ANDREA MEJÍAS

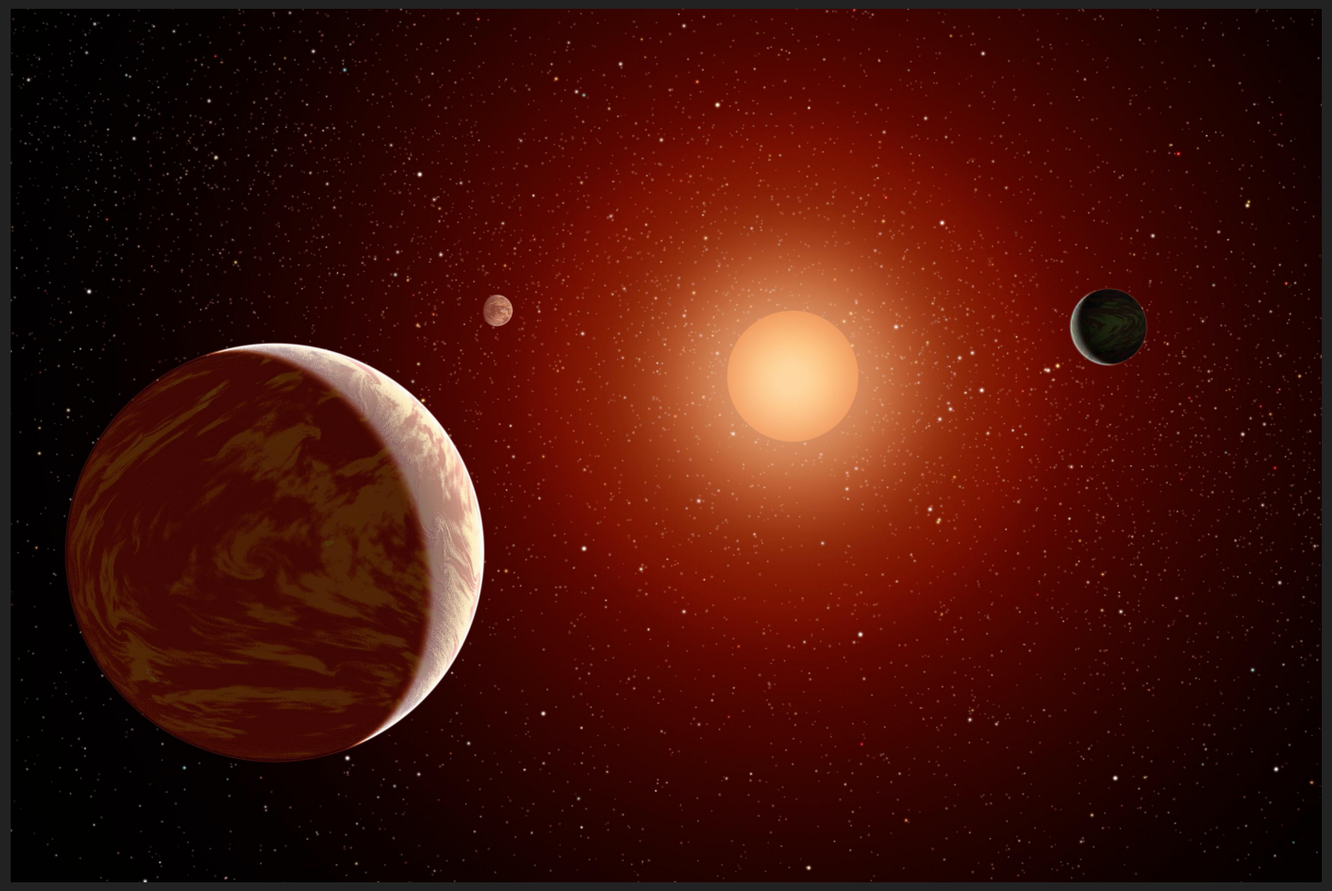
M DWARFS IN THE VVVX SURVEY

CHARACTERIZATION OF LOW MASS STARS WITH MULTI-WAVELENGTH LARGE SURVEYS

A.MEJASALARCN@UANDRESBELLO.EDU

MW-COST PHD SCHOOL

EXPLORING THE PLANE OF THE MILKY WAY THROUGH THE TINIEST POPULATION



- MOST ABUNDANT STELLAR POPULATION
- LIFETIMES LONGER THAN THE AGE OF THE UNIVERSE
- EASIER TO FIND EXOPLANETS AROUND

- $10^{-4}L_{\odot} < L < 0.1L_{\odot}$
- $2300K < T_{eff} < 3800K$
- $0.08M_{\odot} < M < 0.6M_{\odot}$
- $0.1R_{\odot} < R < 0.6R_{\odot}$

REID & HAWLEY (2005)

GOALS: CREATE THE LARGEST M-DWARF CATALOGUE IN THE INNER PARTS OF THE GALAXY

DR2 (GAIA COLLABORATION ET AL. 2018B)

EDR3 (GAIA COLLABORATION ET AL. 2021)

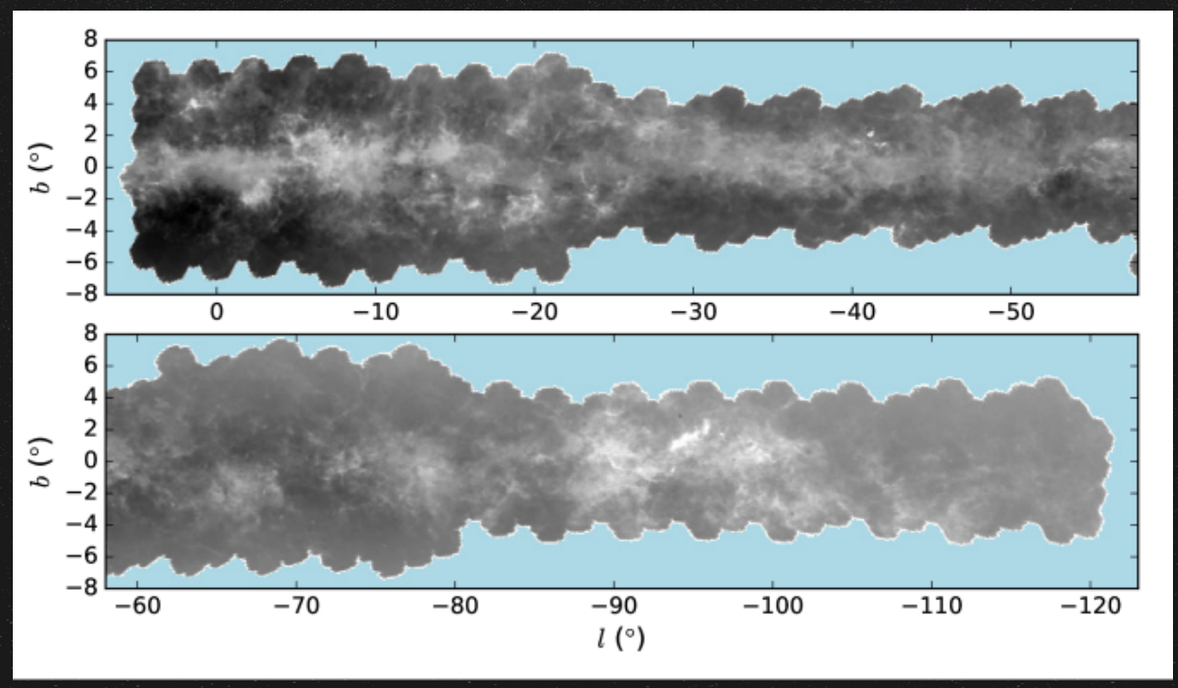
DECAPS

SCHLAFLY ET AL. 2017

J (1.25 μm),H (1.64 μm),KS (2.14 μm)

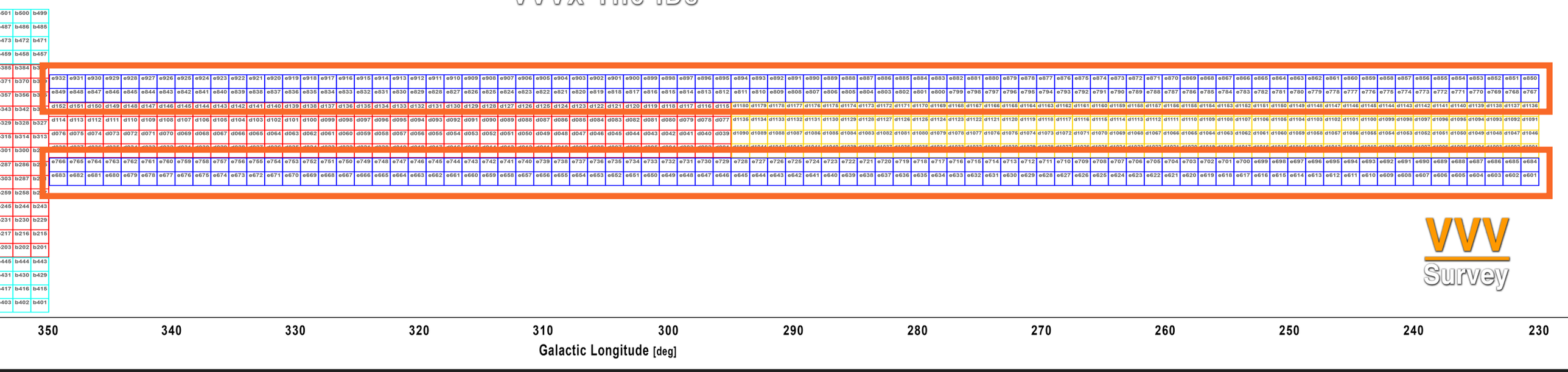
MINNITI ET AL. 2019

G (0.48 μm),R (0.64 μm),I (0.78 μm), Z (0.92 μm),Y (0.99 μm)



M DWARFS IN THE VVVX SURVEY

HTTPS://VVVSURVEY.FILES.WORDPRESS.COM/2015/07/VVVX-TILE-IDS.PNG



332 TILES

$\sim 500 deg^2$

- PHOTOMETRY AVAILABLE IN ALL BANDS (DECAPS + VVVX)
- QUALITY CRITERIA; ERR_KS < 0.1
- PARALLAX CRITERIA; PLX > 1.0 [MAS]
- COLOR SELECTION
- DISCRIMINATION OF POSSIBLE GIANT CONTAMINATION

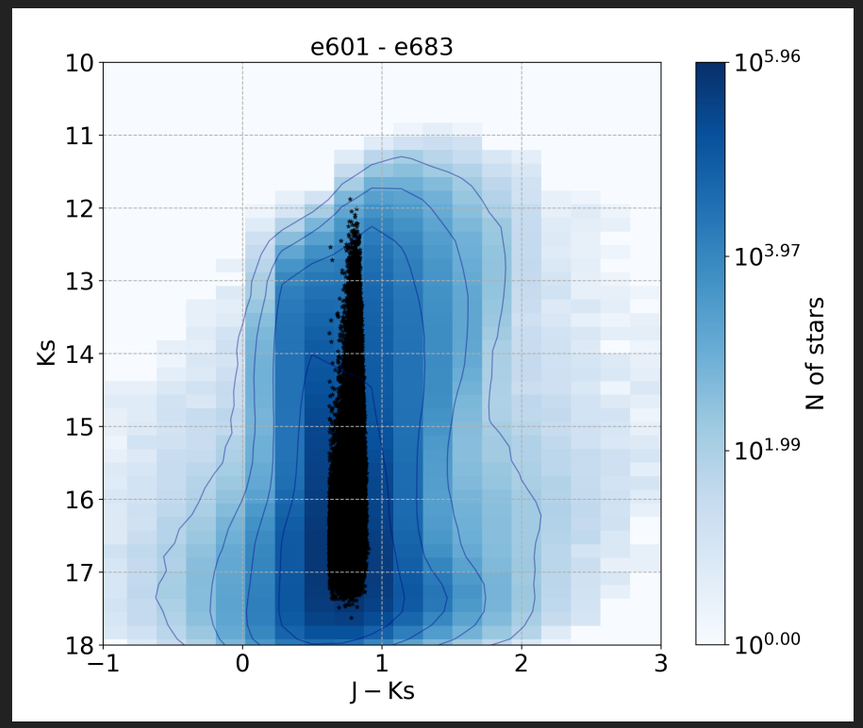
M DWARFS IN THE VVVX SURVEY: COLOR SELECTION AND GIANTS DISCRIMINATION

$$0.414 < J - H < 0.695$$

$$0.058 < H - Ks < 0.504$$

$$0.621 < J - Ks < 1.051$$

ROJAS-AYALA ET AL. 2014



MEJIAS ET AL. (IN PREP)

$$i - z \geq 0.3$$

$$r - i \geq 0.6$$

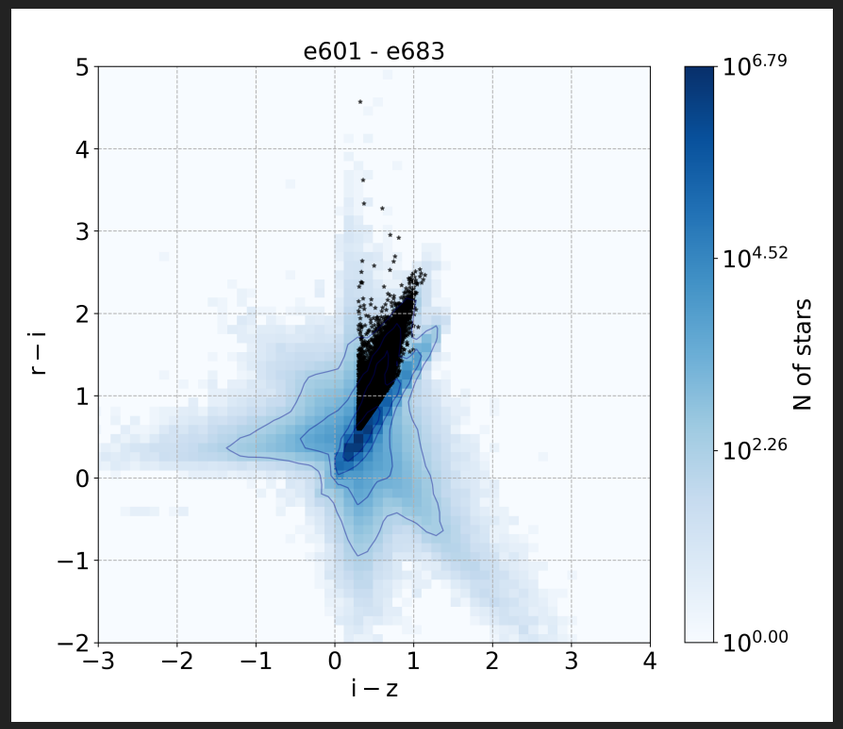
$$r - i \geq 1.35 * [(i - z) - 0.319] + 0.6$$

KOWALSKI ET AL. 2009

$$H_J = J + 5log_{10}\mu[as]$$

$$H_J^{dwarf} > H_J^* = 68.5(J - Ks) - 50.7$$

ROJAS-AYALA ET AL. 2014



CHARACTERIZING M DWARF CANDIDATES WITH VO SED ANALYZER (VOSA)

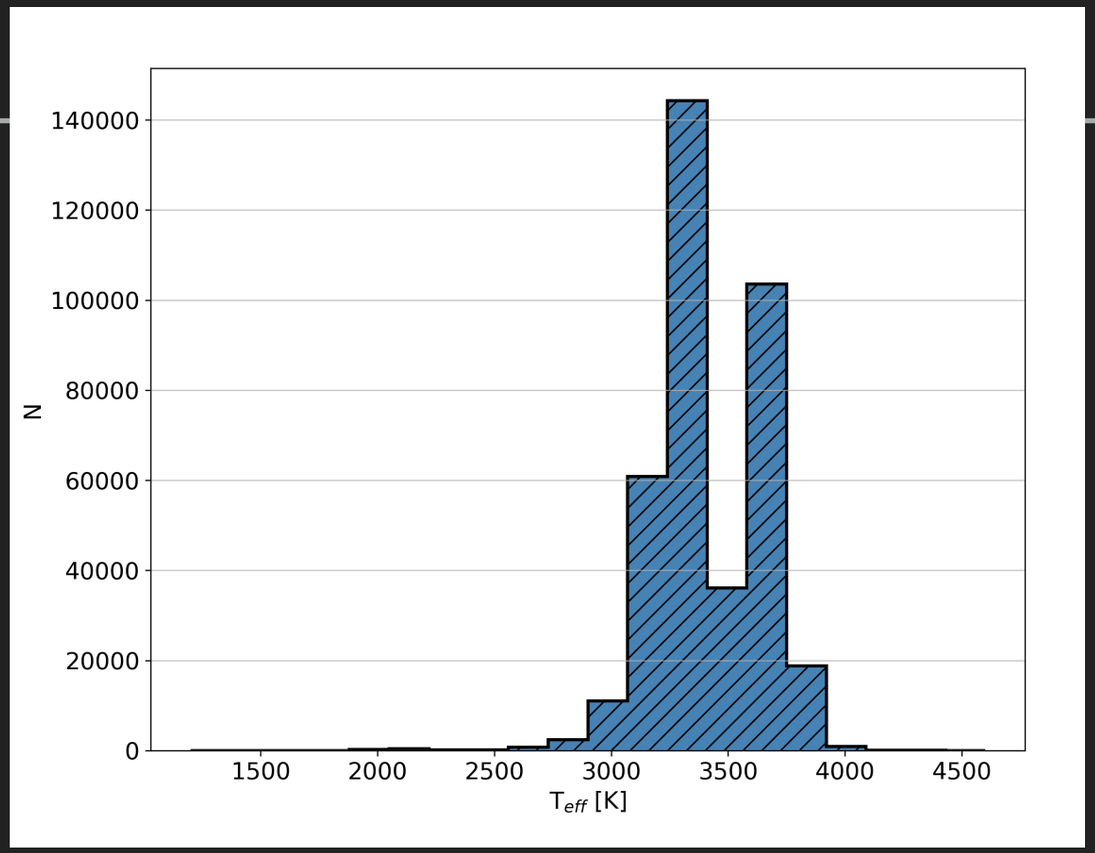
BAYO ET AL. 2008

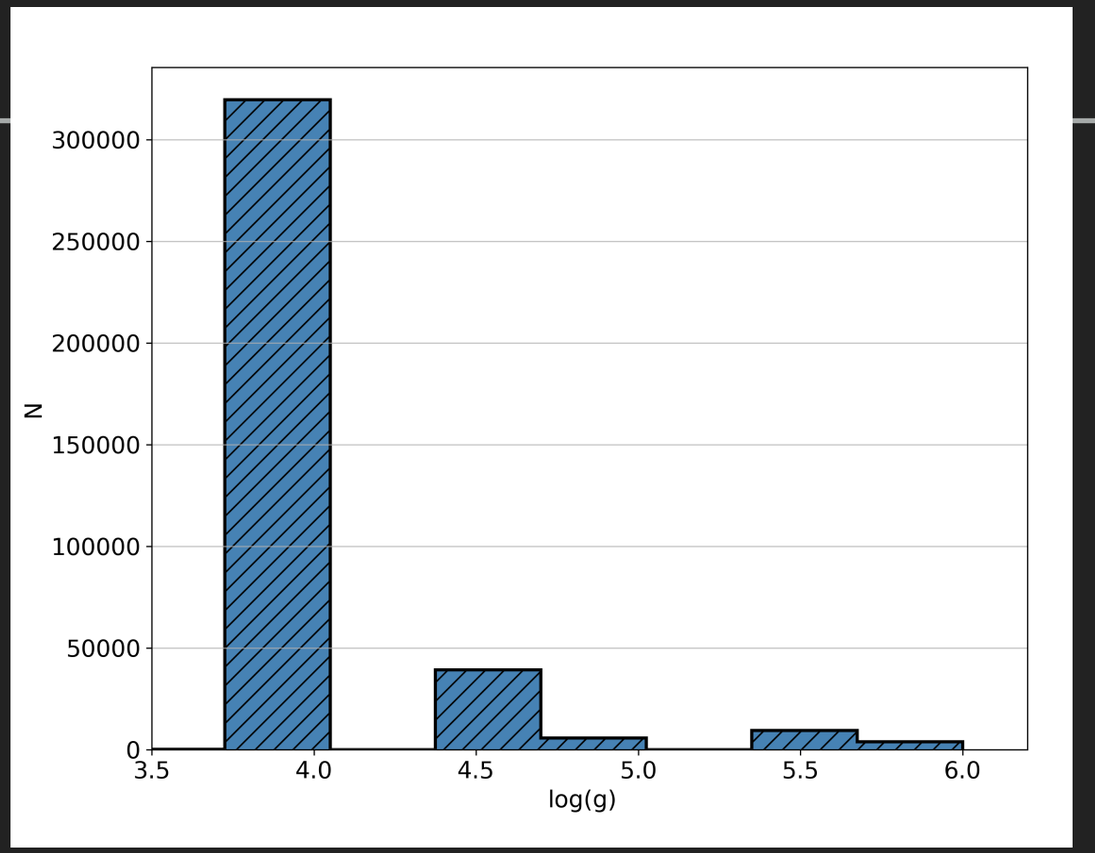
VO-TOOLS ALLOW TO DEAL WITH LARGE SAMPLES OF OBSERVATIONAL/THEORETICAL DATA AND COMPARE THEM WITH DATA AVAILABLE IN THE LITERATURE

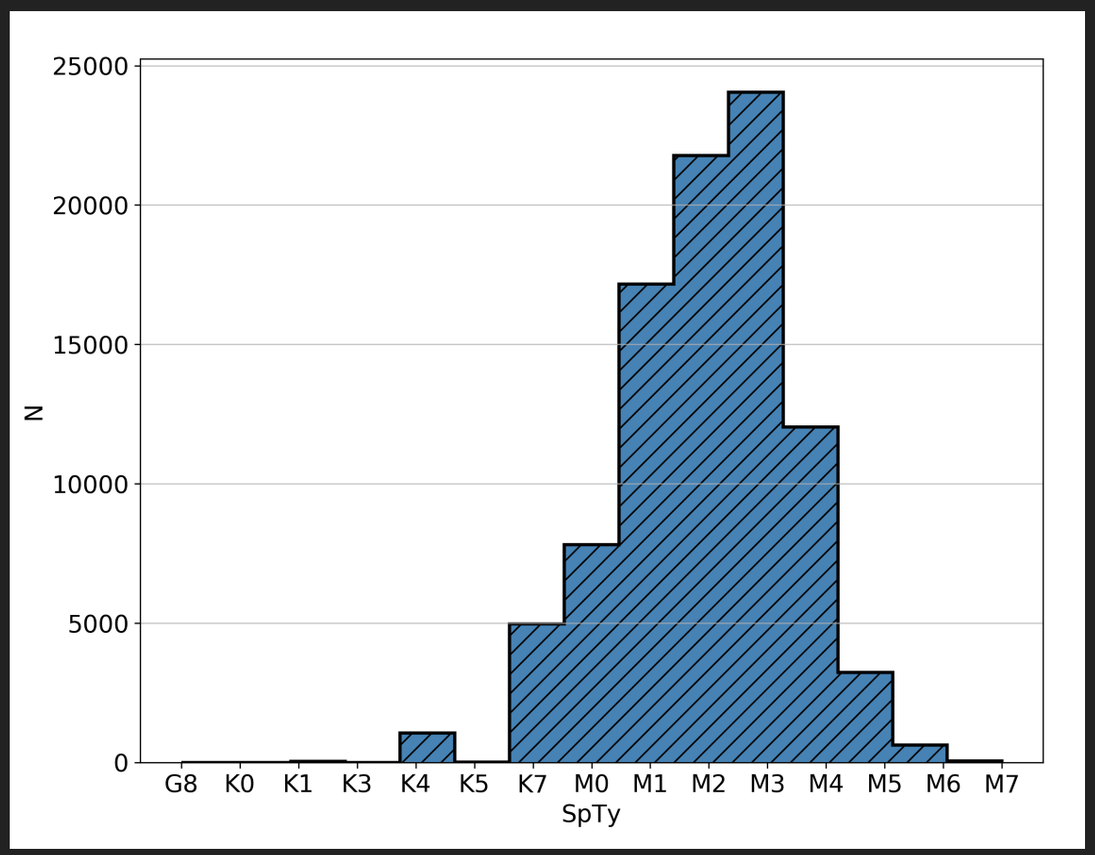
TEFF, [FE/H] AND LOG G → BT-SETTL MODELS (ALLARD ET AL. 2012, BARAFFE ET AL. 2015)

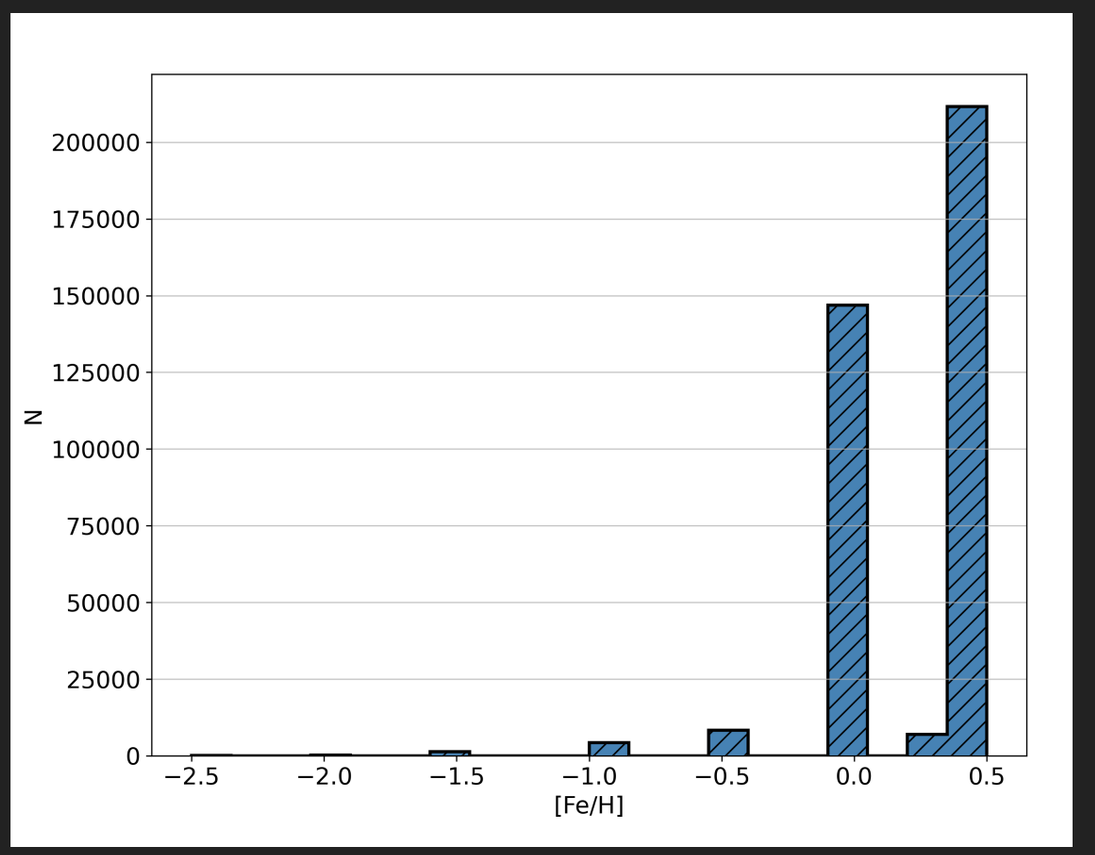
SPECTRAL TYPE → KESSELI ET AL. 2017 TEMPLATE LIBRARIES

$$T_{eff}[K] = 1200 - 4600$$
$$logg = 4.0 - 6.0$$
$$[Fe/H] = -2.5 - 0.5$$







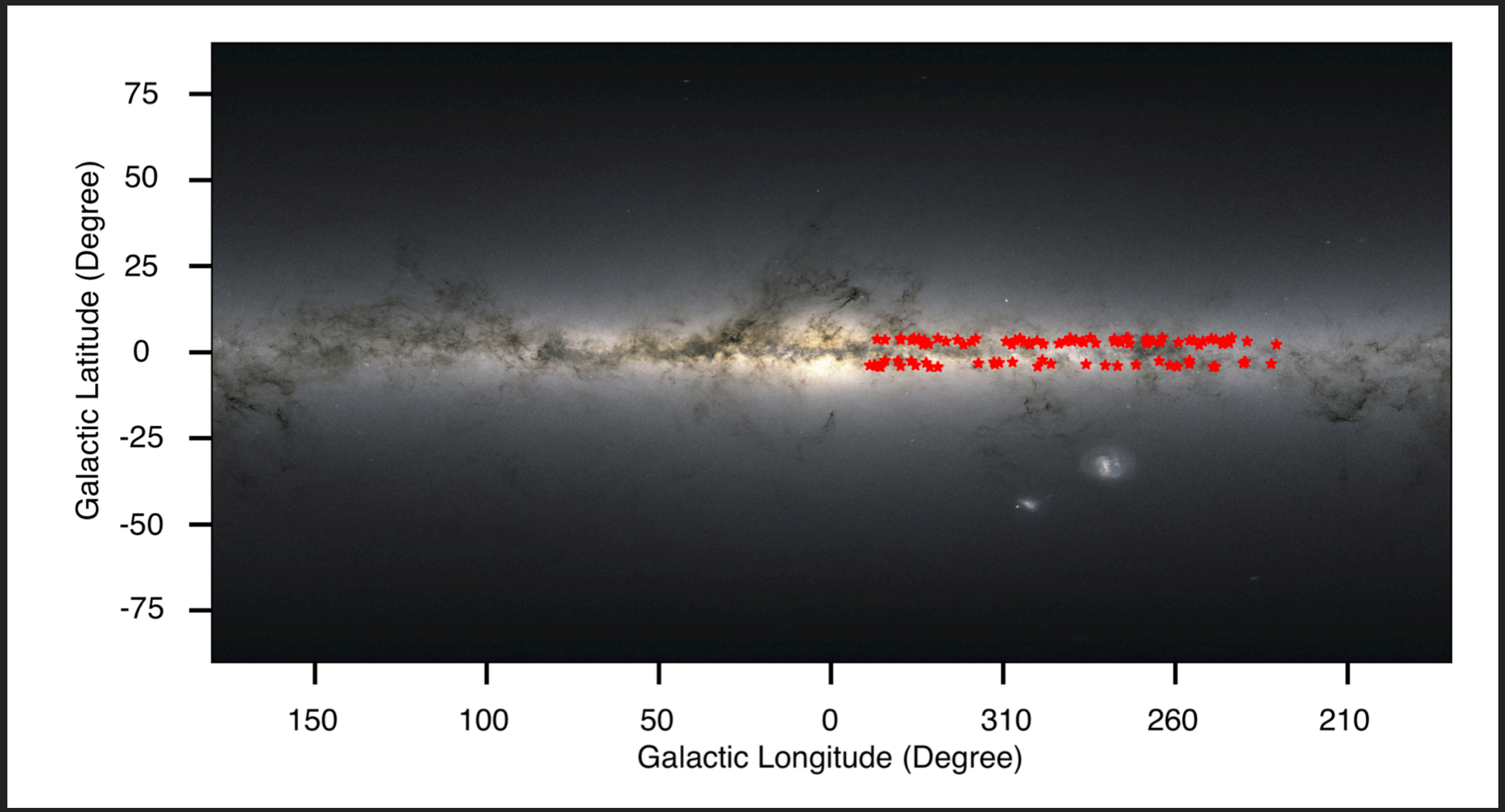


MEJIAS ET AL. (IN PREP)

99 LOW-MASS OBJECTS IN THE GAIA CATALOGUE OF NEARBY STARS

GAIA COLLABORATION ET AL. 2021B

99 OF OUR LOW-MASS OBJECTS ARE WITHIN ~100 PC.

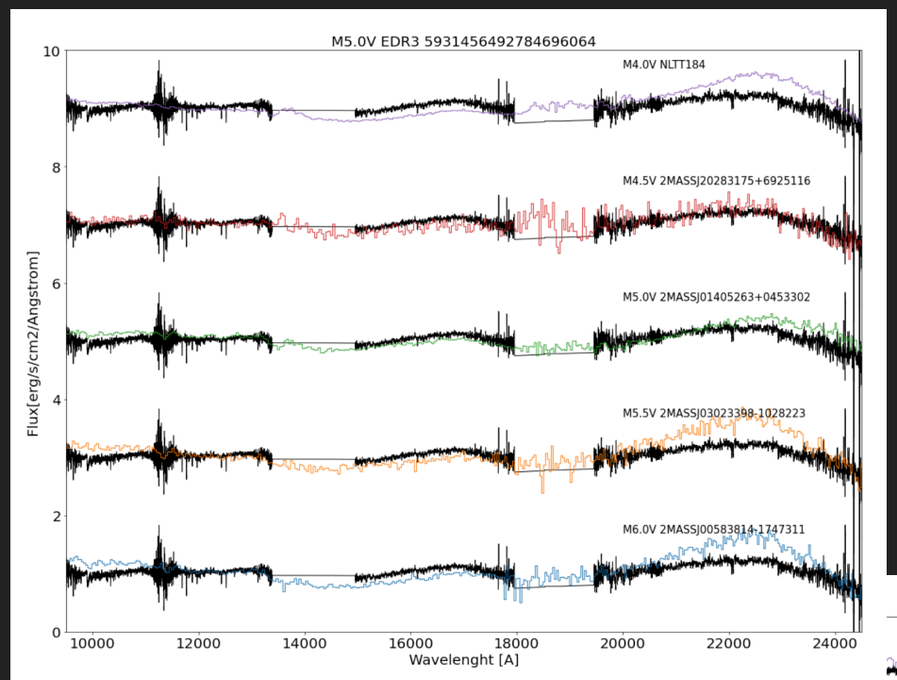


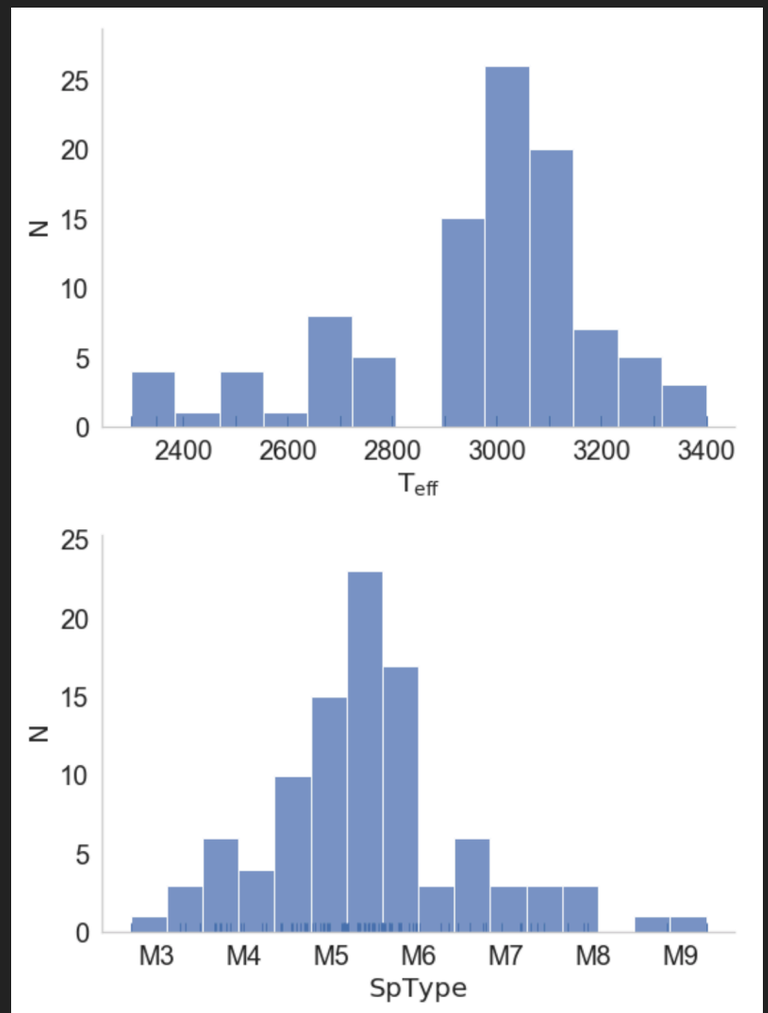
MEJÍAS ET AL. (2021, SUBMITTED TO A&A)

99 LOW-MASS OBJECTS IN THE GAIA CATALOGUE OF NEARBY STARS

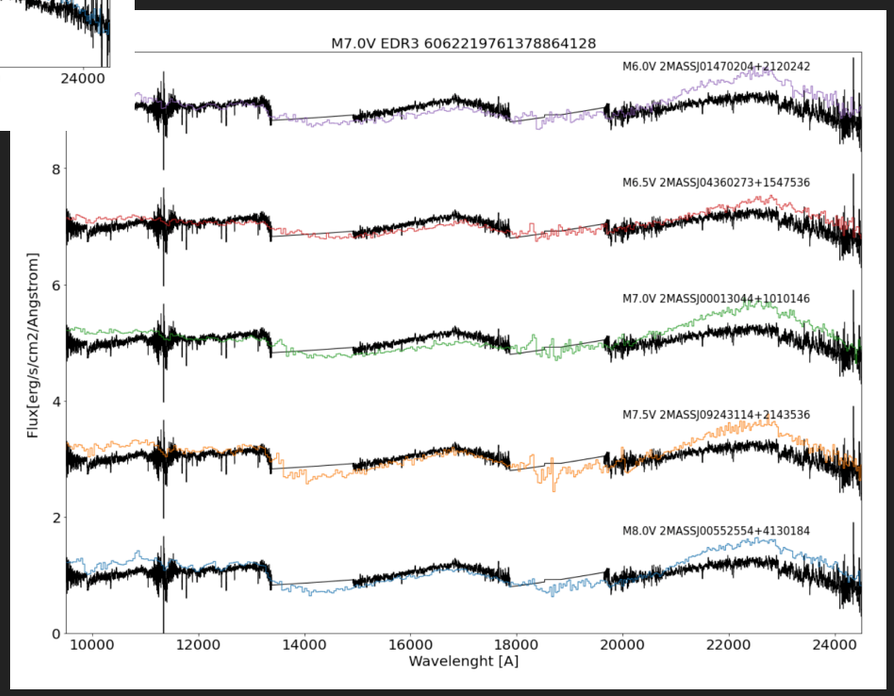
GAIA COLLABORATION ET AL. 2021B

EFFECTIVE TEMPERATURES AND SPECTRAL TYPES AGREE WHEN COMPARING VOSA RESULTS WITH PECAUT & MAMAJEK (2013).





LOW-RES NIR SPECTRA WITH TRIPLESPEC/SOAR



MEJÍAS ET AL. (2021, SUBMITTED TO A&A)

SUMMARY

- M DWARFS ARE FAINT AND SMALL, BUT ARE EXCELLENT TOOLS TO STUDY THE PROPERTIES OF THE MILKY WAY AND STAR/PLANET FORMATION PROCESSES.
- THIS PROJECT WILL PROVIDE A COMPREHENSIVE CENSUS OF M DWARFS IN THE INNER REGIONS OF THE GALAXY, EXPLORING THEIR PHYSICAL PROPERTIES AND VARIABILITY DUE TO EXOPLANET TRANSITS.
- DUE TO THE LARGE AMOUNTS OF DATA AVAILABLE FROM THE NEW SURVEYS, IT IS NECESSARY TO DEVELOP NEW PRECISE SELECTION AND CHARACTERIZATION METHODS.
- VO TOOLS AS VOSA CAN PROVIDE STELLAR PARAMETERS FOR LARGE AMOUNTS OF DATA FROM NEW SURVEYS AS VVVX.

THANK YOU!

A.MEJASALARCN@UANDRESBELLO.EDU