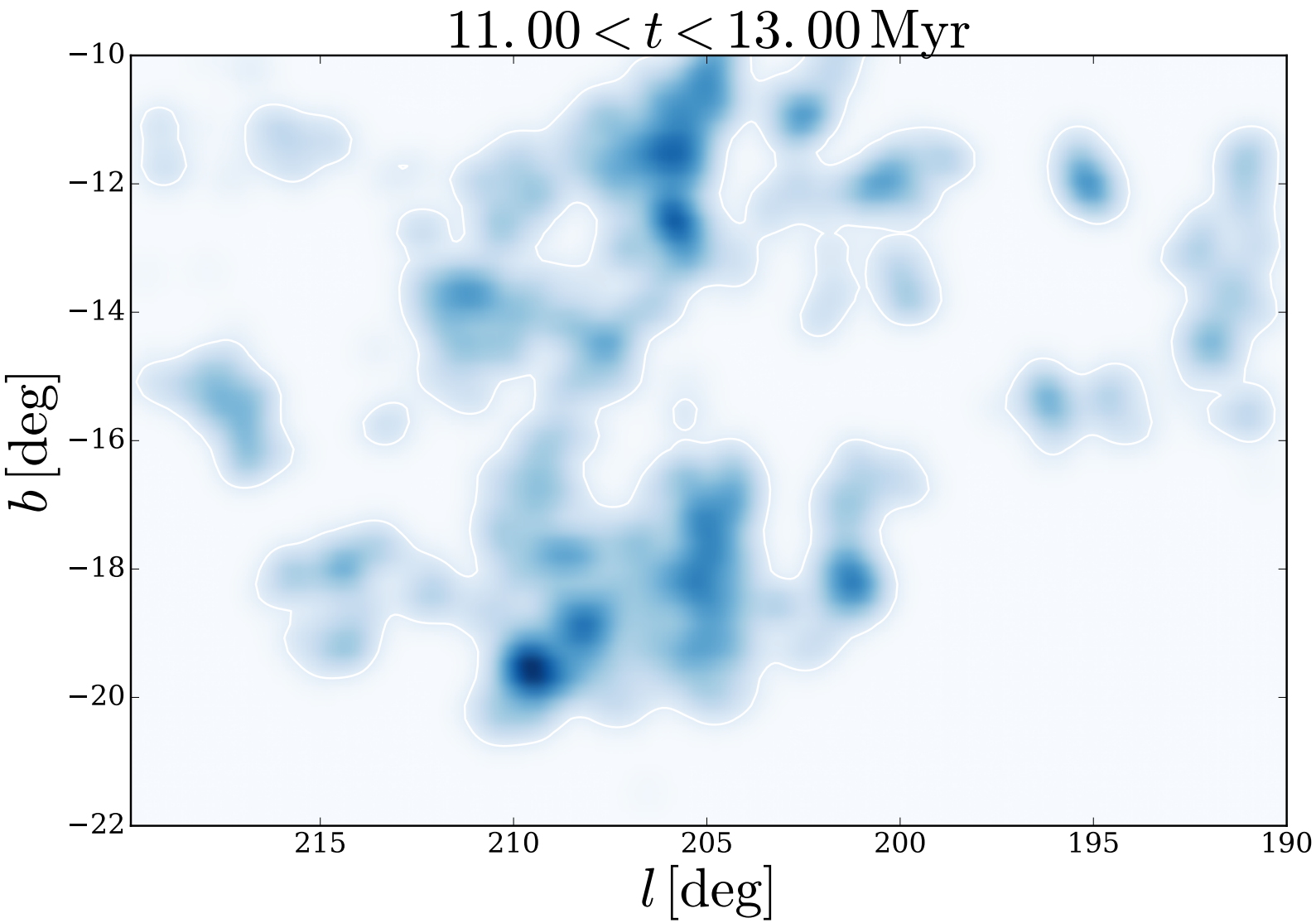
$\Rightarrow$ Bayesian Isochrone Fit (Jorgensen & Lindegren (2005)):
Padova Isochrones with Z = 0.02.



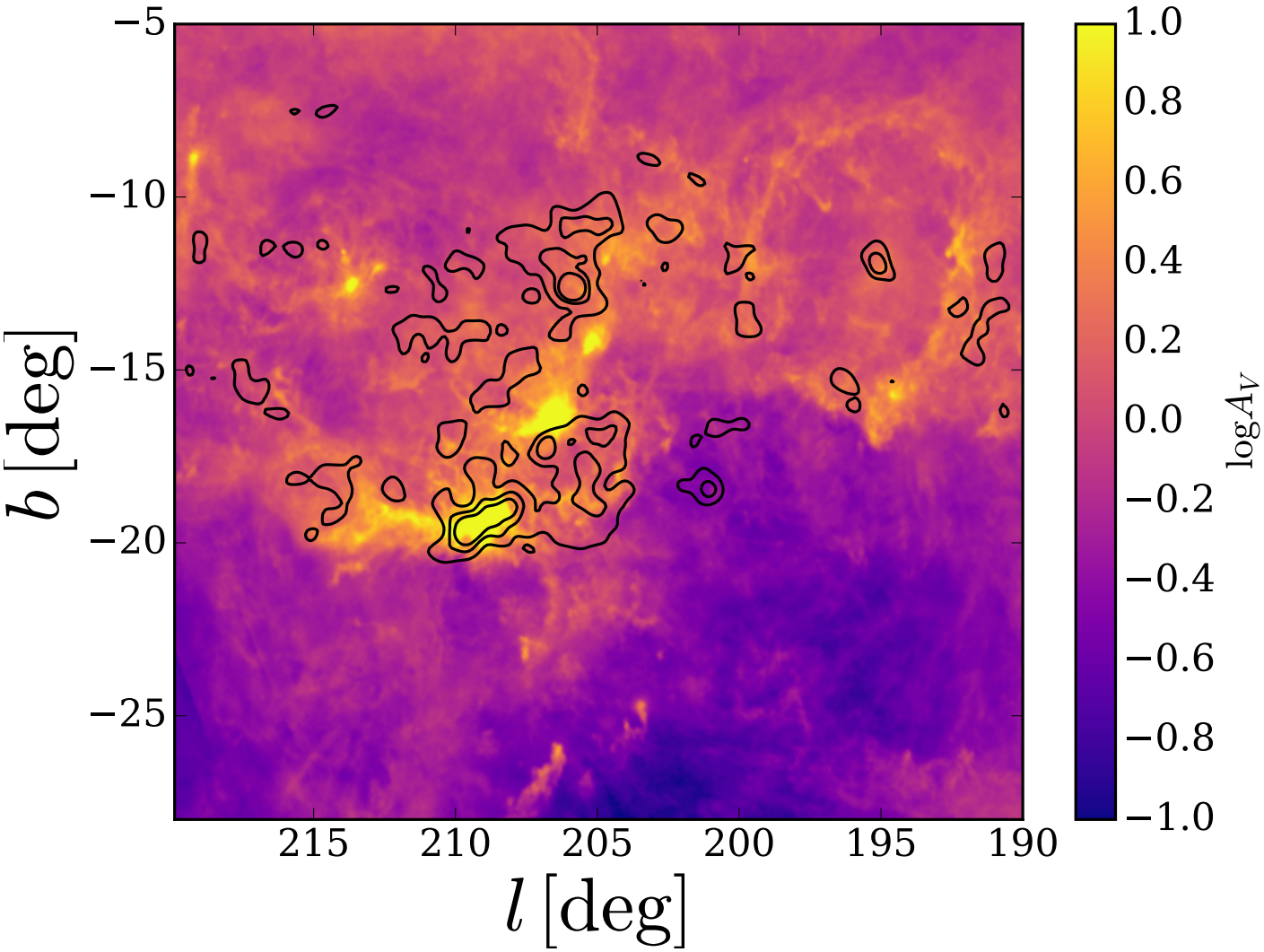
Age Maps with $\varpi = 2.65\,\mathrm{mas}$



Age Maps with $\varpi = 2.65\,\mathrm{mas}$



Relation with the ISM



Extinction Map: Planck Collaboration (2014)

Conclusions

We studied the stellar population towards Orion, finding:

- Parallax gradient from 25 Ori to the ONC;
- Age gradient corresponding to the parallax gradient.

Fresh view of the star formation history of the Orion region.

With *Gaia* DR2 we will be able to address:

- Kinematic properties of the Orion OB association;
- Relation between the OB association and the gas structures in Orion.


esa
Thank you!
gaia

Previous age estimates

Orion OB 1a & λ Ori:	~10-12 Myr
Orion OB 1b:	~ 8 Myr
Orion OB 1c:	~ 3-6 Myr
Orion OB 1d: (ONC/ NGC2068/71/Orion A/B clouds)	~ 2 Myr