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The effectiveness of using MODIS data for monitoring and measuring climate change impacts in Egypt: Nile Delta and North Sinai Coast as a case study

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Undoubtedly, climate change is the greatest challenge facing the human being nowadays as the Earth's climate is getting warmer. The National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA) indicated that the average temperature of the Earth's surface has increased about 1.2 to 1.4 F since 1900. Other climatic aspects experienced changes as well such as patterns of precipitation and storms. The most common reason leads to climate changes is very likely the result of human activities(e.g. fuel combustion). Study area is the most regions of the world affected by climate change impacts according to the fourth report of the Intergovernmental Panel on Climate Change 4th Report of IPCC, 2007, where the report presents a scenario of damaged centers stability in Nile Delta, Port Said and Alexandria(10 million people are at risk), in addition to lose more than 86 square kilometers of the northern lakes, about 200,000 acres of the most valuable agricultural land a result of high temperature and the consequent rise in average sea level.In Egypt, air pollutants (e.g. SO_2 and CO_2) gave rise to high concentrations of air pollutants especially in Greater Cairo Region. For that reason, a national air quality network (42 stations) has been established by Egyptian Environmental Affairs Agency with the cooperation of the Danish International Development Assistance to monitor the status of the air environment in Greater Cairo region (14 stations), Alexandria (8 stations), Delta and Canal region (10 stations), Upper Egypt (9 stations) and Sinai (1 stations). It is, therefore, notable that concentrations of different pollutants varied considerably in space and time. The major objective of this study is to monitor and measure climate changes on the Nile Delta and northeastern coast of Egypt using integrated data obtained from MODIS images, climatic normals, in situ measurements, and national air quality network from 1998 to 2012. To achieve that aims the present study will use the HYDRA visualization software with the characteristics of the MODIS climatic data. MODIS is ideal for monitoring large-scale changes in the biosphere that will yield new insights into the workings of the global carbon cycle. While no current satellite sensor can directly measure carbon dioxide concentrations in the atmosphere, MODIS from both the Terra and Aqua platforms can be successfully used as a climate model to integrated with climate data from stations for linear regression estimates and measure the changes impacts of some elemnts such as daily maximum and minimum air temperatures changes, clouds cover, aerosols and carbon dioxide concentrations changes at a local scale on Nile Delta and North Coast. In this work, results obtained from MODIS data is validated using the previously mentioned data sets to reveal nature and characteristics of the climate change, changes in green house gas concentrations and aerosols. Also The results are in agreement with the observed values in the study area, and highly required for many applications related to Integrated remote sensing techniques with actual field measurements and data Meteorological Authority in different periods to Reduce the risk of climate change.

Key words: HYDRA visualization, Heat Island impacts, MODIS Images (Terra and Aqua).