Project Compass: A Preliminary Analysis

An Arek'Jaalan Project

A Multidisciplinary Division Research Initiative

Project Compass Distant Stellar Object Data Capture (DSODC) Preliminary Analysis

Drafted by Capsuleer Mark726

Abstract

Data collected for Project Compass[1] have been used to tentatively locate Anoikis space within the same galaxy as New Eden, and even within a few hundred light-years. Furthermore, Anoikis systems have been tentatively located near to each other as well, fulfilling at least two goals from the DSODC mission statement. Broad-spectrum full sky data were collected from 24 different Anoikis systems, four systems from each class of wormhole space. Using the spectral data gathered from these and other images, a distinctive star cluster was tentatively identified both in Anoikis systems and New Eden. Due to the principles of parallax and spectroscopy, it can be safely concluded that Anoikis and New Eden are located near each other. The data, as well as this preliminary analysis, have been forwarded to Dr. Hilen Tukoss and Eifyr and Co. for their review and commentary.

Overview

Anoikis space has been accessible from New Eden ever since the Seyllin and related main sequence events that appear correlated with the opening of the first wormholes[2] in YC 111. Since then, attempts to understand the mysteries of Anoikis have been extensive, yet many mysteries about even fundamental aspects of Anoikis remain. Project Compass is an attempt to lay the foundations of further understanding of Anoikis.

Project Compass attempts to answer the key question of where Anoikis is located compared to New Eden. Are they located in the same galaxy? The same part of the galaxy? Or across the universe entirely? The Distant Stellar Object Data Capture (DSODC) was proposed to answer this fundamental question. Using the principles of spectroscopy and parallax, it attempted to ascertain whether the same distant stellar or extra-galactic point sources could be identified from both Anoikis and New Eden space. Although heavier analysis from Eifyr's supercomputers are needed, basic data crunching (from computer access granted courtesy of the Center for Advanced Study) has identified at least some matching interstellar point sources.

[1] Full details regarding Project Compass's DSODC can be found in the Arek'Jaalan public portal.
[2] A full review of the events of the Seyllin Incident is available here.

Methodology

Basic Spectroscopy

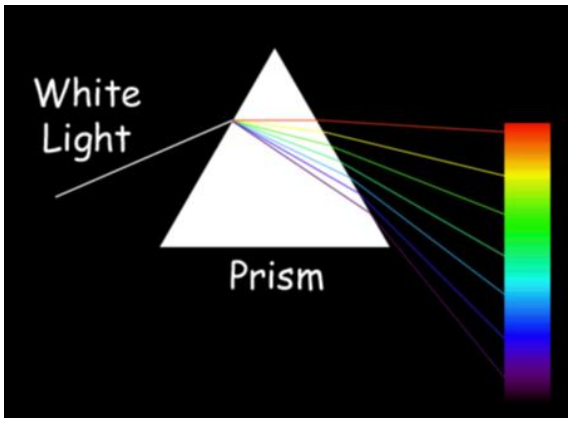

Figure 1: A basic demonstration of how white light is broken down in a prism to its constituent colors.

Spectroscopy revolves around the study of light, and how it interacts with matter. White light can be divided into a spectrum using a prism. In a so-called perfect blackbody, an object hot enough to emit light will emit a purely continuous spectrum, with no breaks in the rainbow that appears after the prism breaks up the light (at left). However, blackbodies in nature are never perfect. This is because photons interact in a specific manner with photons.

Without getting too deeply into the physics of the phenomenon, suffice it to say that atoms and molecules all absorb light of specific frequencies, and emit light at specific frequencies as well. Each atom and molecule emits a unique spectral "fingerprint", because each atom and molecule absorbs specific and unique frequencies of electromagnetic radiation. Of course, objects in space are rarely made up of purely one element. By analyzing spectra closely, researchers can determine not only what elements or molecules are present within an emission body (such as a star), but also the relative amounts of each element or molecule present. The situation is the same when light passes through an element, where specific frequencies of light are absorbed (such as when light passes through nebulae). Because the chemical make ups and relative amounts almost never precisely match up between one object and the next, spectra are useful in identifying stellar and extra-galactic objects over long distances.

Parallax

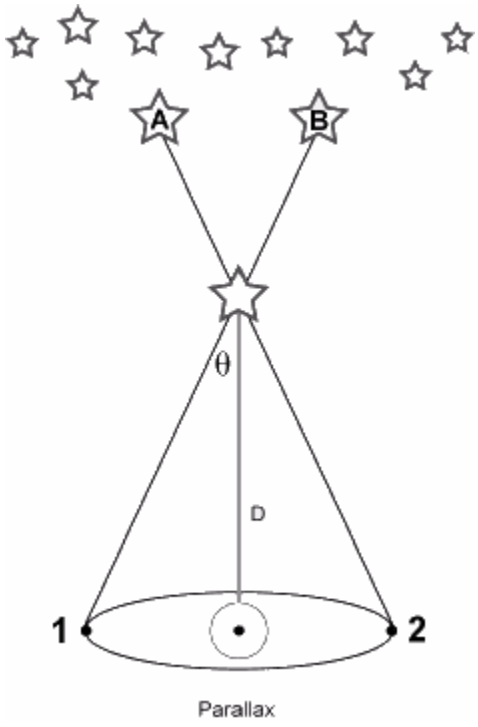

Figure 2: Parallax demonstrated in a simple setup. By knowing the radius of the orbit and the degree of change from A to B, the distance can be determined.

Parallax relies on the simple fact that objects that are closer appear to the human eye to move more than farther objects, even when the closer and the farther object are moving at the same speed. This principle also works in the reverse: when the frame of reference moves, a close object will appear to move more against the background than a more distant object. Parallax was used in the pre-space-flight era of each empire to determine precise distances between the closer stars to their respective home systems.

Of course, one drawback to this method is that at some point, the relatively small (on a galactic scale, at least) radius of a habitable planet's orbit around a star means that when an object is too far, the object's apparent motion is simply too small to be observable even with advanced equipment. Even nowadays, there are extra-galactic objects that show no apparent motion when viewed from one side of New Eden to the other, meaning that unless we rely on other, so-called "standard candles"[3], we cannot determine the distance to objects beyond a certain distance.

Project Methodology

Using these principles, the author of this analysis went on an expedition to Anoikis with his Tengu-class vessel, *Scientia*. His goal was to collect a random sample of four systems from each of the six identified classes of Anoikis space. Each system was chosen merely as first encountered over a period of 2 weeks. Scans were commenced from low security space in the Monalaz constellation daily, until a suitable Anoikis system was discovered. When possible,

Figure 3 A sample of data obtained from camera drones. This particular sample was taken from J171622, a Class 5 system with a nearby cataclysmic variable (not visible).

[3] A discussion of standard candles, though beyond the scope of this report, can be found here.

the author went deeper into Anoikis space rather than backtracking to another known New Eden system, until all classes of Anoikis space had a suitable sample size.

Once an appropriate wormhole system was discovered, the author created and warped to an appropriate spot in the system. A spot was deemed appropriate if at least one AU (astronomical unit) from all planetary bodies and other celestial objects, with no Sleeper structures within at least one million kilometers. Distances were necessary to ensure that as few extra-system objects as possible were obscured by intra-system objects. Once *Scientia* was in an appropriate position, standard camera drones were used to obtain an image of the entire sky. Spectroscopic data was included in this. Because specialized equipment was not available, standard drones were used. Although the drones were only able to capture the brighter extra-system objects, for the purposes of initial Project Compass data, this was sufficient. To ensure a full sky capture was possible, once imagery was captured from one vantage point, the Tengu was warped to a second point on the opposite side of the local star, to ensure that the star did not obscure any potentially useful data.

Once the data was collected, all data was posted to GalNet, with copies forwarded to Eifyr for analysis. Although the original intent of Project Compass was to have Eifyr perform all data analysis, personal contacts from the author's capsuleer training program, the Center for Advanced Studies, allowed the author to perform basic comparative analysis of at least the brighter objects with CAS computers. Although the Eifyr analysis shall, for Arek'Jaalan purposes, remain the official analysis, the preliminary data from the CAS computers has proved interesting enough to warrant this report.

Experimental Data

Data was successfully obtained from the target number of systems. Samples from 24 systems was gathered and collated from *Scientia*. In addition, the search for the appropriate classes of systems took the author through a number of Anoikis systems where the survey for that particular class was already complete, but still had noteworthy stellar phenomena nearby. When possible, images of these phenomena were captured to be added to the database, in order to identify the phenomena over longer distances. In all, 24 systems were fully surveyed, while an additional 26 systems were partially surveyed for their nearby stellar phenomena. The systems fully surveyed, as designated by their locus signatures, include:

Class 1: J104138, J104201, J115808, J153530
Class 2: J102504, J122732, J122931, J142055
Class 3: J124329, J152044, J164116, J210952
Class 4: J134407, J135543, J155831, J213820
Class 5: J115907, J142858, J151300, J171622
Class 6: J104632, J115935, J120103, J151325

Systems partially surveyed for interesting stellar phenomena include: J100009, J100728, J101000, J101336, J104606, J105000, J105017, J121928, J122803, J123454, J133030, J133119, J141740, J144621, J150515, J151909, J152218, J152325, J155256, J160715, J161138, J162010, J162753, J212238, J221855, J222830.

All images and data can be found on GalNet at this address:
http://evetravel.wordpress.com/project-compass-spectrographs/

Analysis


Figure 4: J142055 capture

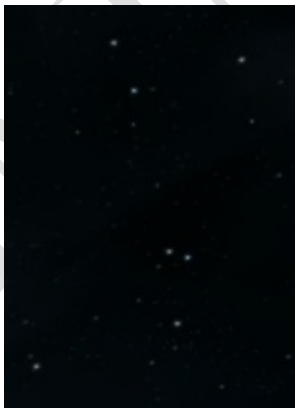
Figure 5: J120103 capture

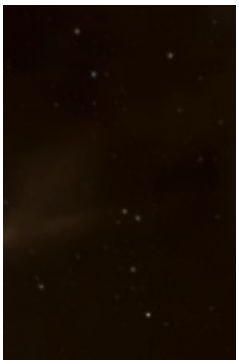
Figure 6: Pelkia capture

Although 24 systems out of the estimated 2,499[4] in Anoikis is not a large sample (roughly one percent of the systems in Anoikis), it should be deemed representative because of the random sampling and the coverage of all classes. That said, sampling errors may be present.

The above images show images of a similar, but not precise patterns. Indeed, the deformation of the pattern (nicknamed Orion for simplicity's sake) are consistent with the deformation due to parallax when the objects are seen with respect to each other from vantage points set apart from each other. Although the asterism

[4] See http://wiki.eveonline.com/wiki/Wormhole_Space

certainly appears similar in each image, without spectroscopic confirmation from each observation system, there can be no confirmation that these similarities are not more than merely coincidental. It is notable, however, that the same pattern can be found in every Anoikis system survey (although not included in this report, they are available upon request), which suggests that it is, in fact, a distant group of objects yet the same ones.

However, initial spectroscopic analysis from CAS, does suggest that the point sources present in Orion are 1) all distant stars (average distance from New Eden: approximately 3,500 lightyears) in the same relatively young open cluster (meaning that they are all approximately the same distance and of roughly the same age), and, more importantly 2) the *same* stars from system to system. The spectroscopic data from three of the seven point sources in Orion can be seen in Appendix 1. Of particular importance, however, is that in all 24 Anoikis systems surveyed, as well as Pelkia (the author's current home base), as well as two of the 26 systems for which there are a partial record that includes Orion, the same spectral sequences can be found. The chances of two sets of stars having the same spectral readouts in the same relative patterns are astronomically small. Some variances between observations were observed, but these could be accounted for by variations in the local interstellar medium which introduced unique local fluctuations in the spectra.

Figure 7: Orion as viewed from J213820, showing strong deformation compared to Pelkia.

Based on the conclusion that these are the same seven stars, whose distances can be estimated, regressive analysis allows computers to determine the positions of the star systems surveyed based on the amount of deformation of Orion from the base system of Pelkia. Small amounts of deformation (present in systems such as J104138, J115907, and J 124329) from the Pelkia pattern mean that the system is fairly close to Pelkia (based on the distances to the nearer of the Orion galaxies, this means within 100 lightyears), while larger deformations of the Orion asterism from the Pelkia baseline means that the system is farther from Pelkia. Maximum deviation appears to put the farthest of the surveyed system (system J213820) at approximately 300 light years.

Preliminary Conclusions

Initial conclusions can be drawn from the basis of the above analysis. Most importantly for the purposes of Project Compass, it can be safely concluded that

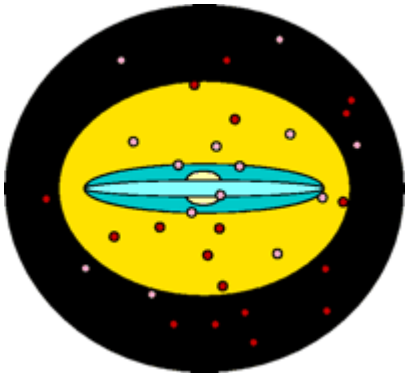

Figure 8: An illustration of Anoikis. Blue represents New Eden space, yellow represents Anoikis space.

Anoikis is located spatially near New Eden. Intriguingly, analysis of the Orion deformations point to a conclusion that Anoikis systems are clustered in a "halo" around New Eden systems, roughly centered around the center of New Eden. The distances between New Eden and Anoikis are sufficient that the stellar phenomena so apparent in Anoikis (such as the various pulsars, black holes, and red giants) are not immediately visible from New Eden, yet close enough that more distant stellar clusters, such as Orion, are still apparent. Given the amount and types of deformation, the sample of Anoikis systems seems to be distributed evenly in a halo around New Eden, and there is no reason to suspect that more systems would not, in fact, verify this initial conclusion. This does raise the question of why wormholes seem limited to an area of approximately 500-1000 lightyears in diameter, and why New Eden appears to be in the center. A number of theories, both natural and artificial in origin, present themselves, but those theories go well beyond the scope of this report, and certainly bear further explanation. The fact that similar deformations can be seen across New Eden only backs up the conclusion that Anoikis and New Eden are located within the same stellar neighborhood.

An unexpected conclusion of Project Compass's DSODC is that there is strong evidence to suggest that New Eden is not located within a spiral galaxy. In a brief review of the literature available, such a conclusion has never been suggested before by capsuleer researchers. This conclusion is drawn from the strikingly uniform stellar distribution across skies in both New Eden and Anoikis space. Scientists expect that, if we were located within a spiral galaxy, stellar distribution would be much less uniform, due to the relative flatness of the galactic structure. In such a system, stars would appear more densely concentrated in a band travelling through the sky (an artist's conception of such a sky is viewable here). DSODC's extensive visual surveys show no evidence of such banding within either New Eden or Anoikis space, suggesting that New Eden and Anoikis located either within a larger elliptical galaxy, or perhaps a dwarf or irregular galaxy. The stellar density does not change from one observational direction to another, or one system to another, suggesting that New Eden is located within a fairly uniform galactic structure. The amount of gas present within New Eden and Anoikis (visible as nebula from most stellar systems) suggests that New Eden is not located within an elliptical galaxy (which are typically devoid of interstellar dust). However, further

exploration from other Arek'Jaalan teams will be necessary before one galactic structure or another can be confirmed.

Another conclusion from DSODC bears on Project Compass's other endeavor: the Time Dilation Measurement. It has been suggested by some that Anoikis is located in a different time than New Eden; that wormholes traverse both space and time when bringing in capsuleers. Although much less conclusive, DSODC data suggests that this is not the case. Orion stellar spectra match each other from both Anoikis and New Eden space. Over any astronomically significant time period, spectra will generally shift to reflect different chemical compositions as stars age, yet no such variances are apparent. Even over a few thousand years, positions of stars can be expected to change with respect to each other.[5] However, the deformations observed between Anoikis and New Eden can be explained through parallax alone. Regressive models that calculated the parallax do not show any need to account for temporal displacement. While being able to capture a New Eden star from Anoikis to compare data would prove more conclusive, initial analysis at least suggests no temporal difference between New Eden and Anoikis, though further explanation is certainly warranted.

These conclusions show the success of the DSODC. Its primary purpose – to determine the distance between Anoikis and New Eden – was fulfilled. As noted in the introduction, this is a purely preliminary analysis. Final results from Eifyr and Co. will be eagerly awaited by the author, as well as comments from the Arek'Jaalan project at large.

[5] An example of relative stellar motion, and how it may affect visible star patterns, is available here.

Appendix 1 (Spectral readouts from three stars in Orion)

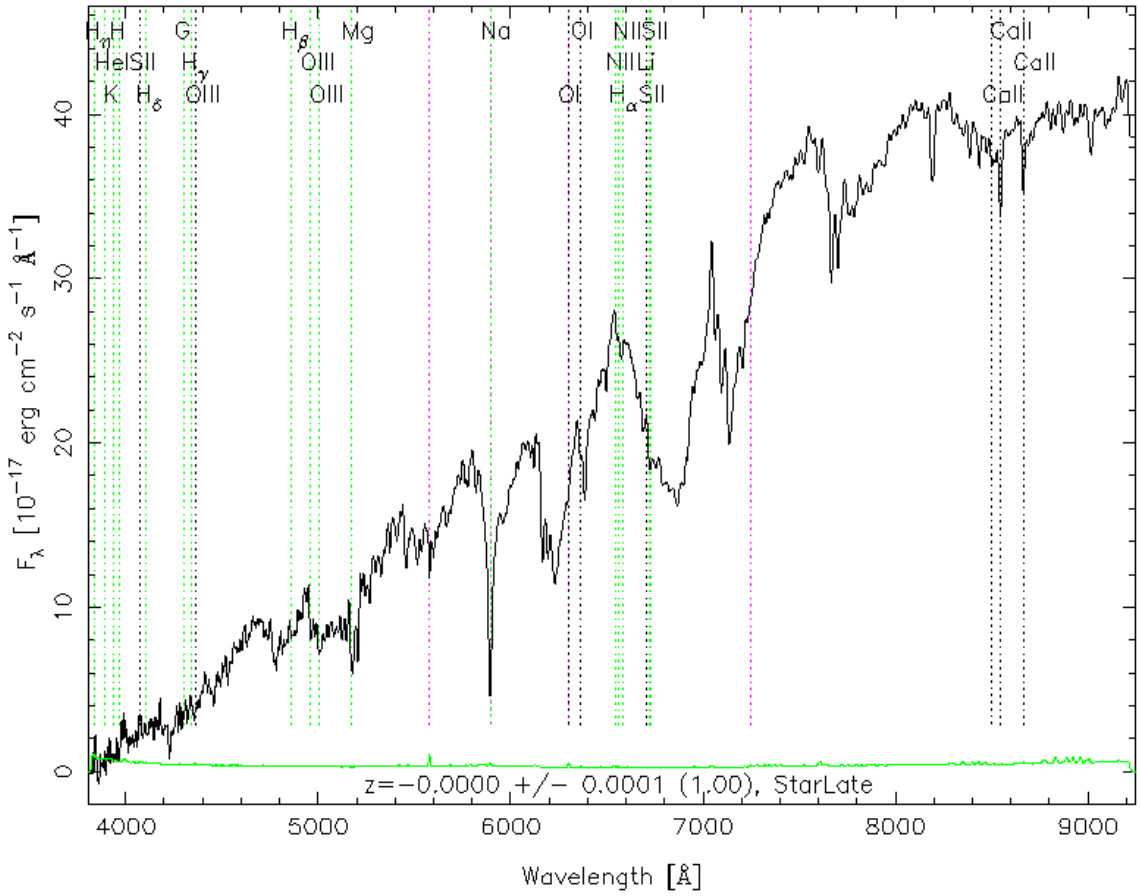

Figure 9: Spectroscopic data taken from the left-most star on Orion's "belt". The green line represents corrections in the data due to the local interstellar medium in J120103.

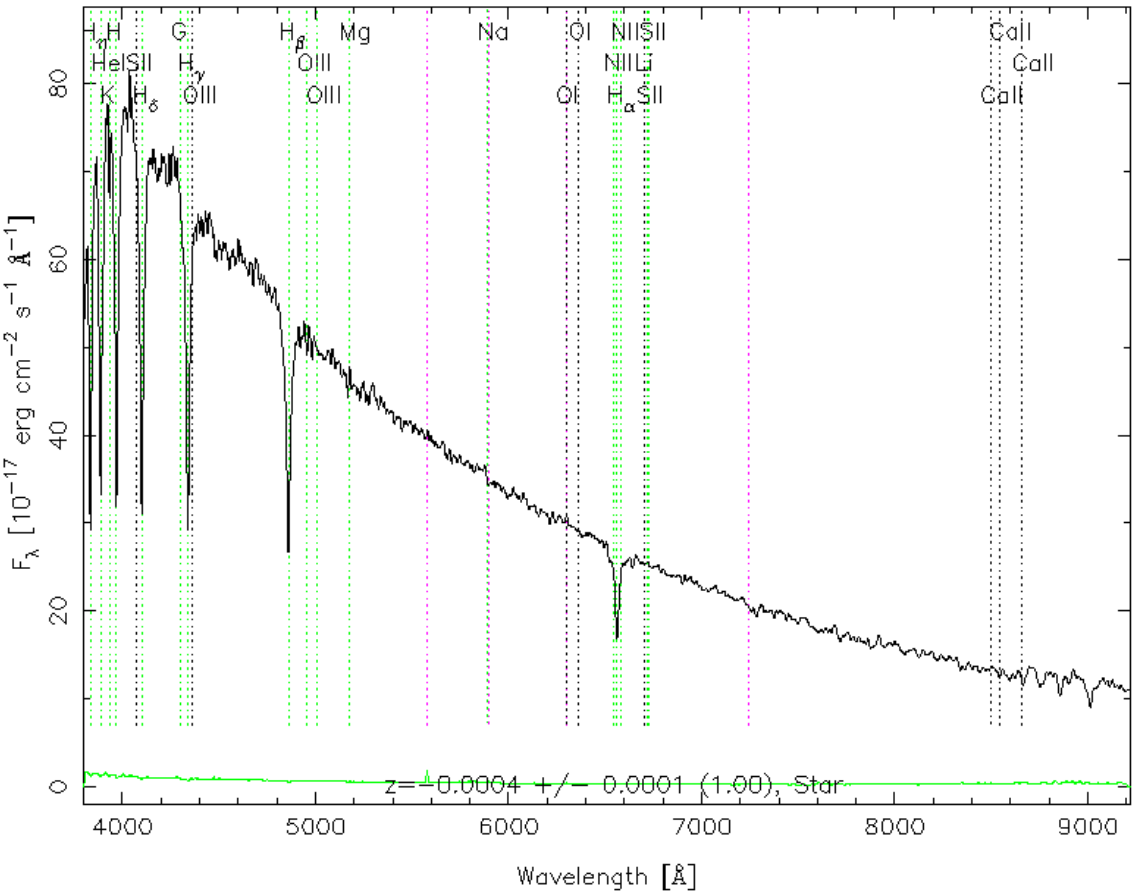

Figure 10: Spectroscopic data taken from the star in the lower right of Orion. The green line represents corrections in the data due to the local interstellar medium in Pelkia.

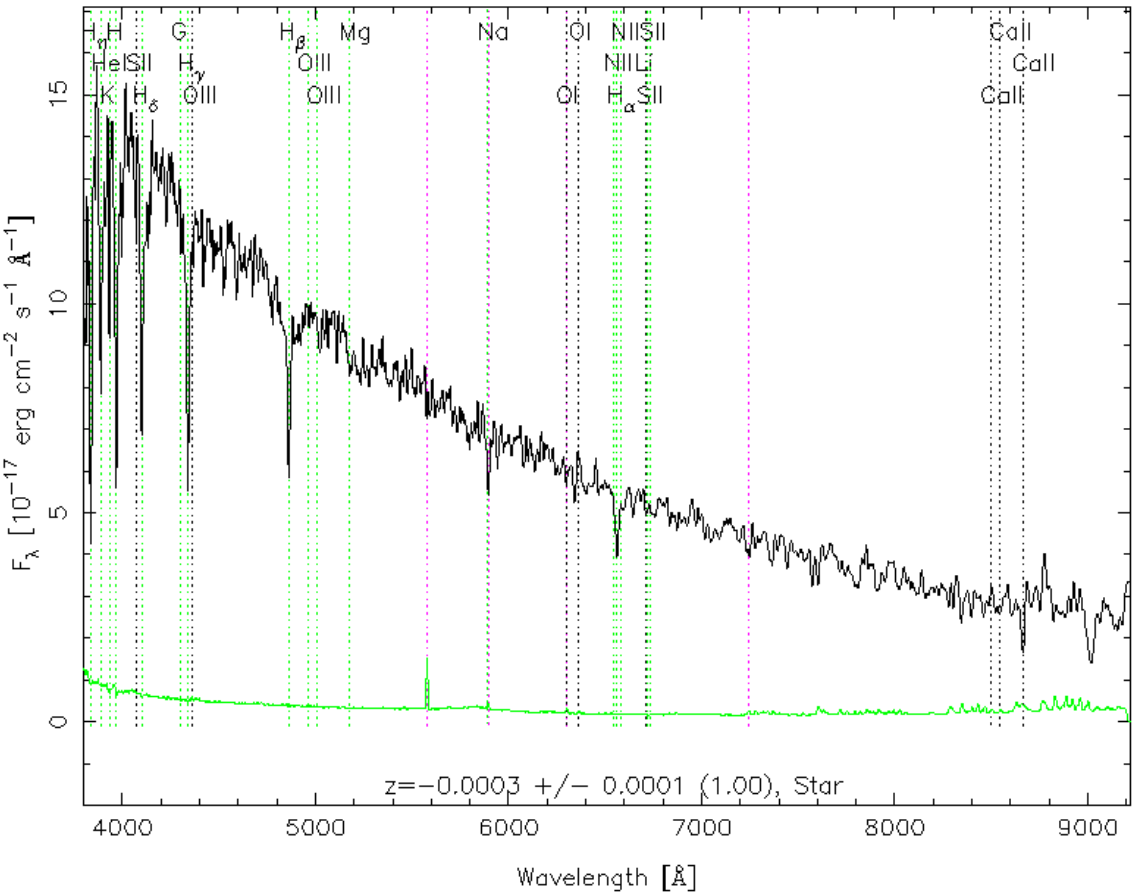

Figure 11: Spectroscopic data taken from the upper left star in Orion. The green line represents corrections in the data due to the local interstellar medium in J142055.