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World Köppen-Geiger gridded climatologies by means of different datasets: changes in climate classes between 1951-80 and 1981-2010

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On a global basis, climate classification is one of the most widespread ways to describe climate features and climate change issues. In scientific literature, many different classifications can be found, but the most used ones are based on the Köppen scheme and its further modifications into Köppen-Trewartha (K-T) and Köppen-Geiger (K-G) schemes. For our analysis we adopted the K-G whose main inputs are monthly precipitation and mean temperature data. A subset of sixteen derived secondary variables is then computed including seasonal precipitation sums, the amount of precipitation of the winter and summer wettest and driest months, the temperature of the hottest and coldest month, and so on. This set is eventually used to divide the climate into 5 major classes (cold, arid, tropical, continental, and oceanic) and many sub-classes for a total of 31 climate classes. In general, the K-G scheme is mainly defined by temperature values, whilst precipitation regimes are mostly used to derive the sub-classes.
The aim of this study is double: update the world K-G maps to 2010, and compare the results obtained by means of different datasets as input. In the next future, we plan updating K-G grids to 2012. Global and European K-G climatologies have been computed for two periods (1951-80 and 1981-2010) directly on the 0.5˚x0.5˚ (Global) and 0.25˚x0.25˚ (European) grids. We present a K-G map for both periods obtained with the various datasets supported by statistics that account for the shifts in each climate class. We based our analysis on three different combinations of datasets: the first one uses global precipitation and mean temperature data of the CRU dataset (version 3.2, Climate Research Unit of University of East Anglia); the second one uses global gridded mean temperature of CRU and gridded precipitation from the Global Precipitation Climatology Center (GPCC, Full Data Reanalysis Version 6.0) of the Deutscher Wetterdienst (DWD); the third one uses the E-OBS (version 7.0) gridded temperature and precipitation data from the European Climate and Assessment Dataset (ECA&D, Royal Meteorological Institute of the Netherlands) in order to perform a detailed continental case study.
According to the mixed GPCC-CRU, cold climate areas decreased from 23.3% in 1951-80 to 22.1% in 1981-2010, whilst arid areas increased from 17.7% to 18.7%. For the other main climate classes no significant changes were observed (tropical from 14.6% to 14.7%, warm oceanic from 17.0% to 17.2%, cold continental from 27.4% to 27.3%). In the Northern Hemisphere the changes are most evident for cold areas (from 19.4% to 17.8%), whilst in the Southern Hemisphere this is true for tropical areas (from 28.2% to 29%) and warm oceanic areas (from 16.7% to 15.6%). These results are confirmed by using the CRU-CRU dataset which results in similar class values. All the datasets agree on the fact that Europe is highly involved in changes: it is particularly evident for the cold continental areas (from 57.9% to 53.4%) that are turning into warm oceanic areas (from 32.2% to 37.2%).