



A High-resolution Köppen-Geiger climate classification for Europe: update to 2011 and decadal evolution from 1951-60 to 2001-10. Do we need new classes?

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The Köppen-Geiger climate classification is a simple but very effective and widespread way to categorize geographic regions according to monthly and annual mean temperature and precipitation sum. It is based on more than 30 classes that can be basically grouped in: polar, alpine, desert, steppe, tropical, subtropical, Mediterranean, oceanic and continental climates. All of them are further sub-divided in other classes. We used a new quality-checked and complete temperature and precipitation monthly dataset for 2001-11 to update the Köppen-Geiger maps, including high-resolution grids (grid cell resolution: 0.1°) for the last 11 years. More than 4,700 records have been used to draw annual maps and a decadal 2001-11 average map. We used two approaches: we interpolated temperature and precipitation on the grid with external drifted Kriging models and then calculating the climate classes on the grids; otherwise, we calculated climate classes on the station locations, then we interpolated the results on the grids with a nearest neighbor technique. Here, we show that at $0.1^\circ \times 0.1^\circ$ resolution the differences between both options are very small. Then, we used the E-OBS temperature and precipitation grids to calculate the decadal maps of the Köppen-Geiger climate classification of 1951-60, 61-70, 71-80, 81-90, 91-00, 2000-10: we show maps and statistics of how many grid cells have changed from one class to another during the 60-year period. There is a clear evidence of an increase of desert-like regions in Europe, especially in the Mediterranean area and in the Balkans, mainly due to the temperature increase in the last 20 years. In the end, using the land cover maps provided by JRC, we discuss a possible modification of the Köppen-Geiger classes that may better fit the current European climatic conditions, also because the Köppen Geiger classes were conceived for worldwide maps.