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Climatological Modeling of Monthly Air Temperature and Precipitation in Egypt through GIS Techniques

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Abstract
This paper describes a method for modeling and mapping four climatic variables (maximum temperature, minimum temperature, mean temperature and total precipitation) in Egypt using a multiple regression approach implemented in a GIS environment. In this model, a set of variables including latitude, longitude, elevation within a distance of 5, 10 and 15 km, slope, aspect, distance to the Mediterranean Sea, distance to the Red Sea, distance to the Nile, ratio between land and water masses within a radius of 5, 10, 15 km, the Normalized Difference Vegetation Index (NDVI), the Normalized Difference Water Index (NDWI), the Normalized Difference Temperature Index (NDTI) and reflectance are included as independent variables. These variables were integrated as raster layers in MiraMon software at a spatial resolution of 1 km. Climatic variables were considered as dependent variables and averaged from quality controlled and homogenized 39 series distributing across the entire country during the period of (1957-2006). For each climatic variable, digital and objective maps were finally obtained using the multiple regression coefficients at monthly, seasonal and annual timescale. The accuracy of these maps were assessed through cross-validation between predicted and observed values using a set of statistics including coefficient of determination (R2), root mean square error (RMSE), mean absolute error (MAE), mean bias Error (MBE) and D Willmott statistic. These maps are valuable in the sense of spatial resolution as well as the number of observatories involved in the current analysis.