Colorado Science and Engineering Fair

2024 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: The Simulation of Gravity Waves

Finalist's Name: Zachary Carr

School and City: Limon Public School, Limon

Sponsor's Name: Becky Thompson

Category: Engineering (ENGR)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Atmospheric gravity waves, or specifically lee waves, are stationary atmospheric waves seen as masses of parallel, white slim clouds. Gravity waves could be described as "rolling clouds." The name gravity waves was intriguing and was the reason for the research. The goal was to display gravity waves on smaller scales and to help the understanding of their effects on the atmosphere.

With research, it was understood that gravity waves are acted with a force trying to restore a hydrostatic equilibrium with gravitational force dragging the air column down, and/or buoyancy raising the column up due to the air density. A stable atmosphere is needed as it performs the restoration of hydrostatic equilibrium.

To create the gravity wave chamber, a simple construction of a chamber was developed. Through testing this box was modified until it created a wave satisfying the requirements. This complete chamber was then tested further with four different tests all doing the same procedure.

Results found with the small-scale gravity wave chamber were that using liquid nitrogen entering a hot chamber creates a simulation of gravity waves. From data gathered, the waves can be seen to build to a climax then fall to dispersion, the higher force exerted to create a gravity wave, the larger it is, and with too much force, the gravity wave leads into a breaking wave.

Using these discoveries, further research could be done on the small-scale gravity waves to help understand the effect of the atmospheric gravity waves.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature: Z McCarr Date: 2/27/24

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES o all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.