Cody Paper – Annotated Bibliography – ASTR 341

Goals

- What is your purpose in reading this paper? Based on the title, what might you be able to learn from it and how might that knowledge help you with your project?
  Answer: I want to better understand the methods that went into the reduction and processing of the raw data on the way to producing light curves.

- Do you have any specific questions you want to answer?
  For example: "I want to know if M-dwarfs and brown dwarfs form in different ways", or "I want to understand whether the observations in this paper are similar to what I'm doing".
  Answer: I want to learn how some of these observations directly relate to the IMF of the cluster and how we can learn about its mass distribution from these data points and observations. I am also interested in how disks affect the variability of the young stellar objects.

Abstract/Summary

The abstract will usually provide complete clarification of the title, and describe the essence of this study.

What new questions does the abstract pose to you, if any?
Answer: After the first readthrough I don't have any specific questions.

Introduction

Read through the introduction, then answer the following. It should outline what work has been done prior to this paper to set the stage/answer big outstanding questions in the field.

What is the overall importance of this research?
Answer: This research will help us better understand the properties of young low mass stars and how they evolve.

What are the authors doing in this paper?
Answer: The authors brought together an impressive amount of similar data that allows them to conduct a large analysis on short term variability on such low mass stars.

Use textbook or internet to get more information about **three** unfamiliar terms/concepts from the introduction:

Topic 1: Young stellar objects

- YSOs are also associated with early star evolution phenomena: jets and bipolar outflows, masers, Herbig–Haro objects, and protoplanetary disks (circumstellar disks or proplyds). (source)

Topic 2: Short term variability and low cadence data

- https://en.wikipedia.org/wiki/Variable_star

Topic 3: Time domain behavior

- https://resources.pcb.cadence.com/blog/2020-time-domain-analysis-vs-frequency-domain-analysis-a-guide-and-comparison

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Figures, Graphs and Tables

Read through all of the figures/graphs/tables and their captions before reading the rest of the paper. Try to get as much information out of them as possible. Then return to them again once you start reading through the paper.

After reading abstract, intro and methods, but *before* reading results and discussion:

Identify and include the **three** most important/useful figures or tables from the paper below (i.e. your highlight reel). For each figure, answer the following:

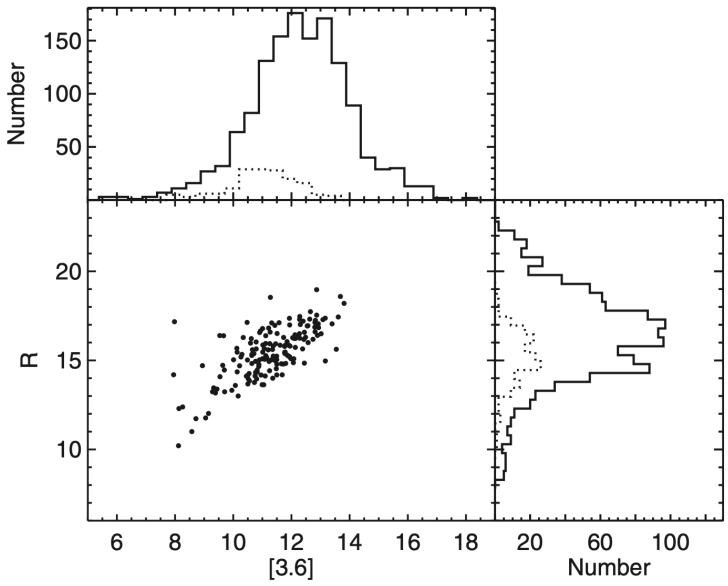

Figure 2. We present the distributions of 3.6 μm and R-band magnitudes characterizing our disk-bearing sample, shown as dotted histograms. The solid histograms show the distributions of all ~1500 confirmed cluster members in these bands.

Figure or Table

- Describe: A scatterplot of 3.6 micron and Rband magnitudes with accompanying histograms for each.

- How are these measurements made? These measurements comprise photometry data from the repeated observations of the cluster. They were taken in generally the same way we took photometry last semester.
- What conclusions can you draw from this data? The distributions are relatively normal and correlated, which makes sense as the brightness of stars in the two bands should be relatively proportional.
- How does this data contribute to the argument the authors are making? The data is a solid demonstration of the sort of information the authors will be using to make their claims later on in the paper.
- What questions does this data raise for you? I am interested if there is a clear physical reason for the spread from a direct proportionality.

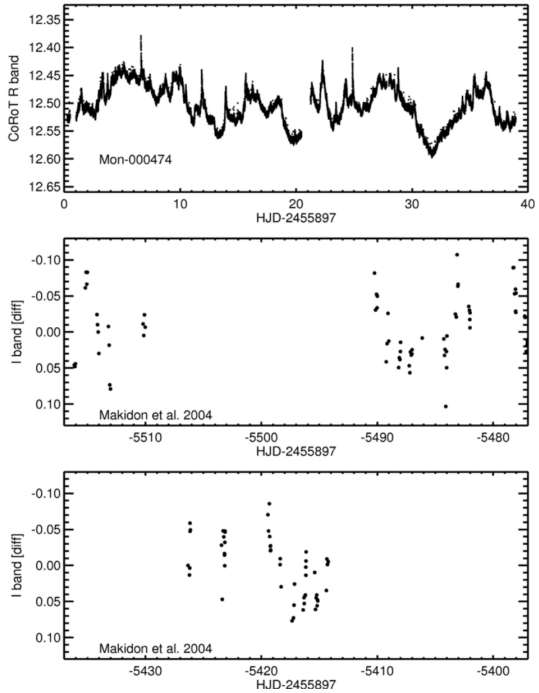

Figure 7. Light curves for Mon-000474, as observed by *CoRoT* from space (top) and Makidon et al. (2004) from the ground (middle, bottom). Short-duration flux increases appear in the high-cadence data but are difficult to discern in ground-based time series.

Figure or Table

- Describe: What is being shown in this figure? Three light curves for the same star.
- How are these measurements made? These measurements were taken from different telescopes and then reduced to create light curves with a relatively short cadence.
- What conclusions can you draw from this data? The data taken from CoRoT is much more complete and clear compared to the ground based telescopes.
- How does this data contribute to the argument the authors are making? The authors are claiming that their use of a space telescope will increase their accuracy and rate of data compared to the use of ground based telescopes.
- What questions does this data raise for you? I'm interested in how our ground based telescope will compare to the space based data from the paper.

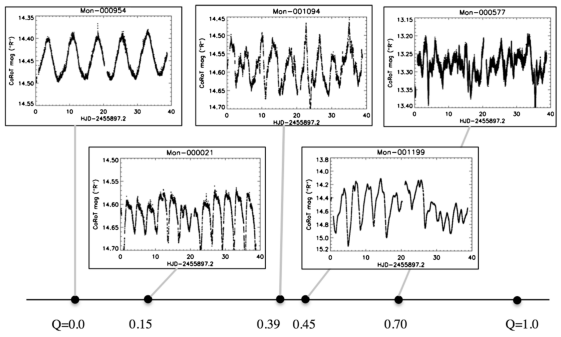

Figure 29. *CoRoT* light curves with representative values of the Q parameter, ranging from periodic (Q = 0–0.15) to quasi-periodic (Q = 0.15–0.5) to aperiodic $Q > 0.5$.

Figure or Table

- Describe: What is being shown in this figure? This figure shows light curves with a range of Q values.
- How are these measurements made? The values of the Q parameter were measured by running a similar analyses to the different light curves.
- What conclusions can you draw from this data? The data shows that a wide distributions of values for the Q parameter can be found from the data taken from this cluster.
- How does this data contribute to the argument the authors are making? The authors are trying to show the ranges that the quasiperiodicity can take and how important it will be to understand the causes for the dramatically different looking light curves presented.
- What questions does this data raise for you? I want to better understand how the Q parameter is calculated and what factors directly contribute to its final values.

After reading results and discussion:

Describe any additions/corrections/new insights/questions based on reading the author's interpretations of the figures.
For example: "The color-magnitude diagram in Figure 2 actually showed two populations of stars, not just one, and was meant to show trends in evolution. I want to know why the populations look different even though they're the same age."
Answer: I did not find any major additions or corrections on my first read through. As I get better at reading papers though I'm sure I'll find more.

Body of the paper: Results & Discussion

Now it is time to read through the entire paper.

From your reading of the Results & Discussion sections, try to answer **at least three** of the questions that you came up with from reading the title, abstract and figures. Do not get bogged down in the details of the procedure or analysis sections. Read for broad concepts that will allow

you to understand the figures.

Question 1:
Answer: Section 7 helped me better understand the correlations I was questioning earlier from one of the figures. The answer is a lot more complex than I believe I can explain here, but it is detailed throughout the section.

Question 2:
Answer: My question about disks was answered quite well in section 8.

Question 3:
Answer: My question about the IMF was not directly addressed, although I am sure I'll learn more about it in future papers I read.

Take-home for you

Briefly summarize what from this paper is relevant to your project.
For example: "Good introduction that explains...", "Table 2 has the collection of data for related types of stars", "Interesting examples of young stellar object lightcurves", etc.
Summary: The tables of data will be extremely relevant to our project. The methods section will also be useful, as well as the observational techniques they outlined. As far as their analyses, I am still unsure of exactly what form our project will take and therefore not exactly convinced which elements of this paper will be immediately relevant.

List questions to follow up that are relevant to your project.
Answer: I am still interested in the direct correlation between some of the variability parameters and the IMF.

List methods/techniques that may be of use to you.
Answer: The reduction of the raw data and creation of light curves will be incredibly important, although we will most likely go through most of these in class as well.

*Adapted from templates used in the Jaswal and Follette Labs, Amherst College.