Interpolating of climate data using R

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Interpolation methods are used in many different geoscientific areas, such as soil physics, climatology and meteorology. Thereby, unknown values are calculated by using statistical calculation approaches applied on known values.

So far, the majority of climatologists have been using computer languages, such as FORTRAN or C++, but there is also an increasing number of climate scientists using R for data processing and visualization. Most of them, however, are still working with arrays and vector based data which is often associated with complex R code structures. For the presented study, I have decided to convert the climate data into geodata and to perform the whole data processing using the raster package, gstat and similar packages, providing a much more comfortable way for data handling.

A central goal of my approach is to create an easy to use, powerful and fast R script, implementing the entire geodata processing and visualization into a single and fully automated R based procedure, which allows avoiding the necessity of using other software packages, such as ArcGIS or QGIS. Thus, large amount of data with recurrent process sequences can be processed.

The aim of the presented study, which is located in western Central Asia, is to interpolate wind data based on the European reanalysis data Era-Interim, which are available as raster data with a resolution of 0.75˚ x 0.75˚, to a finer grid. Therefore, various interpolation methods are used: inverse distance weighting, the geostatistical methods ordinary kriging and regression kriging, generalized additve model and the machine learning algorithms support vector machine and neural networks. Besides the first two mentioned methods, the methods are used with influencing factors, e.g. geopotential and topography.