

Research Support Funding Application 2019/2020

Research Title:

“Analysis of Air Pollution Concentration over Pokhara, Nepal, AERONET Site of Nepal”

Applicant:

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1. Project Description:

1.1 Conception and Definition:

Analysis of air pollution data observed from different instruments is important in the field of health sciences. These days, air pollution is becoming one of the world's serious problems causing the deaths of millions of people every year (<https://www.who.int/airpollution/data/cities/en/>). Air pollution is also impacting global climate change and analysis of air pollution data will help to identify the source of pollution. A study of air pollution is also associated to identify the cause of various health issues such as variety of diseases, birth defects, death. Previously, a student from Franklin Pierce University (FPU) have analyzed the aerosol data observed from AERONET (Aerosol Robotic Network) site of Pokhara and was able to identify chemical components based on the aerosol optical data (Michael, C, 2017). Comparing the air pollution data observed from different instruments over the same location will give scientifically reliable data. In this proposed proposal, we will be using different instruments, Synsidyne Nephelometer, air pollution monitor in the same site. The air purple and Sensidyne Nephelometer will give surface level air pollution data and can be compared with the column integrated air pollution data, which will be available from AERONET website. The column air pollution data are significantly relied on the long range transportation of air pollution and surface level pollution data are mainly impacted by local pollution.

A Sensidyne Nephelometer and air purple are available at FPU, supported from previous research faculty funding support, and was used to measure the air pollution data over Jaffrey and Keene of New Hampshire. Air purple is continuously observing the data over Jaffrey, NH. The result of this measurement was presented in American Physical Society's March Meeting 2018 and International conference of American Association of Aerosol Research, in St. Louis, in the last

September 2018 (Parkhurst, et al., 2018; BARINELLI, A et al 2018). Along with my experiences of working, creating and leading scientific projects by involving students in Franklin Pierce University I am going to collaborate with the researchers from different Institutes of Nepal. This will provide the opportunity to obtain the access of pre and post air pollution data which might be important to extrapolate with our air pollution data. Collaborating with many national and international level researchers of this field and establishing relation with the investigators of this field for future collaboration will be very important for the access of air pollution data from different observation sites for future research activities.

Combining all these research performances, I am confident to lead a research project and engage undergraduate students for the study of experimental data and theoretical analysis of overall environmental impact of air pollution over the atmosphere.

2. Plan and Methodology:

I plan to work on measurement of air pollution data by using Sensidyne Nephelometer, purple air monitor over the Pokhara, where NASA has established an AERONET site (https://aeronet.gsfc.nasa.gov/cgi-bin/draw_map_display_inv_v3). I will visit the site and install the air purple instrument at the same location of AERONET Sites for about a month. I have already made a personal communication with principal investigator (Dr. Arnico Pandey, email: arnico@virginia.edu) of Pokhara AERONET site for installing our instrument at the same location and using their data. Our students will be invited for analyzing the air pollution data observed over Pokhara, Nepal. Before taking the instrument in Nepal, our students will be involved of using the instruments to measure the local level air pollution by using Sensidyne Nephelometer. One of our students have used this instrument in the last year, however, he graduated last spring and now I

am looking new students to handle this instrument. They will be trained for using this instrument and analyze the air pollution data.

At this time, Sensidyne Nephelometer needs to re-calibrate before using and therefore, it needs to be sent to the manufacturer company for calibration, which will take about a month.

3. Significance of the Project:

This work will be important on providing a reliable air pollution data at surface level by comparing atmospheric column size segregated air pollution data. The surface level air pollution data is important to correlate directly with the impact on health issues of the people. Our students from FPU will be trained to analyze and handle the instruments, which will prepare them to handle any scientific data based on the mathematical tool, collaborate with international level researchers. This will support our students to engage in a research related to health sciences and gain their knowledge for their independent research activities. They will receive the knowledge of using and handling the air pollution monitors before taking to Nepal for observing the data. Students will be prepared to prepare annual report, prepare abstract, manuscript to present in the scientific conference. I am confident that the research funding for this project will support my research continuation by involving students and make a collaboration with national and international

References:

BARINELLI, A., Miller, R.J., Parkhurst, L., Bitter, C., **Aryal, R.**, ; Measurement of Particle Concentrations in Southern New Hampshire , Paper Number: 4.RA.22; International Aerosol Conference, 2018, America's Center, St. Louis, Missouri (Abstract, Conference Proceeding, 2018)

Michael, C., **Aryal, R.P.**, Tripathi, S., Aerosol chemical components based on aerosol optical properties at different AERONET sites (manuscript in preparation for scientific journal)

Parkhurst, L., Barinelli, A., Miller, R., Bitter, C. **Aryal, R.**, ; Diurnal variability of total suspended particulate, PM 2.5, by using Sensidyne Nephelometer, American Physical Society March Meeting, 2018 (APS G 60.00042) (Abstract, Abstract, Conference Proceeding, 2018)

Michael, C., **Aryal, R.P.**, Thapa, M., Kafle, R., Tripathi, S., Atmospheric Aerosols and Effects on Biogeochemical Cycles and Climate II, Fall AGU meeting 2016 (A31 C) (Abstract, Conference Proceeding, 2017)

Marcq, S., Laj, P., Roger, J. C., Villani, P., Sellegri, K., Bonasoni, P., Marinoni, A., Cristofanelli, P., Verza, G. P., and Bergin, M.: Aerosol optical properties and radiative forcing in the high Himalaya based on measurements at the Nepal Climate Observatory-Pyramid site (5079 m a.s.l.), *Atmos. Chem. Phys.*, 10, 5859-5872, doi:10.5194/acp-10-5859-2010, 2010.

Smirnov A, Holben BN, Eck TF, Dubovik O, Slutsker I. 2000. Cloud Screening and quality control algorithms for the AERONET database. *Remote Sensing Environ.* **73**: 337–349.

3. Itemized Budget

Name of Items	Cost	Justification
1.Recalibration of Synsidyne Nephelometer	500	This instrument needs to calibrate in every two years
2.Students Assistants	1000	Students will be involved to use instruments and analyze the data. They will be paid hourly basis
3.Books related to research topics	0	0
4.consultation and seminar	1000	Using instrument at different place, we need some technicians and need to organize a meeting with local experts
4. Course Release Cost	0	
5.Room /Board Expenses	1500	While installing and observing the data we need support for board/room
Total Expenses	4000	4000