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Precipitation Indices Low Countries

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Since 1995, KNMI published a series of books(1), presenting an annual reconstruction of weather and climate in the Low Countries, covering the period AD 763-present, or roughly, the last millennium. The reconstructions are based on the interpretation of documentary sources predominantly and comparison with other proxies and instrumental observations. The series also comprises a number of classifications. Amongst them annual classifications for winter and summer temperature and for winter and summer dryness-wetness. The classification of temperature have been reworked into peer reviewed (2) series (AD 1000-present) of seasonal temperatures and temperature indices, the so called LCT (Low Countries Temperature) series, now incorporated in the Millennium databases. Recently we started a study to convert the dryness-wetness classifications into a series of precipitation; the so called LCP (Low Countries Precipitation) series. A brief outline is given here of the applied methodology and preliminary results.

The WMO definition for meteorological drought has been followed being that a period is called wet respectively dry when the amount of precipitation is considerable more respectively less than usual (*normal*). To gain a more quantitative insight for four locations, geographically spread over the Low Countries area (De Bilt, Vlissingen, Maastricht and Uccle), we analysed the statistics of daily precipitation series, covering the period 1900-present. This brought us to the following definition, valid for the Low Countries:

A period is considered as (very) dry respectively (very) wet if over a continuous period of at least 60 days (∼two months) cq 90 days (∼three months) on at least two out of the four locations 50% less resp. 50% more than the normal amount for the location (based on the 1961-1990 *normal period*) has been measured.

This results into the following classification into five drought classes hat could be applied to non instrumental observations:

Very wet period (+2): Wide scale river flooding, marshy acres and meadows.-Farmers cope with poor harvests of hay, grains, fruit etc. resulting in famines.-Late grape harvests, poor yield quantity and quality of wine.

Wet period (+1): High water levels cq discharges of major rivers, tributaries and brooks, local river floodings, marshy acres and meadows in the low lying areas.-Wearisome and hampered agriculture.

Normal (0)

Dry period (-1): Low water levels cq discharges of major rivers, tributaries and brooks. Some brooks may dry up.-Summer half year: local short of yield of grass, hay and other forage.-Summer half year: moor-, peat- and forest fires.

Very dry period (-2): Very low water levels cq discharges of major rivers and tributaries. Brooks and wells dry up. Serious shortage of drinking water; especially in summer.-Major agricultural damage, shortage of water, mortality stock of cattle. Shortage of grain. Flour can not be produced due to water mills running out of water, shortage of bread, bread riots, famines.-Large scale forest and peat areas, resulting in serious air pollution. Town fires.

By verifying the historical evidence on these criterions, a series of 5 step indices ranging from very dry to very wet for summer and winter half year of the Low Countries was obtained. Subsequently these indices series were compared with the instrumentally observed seasonal precipitation sums for De Bilt (1735-2008), which is considered to be representative for the Central Netherlands. For winter (Oct-March) and summer half year (Apr.-Sept.) the accumulated precipitation amounts are calculated; these amounts are approximately normally distributed. Based on this distribution, the cumulative frequency distribution is calculated. By tabulating the number of summers in the pre-instrumental period 1201-1750 for each of the drought classes, a distribution is calculated which is then

related to the modern accumulated precipitation distribution.

Assuming that the accumulated precipitation amount has not been below (above) the mean precipitation minus (plus) three standard deviations for the corresponding season, an accumulated precipitation amount which relates to each of the five drought classes in the classification can be estimated.

(1) Buisman, J. , Van Engelen, A.F.V. (editor), Duizend jaar weer wind en water in de Lage Landen, Van Wijnen, Franeker (Netherlands), Vol. I763-1300, 1995, Vol. II, 1300-1450, 1996, Vol. III, 1450-1575, 1998, Vol. IV, 1575-1675, 2000, Vol. V, 1675-1750, 2006.

(2) Shabalova, M.V., Van Engelen, A.F.V., Evaluation of a reconstruction of winter and summer temperatures in the Low Countries, AD 764-1998, Climatic Change 58: 219-242, 2003