International Advance Journal of Engineering Research (IAJER)
Volume 2, Issue 1 (Jan- 2019), PP 04-06
ISSN: 2360-819X
www.iajer.com

Research Paper **Open Access**

Possibility of Using MODIS AOD Data for PM2.5 Monitoring

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ABSTRACT: Satellite-based remote sensing could serve as an alternative to station-based PM 2.5 monitoring because of its large spatial coverage. The purpose of this study was to explore the possibility of using MODIS AOD data for PM2.5 monitoring in the state of North Carolina (NC), United States. In this study, spatialtemporal correlation between MODIS AOD and ground PM2.5 was examined at daily, monthly and seasonal levels after corresponding values were matched for AOD and PM2.5. Temporal AOD-PM2.5 correlation was also examined for each Air Now PM2.5 station in NC. Results revealed that there was no statistically significant spatial correlation between the MODIS AOD and ground PM2.5 in NC at daily level in 2011. The temporal correlation between MODIS AOD and ground PM2.5 was statistically significant for every station in NC in 2011. This significant correlation will help develop a practical method for statewide PM2.5 monitoring using MODIS AOD in the U.S.

Keywords - AOD-PM2.5, correlation, spatial, spatial-temporal, temporal

I. INTRODUCTION

The paper therefore examines sampling as the most viable method of carrying out research in this area. Various descriptions (definition) of Panorle vis-a-vis population were x-rayed, we also looked at role of sample in research what an appropriate samples for a study should be: sampling methods and techniques that are available, what makes a good sample after the x-raying all available authorities work within the limit of available time, we found that though probability sample is most technically describable, many researchers in the social research adopt other methods in the non-probability approach. We concluded that whatever the method, what is essential is that problem solving must be preceded by research and samples study rather than population. It is mostly cost default, but the method to adopt should be contingent to balancing the level of technical ability, the degree of precision desired and the time and cost associated with the desired result.

Man is a rational animal, and rationality is the fact that he uses his faculty to solve problems. A lot of problems man solves are done by the process of observation of phenomena experimenting on causes and effects and according to Awokeni (2001), by conducting research in which information is discovered, tested and validated" whether any of the processes of solving problems above is adopted, in many circumstances the objects or events of observation, experiment or research study may be large, cumbersome, expendable or unattainable that it may be difficult if not impossible to cover all individual "candidates" (Onwuchekwa, 1993) the collection of their objects, individuals or events that share a common characteristic for observation or investigation is what Unyimadu (2005) called population.

Most human problem that requires solving which invariably gives rise to investigative study rests in the population. And to get matters clear about population, Macodo (1997) described population as the entire group of measurement or observation that the investigation is concerned with. It is also the totality of unit, unit under study (Macodo, 1997). Though, some of their collection of all the elements of study being studied Waller 1999 could be small enough do investigation by a researcher, most times census study is very often rather an expensive affair, especially when the population is large; hence, most authorities advocate sample study.

II. MATERIAL AND METHODS

In this study, Terra MODIS AOD 3km data (Atmosphere level 2 Aerosol Product in HDF format, Collection 6) collected in 2011 were ordered and downloaded from the Unites States Geological Survey (USGS) web site. HDF data processing procedures include the reprojection of MODIS AOD data to a universal traverse Mercator (UTM) projection and conversion of file format to Geo TIFF. Hourly PM2.5 data for each PM2.5 station in North Carolina was downloaded from the U.S EPA AirNow web site. AirNow is a U.S EPA program

that provides public with easy access to national air quality information online. There were seventeen AirNow stations providing hourly PM2.5 measurements in NC in 2011(Figure 1). The latitude and longitude of each AirNow PM2.5 station was used to create a shape file containing all hourly PM2.5 monitoring stations in North Carolina. To match overpass time of Terra satellite (10:30-12:30 pm local time), the average of PM2.5 concentration measured at 11 am and 12 pm for each day was selected for the correlation testing.

III. ROLE OF SAMPLE IN RESEARCH

Use of sample affords a researcher the ease and possibility of handling or managing the variables of interest in the study statistically so as to arrive at a definite and comprehensible conclusion with which he can make inference or generalization about the population. A great distortion would be introduced if all the variables of interest are studied in terms of the relationships existing between them, for large population (Cooper and Emory, 1995) this is because the manipulation of tools of statistics and mathematics may be incomprehensible by humans. Again "sampling possesses the possibility of better interviewing (testing). More thorough investigation of missing, wrong or suspicious information, better supervision and better processing than is possible with complete coverage (Cooper and Emory, 1995).

IV. SAMPLING METHODS

In many situation data must be estimated from samples. Optimal sampling methods are fairly well developed in statistics but there methods have not been used extensively in the collection of most data (Wheelwright and Makridakis 1985). Generally these numerous methods of sampling come under two classes.- probability sampling -non probability sampling The different classes of sampling achieve making sure the samples are representative of the population. The difference between them is that the probability sampling, every element in the population has a known chance though not equal of being selected in the sample (Unyimadu, 2005).

SUMMARY

Research must be conducted in order to give an informed decision in in problem solving. Knowledge must be available for human decision, and it may not be acquired without research. Research may require studying a population but in the management sciences where time and cost and human behavior is very dynamic, the only possible way to conduct a quick research and wet be able to use our result to generalize is by using sample study. While the most technical probability sampling, should be the ultimate in order to assure better accuracy and higher decree of precision so that our inference should be as high as 95% degree of confidence, other methods could be used depending on the situation, provided care is taken to conduct a creditable and acceptable study.

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