CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S1508

Project Title
Twinkle, Twinkle, Little Star: Adaptive Optics and Its Role in Stellar Scintillation

Abstract

Objectives/Goals
Does atmospheric pressure, temperature or humidity affect stellar scintillation?

Methods/Materials
1 pair of high power binoculars or telescope
1 stopwatch or timer
1 scientific journal
1 computer with Internet access, or a television with cable access
Select a star with which you will test your hypothesis. Discover and organize a time to take measurements. Using your Star Finder, locatate your star. Once you have found your star, locate actual star using your magnification equipment of a telescope or binoculars. Once you located your star, set your timer, stopwatch or timer to 1 minute. Once you press the button, begin to count the number of times the star #twinkles,# stopping when the counting device goes off. Record your observations in a scientific journal. Using the Internet or television, discover the current temperature, air pressure and humidity when you took your calculation, and discover the amount of telescopic adjustment used by the Palomar Observatory for that time period in order to compare results. Record findings. Analyze charts and raw data to form a conclusion.

Results
The data supported my hypothesis that temperature affects the amount of stellar scintillation that can be witnessed in a one-minute period, but disproved my hypotheses that air pressure and humidity also affect stellar scintillation. My data was supported by my research into the use of lasers to improve the visibility. The refractive index inhomogeneities of the turbulent air cause wave-front distortions of optical waves propagating through the atmosphere, leading to such effects as beam spreading, beam wander, and intensity fluctuations (scintillations).

Conclusions/Discussion
If I were to conduct my experiment again, I would change my technique for gathering and collecting data. There are so many variables involved when viewing the stars, that I would like to have been able to use a high-powered telescope, binoculars and the naked eye, and compared the different rates of scintillation that occurred for each, thereby providing myself with more conclusive data.

Summary Statement
I tested the variables that lead to intensity fluctuations of the stars and how adaptive optics helps with compensating for those variables.

Help Received
Mr. William Hatch and Dr. Catherine Ohara helped with the comprehension of the components of adaptive optics. Dr. Jonathan Koramora helped with the astronomy aspect of my project.