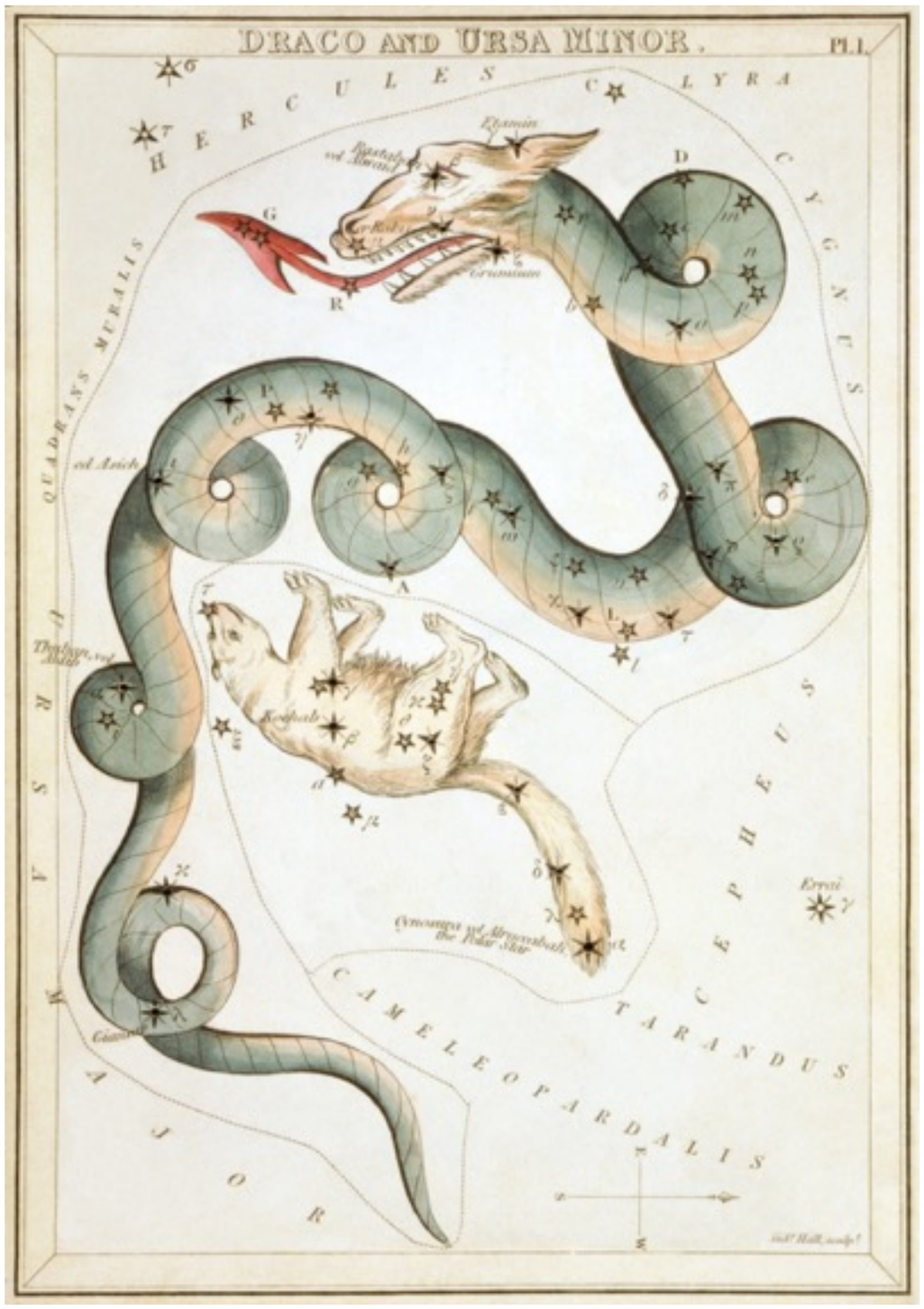
Stellar kinematics and metallicities in the Draco and Ursa Minor dwarf galaxies



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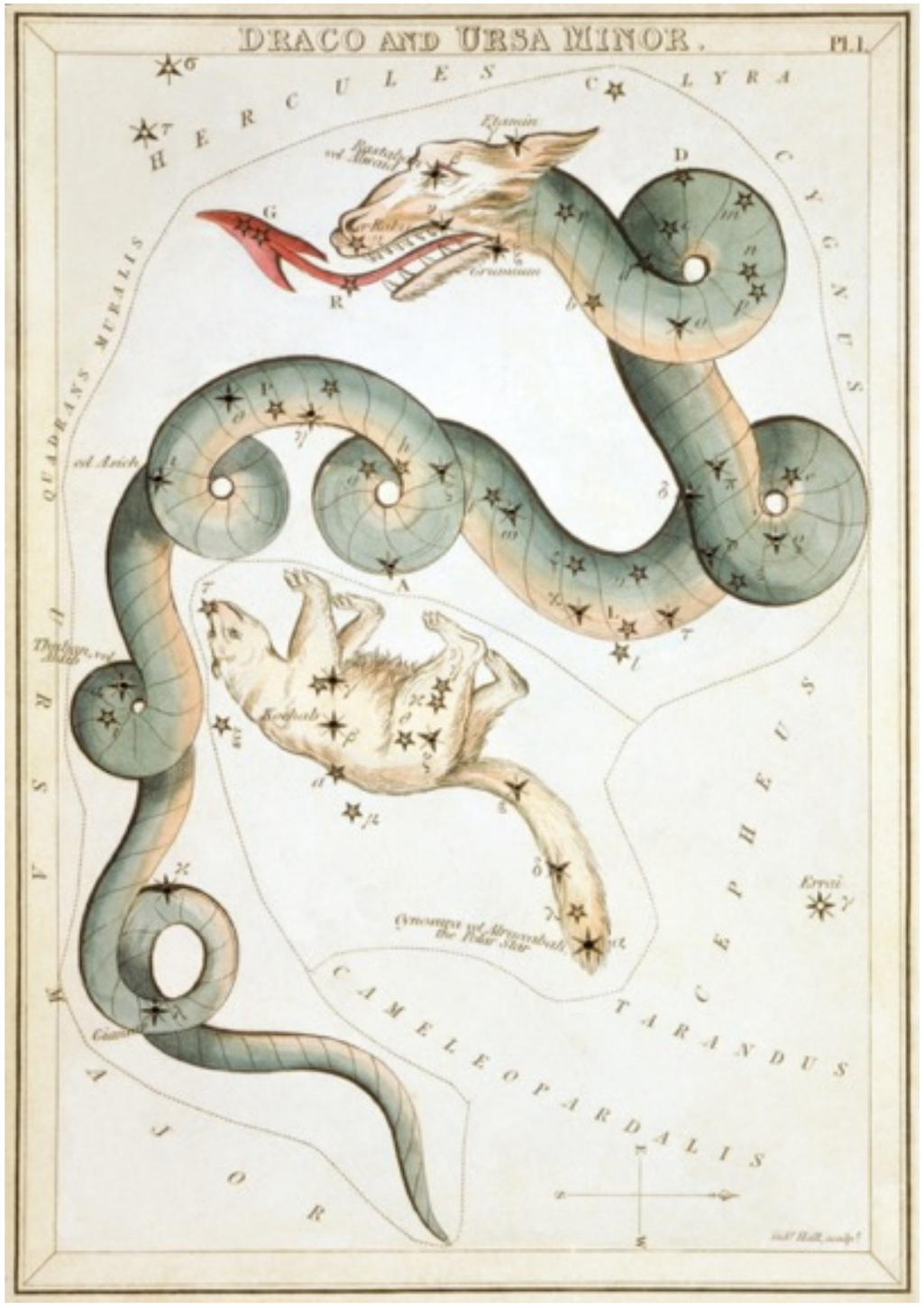

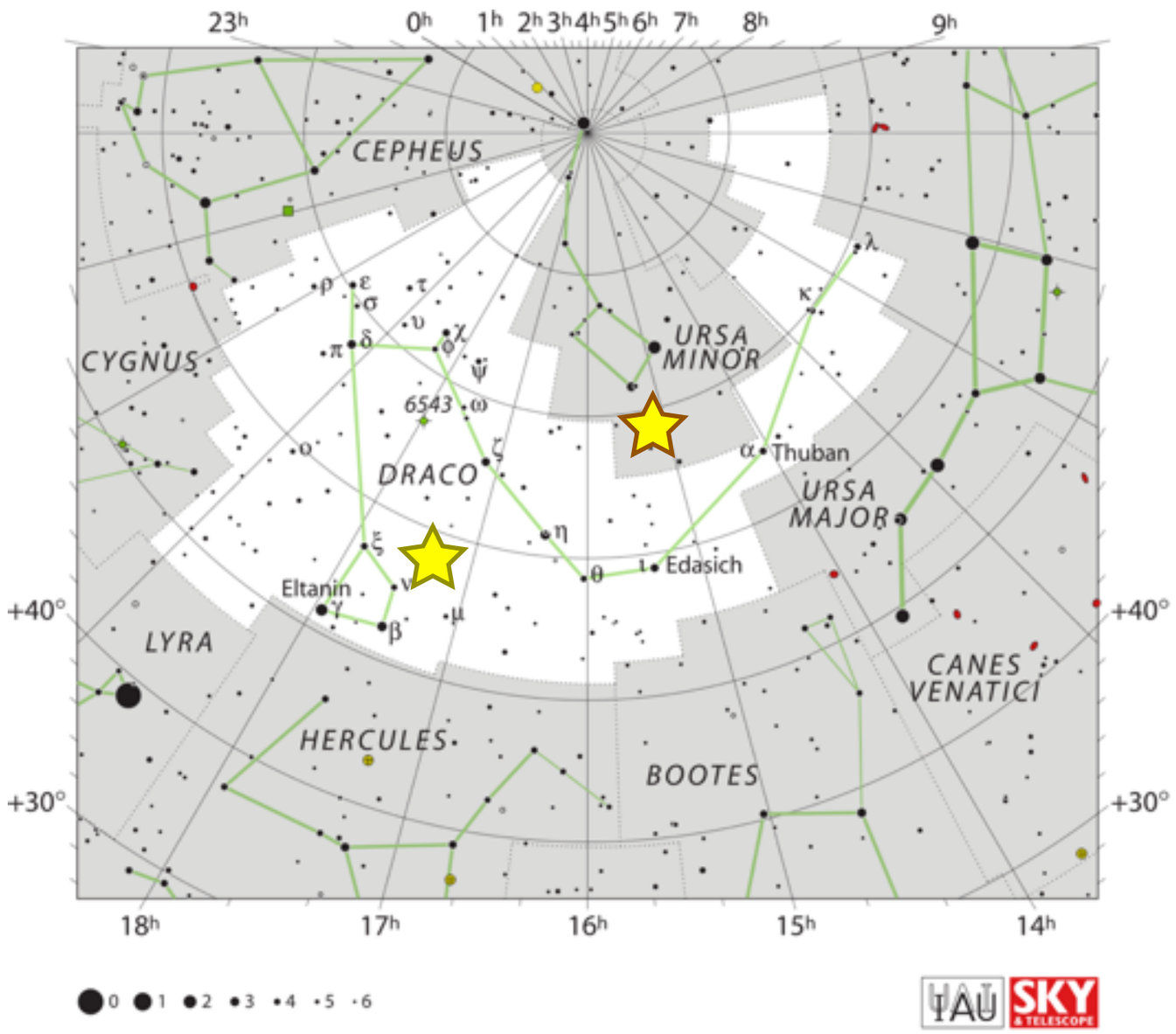

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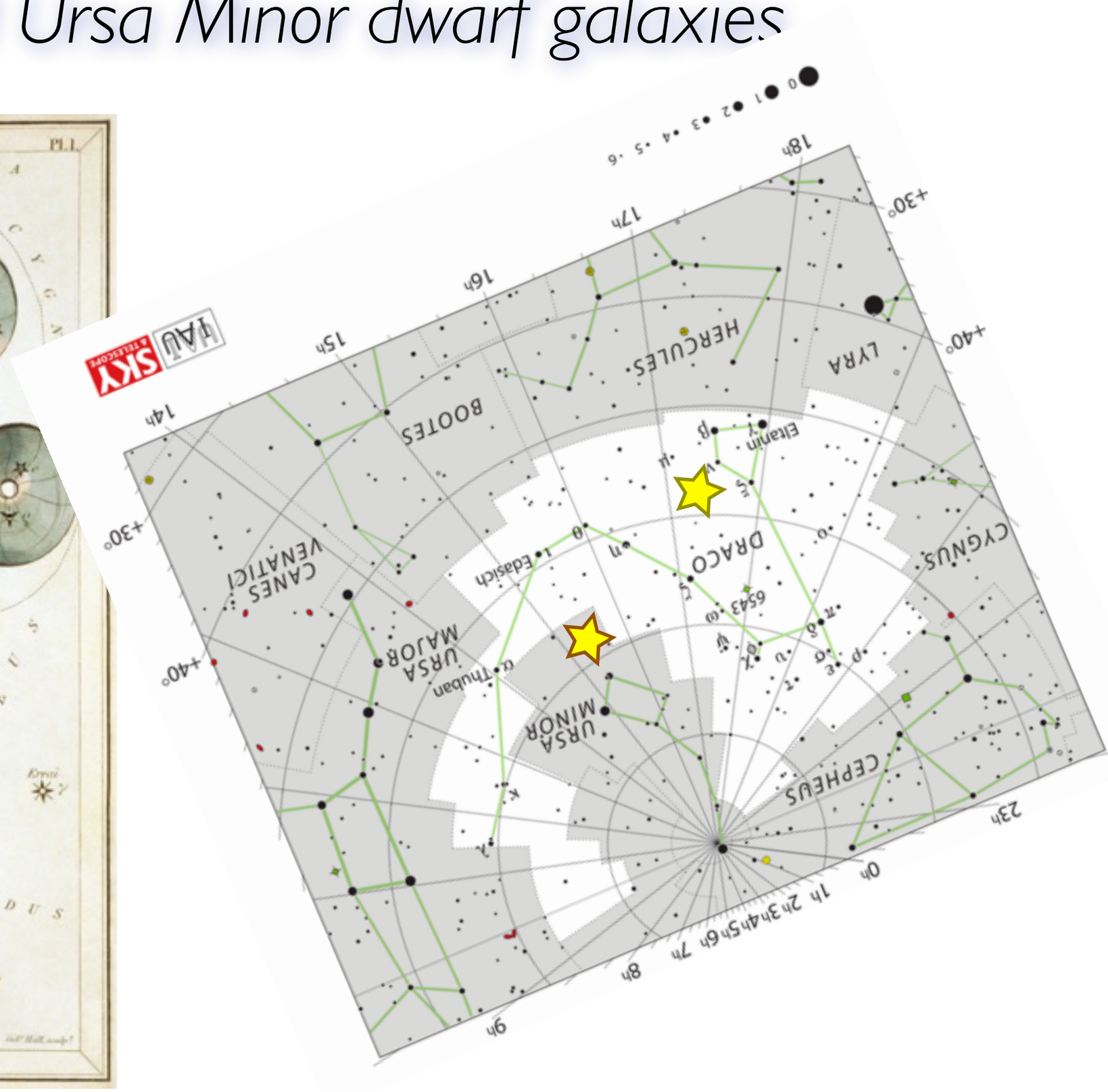
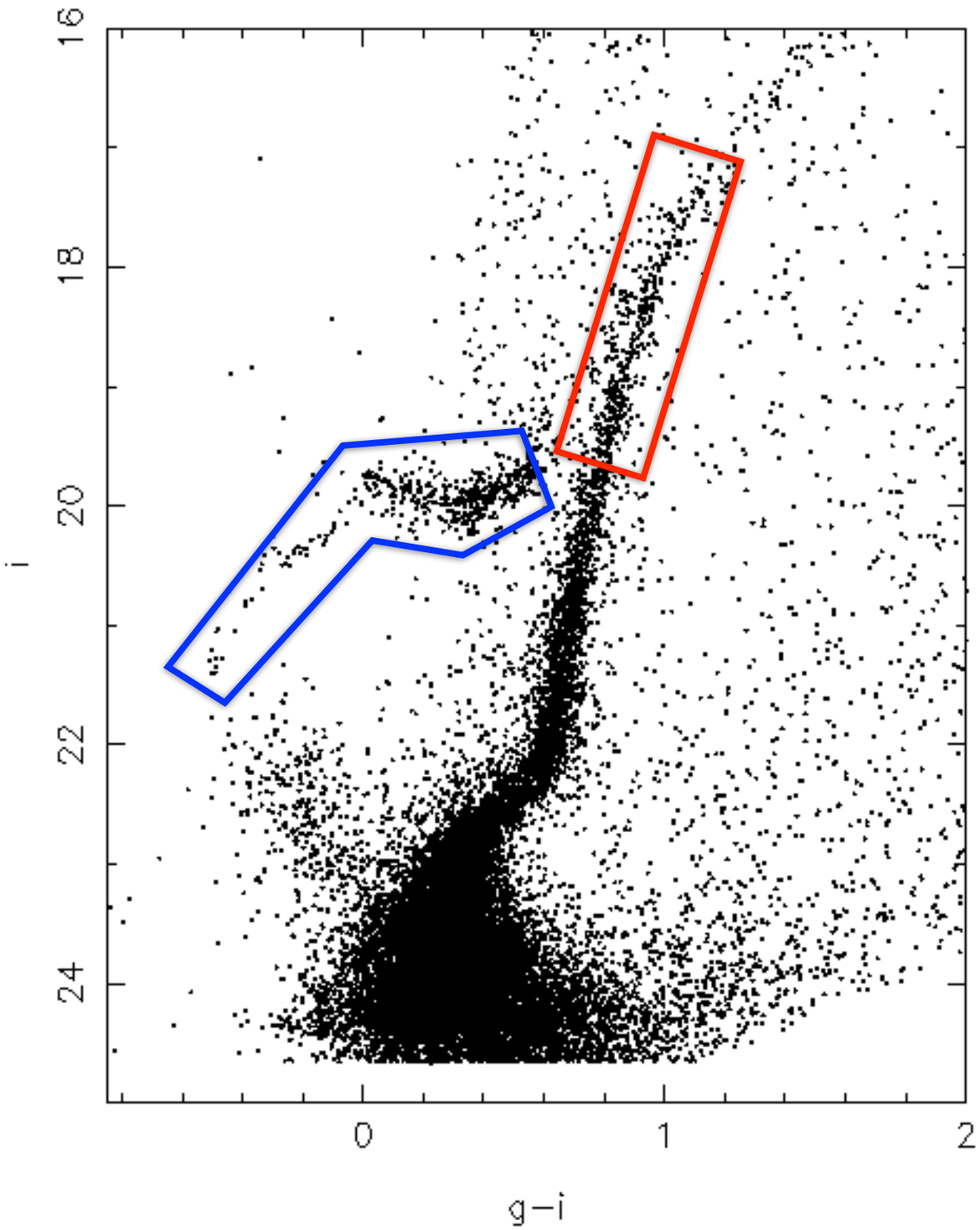
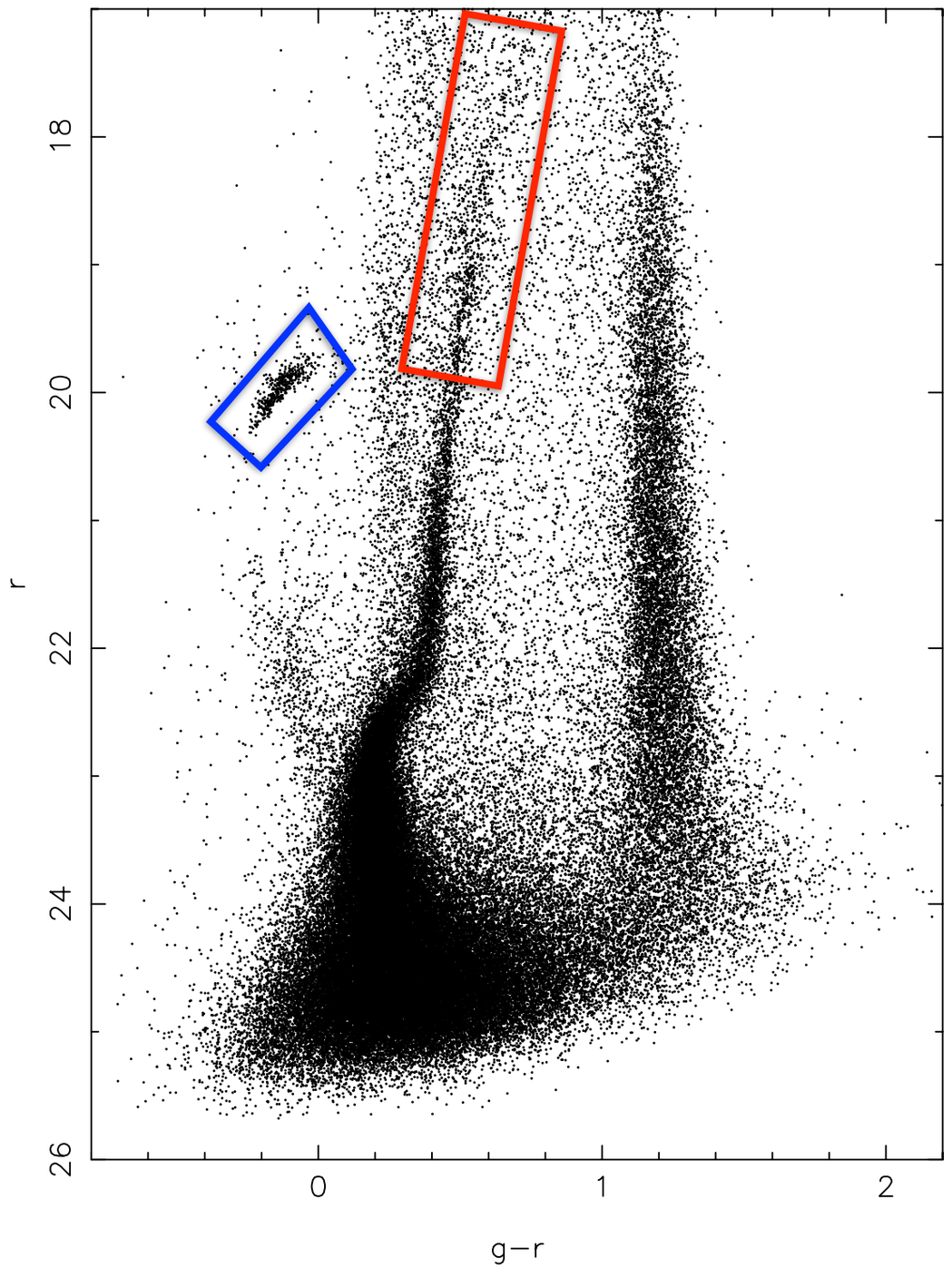


Draco colour-magnitude selections Ursa Minor





Draco Observations Ursa Minor

- May 2014 (4 nights) @WHT
- AF2-WYFFOS (wide-field multi-fibre spectrograph)
- target regions: Ca II triplet, Mg b triplet
- spatially: uniformly observe RGBs and HBs in both galaxies
- aim: get as many radial velocities and [Fe/H] as possible

Additionally (in prep for WEAVE):

- observe lots of 'sky': optimise software for skyline subtractions (Cambridge)

team:

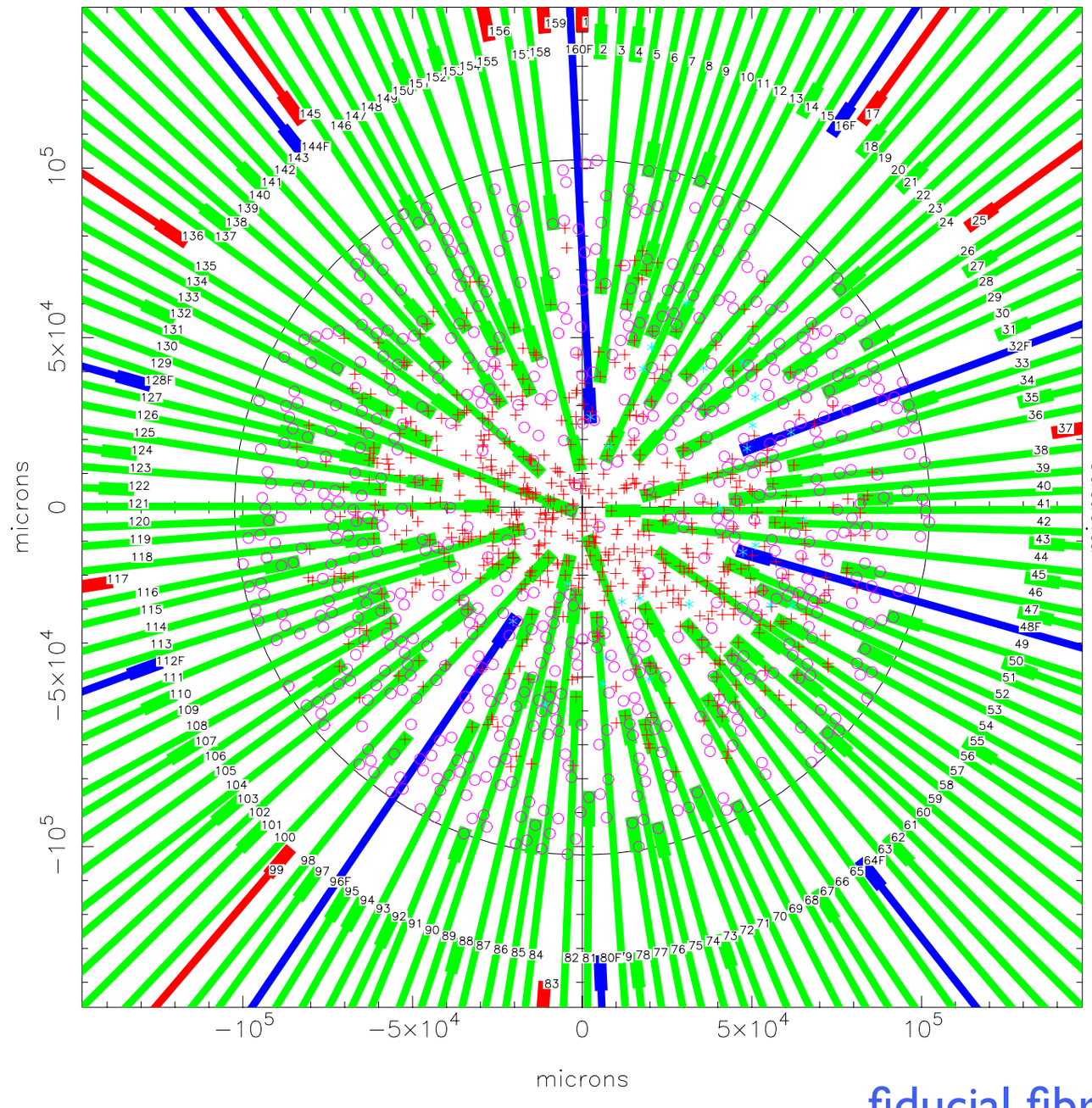
Eline Tolstoy (PI)
Mike Irwin
Shoko Jin
Johanna Hartke
Maarten Breddels
Giuseppina Battaglia
Amina Helmi

La Palma, May 24 2014

AF2-WYFFOS fibre configuration Ursa Minor

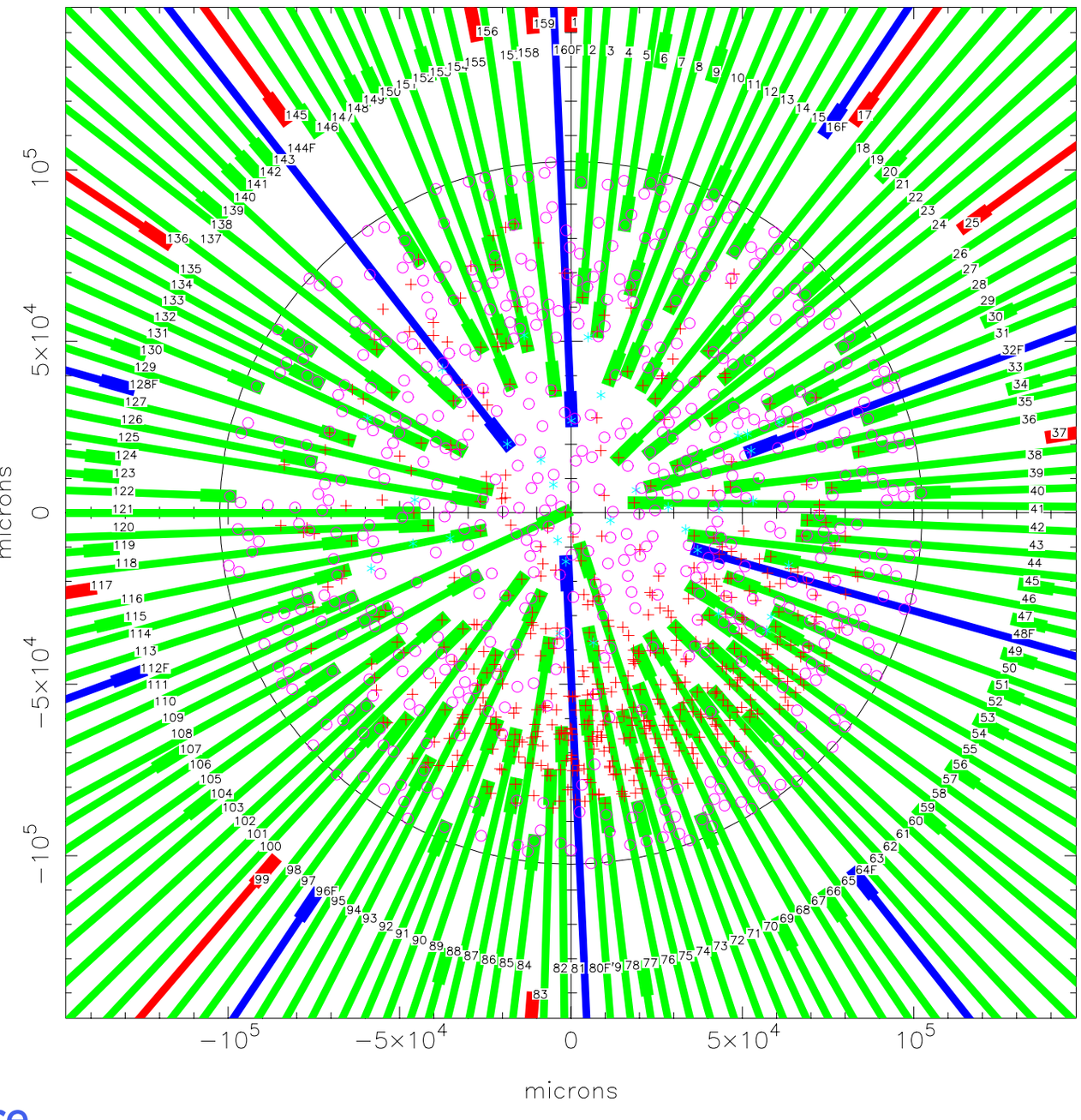
central field

Autofib 2 Configuration
FIELD 2 IN UMI (GRATING RED) (centre 15 9 11.04 +67 12 53.97)



off-centre field

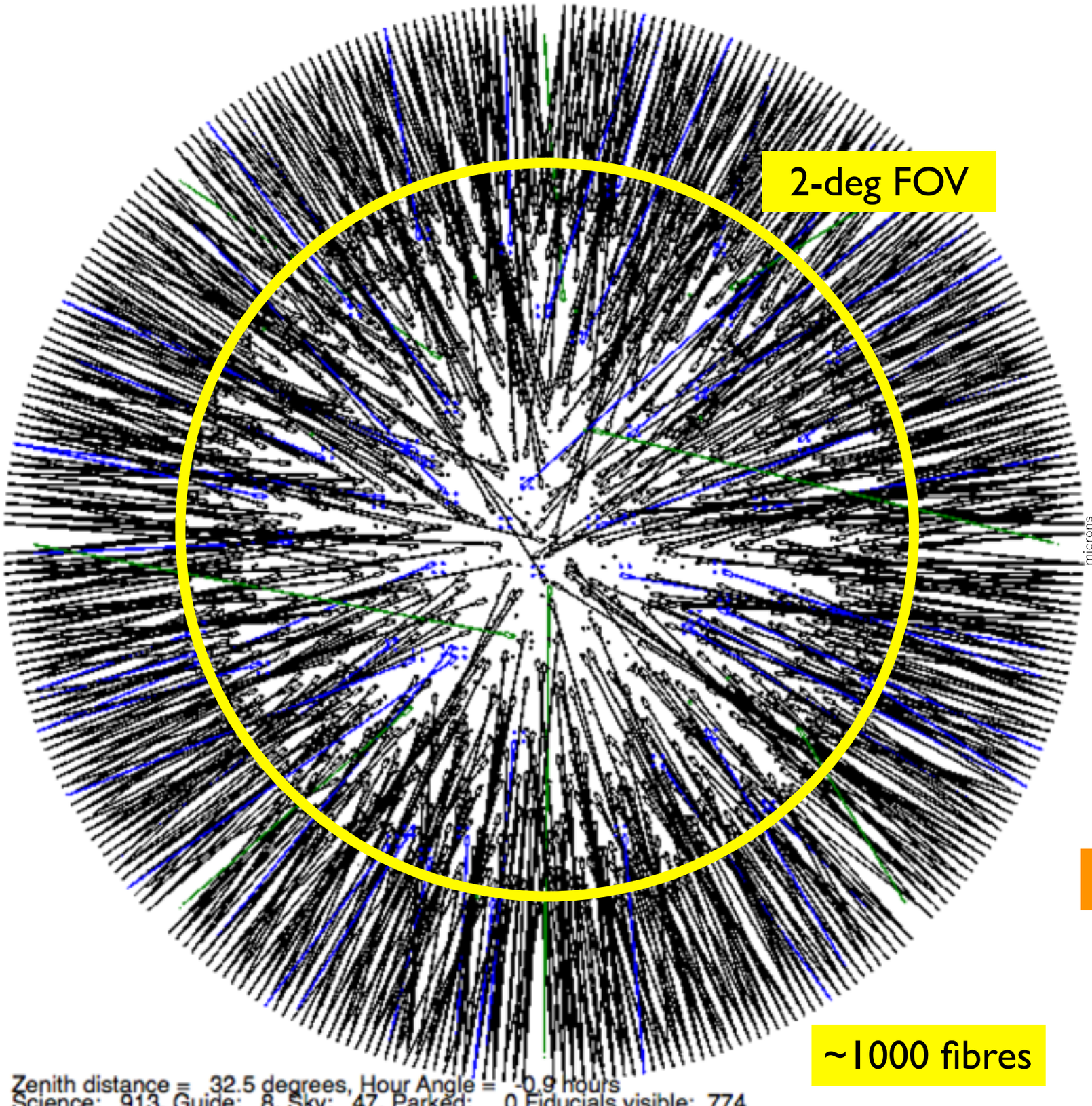
Autofib 2 Configuration
FIELD 4 IN UMI (GRATING RED) (centre 15 11 13.96 +67 0 51.03)



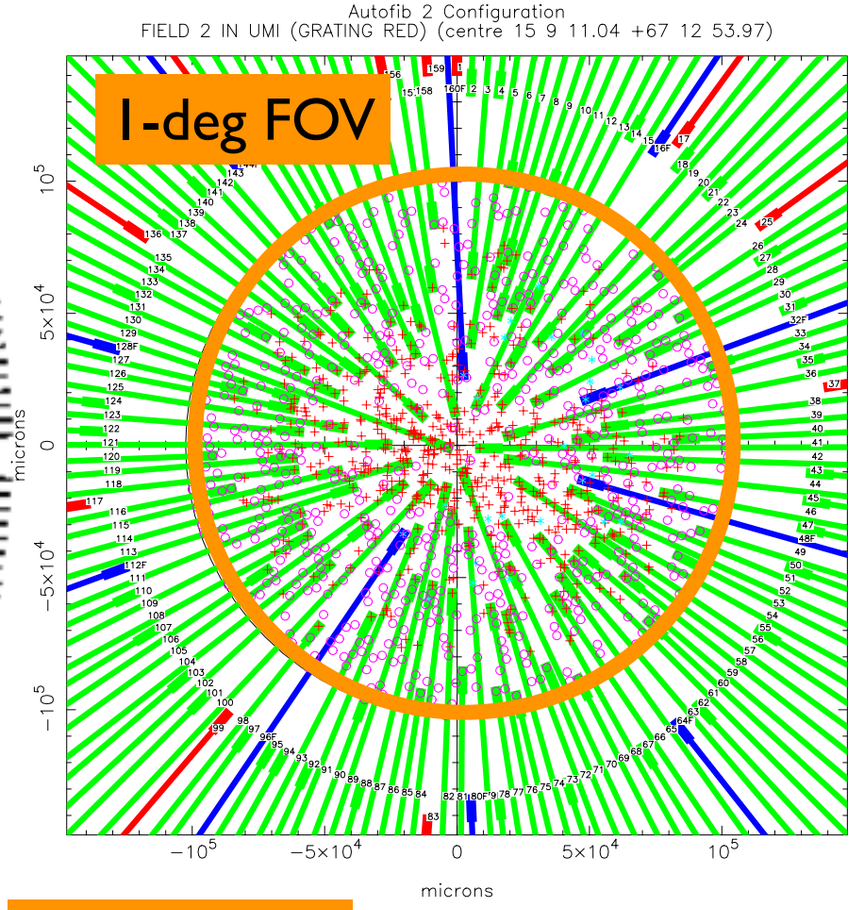
fiducial fibre +

programme fibre o

fibre configuration: WEAVE vs AF2



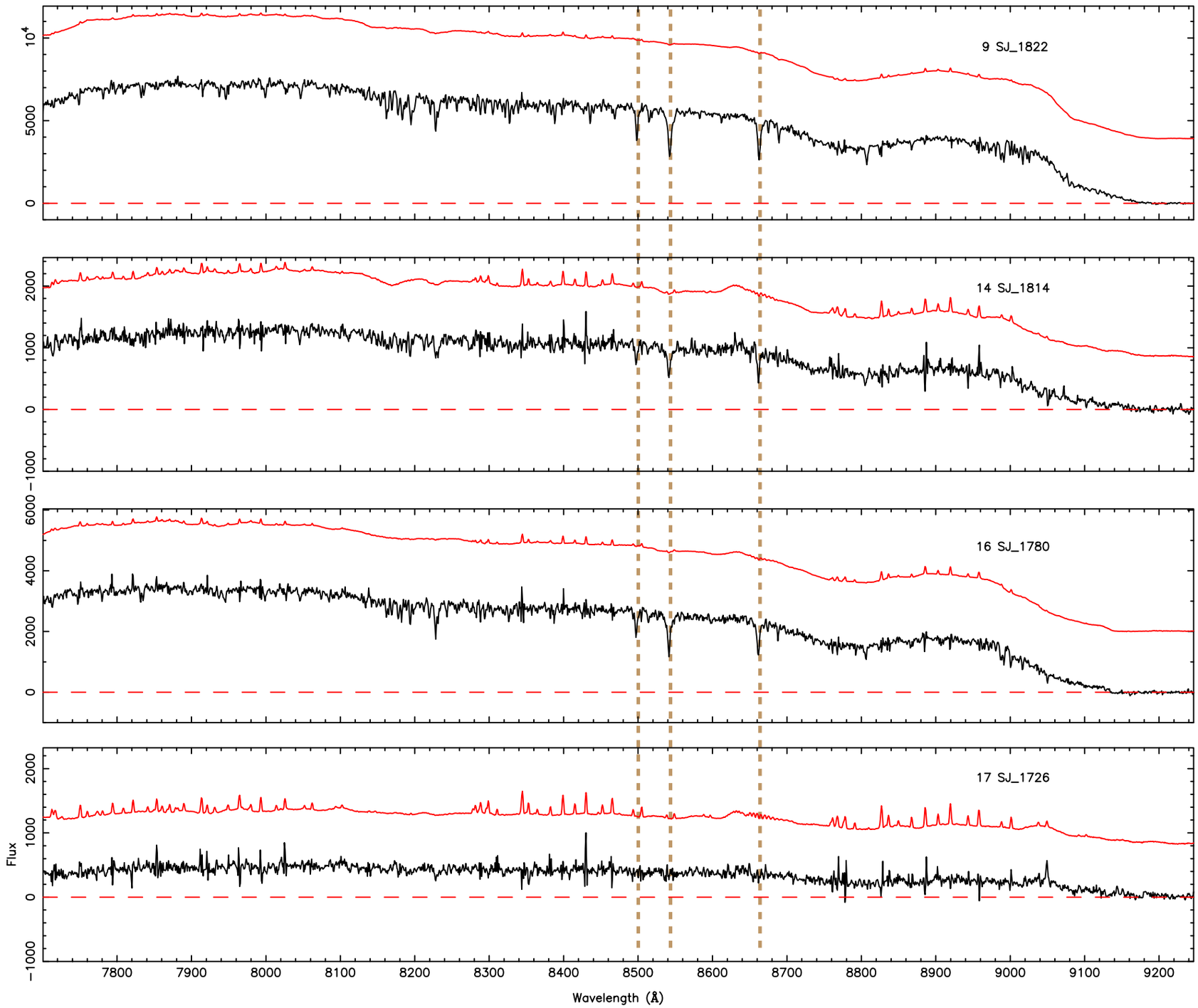
~1000 fibres



~100 fibres

spectra

Ursa Minor

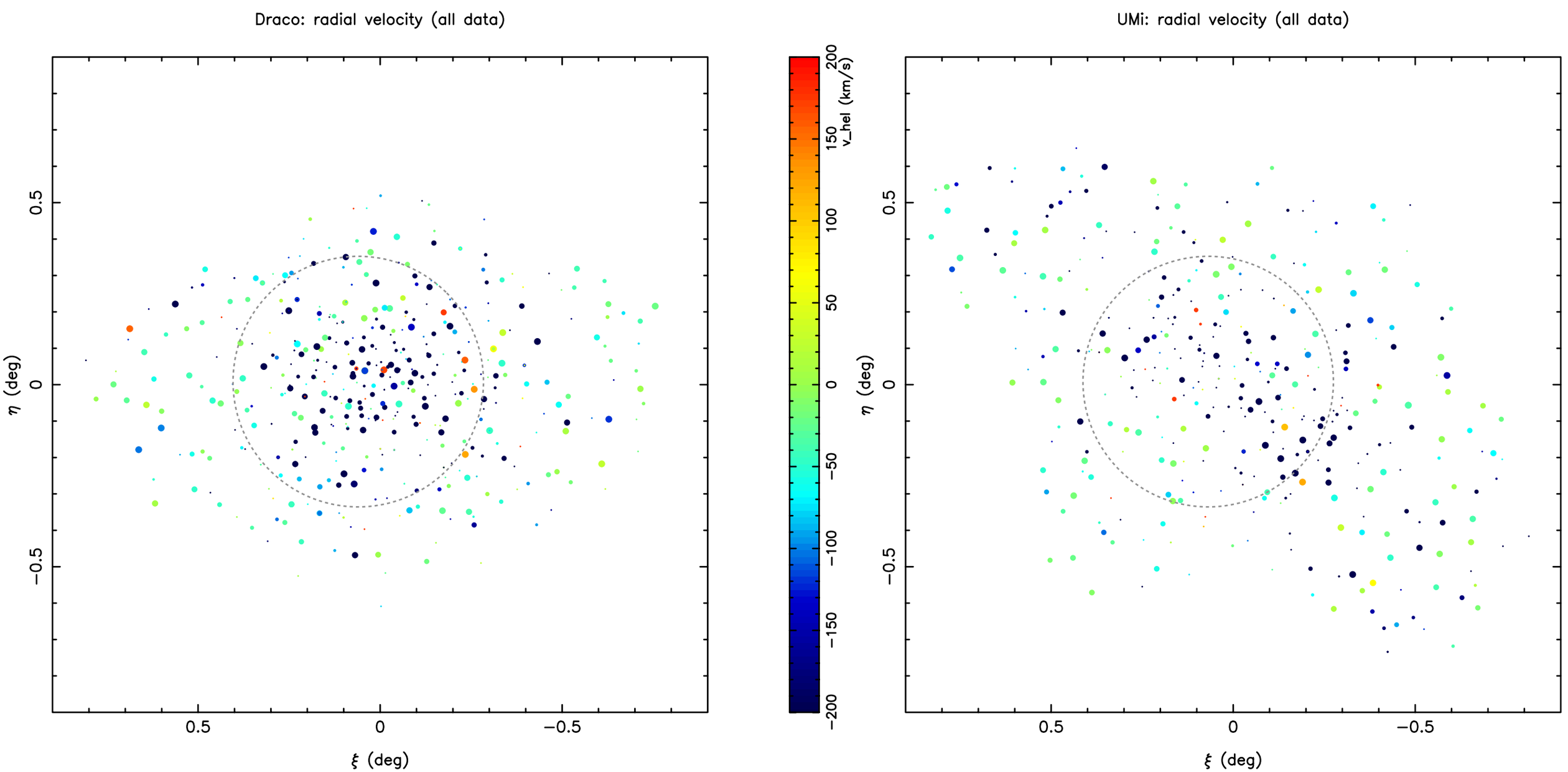


S/N	g (mag)	[Fe/H]
>40	17.3	−1.3
>20	18.5	−1.2
>30	17.8	−1.4
<10	19.8	−1.9

Ca II triplet → [Fe/H]

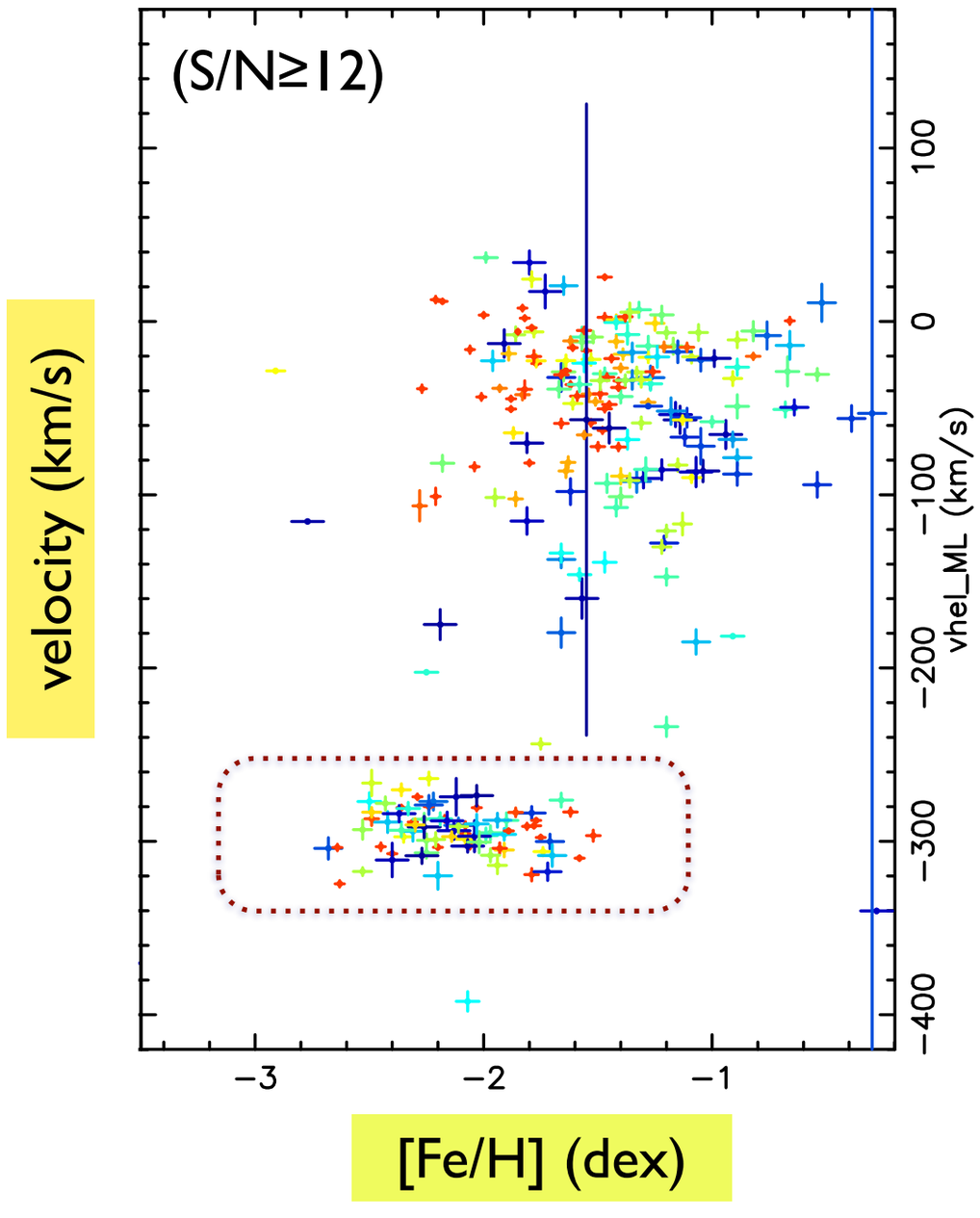
Draco velocity data Ursa Minor

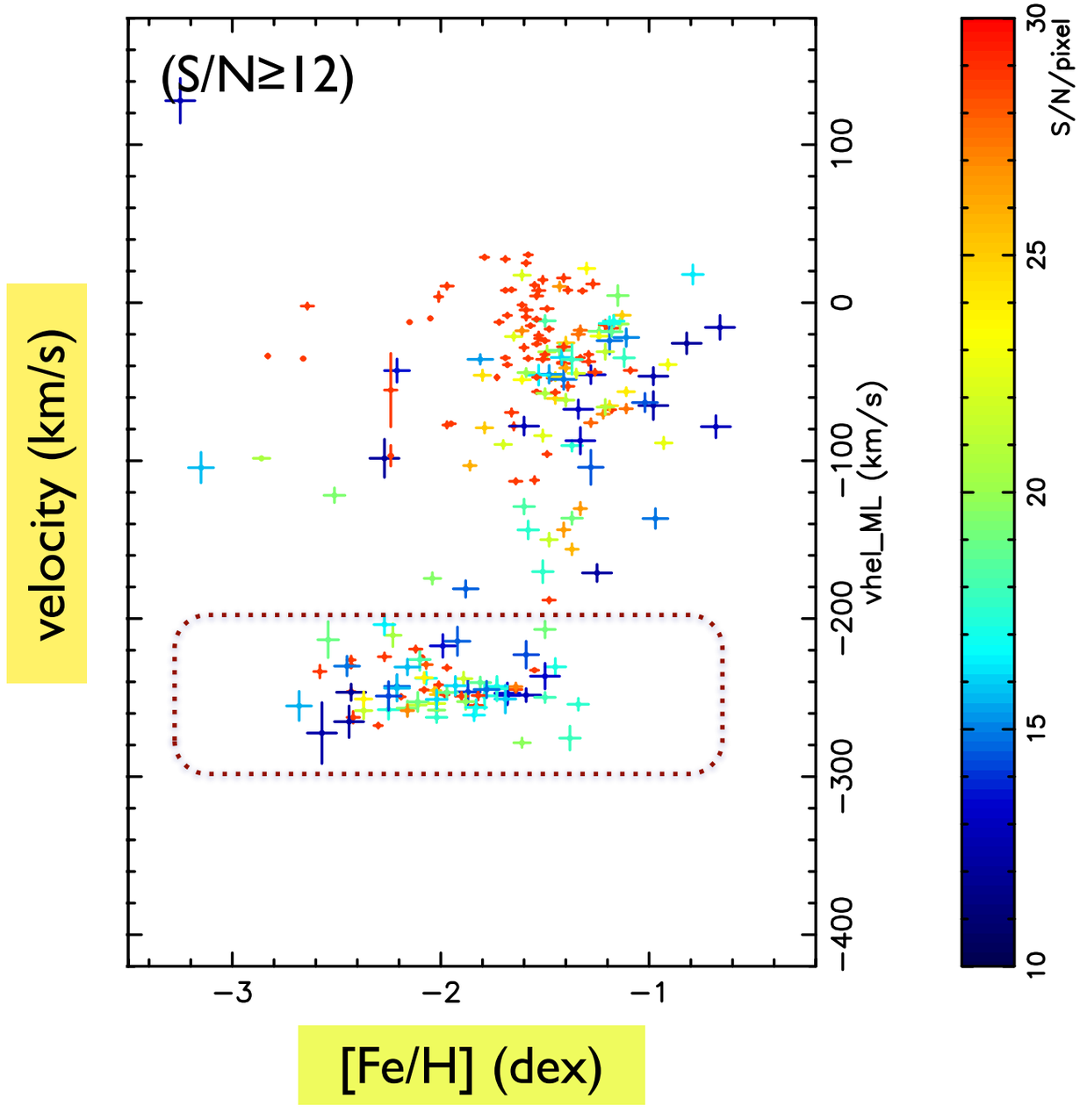
- first task: *remove* foreground (Milky Way) stars...
  only want dwarf-galaxy members



biggest points = smallest vel. errors

Draco identifying members Ursa Minor



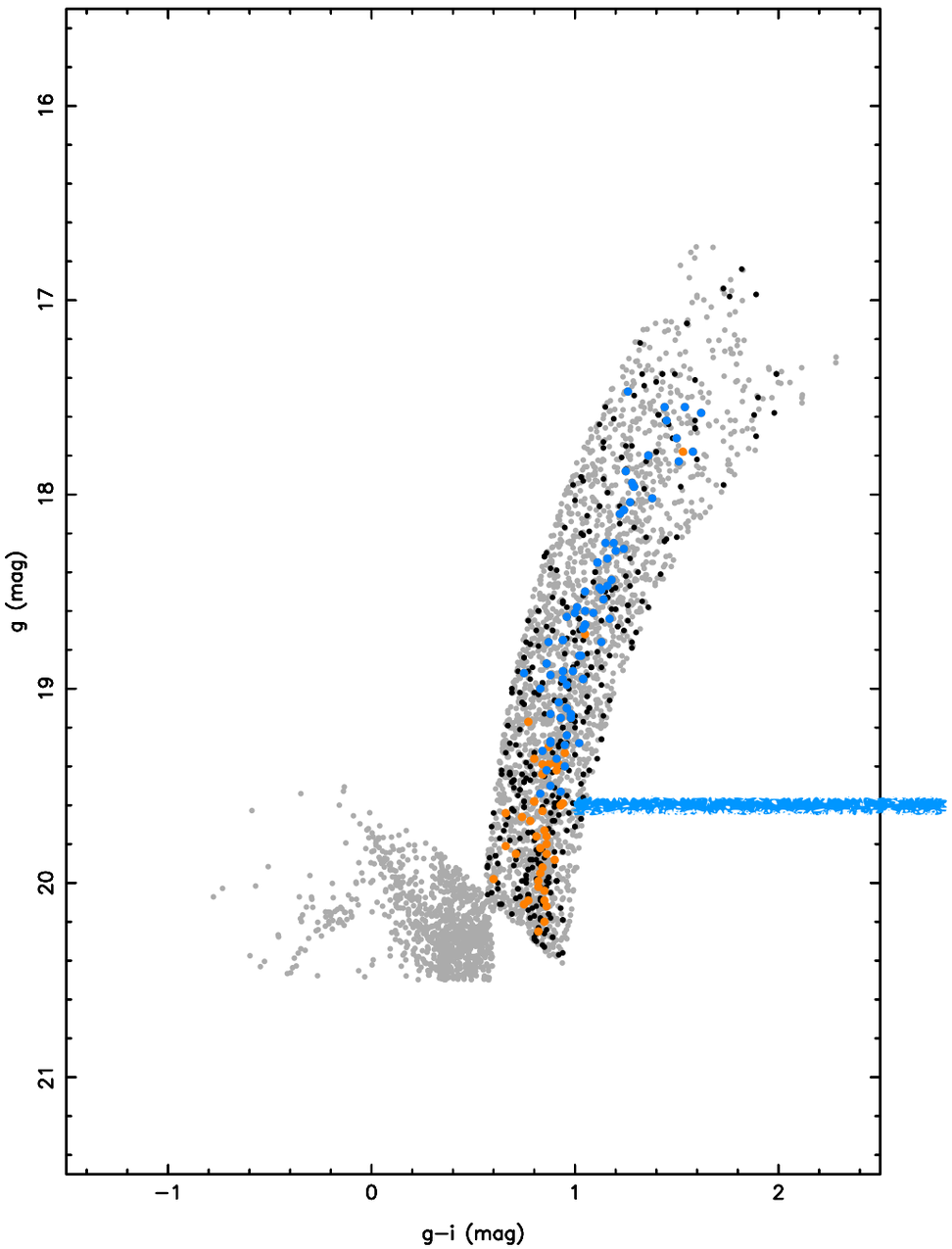


➞ good separation of dwarf-galaxy stars from foreground "contaminants" in velocity space

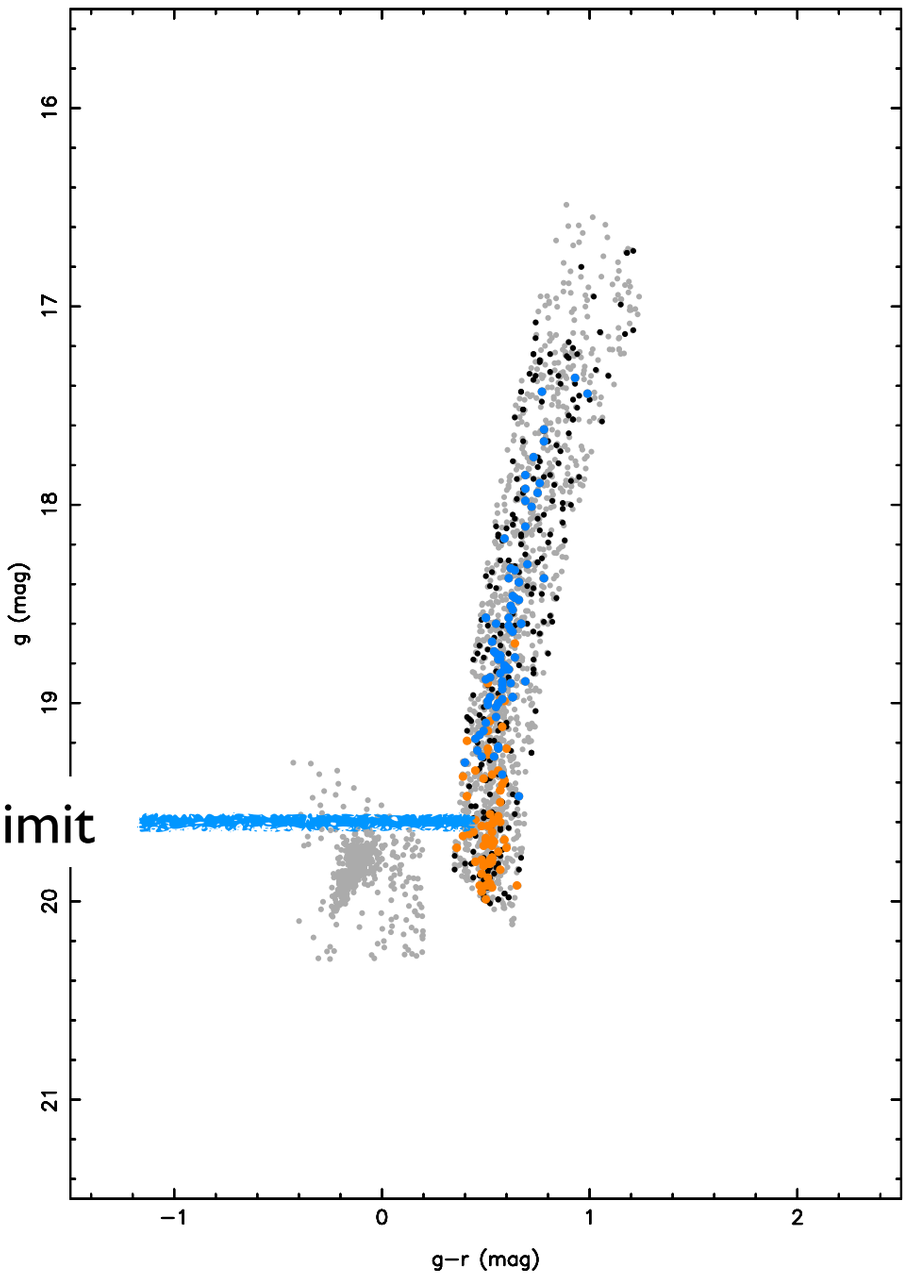
Draco colour-magnitude diagrams Ursa Minor

observed

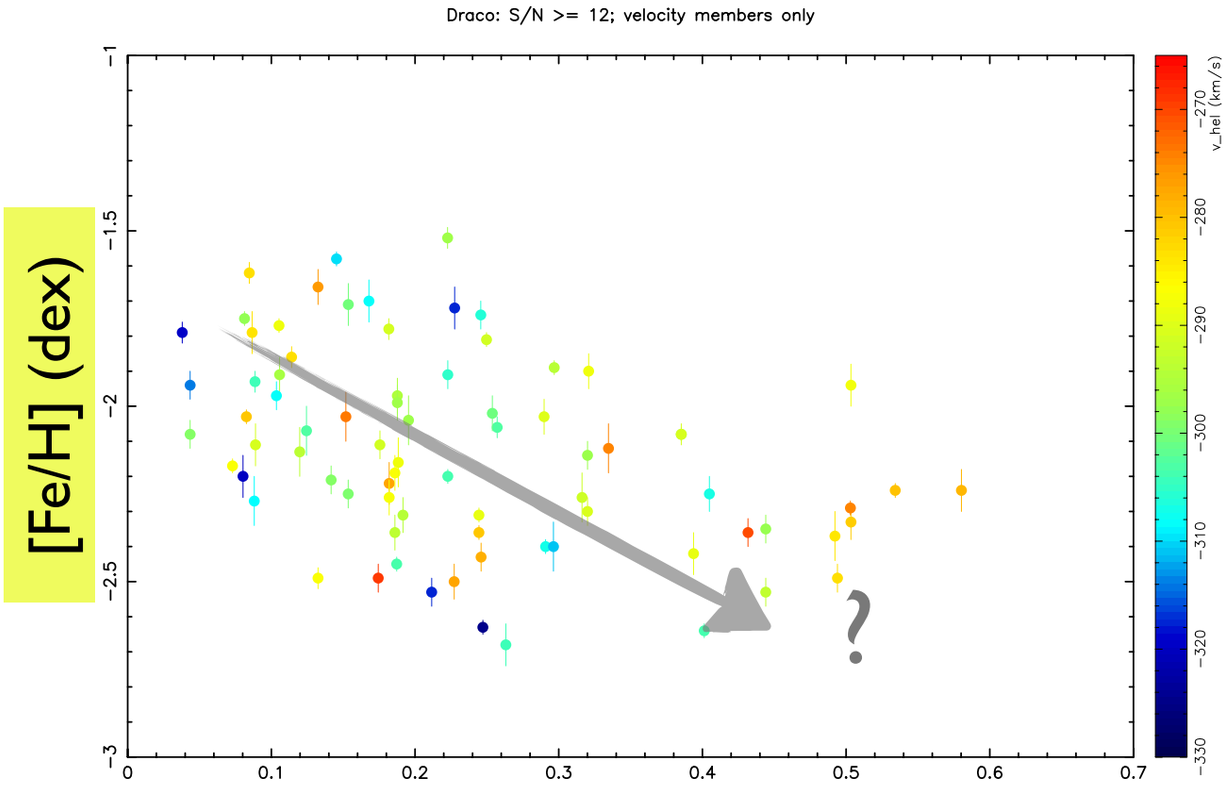
all candidates | velocity members | (S/N≥12)

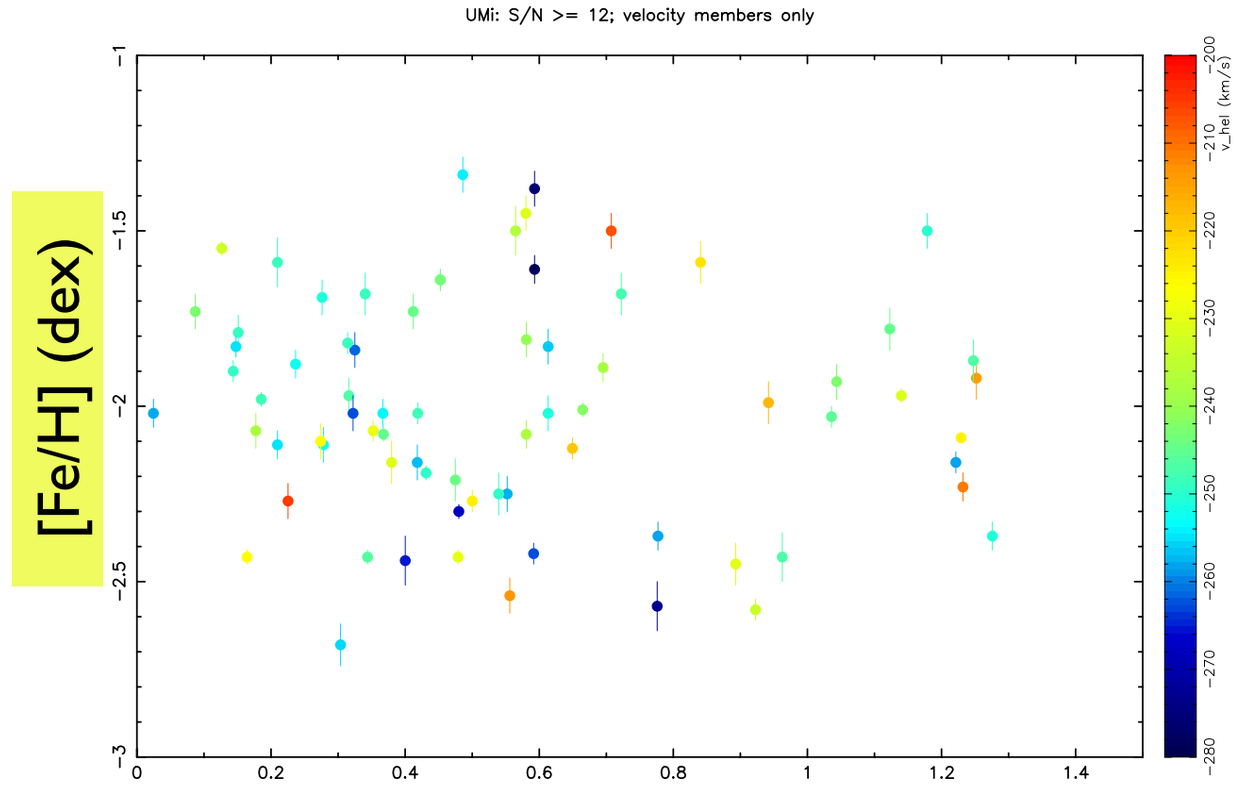


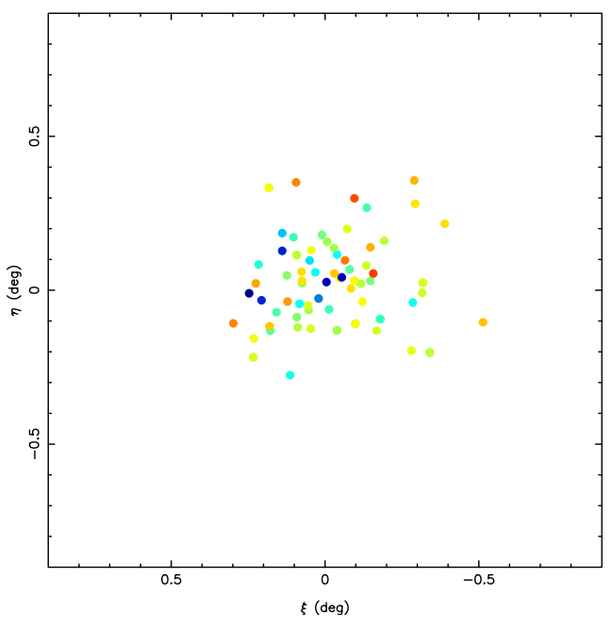
~ a magnitude limit



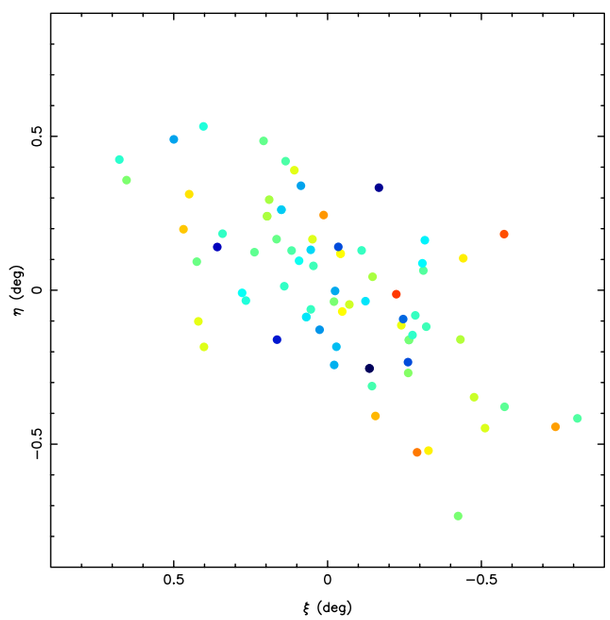
Draco spatial [Fe/H] distribution Ursa Minor



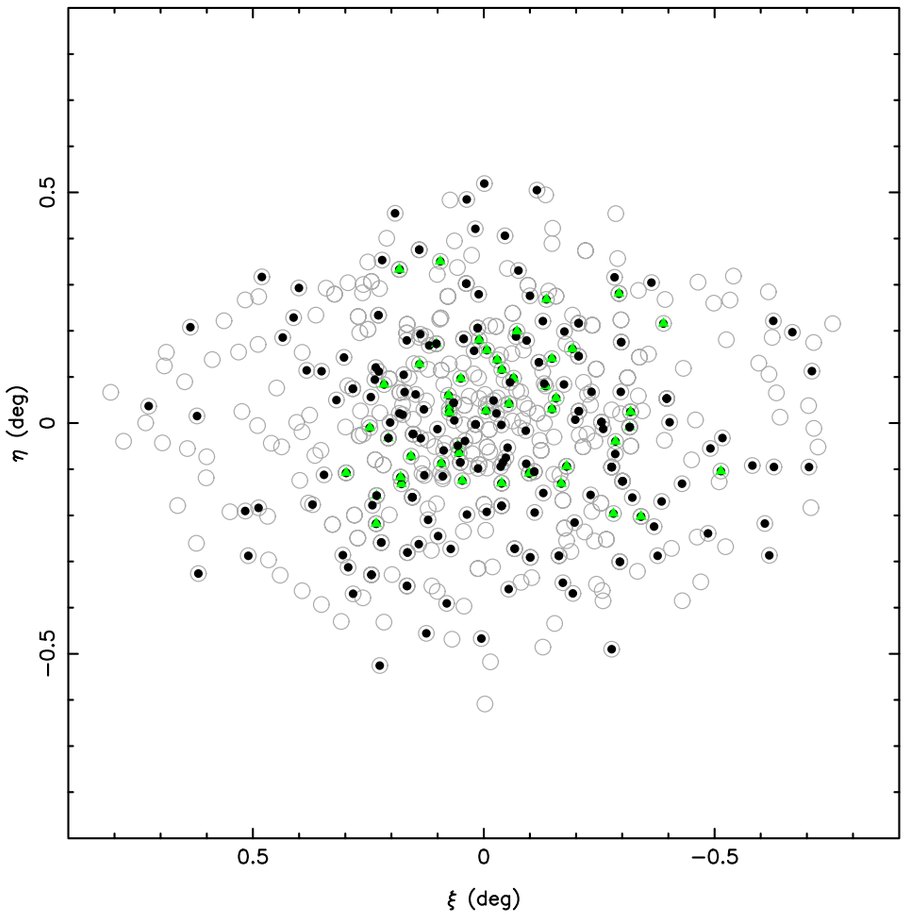


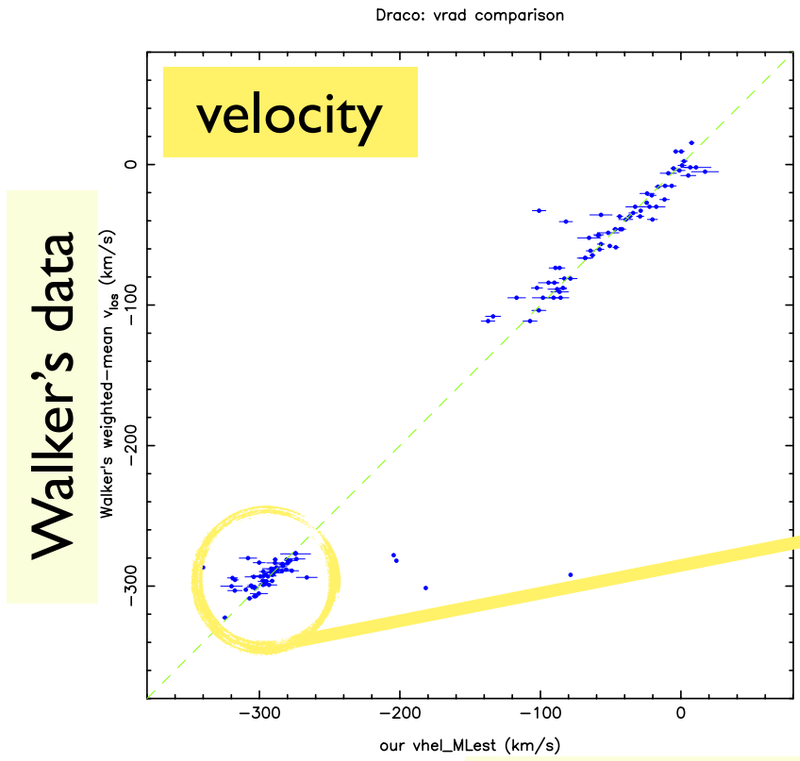


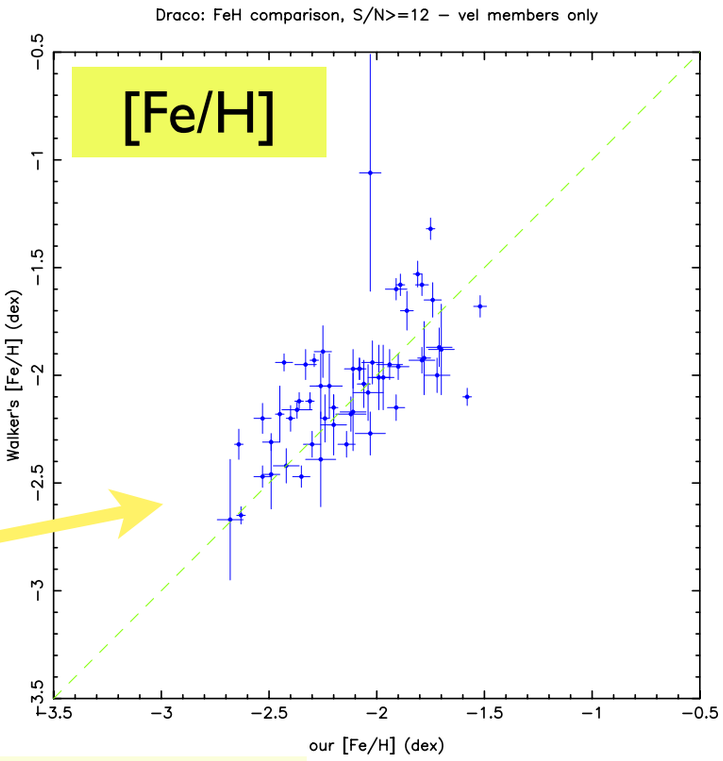
spatial distributions
of same stars as above



Draco comparing/combining with another survey







our measurements

↑ : all our data + overlap with Walker et al. (2015)

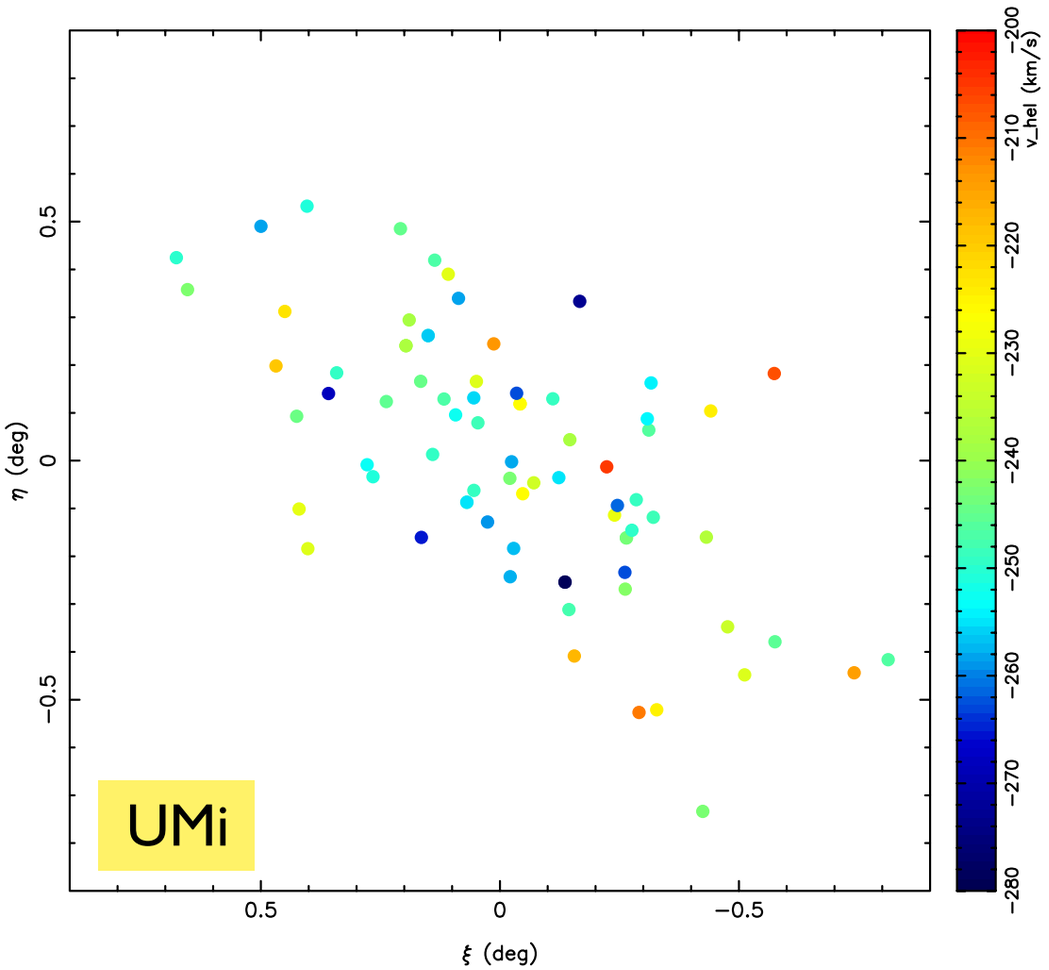
↑ : cross-matched data (S/N≥12)

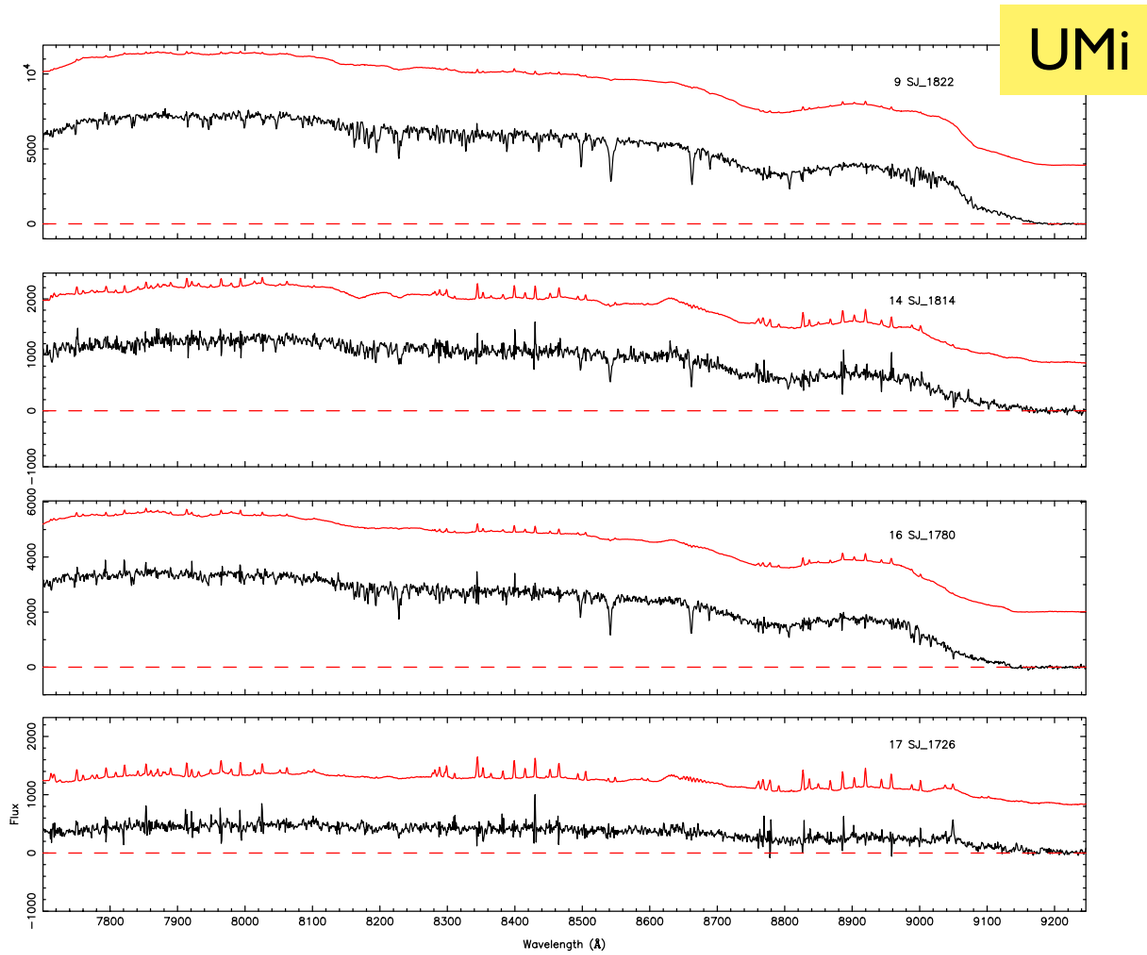
- **246** matches out of 524 (ours) | 1563 (Walker)
  - of which **55** with **S/N≥12** and **'velocity member'**
- our dataset (still) has individual (repeat) measurements
- Walker catalogue has error-weighted means of repeat measurements

WHT/AF2-WYFFOS vs. MMT/Hectochelle
fibre number: 150 vs. 240
field diameter: 1 deg (same)
metallicity indicator: Ca II triplet vs Mgb triplet + direct Fe lines

Summary: Draco/UMi with WHT's current MOS

- AF2-WYFFOS works well (in red)
- velocities for RGB stars to ~4 km/s at >70 kpc
- CaT ➙ [Fe/H] shows:
  - metallicity gradient (Draco)
  - well-mixed metallicity (UMi)





ongoing work:

- metallicity vs kinematics (Draco vs UMi)
- dynamical (Schwarzschild) modelling (Draco/UMi)
- iron out issues in sky subtraction (also for WEAVE)
- optimise observing strategy (May 2015)