

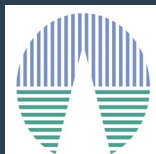


Censo de estrellas frías hacia en el disco galáctico

Miriam Cortés Contreras

Departamento de Física de la Tierra y Astrofísica

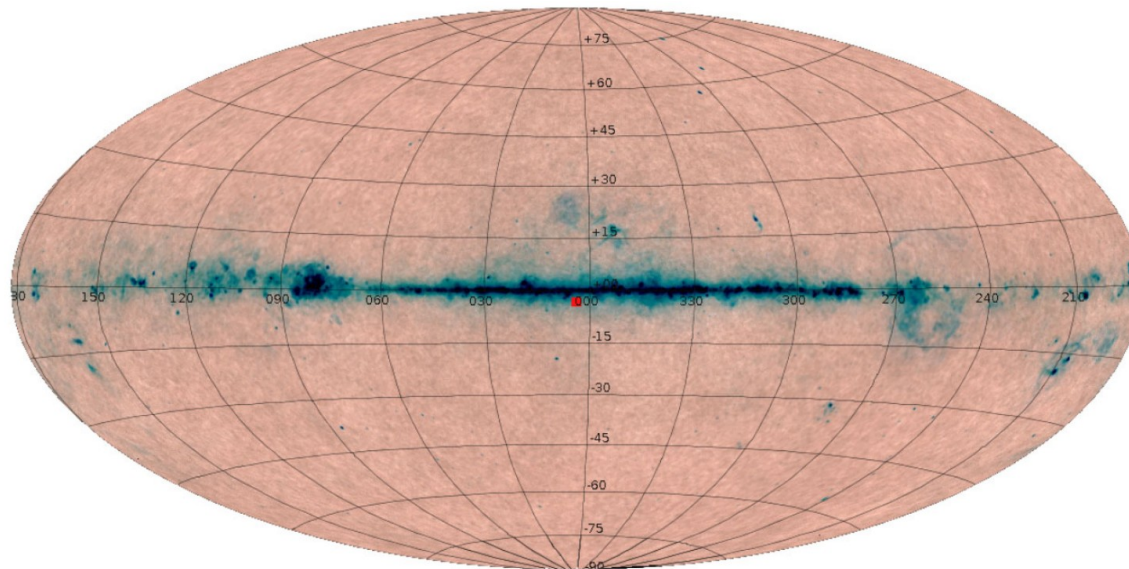
Marzo 2026



Proyecto

Crear un censo de estrellas de tipo solar y estrellas frías en dirección al centro galáctico a 500 pc.

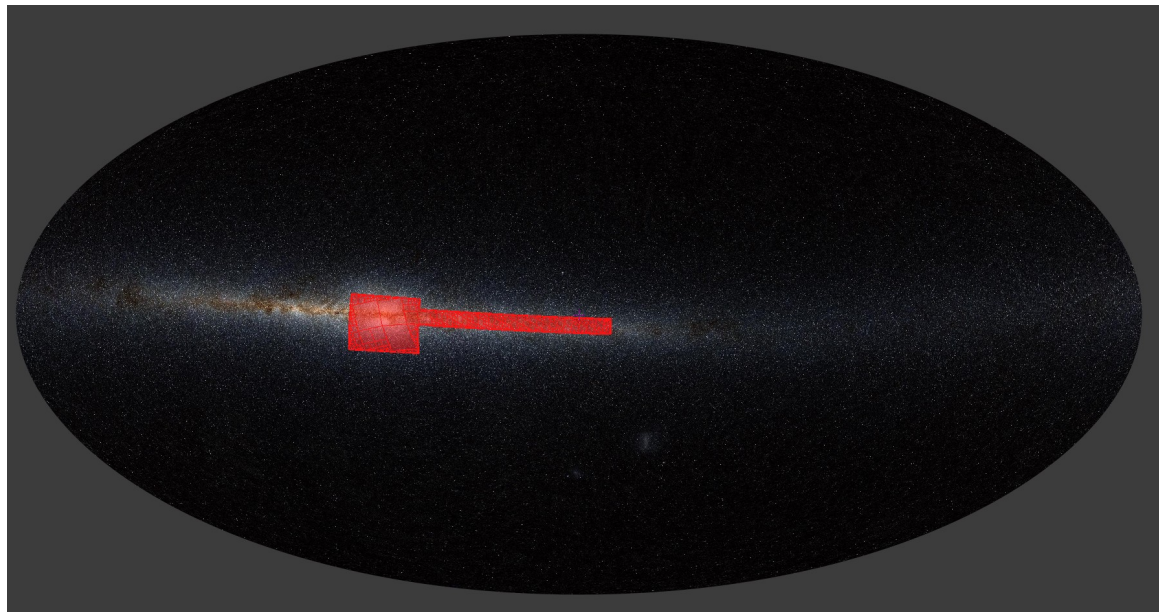
- Alta densidad estelar
 - Polvo interestelar
 - Composiciones químicas, edades, multiplicidad...
 - Catálogo para submuestras de trabajo: exoplanetas, enanas marrones, subenanas...
- } Proporción de estrellas con parámetros físicos determinados en estrellas de baja masa «



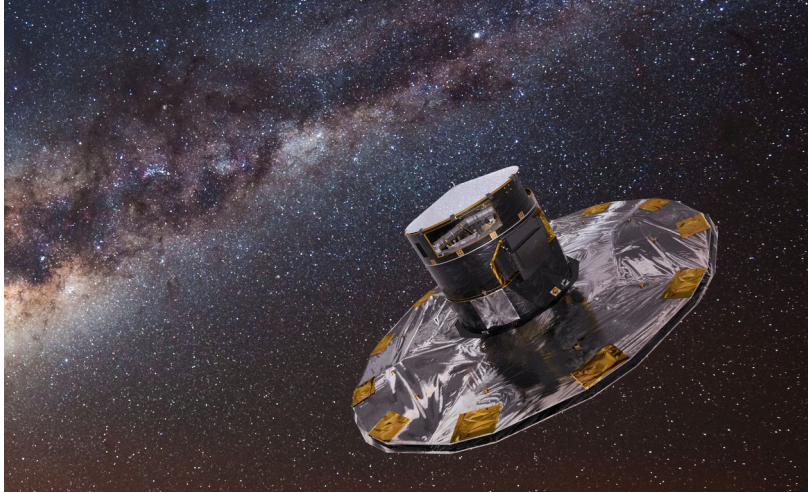
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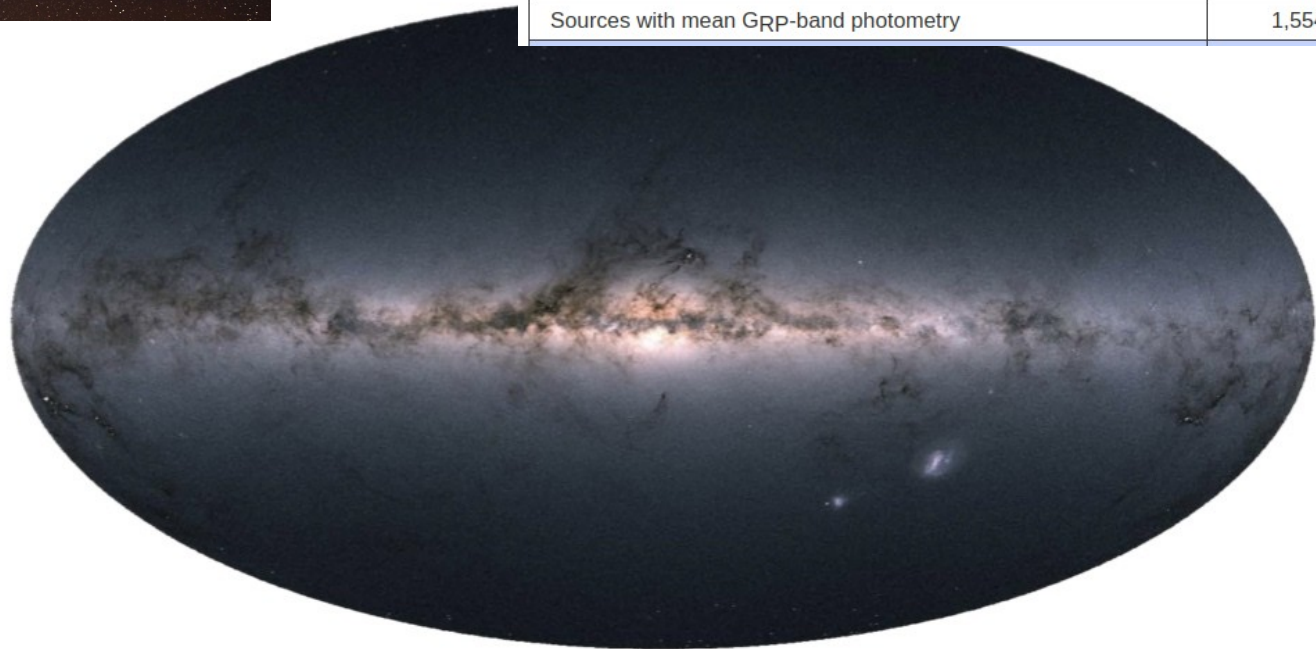


Gaia DR3

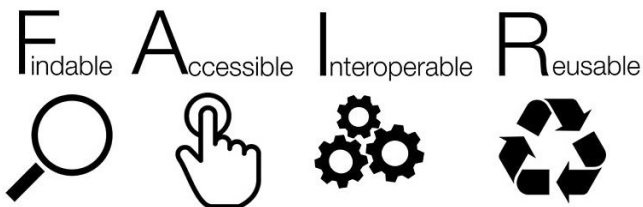
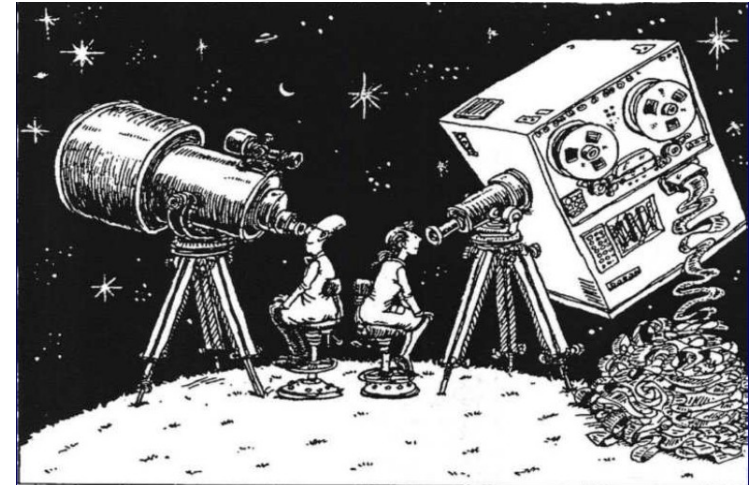


Gaia

	# sources in Gaia DR3
Total number of sources	1,811,709,771
	Gaia Early Data Release 3
Number of sources with full astrometry	1,467,744,818
Number of 5-parameter sources	585,416,709
Number of 6-parameter sources	882,328,109
Number of 2-parameter sources	343,964,953
Gaia-CRF sources	1,614,173
Sources with mean G magnitude	1,806,254,432
Sources with mean GBP-band photometry	1,542,033,472
Sources with mean GRP-band photometry	1,554,997,939

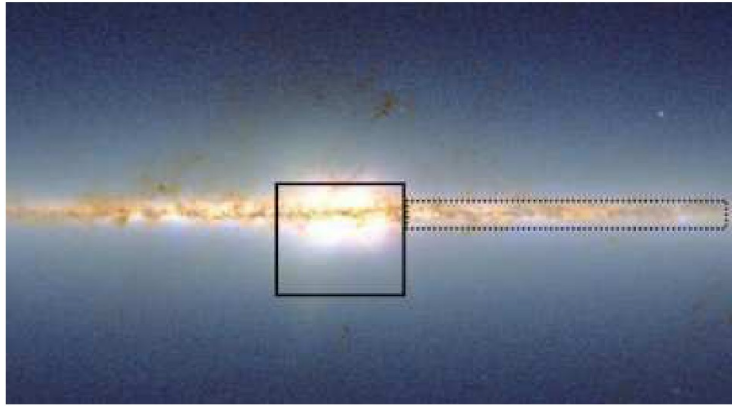


Observatorio Virtual

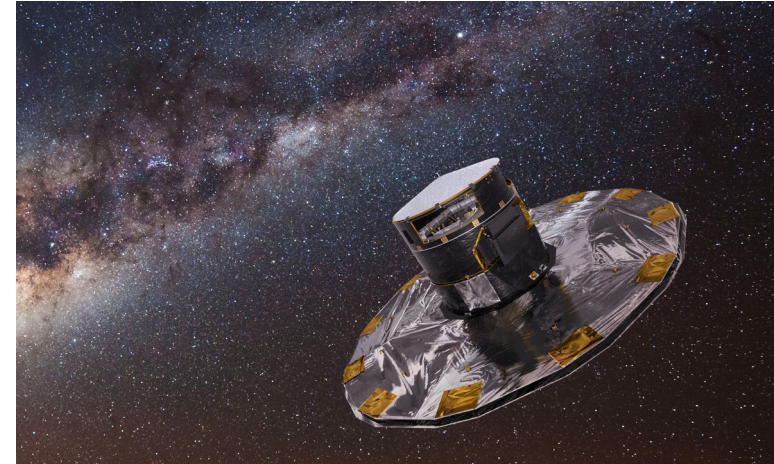


Goal: Easy and efficient access and analysis of the information hosted in astronomical archives.

VVV + Gaia + Observatorio Virtual



+



+



TOPCAT



VIZIER



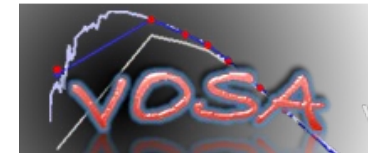
ALADIN



STILTS



X-MATCH



VOSA

Ms en VVV (Cruz et al. 2023)

7925 M-dwarf stars identified

1) Through Gaia parallaxes

- Cross-match with Gaia DR3, with a 1" search radius
- Good astrometric solution ($RUWE < 1.4$)
- Relative G and RP magnitude errors below 10%
- Good parallax measurements ($\pi > 0$ and $\pi_{\text{err}}/\pi < 0.2$)
- Stars within 500 pc

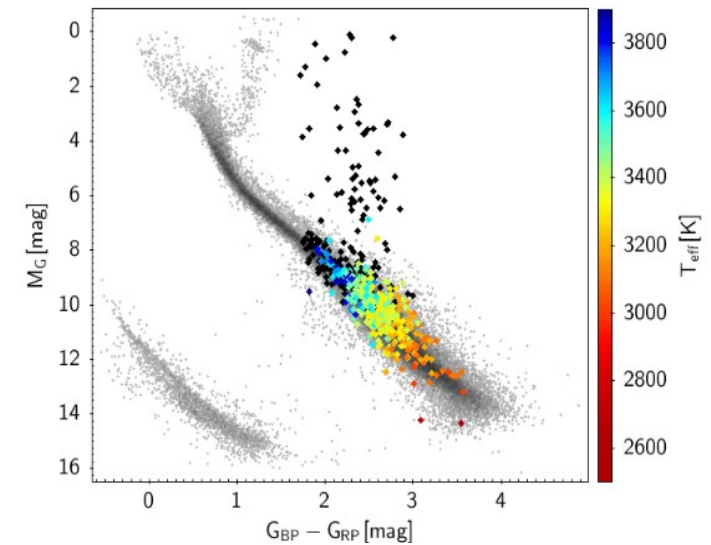
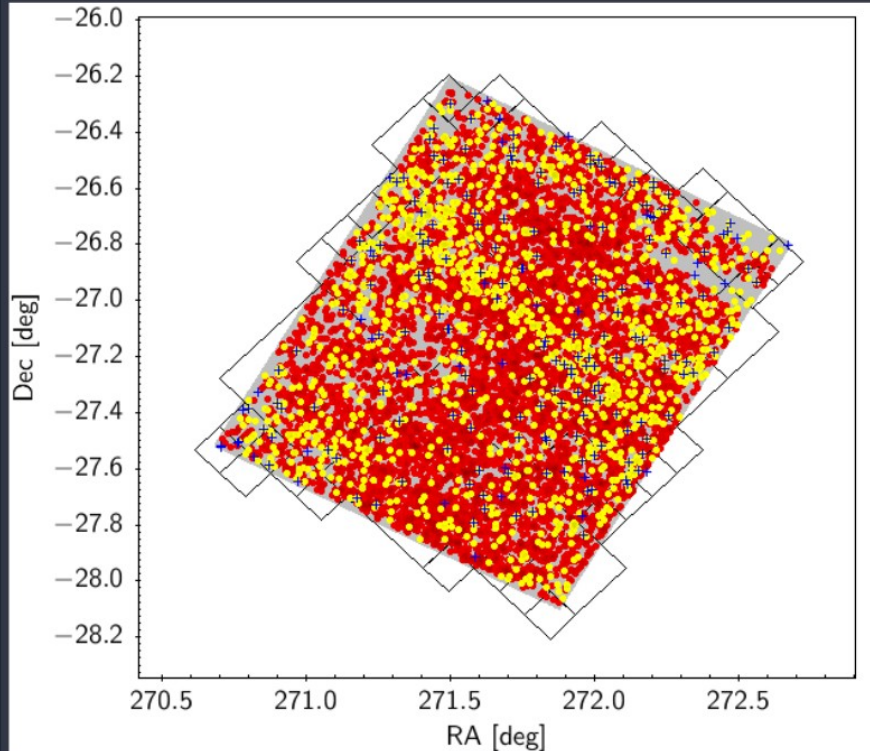
2) Through colour cuts and PMs

- VISTA ZYJKS bands and relative errors of less than 5%
- Colour cuts for M dwarfs from Rojas-Ayala et al. (2014)
- Gaia DR3 for proper motion (PM), 1" search radius
- Relative PM_RA and PM_Dec errors below 20%
- Reduced PM criteria
- PM > 10 mas/yr
- G mag and ga (1.4)
- Stars within 500 pc from empirical solid

Patricia Cruz - SVO science meeting - March 2023

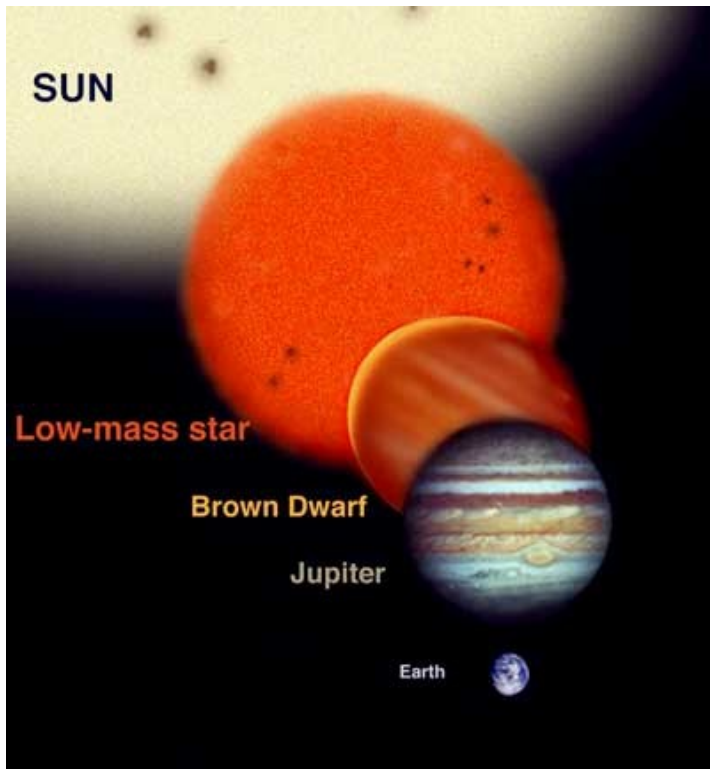
M dwarfs in Gaia DR3: 208
M dwarfs VVV+Gaia+VOSA:
7925

Comparison to Gaia M dwarfs



Patricia Cruz - SVO science meeting - March 2023

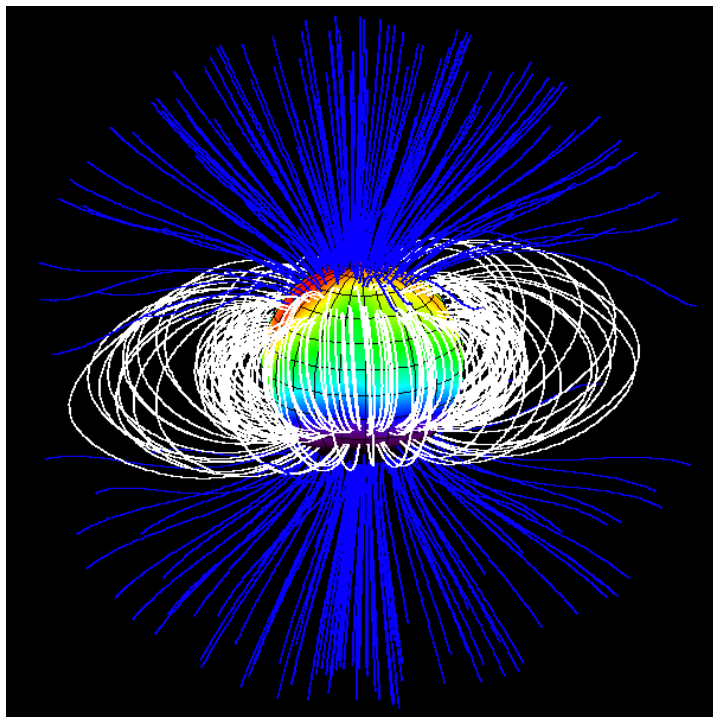
M_s



Convective envelopes & radiative cores -> full convection

- Long lifetimes → tracers of the structure, kinematics, and evolution of the Galaxy
- M - LTY → formation and evolution processes involving stellar objects at the end of the HRD
- Prime targets of exoplanet surveys as possible hosts or habitable Earth-like planets

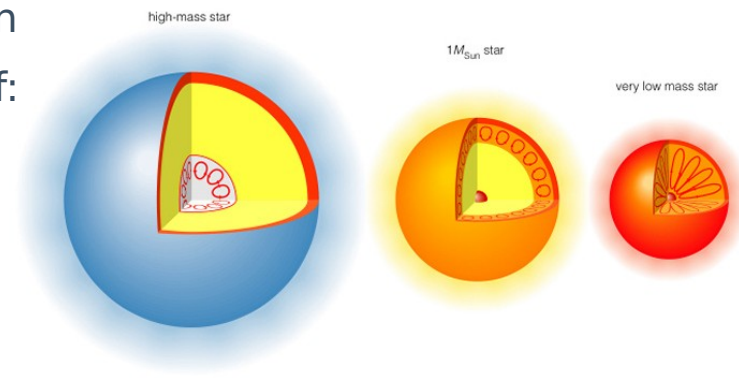
M_s



Donati et al.
2006

Convective envelopes & radiative cores -> full convection

- Dynamo generation of magnetic flux
- Activity - rotation connection
- Activity - age connection
- M dwarf companions of:
 - FGK → metallicity
 - WD → age

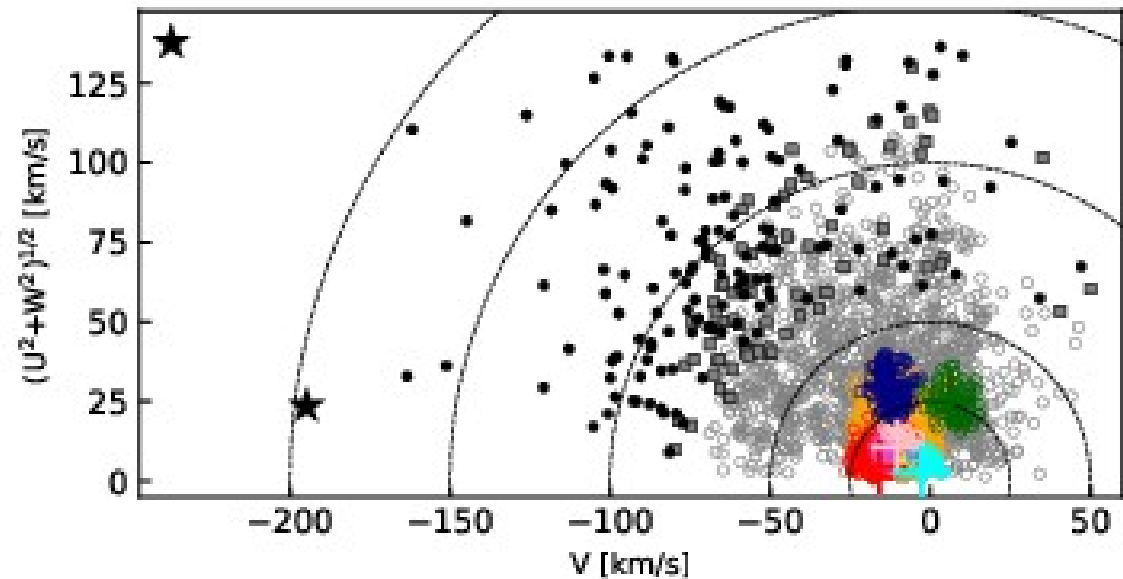


Caracterización

- Poblaciones estelares:

1. Cinemática

- » Subenanas (viejas, pobres en metales)
- » Enanas (MS) – jóvenes?



CC et al. 2024

RA, DEC, plx, pmra, pmdec, RV -> UVW

SteParKin (update from Montes+, 2001) -> Galactic populations

SteParKin, LACEwing, BANYAN sigma -> SKGs

Caracterización

Gagné et al. 2023

- Poblaciones estelares:

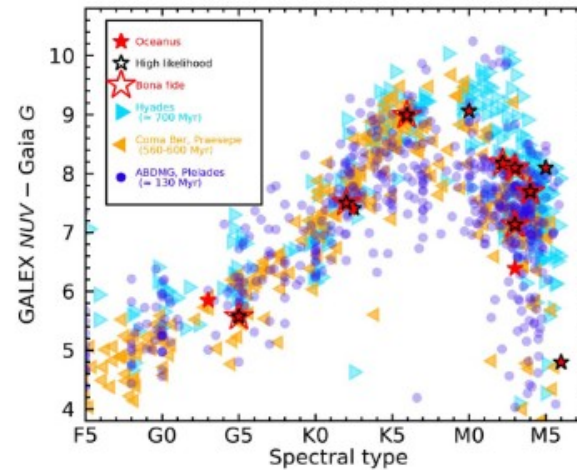
1. Cinemática

» Subenanas (viejas)

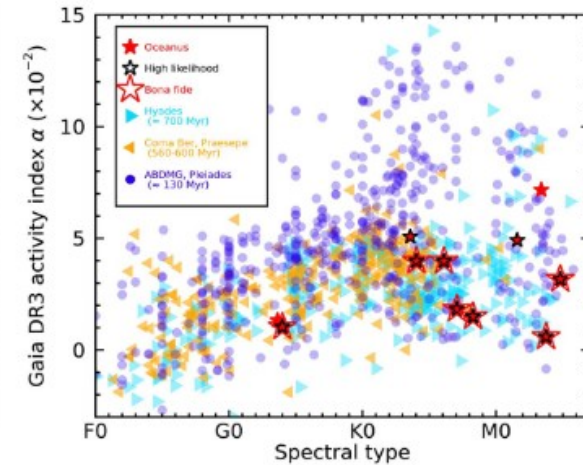
» Enanas (MS) – jóvenes?

2. Determinación de parámetros

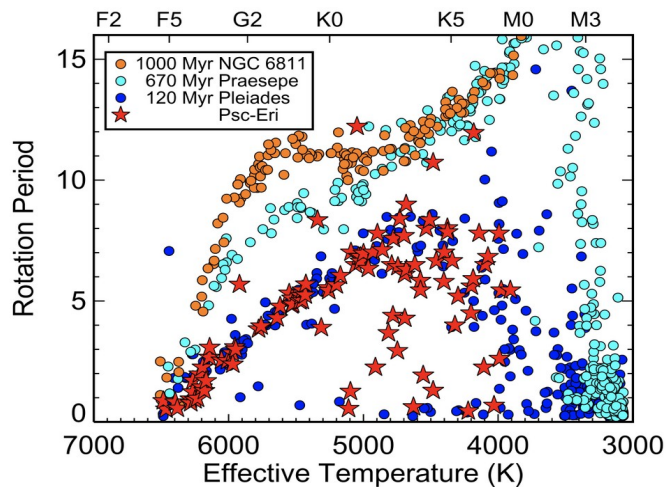
» Actividad



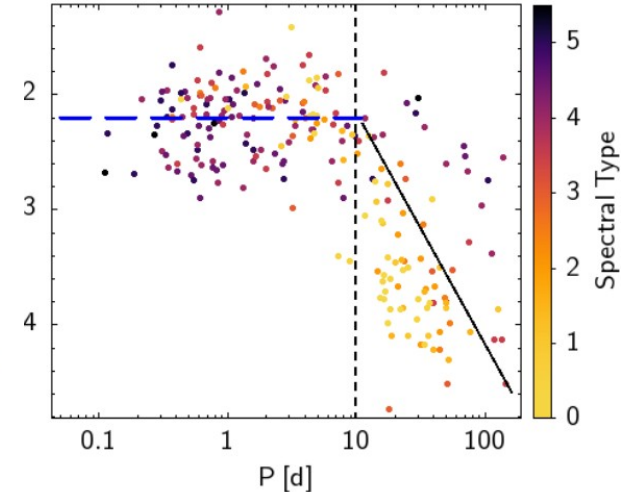
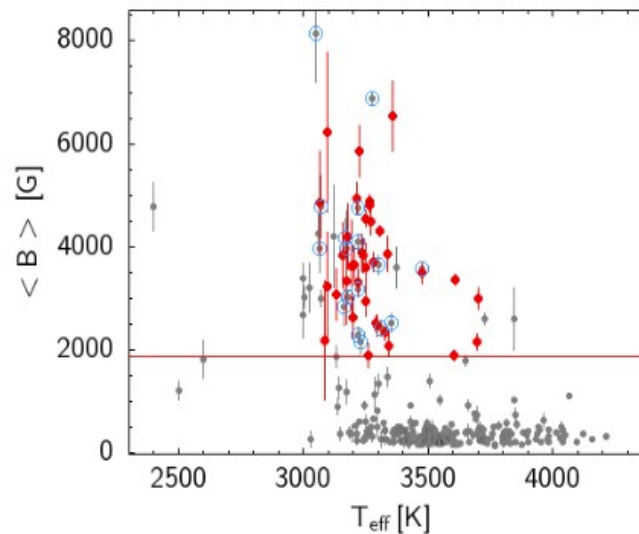
(c) Gaia



(b) Activity



Curtis et al. 2019



al. 2024

Caracterización

- Poblaciones estelares:

1. Cinemática
2. Determinación de parámetros

- Multiplicidad en Ms hasta 500pc

- Enanas: ~ 25% (↑ ~40% Cifuentes+2025)
- Subenanas: ~ 3% (↑ ~20% simulaciones)

Table 1. Stellar multiplicity fractions.

Reference	Investigated spectral type	d_{lim} [pc]	Multiplicity fraction [%]	Projected physical separation, s [au]	Survey method ^a
Duquennoy & Mayor 1991	F7–G9	22	~ 65	~ 0.01–225	RV, WI
Raghavan et al. 2010	~ F6–K3	25	44 ± 3	~ 0.005–100 000	RV, AO, S, WI
Reid & Gizis 1997	K2–M6	8	32	~ 0.1–1800	RV, S, WI
Leinert et al. 1997	M0–M6	5	26 ± 9	~ 1–100	S
Fischer & Marcy 1992	M	20	42 ± 9	~ 0.005–1000	RV, WI
Jódar et al. 2013	K5–M4	25	20.3 ^{+6.9} _{-5.2}	~ 0–80	LI
Ward-Duong et al. 2015	K7–M6	15	23.5 ± 3.2	~ 3–10 000	AO, WI
Bergfors et al. 2010	M0.0–M6.0	52	32 ± 6	3–	LI
Janson et al. 2012	M0.0–M5.0	52	27 ± 3	3–	LI
Law et al. 2008	M4.5–M6.0	15.4 _{±0.2}	13.6 ^{+6.5} _{-4.0}	~ 3–30	LI
Siegler et al. 2005	M6.0–M7.5	30	9 ⁺⁴ ₋₃	≥ 5	AO
Janson et al. 2014a	M5.0–M8.0	36	21–27	~ 0.5–100	LI
Close et al. 2003	M8.0–L0.5	33	15 ± 7	15	AO
Bouy et al. 2003	M7.0–L8.0	20	10–15	1–8	HST
Reid et al. 2008	L	20	12.5 ^{+5.3} _{-3.0}	13	HST
Burgasser et al. 2003	T	10 _{±0.2}	9 ⁺¹⁵ ₋₄	1–5	HST

Explotación científica

- Cinemática y estructura de la MW
- Clasificar y caracterizar UCDs -> mecanismos de formación?
- Multiplicidad:
 - Formación y evolución?
 - Determinación de parámetro estelares (R, M)
- Simetría en 500pc
- Proporcionar:
 - muestras bien caracterizadas para testear modelos de formación y evolución
 - Muestras búsqueda exoplanetas



¡Gracias!