3D mapping of the Solar Neighbourhood with Gaia DR2

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The Gould Belt

- OB type stars cluster in loose groups → OB associations.
- They seem to form a belt.
- Giant molecular clouds are found to be related to the most prominent OB associations.

Formation scenarios:
- oblique impact of high velocity cloud on the Galactic Disk (Comeron & Torra, 1992; Comeron et al., 1998)
- cascades of supernova explosions (Poppel, 1997)
The Gould Belt

Goals

- trace the three dimensional configuration of the Solar Neighbourhood, focusing on young groups and OB associations.

- derive the kinematic properties and the star formation history of the Solar Neighbourhood.
Selecting young stars in Gaia

Colour-magnitude diagram of the Orion region
Selecting young stars in Gaia: UMS

[Diagram showing a colour-magnitude diagram of the Orion region, with regions marked as Upper Main Sequence (UMS), Giants, Pre-Main Sequence (PMS), and Bad photometry.]
Selecting young stars in Gaia: PMS

Colour-magnitude diagram of the Orion region
Extinction correction
Extinction correction

We select stars younger than 20 Myr
Tangential velocities

Members of clusters and associations share the same spatial velocity + small velocity dispersion.
3D mapping of PMS stars
3D mapping of UMS stars

Y(pc)

X(pc)

Z(pc)

Galactic Centre

Galactic Rotation

500.

250.

0.00

-250.

-500.

350.

175.

0.00

-175.

-350.

0.00

-175.

-350.

-500.

-500.

-250.

0.00

250.

500.
Ages of PMS stars

Blue: $10 < t < 20$ Myr
Green: $5 < t < 10$ Myr
Red: $t < 5$ Myr

Older stars are more diffuse
Young groups are compact
We observe an age gradient in Sco-Cen, confirming previous studies.
We combined Gaia DR2 astrometry and photometry to study the 3D configuration of young stars within $d = 500$ pc.

We create 3D density maps of UMS and PMS stars.

Three main structures are visible: Sco-Cen, Vela, and Orion (and other smaller density enhancements).

We study the ages of PMS sources confirming previous results.

Check this out! http://galaxymap.org/dr2/
(Preliminary) Conclusions

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Is there a Gould Belt?
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Is there a Gould Belt?

We find no evidence of a Belt-like structure!
Thank you!