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REGIONAL STUDY OF SEA SURFACE TEMPERATURE, CHLOROPHYLL AND AEROSOL CONCENTRATION IN THE NORTH ATLANTIC OCEAN USING MODIS DATA

Abstract

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report looks at the relationship between climate change and recent observed impacts in the natural and human environment. The report notes an increasing number of extreme events occurred in the past fifty years, and considers likely that higher temperatures, heat waves and heavy rainfall will become more frequent in the future, which can be disastrous for humankind. Information is based largely on data sets that cover the period since 1970 to produce studies of observed trends in the physical and biological environment. In this sense, Earth Observation plays a key role in order to provide global coverage and up–to–date data of many environmental parameters that are useful for studying climate change and global warming.

The effects of global warming vary from region to region around the planet, with studies focusing more in some areas than others. In this context, temporal and spatial changes in certain atmospheric and oceanographic parameters need to be accounted for as they can directly be affected by climate change. Thus, our work aims to assess aerosol optical depth, chlorophyll–a concentration, and sea surface temperature trends in the North Atlantic Ocean, as this area is considered a major player in climate change. Previous work has been done, covering, however, a previous time period or just considering coastal areas.

Aerosol optical depth, chlorophyll–a concentration, and sea surface temperature level 3 monthly MODIS imagery from NASA OceanColor have been used in this study. These data spanned March 2000 to November 2011 for MODIS Terra, and from July 2002 to November 2011 in the case of MODIS Aqua. Images contain a matrix of 8640 pixels in longitude and 4320 pixels in latitude, with 4.4km x 4.4km resolution geographical grids. The region of interest selected for our study covers the North Atlantic Ocean, with latitudes between 15°N and 45°N and longitudes from 10°W to 80°W.

A detailed study has been conducted analyzing grids of 220km x 220km in order to obtain a map highlighting those areas presenting a greater variation. This way a regional evaluation can be performed and the relation between the three parameters can be assessed. Global trends for the North Atlantic Ocean have also been computed showing a slight decrease of around 0.2° C in sea surface temperature and 0.02 mg/m3 in chlorophyll concentration.