CLIMATE

The reference period for climate is 1961-1990. The Royal Meteorological Institute and the civil and military aviation authorities supplied the observations that were used. All the data are preserved in the archives of the Royal Meteorological Institute. Incomplete data sets have been treated by the recommended statistical tecchniques of R. Sneyers (Dupriez & Sneyers, 1978, for precipitation; Sneyers & Vandiepenbeeck, 1985, for temperature).

Precipitation

The spatial distributions of precipitation and of their variations in the course of the year are shown on the six figures, as follows:
a) five maps of which one depicts annual precipitation and the others are for the months of January, April, July and October, chosen to represent the chief seasonal characteristics;
b) a cartogram representing the regime types and their spatial distribution.

Two types of information appear on each of the maps:
a) isohyet lines spaced at 50 mm intervals (by year) or 5 mm intervals (by month) up to a certain level (1000 mm an year or 80 mm a month) after which the intervals are doubled; so that the intervals should at least be equal to the smallest significant statistical difference between adjacent stations, a difference which is more marked in the well watered areas of highland Belgium;
b) colour patches in proportion to the difference between the observed values at each station and the expected values as a function of altitude for the relevant period (regression line); these patches are green or red depending on whether the residual is positive or negative.
The residuals resulting from the altitude regression calculation have been integrated into a simple model (Alexandre *et al*, 2000). For each ground point:

R (precipitation) = a · Z (altitude) + b + r (residual)

a and **b** are given from the regression calculation using the available 277 rainfall stations;
Z: the altitude, has been found from a numerical terrain model (from a 500 metre grid, in view of the degree of detail required);
r: the residual value at the point under consideration, has been calculated by interpolation using the kriging procedure (the value is a function of the observed values within a defined perimeter).

Period	**a** (rate of precipitation)	**b** (sea level precipitation)
Year	8.4 mm/100m	745 mm
January	1.0 mm/100m	58 mm
April	0.7 mm/100m	50 mm
July	0.6 mm/100m	68 mm
October	0.45 mm/100m	68 mm

Commentary on the different isohyet maps is facilitated by the presence of residuals which underline the zones where precipitation accords with the regression values or deviates from it abnormally. Factors resulting in residuals besides that of relief are:
a) Exposure or shelter related to the atmospheric rainfall circulation. The southern slopes of the Ardenne are often better watered than the central Ardenne (the Ourthe above Laroche and the upper basins of the Sure and the Our) and even, in winter the plateau of the Hautes Fagnes.
b) The conditions that are favourable to instability precipitation due either to the environment (Antwerp Campine, in winter), or to a relief resulting in conditional instability (Hautes Fagnes, in July).
c) Proximity to the sea where the surface temperature is temporarily higher, as is the case in Flanders in the month of October.

Annual precipitation regimes are identified on the basis of the position during the year of absolute and secondary maxima, as well as by their amounts. There are extensions throughout the year of periods of abundance and drought.
In the wider context, each of the regions shows a maximum centred on the beginning of winter (October, November or December), a slowing down in February, a limited recrudescence in the month of March and a new maximum in summer (June or July). The more typical regimes are exemplified by those of Deinze, Liège-Cointe and Carlsbourg, where the maximum peaks are produced respectively in October, June-July and December. In contrast, in the western Ardenne (Amblève) all months are well watered.
The regime analysis has been made so made such that there is only a slight variation between the stations within each group whilst there is a greater variation between the groups. The disparate character of certain small zones within the confines of larger homogeneous spreads, for example the Antwerp region and the valley of the Senne, is due to this objective step by step linking method of classification, and depending itself on the number of groups.

Temperature

The method used for the maps of mean temperature is almost identical to that used for the maps of precipitation. Two types of information are equally represented:
a) isotherm curves with an interval of 1° C, for the months of January and July as well as for the year.
b) positive and negative values at different levels to indicate variations with regard to the 208 thermometric stations.
The model is the same type as that used for precipitation:

T = a · Z + b + r

The regression characteristics this time being:

Period	**a** (relating to altitude)	**b** (sea level temperature)
Year	-0.53° C/100m	10° C
January	-0.63° C/100m	2.8° C
July	-0.45° C/100m	17.4° C

The spatial interpolation of the residuals (**r**) is more delicate than in the case of precipitation because of the impact of the immediate environment of the station on temperature, especially minimum temperature which frequently affects the calculation of the mean. A clearing, a local source of warmth, can produce very localised values and these should only interfere feebly in the relative estimation of neighbouring points. The residuals with respect to the regression permit these anomalies to be localised and have, besides, the merit of underlining those spaces which react together, as is the case with the larger regions such as "maritime" Flanders, the Campine, the high plateaus of the Ardenne, the Gaume, and again, certain valleys and heat islands which surround large towns and the industrial sites.

Wind

The cartogram relating to winds shows two types of information: the mean annual windspeed (in metres/second) and frequency distribution according to direction of origin, both at 10 metres above the ground. These observations have only been made at certain aerodromes (about fifteen in all). They indicate a too high influence of the immediate environment, as can be seen from the disparities between the wind roses where the dominant effect of katabatic winds is seen in the wind rose for Spa-Malchamps. Nevertheless, some main features can be seen as far as the mean wind speeds are concerned: they are very high along the coasts, diminishing rapidly inland, slowly increasing in the Ardenne, then decreasing again in Lorraine, features confirmed by measurements in neighbouring stations in foreign areas near to Belgium.

Summary bibliography:

J. Alexandre, M. Erpicum, G. Mabille, and Y. Cornet. 2000. *Précipitations atmosphériques et altitude. Prélude à une cartographie des montants mensuels et annuel sur le territoire de la Belgique.* Publication of the International Association of Climatology. V. 13.
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R. Sneyers and M. Vandiepenbeeck. 1985. *Les normales du réseau thermométrique belge.* Royal Belgium Meteorological Institute, publications Series A, n° 106, 34p.