DETERMINATION OF THE CHANGES IN WORLD SEA SURFACE TEMPERATURE BY USING GIS

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Global warming is one of the most important problems for humanity in 21st century. As a result of the increasing atmospheric carbon dioxide concentration, global temperatures rise by least 1-2 °C in the coming century. To bring the importance of the global warming to human's notice, showing the sea surface temperature changes in time interval should be an effective way. In this study, the world sea temperature changes are mapped in time intervals. Additionally the effects of the volcanic eruptions over the sea surface temperature are also examined in the scope of this study. Finally, sea surface temperatures were estimated for the years of 2025 and 2050 by examining the changes in time.

Sea surface temperature (SST) data weekly collected by NOAA The Climate Diagonastics Center between the dates of 29.10.1981 - 28.12.1989 and 31.12.1989 – 21.12.2008 were used for examining the changes on surface temperatures of the world seas. In the first step of the study existing location based raw data was reorganized for producing interpolated area maps. Universal Transverse Mercator projection, which is conform and has less total areal distortion, is used while mapping global SST and temperature changes in this study. MATLAB software was used transforming the geographic coordinates of the data to projected coordinates. In the second step; since there is not data from all over the Earth surface, Ordinary Kriging Interpolation method is used for interpolating the data to cover the world. Interpolation process was executed by using ArcGIS software and the results were visualized by using visualization tools of same software. The temporal sea surface temperature maps were compared bilaterally and effects of the volcanic eruptions were correlated with the changes on SST.

To be able to determine the climate effect on sea surface temperatures, the data of January and July dated 1982, 1997 and 2008 were used. The year of 1997 was particularly selected for observing the potential effects of Kyoto protocol which was signed in 1997. Estimations of the years to 2025 and 2050 were done by 3 different time series analysis methods that are basic mathematic regression, fuzzy logic and neural network. In usage of fuzzy logic and neural network, 5th time period was estimated from first 4 periods. Time periods were determined monthly for overcoming the difficulties on processing the weekly data that need a huge memory capacity. Estimations introduced by using neural network and fuzzy logic methods were resulted with accuracy of ± 2 ^{o}C. However these results were not considered as satisfying results since even 1 ^{o}C is very important in sea temperature. Therefore the results of basic mathematic regression, with an average accuracy of 0.8 ^{o}C, were used in the study.

As a result of this study an increase in sea surface temperatures were sighted in direction to north hemisphere from 1982 to 2008. Seasonal effects were clearly identified as increase in temperatures from January to July and decrease from July to January. Depending on the SST estimations obtained by time series analysis of the data dated the period of 1987-2008, the velocities of increase in temperature were determined as 0.11^{o}C/year and 0.065^{o}C/year for the years of 2025 and 2050 respectively.