Abstract

It is well established that LiDAR data taken from Earth’s surface has good applications towards investigating the impacts of air pollutants in the atmosphere. This thesis attempts to use the applications of LiDAR data with respect to current events that may be influencing total air pollutants and overall global climate warming. With the implementation of the sudden global lockdown due to the COVID-19 virus, an opportune moment was presented in which the use of transportation, and consequently the release of major human pollutants, was decreased quickly and drastically. In this report, I will attempt to determine the extent of the impact of human transportation on the total air pollutants and air “transparency” within Southern Ontario, Canada. In doing so, I must determine a method in which to process and compare LiDAR data from different time periods. To do this, I will look at an easily definable anomaly within the LiDAR data, such as that from the California wildfire smoke, and compare with normal conditions. By processing and establishing a method in which to compare data using a clearly definable anomaly, I will be able to apply the same techniques to data from the months of March2020 – Sept 2020 with a good deal of success. Thus, to accurately come to conclusions about the impact of this lockdown, I will determine a baseline (average) level of air pollutants and transparency using data from 2017 to the present day. Such a sudden decrease in human created pollutants during the months of the lockdown has never before been seen. This provides an ideal basis in which to determine the impacts of transportation pollutants on the atmosphere and henceforth come to a conclusion about the overall impact on global warming.

In about the data of interest from this time period, I determine a baseline using data from 2017 – present day baseline with which to compare data from March 2020 – Sept 2020 by working with LiDAR data from previous years.

I will establish a method (algorithm) that is able to

which is a major contributor to global climate warming, on the amount of air pollutants within Southern Ontario. In doing so, I will attempt to determine a baseline using LiDAR data from previous years

such as vehicles world wide In doing so, I will

Atmospheric data is complicated and can have a lot of variables that affect the data.

Focus the abstract into only the lockdown and determining the impact of the pollution there.

It is hard to find a baseline so the first thing would be to determine a baseline from the ceilometer and lidar data.

Start with the wildfires, so look at the month of September and look at the plots and see if there is something that stands out.

* Using atmospheric physics in order to determine the extent of climate change’s impact on atmospheric data for this year compared to other years and comparing to other sites
* Investigate the impact of the lockdown on the atmospheric “transparency”, and determine the average transparency using LiDAR data from years 2017 to 2020. This can quantify the effect of cars and transportation on the pollution in the atmosphere
* Investigate the impact of the California wildfires on air quality in Canada around the gta and London. Determine whether or not this will be a problem if the smoke cloud is coming into air that we breathe.
* Because this is a project in atmosphere physics, climate change can be a quantifiable measurement and so I am attempting to determine whether specific events from this year have a great impact on the data or not and why
* “smoke tends to stay in the air higher and will be deposited in lower atmospheres further downwind” – nasa. This could prove to be a problem for us
* I know that the fires and lockdown DOES have an impact on climate change, but to what extent is this impact and what are the repercussions?
* I could compare the smoke travelling to previous years of the wildfires and seeing if there is any link
* Determining the components of what make up the smoke that is travelling based on the refraction/reflection from lidar and then see the total impact from wildfires over the years and how much it changed (check California site in particular and then cross reference with sites in Canada and its impact there)
* Determine the particulate concentrations based on the refraction/reflection of particles using the lidar data to determine if they are harmful and contributing to climate change and whether they have the potential to harm humans if they are able to travel to lower layers of the atmosphere
* Smoke will pass over BC again today (oct 1) so could detect in BC and compare with here and determine the difference with distance from source

California wildfires:

* Essentially I will try to track the cloud from the California wildfires using the lidar data that is available
* Look at the concentrations and degree of dispersion, absorption, scattering within the US where there is smoke being detected
* Then look at Toronto and London lidar data and see the degree of absorption,scattering etc when smoke has been detected here and perhaps in BC as well
* And maybe in Europe to see if there are traces of the cloud within the atmospheric data there
* Then I will try to see if there is some sort of correlation with the degree of pollutants with respect to distance from the source
* Try to determine whether the components of the smoke will reach lower atmospheric layers where humans can be directly impacted
* TRACK the cloud of smoke and determine the degree of its effect in certain areas in the world

Lockdown:

* Again in this section, I am trying to compare with different sites around the world to see the degree of the transparency in the air within the months of March to September when the lockdown was put in place
* From the years 2017-2020 I can come up with an average transparency that can be quantifiable
* Use the lidar data to determine the flux of the pollutants within the air through the months in lockdown and otherwise
* Could potentially also determine the amount of backscatter from a particular pollutant and determine the relative impact of the pollutants

Overall, tying the two things together to come up with an overall impact of current events on the pollutants within the atmosphere.

Aeronet:

* Network of ground based photometers that measure the atmospheric aerosol properties
* Uses solar powered CIMEL electronight 318A spectroradiometers

<https://www.tandfonline.com/doi/pdf/10.1080/00022470.1969.10466474>

Graphical user interface, application

Description automatically generated