# Seasonal Variation of the Lower Atmosphere

Hahn, Adeline

Climate change has been altering the atmosphere. Signs of climate change can be seen in the temperature lapse rate, radiation, ultraviolet light, and barometric pressure levels of the lower atmosphere. Through high altitude balloon launches, one in every season, data was collected through Arduinos, programmable mini-computers that operate from C++ code and circuitry. Code was written to open the SD card file, record the time, label the data, read the sensors and record the data. The sensors were wired to a breadboard, and pieces were 3D printed to attach the sensors to the payload box. The high altitude balloons flew to between 23,000 meters and 31,000 meters. The data showed levels of ultraviolet light to be 14% higher in April than October and February, with levels of 11 on the UV index, in the extreme range. Radiation level peaked in August at 20 km, with 1200 counts per minute. Spending one year in space at this altitude would be over the yearly occupation dose for radiation, and 19 times what average people receive yearly. Barometric pressure levels remained steady throughout the year. This is a good sign, as major changes in the atmosphere change the pressure of the atmosphere. The temperature lapse rate remained steady, -.0065 plus or minus 3%, in all months except February. However, data from the National Weather Service in Great Falls showed a lapse rate of -.0061, so sensor error is probably the reason behind the different data. The next step of this project would be to write Python code to be able to more easily analyze temperature lapse rate from the past century, as well as conduct more launches to see trends over several years.

**Awards Won:**