

### Abstract

The subject under research in the following paper is a star visible from the Southwest sky, called Altair. Collecting data on Altair using a compass and astrolabe, both Azimuth and Altitude were able to provide important information about where Altair can be seen at different points of time in the night sky. The results showed that the star followed a path westward and declining altitude. This research also provides additional evidence in supporting the changing positioning of the star from night to night, making the Sidereal day evident.

### Introduction

The observation and perceived movement of stars has held great significance in the study of the universe for hundreds and thousands of years. This said the continuation of this practice is something fundamental in the practice of science. Retesting and finding supportive evidence, or even a reason for the dispute allows for investigators to constantly move knowledge forward. With this in mind, the study discussed here has every intention of following through with the same practice of collecting data, in this case surrounding the star Altair, and noticing trends, or even lack thereof. Through close observation, this paper attempts to address the question of how and even why Altair appears to move throughout the night, suggesting that its apparent migration from South to West, and setting as the night goes on, provides supportive evidence of the Earth's repetitive rotation as well as the visibility of the sidereal day.

### Method

Throughout 3 weeks the star of Altair was observed at two different times of the night. One was at 9:10 pm (data collected by Molly Ryan) and a separate time at around 12:09 am (collected by Elia E Safir, sourced from MySLC). Both sets of data were collected with the use of an iPhone compass and an Astrolabe. Data was collected and analyzed with the intent to view trends as they

appear from day to day, as well as contrast the differences that appear between the separate times of about 3 hours.

Results (Graphs)

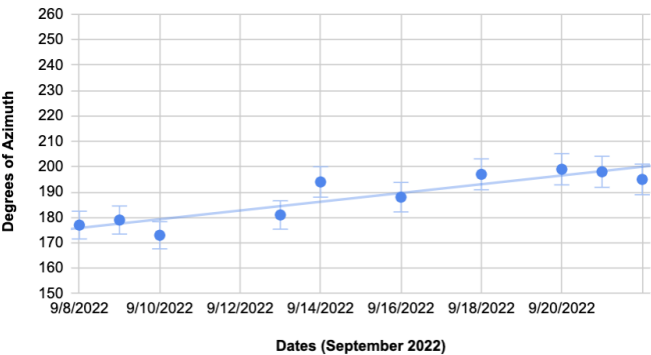
Observations of Altair at 9:10pm

| Date    | Azimuth (degrees) | Altitude (degrees) |
|---------|-------------------|--------------------|
| 9/8/22  | 177               | 62                 |
| 9/9/22  | 179               | 56                 |
| 9/10/22 | 173               | 54                 |
| 9/13/22 | 181               | 55                 |
| 9/14/22 | 194               | 59                 |
| 9/16/22 | 188               | 56                 |
| 9/18/22 | 197               | 59                 |
| 9/20/22 | 199               | 56                 |
| 9/21/22 | 198               | 57                 |
| 9/22/22 | 195               | 55                 |

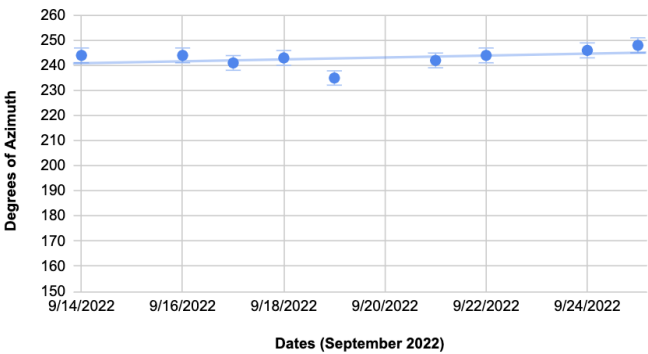
Observations of Altair at 12:09am

| Date    | Azimuth (degrees) | Altitude (degrees) |
|---------|-------------------|--------------------|
| 9/14/22 | 244               | 41                 |
| 9/16/22 | 244               | 39                 |
| 9/17/22 | 241               | 41                 |
| 9/18/22 | 243               | 43                 |
| 9/19/22 | 243               | 44                 |
| 9/21/22 | 242               | 38                 |
| 9/22/22 | 244               | 38                 |
| 9/24/22 | 246               | 39                 |
| 9/25/22 | 248               | 35                 |

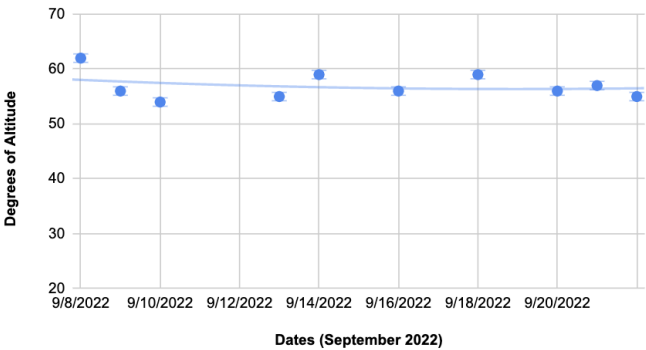
The Azimuth of Altair at 9:10pm



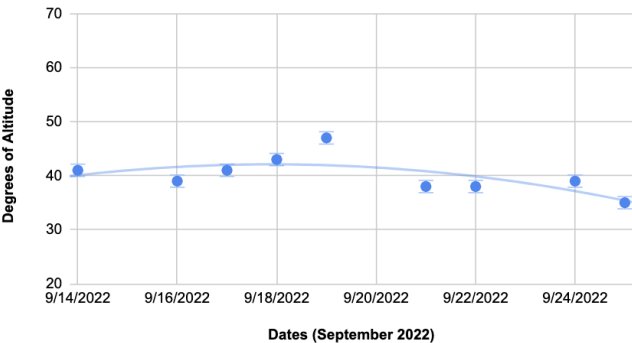
The Azimuth of Altair at 12:09am



The Altitude of Altair at 9:10pm



The Altitude of Altair at 12:09am



### Discussion

Reflecting on the data collected, there is a visible difference between the times. Earlier in the night, the star has an Azimuth that ranges between 173 degrees to 199 degrees. These numbers would place Azimuth in the southern sky from where this data was collected. However, there is a noticeable change in Altair's Azimuth as the night progresses. Later on, the Azimuth is reportedly 235 degrees to 248. As the numbers become higher, it can be interpreted in the terms of Altair (from the point of view of Earth) moving from south to west.

There is also a similar change in its visible altitude between these two times. Earlier in the night, the altitude is higher in the sky, around 50-60 degrees on any given night. This changes as later on it can be recorded anywhere from 38-47 degrees. By these numbers, as time goes on, Altair is lowering in the sky, while simultaneously moving from the South to West. This movement can be explained by the Earth's rotation, in which the Earth moves from east to west following the line of the celestial equator. The change in altitude also correlates with this movement, as the earth is tilted on its axis so to the observer, celestial objects sink below the horizon as the earth turns on its path.

This movement throughout the night is not the only information that these graphs have to offer. The data is also able to provide observations on the placement of Altair from night to night. While this particular data set is limited, there are changes in degrees that show a slight increase in Azimuth at 9:10 pm and then later decrease. Similarly early in the night sees Altair decreasing in altitude and then later in the night there is an opposite increase. This change can be explained by the sidereal day, wherein the stars rise and set slightly earlier each day. While numbers are not precise enough in this data set, the overall trend in movements may be enough to be supported by this phenomenon.

However, this data does have some factors that could affect its accuracy. First to address human error, in the second set of data, the majority of observations were taken at 12:09am. Those days include September 21st, 18th, and 14th. The rest of the data was taken within a five-minute time frame. Earliest being 12:04 and never passing 12:09. It doesn't affect the data too much but it is important to take into consideration. Another issue in this data set was the weather; specifically, on September 19th. That day happened to also be the day that the data was recorded at 12:04. Conditions were cloudy and the measurements "may not be very accurate." The azimuth that day was significantly lower than the average and the altitude was significantly higher as well. As for systematic error that could affect the data's accuracy, the compasses used to collect Azimuth were both on Phones and so specific results should hold a 7 degree disparity due to algorithmic adjustments.

### Conclusion

In conclusion, Altair moves quite a bit within a 3-hour difference. The azimuth goes up later in the night. This means it moves from the South to the West. The opposite happens to the altitude. It starts high but goes down, on average, 15 degrees. Altair is getting lower throughout the night. Even though there are things that could lead to possible errors, like weather and the compass, it is a starting point to find patterns in Altair and how it moves through the night.