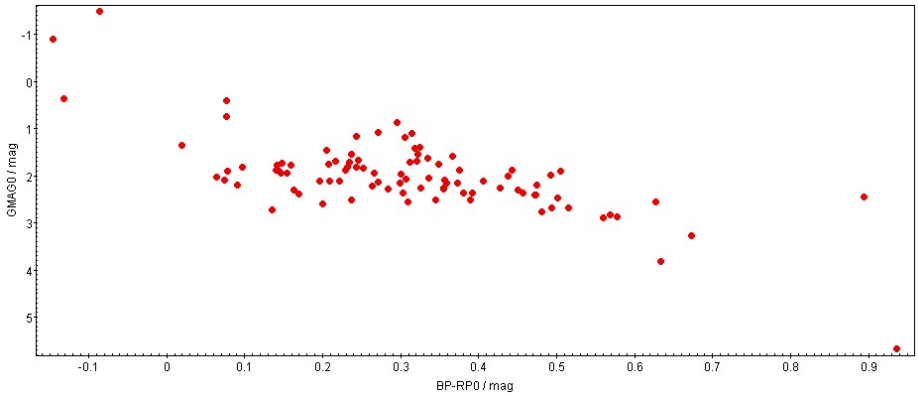
Slide 1: What is an roAp?

- roAp stands for rapidly oscillating Ap star.
    - These can have periods as little as 5 minutes.
- These lie on the delta Scuti instability strip and are usually A:F class stars.
    - The delta Scuti strip is along the main sequence, along with most standard candles.
- Most roAp's have spectral type Sr (Strontium), Eu (Europium), and Cr (Chromium) and sometimes Si (Silicon) (EX: ApSrEuCr spectral type).
    - Meaning they show strong lines of these ionized metals along with chemical peculiarities. A result of radiative acceleration and gravitational settling.
        - Gravitational Settling: particles falling toward the core due to gravity.
        - Radiative Acceleration: In each layer of the star, the particles move according to a diffusion velocity that involves a term describing the momentum transfer between the radiation field and the various chemical species.

Slide 2: Known roAp's

- Referencing documentation from TESS observations on ~ 200 known roAp stars, making a database with these.
    - Using cone search with radius 2" to identify the roAp's in Gaia catalog.
- Then concatenating each roAp table into a database and pair matching starhorse catalog.
    - Starhorse database accounts for accounting for dust extinction
    - Using GMAG vs. BP-RP0
        - GMAG being G broadband filter Absolute Mag
            - Using G filter because it covers more of the spectrum
        - BP-RP0 being B-R color
            - Using this because we want separate indicators, not the same; which would using G filter

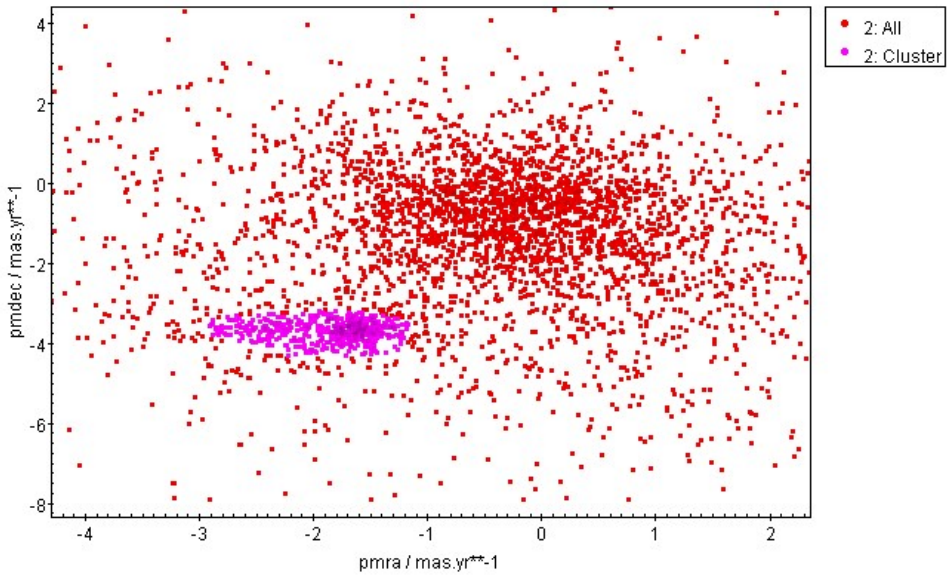


- This is the instability strip for the known roAp's.

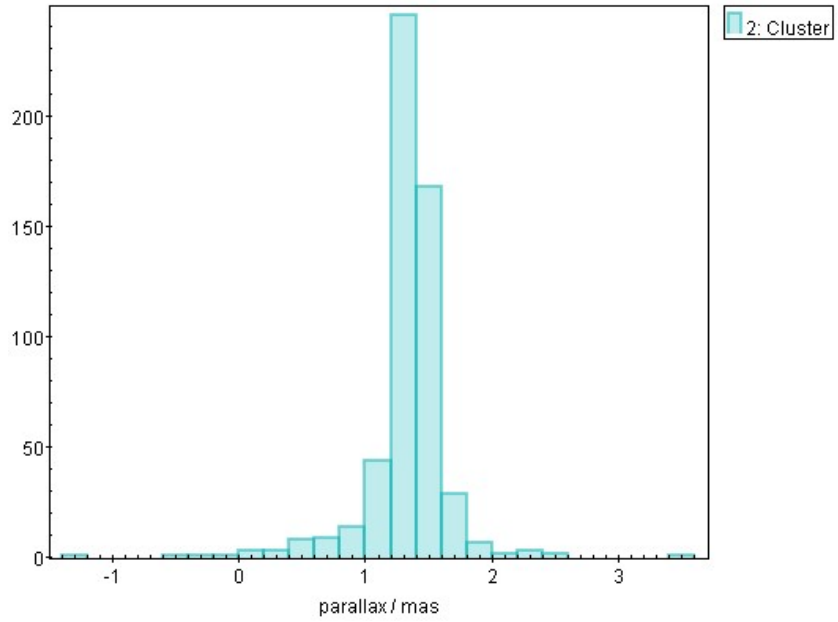
Slide 3: NGC 2264

- Using TopCat with Gaia to plot a 13' FOV of NGC 2264.
  - NGC 2264, or the Christmas Tree cluster with the cone nebula in it, is in the Monoceros constellation and is an open cluster.
  - It is ~720 pc away from earth with an angular diameter of 20'.
  - Pair matching with starhorse to account for dust extinction.

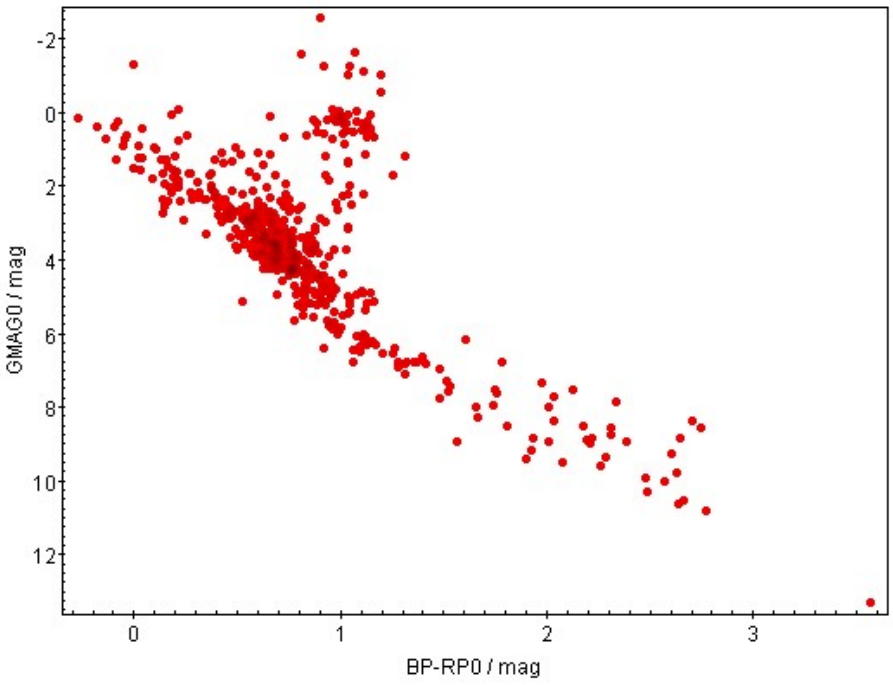
- I selected the dense, pink, group of stars inside the open cluster, fig 2.
  - The other stars in the top right are apart of the galactic disk, which we are not interested in.
  - The pink group is NGC 2264



- Then considering the parallaxes, using a histogram, fig 3.
  - We want our stars to be in proximity of one another.
  - Selecting a range from .6 - 2

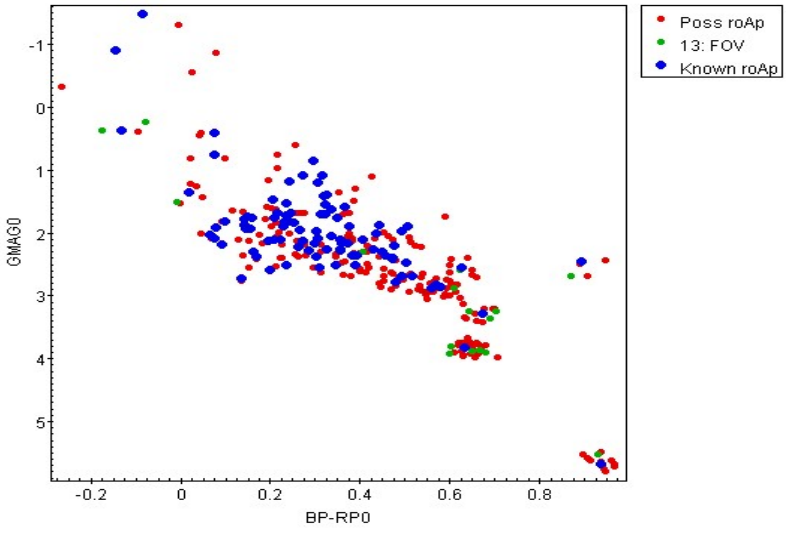


- Now making an HRD with the selected group of stars, fig 4.
  - These are the stars we are looking through to find roAp candidates.



Slide 4: Conclusion

- From NGC 2264 and the known roAp's, I plotted the candidates and known roAp's, fig 5.
    - Doing this by choosing only the stars in NGC 2264 that followed the instability strip of the known roAp's when grouping the plots of fig 1 and 4.



- The green section being the roAp candidates in our images and the red section being all the possible roAp's within 13'.

roAp candidates in our image FOV

#	Gaia designation	Identifier	RA;DEC
1	3326709559553987840	NGC 2264-153	06 41 03.374;+09 40 44.986
2	3326711487994693504	NGC 2264-169	06 41 07.778;+09 44 02.995
3	3326714752169858944	Cl* NGC 2264 RMS 1872A	06 40 11.682;+09 45 55.699
4	3326715297630893184	Cl* NGC 2264 SBL 1534	06 40 21.434;+09 48 04.741
5	3326716397142282240	Cl* NGC 2264 SBL 226	06 40 55.183;+09 50 49.753
%6	3326736811121849216	HD 262066A	06 41 30.092;+09 49 48.324
%7	3326737051640013952	HD 262108	06 41 34.613;+09 51 37.917
8	3326743614350027008	Cl* NGC 2264 SBL 392	06 41 31.989;+10 00 24.443
9	3326928882059976576	Cl* NGC 2264 SBL 204	06 40 50.862;+09 55 53.029
10	3326929393158941056	V* V358 Mon	06 41 03.939;+09 58 09.453

- The **%** stars are the better candidates.