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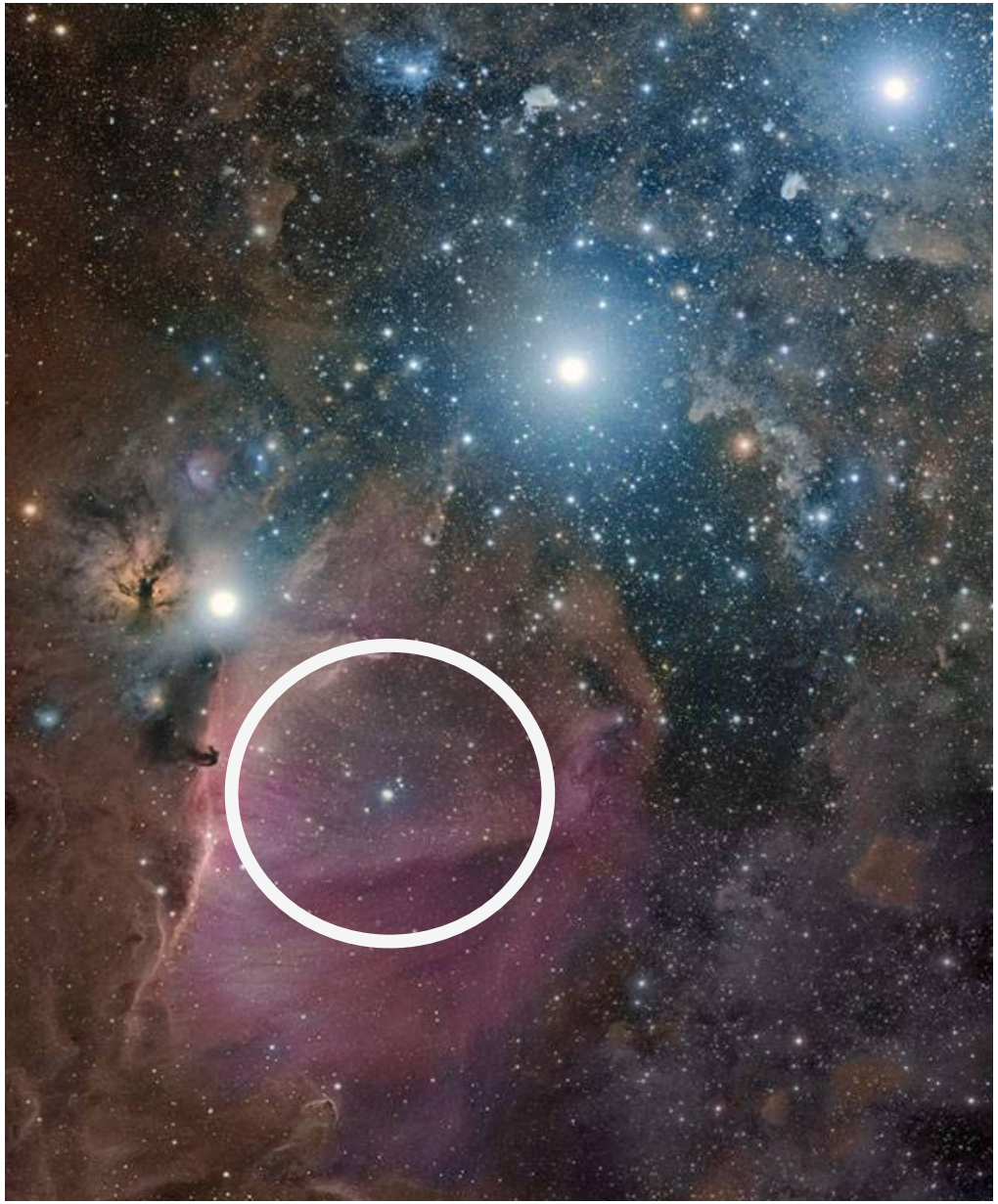
•exo**terræ**: http://exoterrae.eu

σ Orionis: intro

Basic parameters
(σ Ori, the star → σ Orionis, the cluster)

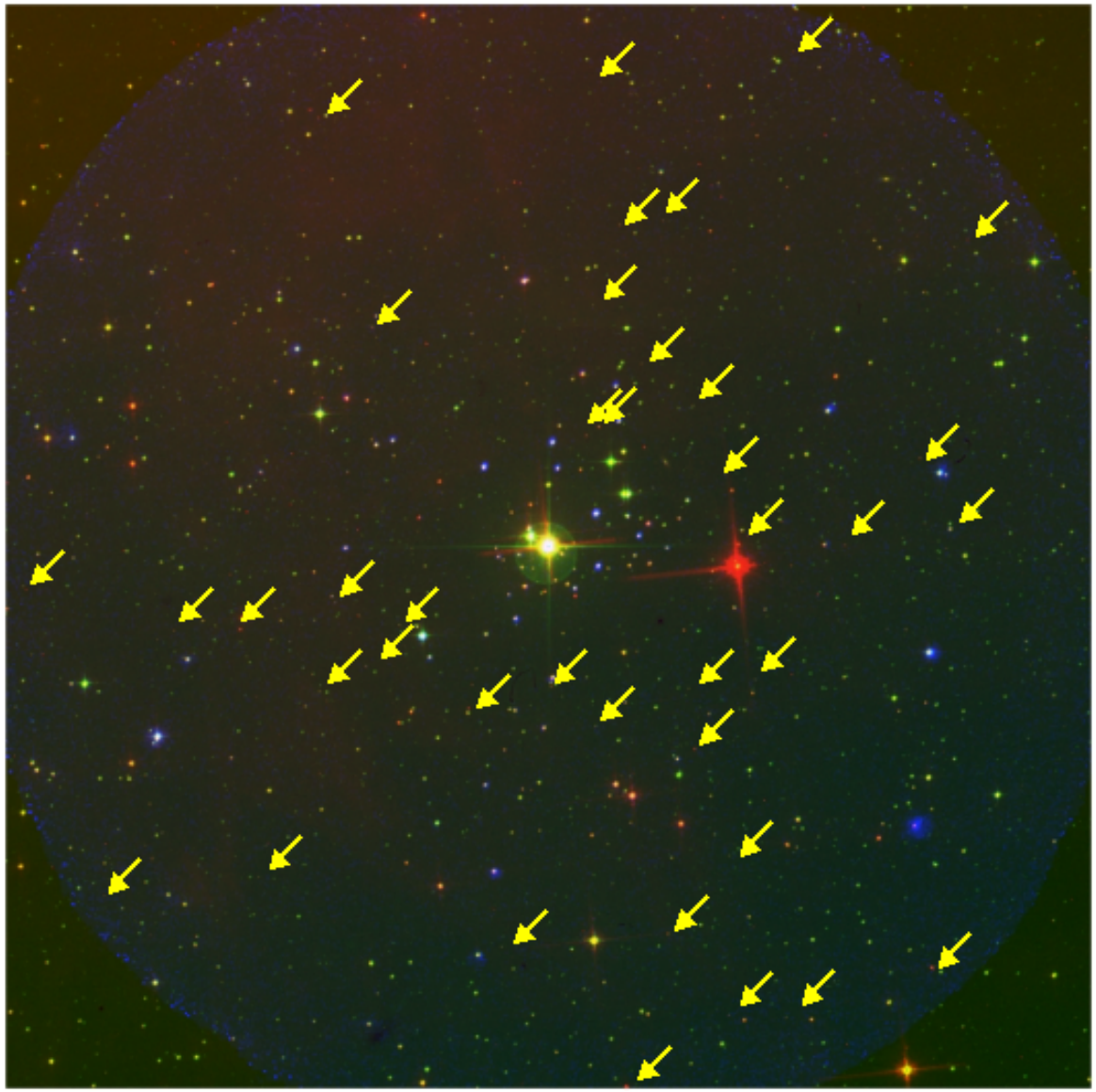
Age τ ~ 3 Ma
(2-4 Ma)
Distance d ~ 385 pc
(352-440 pc)
Radius ρ ~ 30 arcmin
(20-arcmin core)
Extinction A_V < 0.3 mag
(very low $E(B\text{-}V)$)
Solar metallicity
([Fe/H] = 0.0)



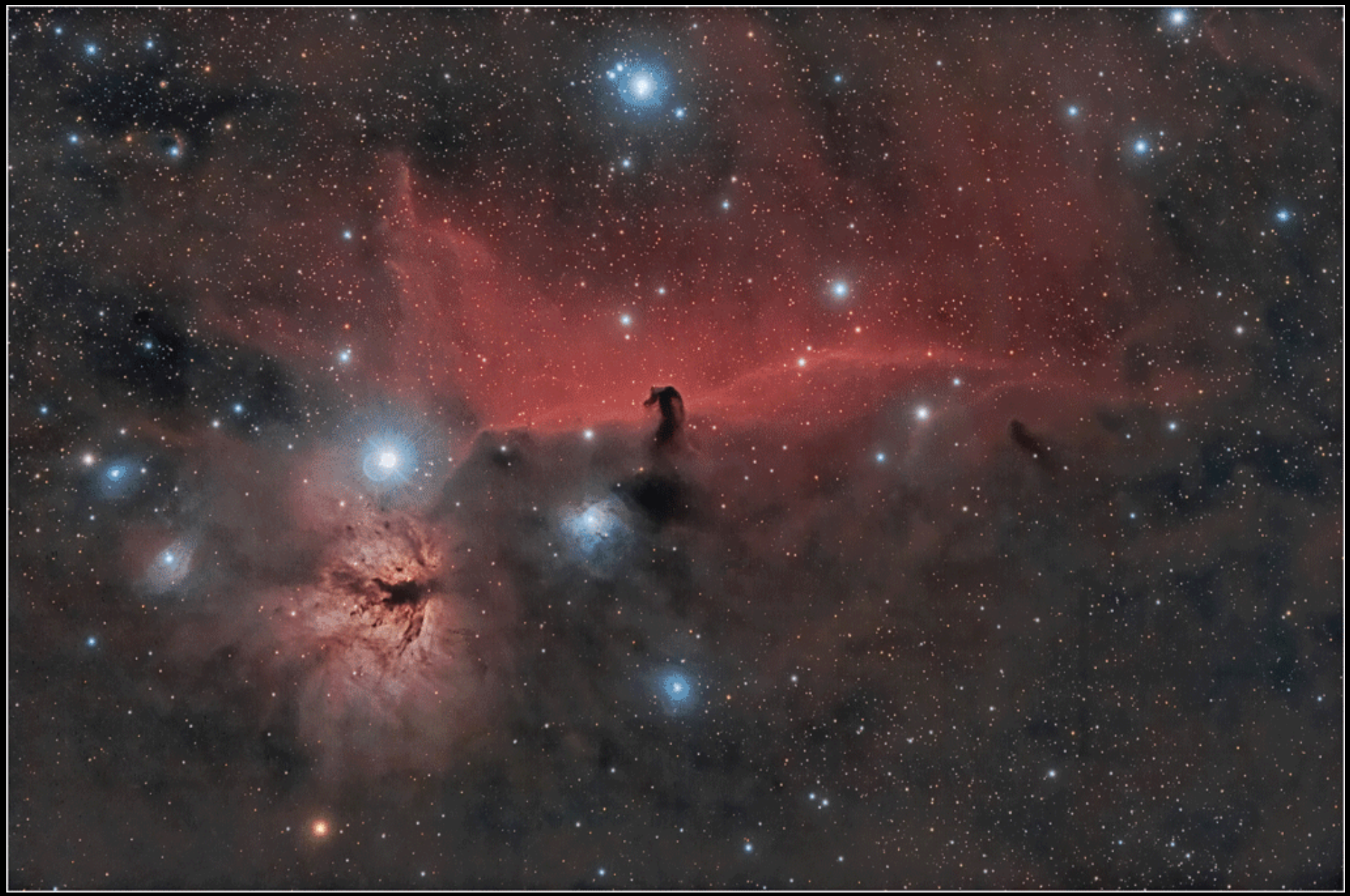
σ Orionis: intro

Importance
(many reasons…)

- Horsehead Nebula
- X-ray stellar population
- Discs at ~3 Ma
- B2Vp He-rich σ Ori E
- Herbig-Haro objects
- Most massive "binary" with astrometric orbit
- Accretion at low masses
- Well-studied **substellar mass function**



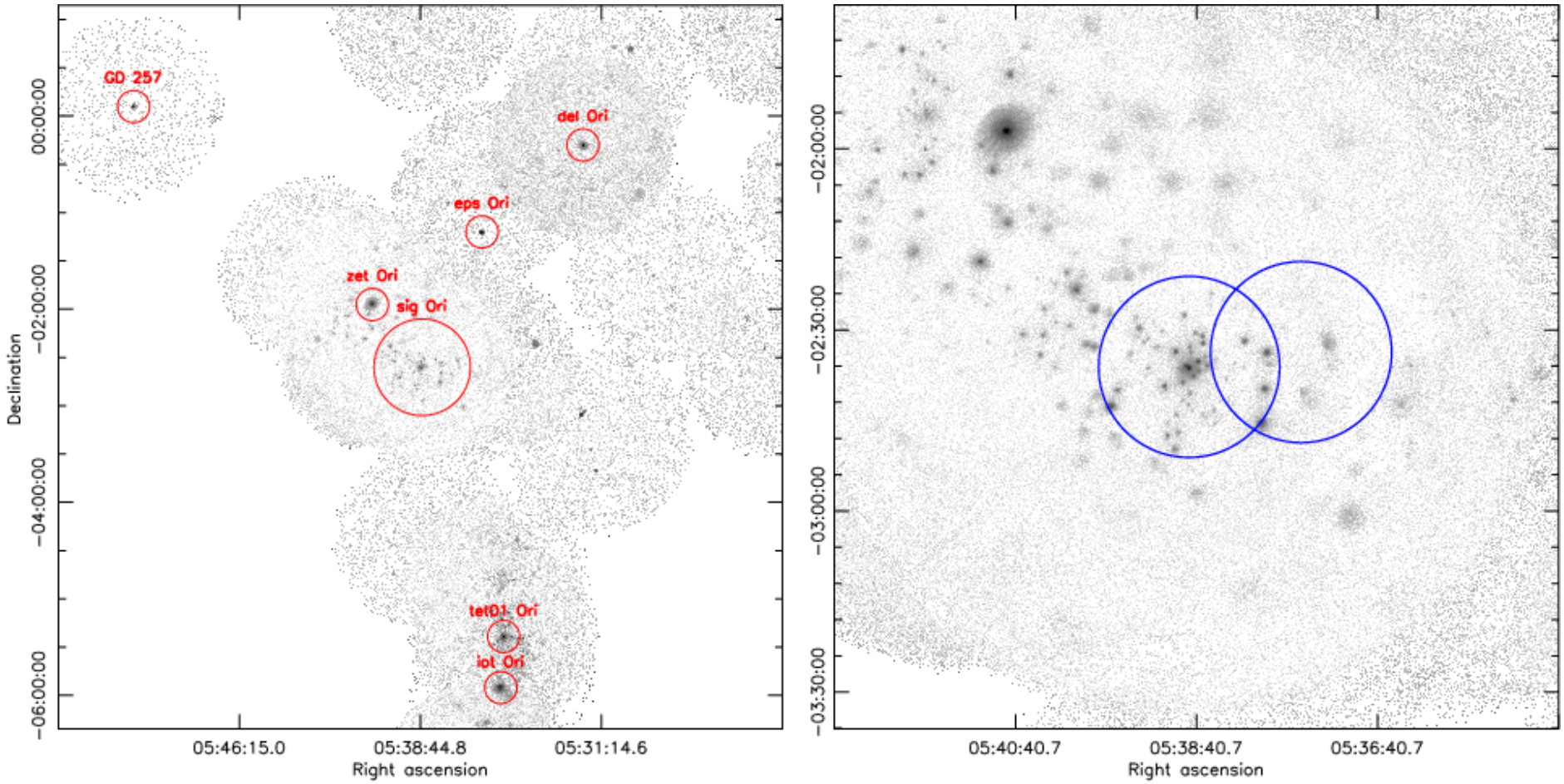
The East of the Orion Belt (Alnitak, σ Orionis, The Horsehead , The Flame…)



Raúl Alcaraz Gómez, AstronomíA & Caballero et al.

#1. A new deep, wide, X-ray survey

YOU = B. Stelzer, M. Á. López-García, J. López-Santiago, J. Sanz-Forcada…



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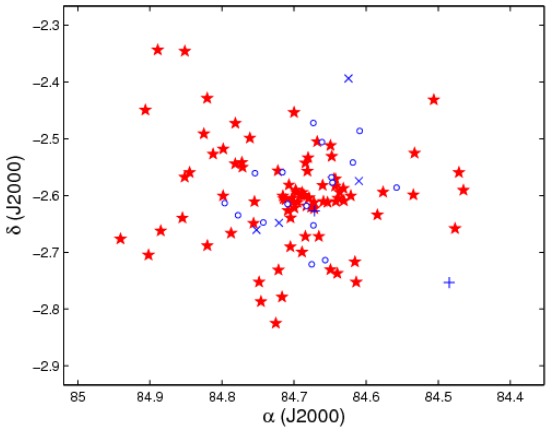

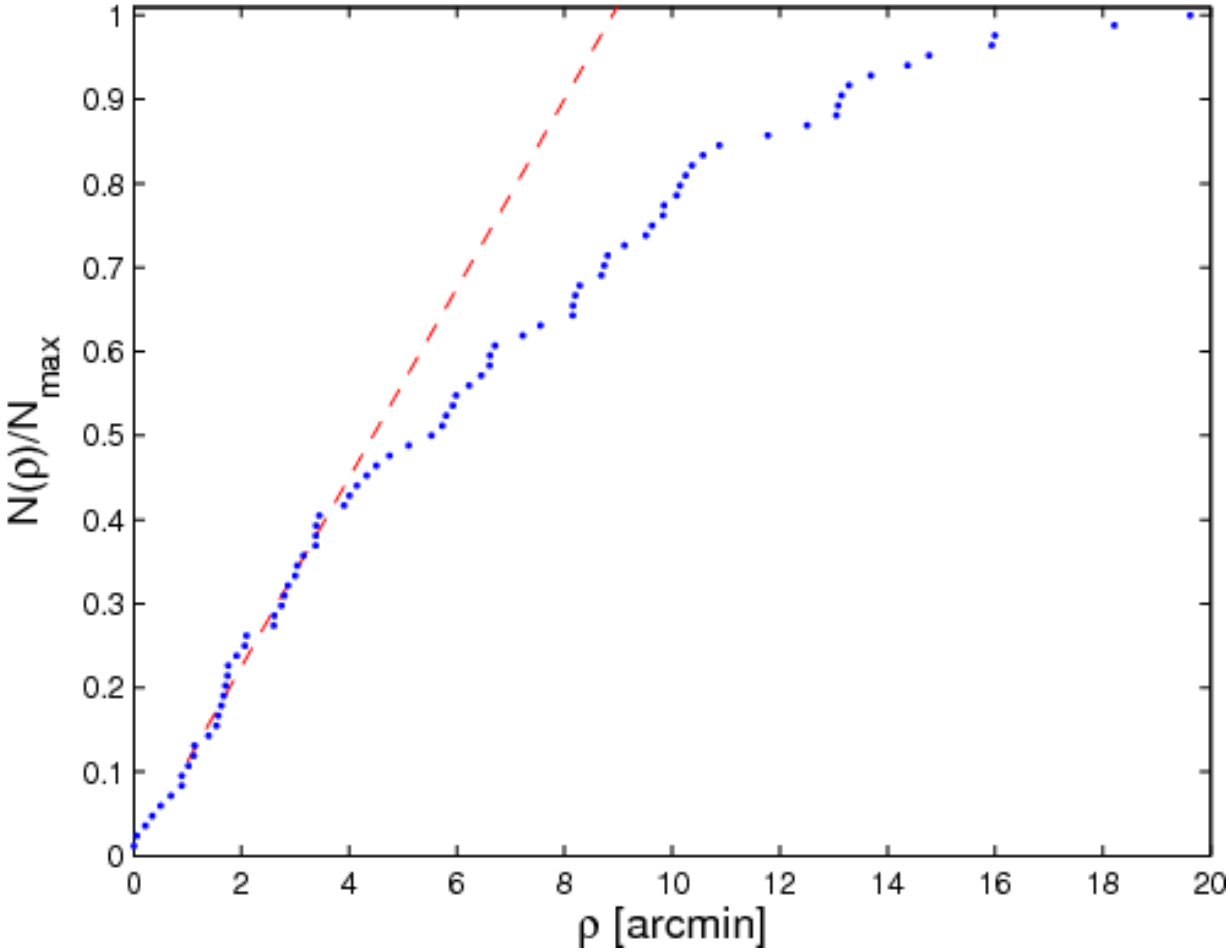

#1. A new deep, wide, X-ray survey

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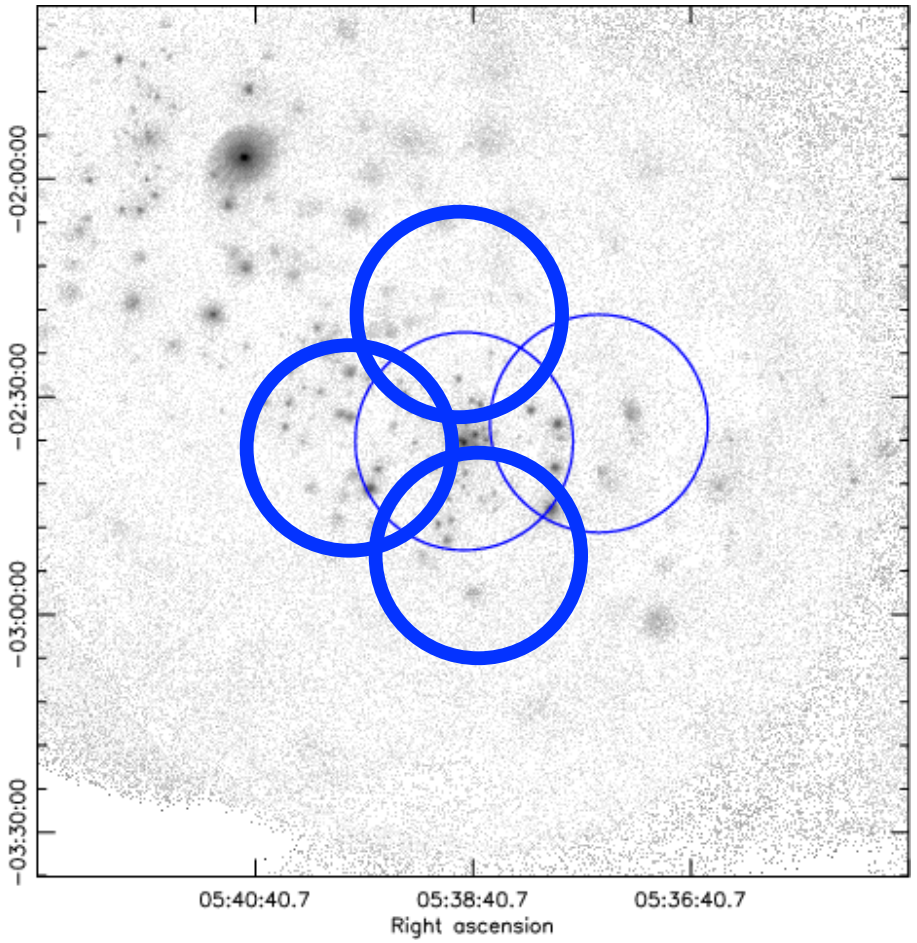
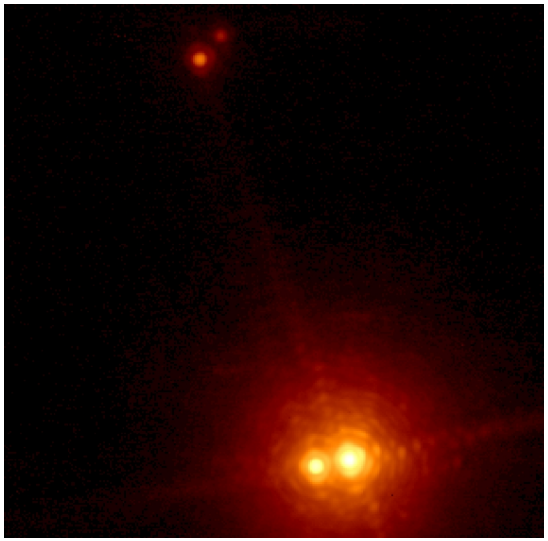
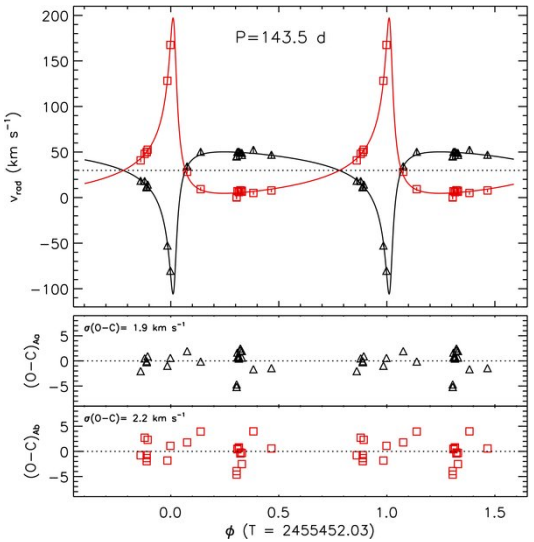
- EPICS/*XMM-Newton*
- 3 x 40 ks
- (Almost the) whole X-ray star population
- Increase number of X-ray brown dwarfs to ~10



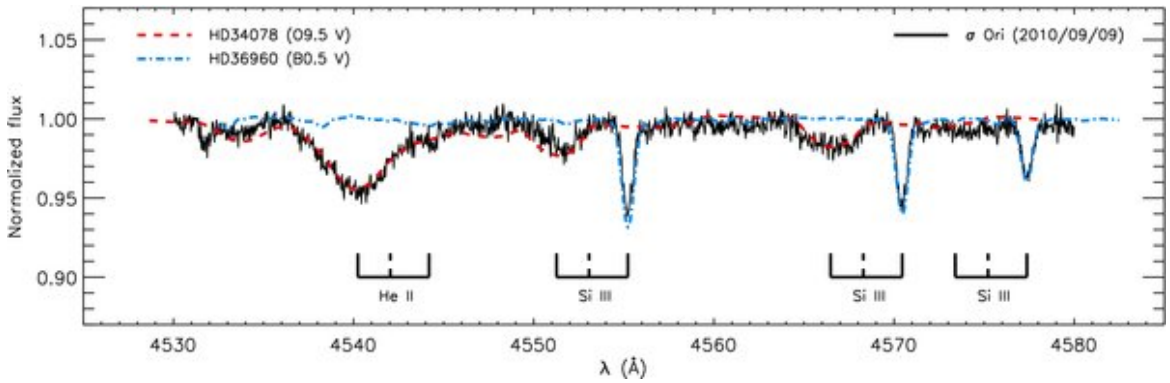
#2a. Winds and radiation from σ Ori AabB

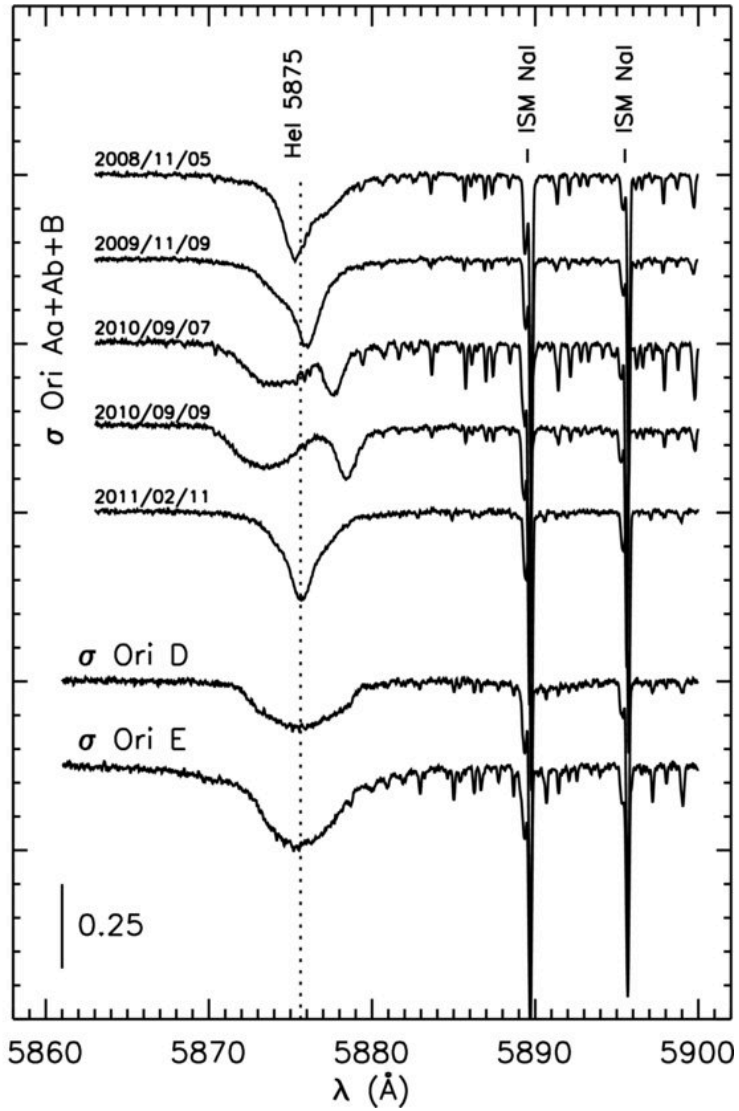
YOU = A. Báez-Rubio, F. Najarro, E. Puga, A. M. T. Pollock…





O9.5V + B0.5V + B1-2V + B2Vp + B2V





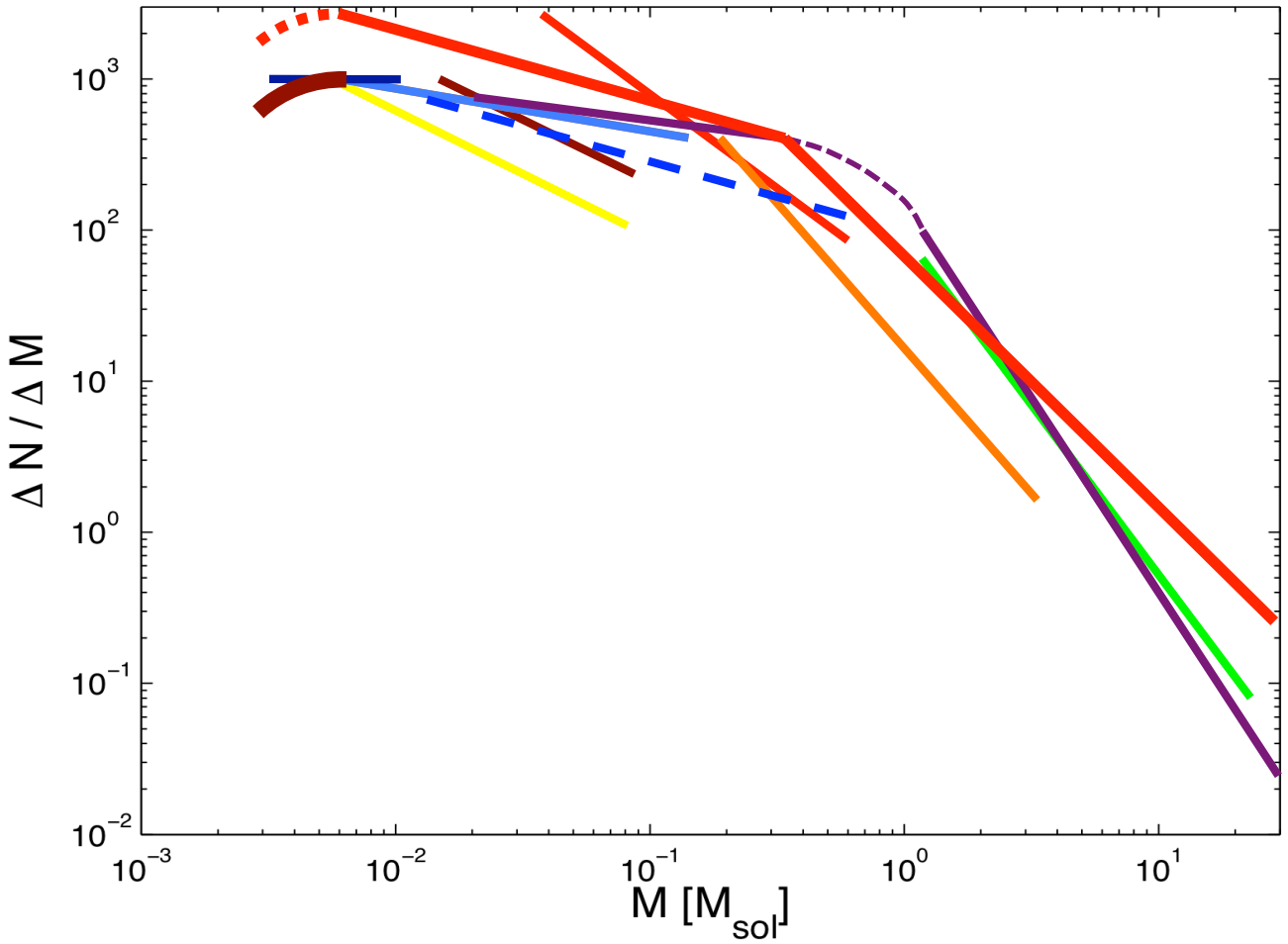
#2b. Winds and radiation from σ Ori AabB

YOU = J. R. Goicoechea, D. Fabien, G. Bañó…

- Horsehead Nebula Photo-Dissociation Region
- How many photons with $\lambda < 91.1$ nm from σ Ori Aab reach the PDR? (Lyman break)
- ALMA observations?

#3. Planetary-mass objects

YOU = C. Alves de Oliveira, M. R. Zapatero Osorio, E. L. Martín, D. Barrado…



#3. Planetary-mass objects

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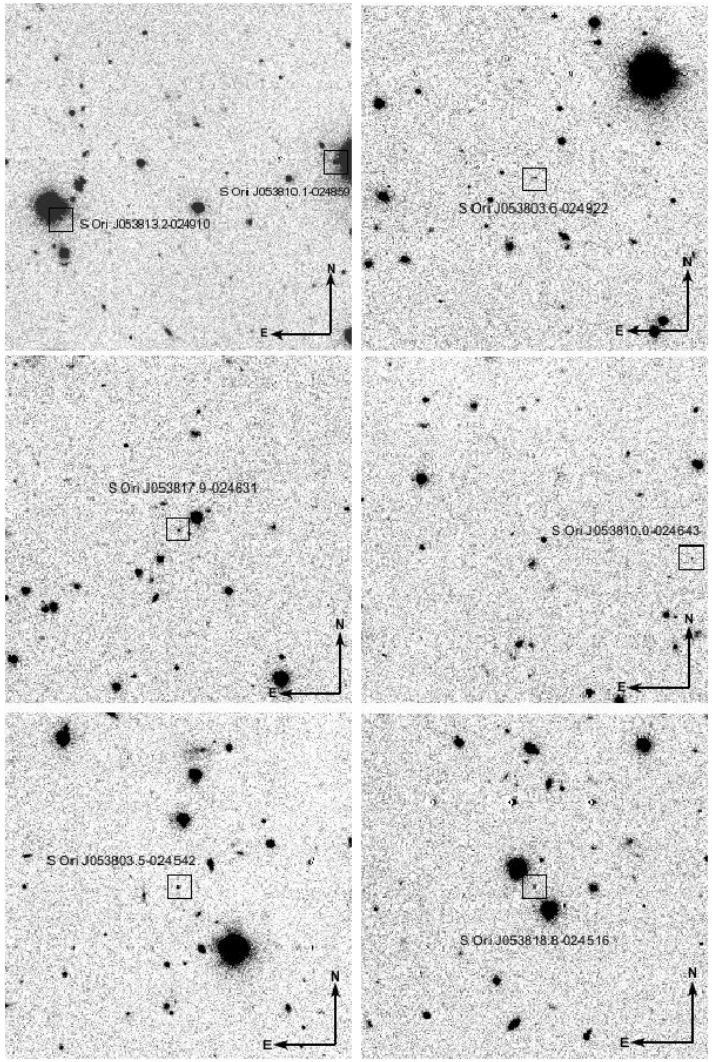
- Very low-resolution spectroscopy of the "brightest" targets: OSIRIS/ GTC
- *I*-26 mag imaging (galaxy confusion): OSIRIS
- Near-infrared methane imaging *and* astrometry (>10-year baseline): HAWK-I/VLT



σ Orionis: "it's full of brown dwarfs…"

•exoterræ

http://exoterrae.eu

carmenes

Discussion (questions to previous talks and open forum)

First session: **star formation, astrochemistry and X-rays** – 35-40 min

Second session: **massive stars, T Tauri stars, brown dwarfs and planets** – 20-25 min

(Third session: *Herschel*, tools and *JWST* – 30 min)

Discussion (questions to previous talks and open forum)

First first session: **star formation, astrochemistry and X-rays**

• *Álvaro Hacar*: Dense core formation in the Taurus Molecular Cloud

• *Pau Frau*: Comparing star formation models with interferometric observations of the protostar NGC 1333 IRAS 4A. Magnetohydrodynamic collapse models

• *Javier R. Goicoechea*: Far-IR spectroscopy of protostars and star forming regions with *Herschel*

• *Belén Tercero*: A line-confusion limited millimeter survey of Orion KL
• *Gisela Esplugues*: Study of cyano(di)acetylene in Orion KL: detection of DC_3N
• *Alicia López Jiménez*: Organic molecules in the massive star forming region Orion KL

Discussion (questions to previous talks and open forum)

Second first session: **star formation, astrochemistry and X-rays**

• *Gustavo Adolfo Cruz-Díaz*: Vacuum-UV spectroscopy of interstellar ice analogs with a H2 lamp as a continuous emission source. Measurements of the UV-absorption cross sections

• *Jorge Sanz-Forcada*: Photoevaporation of protoplanetary disks by XUV stellar radiation

• *Miguel Ángel López-García*: X-ray emission in star-forming regions

Discussion (questions to previous talks and open forum)

First session: **star formation, astrochemistry and X-rays**

Questions to previous talks

Discussion (questions to previous talks and open forum)

First session: **star formation, astrochemistry and X-rays**

Open forum Ia: keywords

Astrochemistry – Magnetohydrodynamics – Molecular data – Protoplanetary disks – Techniques: spectroscopic – Stars: formation, individual: NGC 1333 IRAS 4A, protostars – Galaxy: open clusters and associations: individual: Taurus Molecular Cloud, Orion KL – ISM: lines and bands, molecules – Infrared: ISM, stars – Submillimeter: ISM, stars – X-rays: stars

Discussion (questions to previous talks and open forum)

First session: **star formation, astrochemistry and X-rays**

Open forum Ib: open questions

1. Post-*Herschel* era: ALMA? SPICA? What else? And in the far future?
2. How to maximise the *XMM-Newton* impact?
3. Why Orion KL?
4. What can we, "the Madrilenians", do on *star formation, astrochemistry and X-rays*, relevant worldwide?

Discussion (questions to previous talks and open forum)

Second session: **massive stars, T Tauri stars, brown dwarfs, and planets**

• *Alejandro Báez-Rubio*: RRLs as a tool to study ionized outflows and disks around massive stars

• *Alexis Klutsch*: Mining the sky for accreting T Tauri stars outside star-forming region cores

• *José Antonio Caballero*: What can YOU do in σ Orionis?
• *Catarina Alves de Oliveira*: Planetary-mass brown dwarfs in young clusters
• *María Rosa Zapatero Osorio*: The planetary-mass domain of the σ Orionis cluster

• *Jorge Lillo-Box*: On a full confirmation and characterization of Kepler planet candidates

Discussion (questions to previous talks and open forum)

Second session: **massive stars, T Tauri stars, brown dwarfs, and planets**

Questions to previous talks

Discussion (questions to previous talks and open forum)

First session: **massive stars, T Tauri stars, brown dwarfs, and planets**

Open forum IIa: keywords

Stars: brown dwarfs, low-mass, (luminosity function, mass function), massive, planetary systems, pre-main sequence, (variables: T Tauri, Herbig Ae/Be), (winds, outflows) – Galaxy: open clusters and associations: individual: σ Orionis – Radio lines: stars

Discussion (questions to previous talks and open forum)

First session: **massive stars, T Tauri stars, brown dwarfs, and planets**

Open forum IIb: open questions

1. Boundaries: massive vs. low-mass stars? T Tauri stars vs. "T Tauri brown dwarfs"? Brown dwarfs vs. "planetary-mass brown dwarfs" vs. exoplanets?
2. Minimum mass for a star-forming region?
3. Minimum mass for *star* formation? (i.e., IMF bottom)
4. KOIs: confirmation or validation?
5. What can we, "the Madrilenians", do on *massive stars, T Tauri stars, brown dwarfs, and planets*, relevant worldwide?

Discussion (questions to previous talks and open forum)

Obrigado!