

## LIDAR Comparisons of Mixing Heights

This summer I did research at Sewanee: The University of the South for the physics department, studying the effects the Cumberland Plateau has on the diurnal cycle and night time inversion around Sewanee, Tennessee. We were interested in comparisons to the mixing height of the atmosphere at the top of the plateau, along the edge of the plateau, and at the bottom. The bottom of the plateau is where the effects on the atmosphere is well known through research done around plains. The edge of the plateau and the top is where we are interested in gathering data because not much is known about how a large body effects diurnal cycles, nighttime inversions, and mixing heights in general.

During my research I used a Vaisala CL31 Ceilometer to gather data on the mixing height and cloud base heights to analyse. A ceilometer uses LIDAR technology to detect distance (in our case cloud base heights), aerosols, cloud density, and mixing heights. The ceilometer is connected to a computer running a program called CL-View which handles data from the ceilometer to reveal the information we want. The CL-31 uses a 910nm wavelength laser and is eye safe. The laser fires in 50 microsecond pulses vertically into the air and is collected by the ceilometer itself. The raw data from the ceilometer is a number of counts as a function of distance which allows the program to determine how far above the ceilometer an object is, the closer an object or cloud is the shorter the distance the light travels and more returns are seen more quickly. With a

range of 25,000 feet and a resolution of 10 feet the ceilometer can accurately determine the range of whatever is overhead in our range of interest. The 5 minute deployment of the ceilometer made it ideal to use for our transections where we would take 10min of data at 5 locations, one at the top at Sewanee, three down the side of the plateau, and one at the bottom where it could be considered like a plain, then one at the top again. In addition to operating and maintaining the ceilometer I collected data on predicted mixing heights for our area to compare with our actual measurements, converted and uploaded our data, checked and recorded daily rain and temperature data for Sewanee. I was tasked with learning and becoming proficient in the programming language Python in order to understand and edit programming software for a remote weather station. The station is designed to take data from a number of instruments and transmit data via radio wave to a tower in Sewanee where it can be recorded and stored by a computer and analysed by Kevin Heirs. Equipment for the weather station was shipped to Sewanee where we assembled it and uploaded and tested the program provided by visiting colleges from Athens, Georgia.