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MINISTRY OF TRANSPORT

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Danish Climatological Normals 1971-2000
for European Climate Atlas

Danske klimanormaler 1971-2000
til Europæisk Klimaatlas

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The report (pdf-format) and the matching data set can be downloaded from the publication part of DMI webpages (www.dmi.dk).

Indholdsfortegnelse/Table of Contents

Introduktion

Nærværende rapport præsenterer en række danske klimanormaler for perioden 1971-2000 for 8 lokaliteter jævnt fordelt ud over landet.

Klimanormalerne er det danske databidrag til et nyt Europæisk Klimaatlas, der udgives i et samarbejde mellem de forskellige Europæiske Meteorologiske Institutter.

Det skal bemærkes at nogle af klimaelementerne har en definition forskelllig fra, hvad der er normal praksis på Danmarks Meteorologiske Institut (DMI).

Rapport (pdf-format) og tilhørende data kan hentes på DMI's Internetsider (www.dmi.dk) under "Publikationer".

Introduction

This report presents a number of danish climate normals in the period 1971-2000 for 8 stations throughout the country.

The climate normals is the danish data contribution to a new European Climate Atlas, to be published in a collaboration between the National Meteorological Services in Europe.

Please notice that some of the climate elements have a definition different from the normal practice at the Danish Meteorological Institute (DMI).

The report (pdf-format) and the matching data set can be downloaded from the publication part of DMI web pages (www.dmi.dk).

Observationer og metoder

Meteorologisk døgn og måned
Et "meteorologisk døgn" er defineret så det begynder kl. 06 UTC (GMT) om morgenen og slutter kl. 06 UTC den følgende morgen. 06 UTC er det samme som kl. 07 dansk vintertid (eller dansk normaltid) og kl. 08 dansk sommertid.

En "meteorologisk måned" begynder derfor kl. 06 UTC den 1. i måneden og slutter kl. 06 UTC den 1. i den efterfølgende måned. I denne rapport's tabeller og datafiler vil datoen for en hændelse, der registreres i løbet af et meteorologisk døgn, altid være anført den dag, hvor det meteorologiske døgn slutter. Eksempelvis kan datoen for maksimum temperatur for marts derfor være anført som 1. april, selv om maksimum indtraf den 31. marts.

Stationerne
Rapporten præsenterer månedsværdier og normaler for to stationstyper (se også kort):

Synoptisk station
Denne type station observerer vejr, skydække, sigtbarhed, snedække, lufttemperatur, relativ fugtighed, vind, lufttryk og nedbør kl. 00, 03, 06, 09, 12, 15, 18 og 21 UTC eller oftere. Selvom nogle af stationer har foretaget observationer hver time er disse ikke medtaget i denne rapport. Verden over følger synoptiske stationer altid det samme måleprogram med målinger mindst hver 3. time og de følger de samme retningslinier for målingerne. De danske synoptiske stationer har i tid og rum opereret med en forskellig grad af automation og det har selvfølgelig haft en indflydelse på, hvordan parametrene nøjagtigt er observeret. Stationsnummeret for synoptiske stationer i Danmark består af 5 cifre, altid begyndende med cifrene 06.

Observations and methods

The meteorological day and month
The 'meteorological day' starts at 06 hours UTC (GMT) in the morning and ends at 06 hours UTC the following day. 06 hours UTC is 07 hours Danish Winter Time (or 07 hours Danish Normal time) and 08 hours Danish Summer time.

The 'meteorological month' thus starts at 06 hours UTC on the first of the month and ends at 06 UTC on the first of the following month. In the tables and data files in this report, an event occurring during a meteorological day is always assigned to the date on which the meteorological day ends. The date of the maximum temperature for March could thus be listed as 1 April although the maximum was reached during 31 March.

The stations
This report presents the monthly values of observations from two different types of observation stations (see also the map):

Synoptical station
This type of stations observes weather, cloud cover, visibility, snow cover, air temperature, relative humidity, wind, air pressure and precipitation at 00:00, 03:00, 06:00, 09:00, 12:00, 15:00, 18:00 and 21:00 hours UTC or more often. Although some stations has observed every hour the clock around, they are not a part of this report. Synoptical stations all over the world follow at least the 3-hour interval around the clock, and they always follow the same guidelines. Synoptical stations in Denmark have operated with different automatisation both in time and space, which has of course affected how the parameters is observed. The station number describing synoptical stations in Denmark consist of 5 digits, always starting with the number 06.

Manuel solstation

Denne type station måler døgnets solskinstimer fra midnat til midnat. Der er her kun medtaget observationer af solskin fra en station, nemlig Skagen. Det skyldes, at det er den eneste solstation, der er placeret samme sted som den synoptiske station.

Fejlagtige og manglende data

Alle observationer, der ligger til grund for denne rapport er omhyggeligt blevet undersøgt og samtlige fejlagtige og manglende data er blevet rettet op eller fjernet, før der er beregnet månedsværdier og statistikker. DMI har arkiveret information om samtlige nødvendige justeringer af dataserierne.

Homogenitet

Homogenitet - både i tid og rum- af observationerne er kritisk for enhver type analyse. For at en serie kan regnes for homogen, må målingerne af den pågældende klimaparameter ideelt være udført med samme type instrument og på samme måde gennem tiden. Hvad angår den rumlige homogenitet må de enkelte instrumenter på de forskellige målesteder også være kalibreret ens.

Inhomogeniteter opstår når en eller flere faktorer ændrer sig over observationsperioden. Ændringer i instrumentering, fx introduktionen af automatisk udstyr, vil ikke nødvendigvis lede til en "pludselig" inhomogenitet, men mange ændringer af denne type gør. Stationsflytninger har næsten altid en effekt og det samme gælder nogle gange observatorskift, selvfølgelig specielt når vi har med visuelle observationer at gøre. Faktorerne kan også ændre sig gradvist, fx vegetation der vokser, og i disse tilfælde kan observationerne udvise en ikke naturlig trend.

Manual sunshine station

This type of stations measures hours of bright sunshine around the clock every day. There are only included sunshine duration from one station, Skagen. This is due to the fact, that this is the only sunshine station placed together with the synoptical station.

Erroneous or missing values

All the series of original observations have been examined carefully and all erroneous or missing data have been corrected or removed before calculating the monthly values and statistics.

DMI maintains information on the origin of the monthly values in every series.
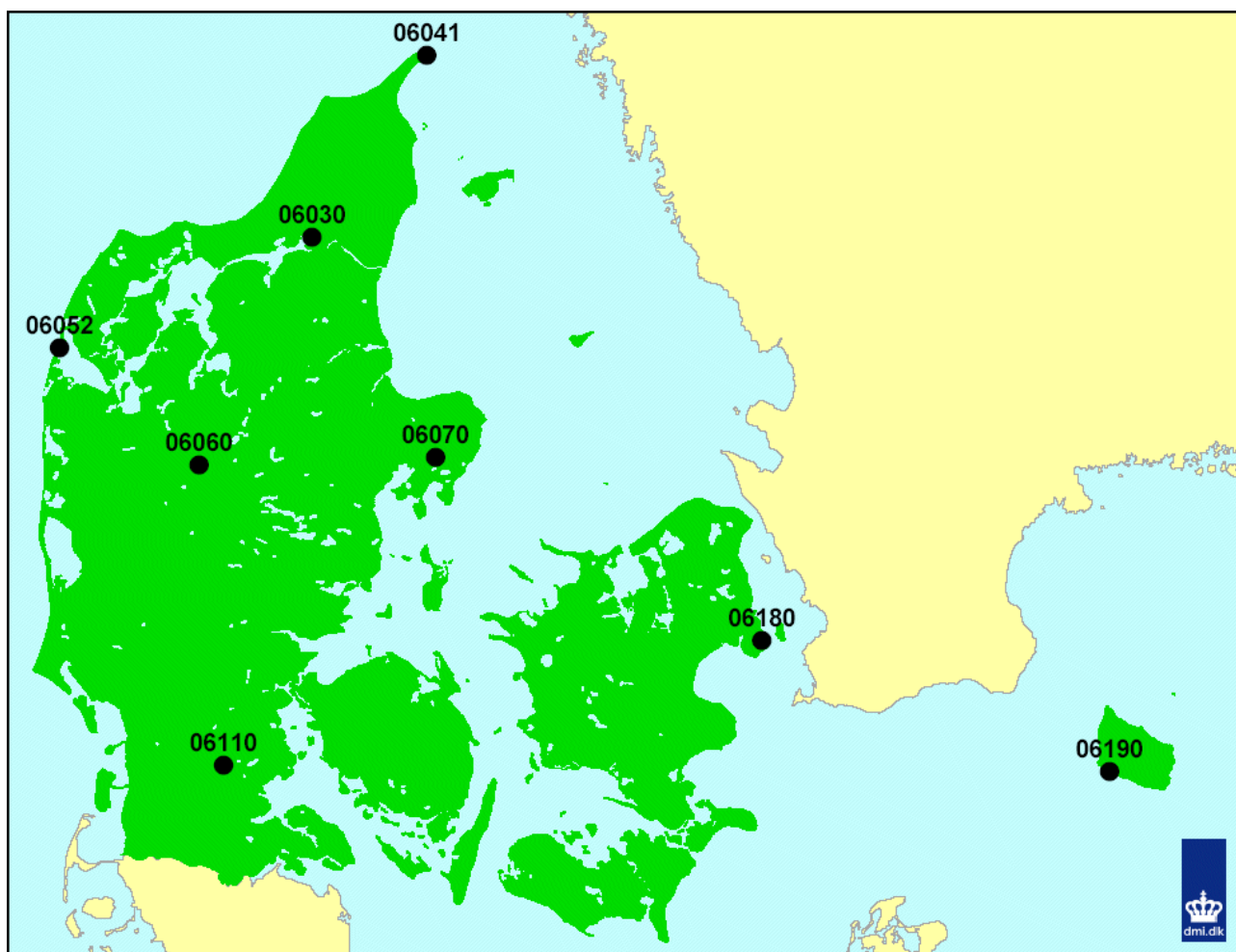
Homogeneity of the series

Temporal and spatial homogeneity of observations is critical to any kind of analysis. The homogeneity of a series requires the local measurement to have been carried out with the same type of instrument and according to instructions unchanged over time. For spatial homogeneity the individual instruments must also be calibrated in the same way as their neighbours.

Inhomogeneity occurs when one or more factors change during the observation period. Changes in the instrumentation set-up, e.g. the introduction of automatic equipment, do not necessarily lead to abrupt inhomogeneity, but many changes do. The relocation of a station nearly always have an effect. The same applies sometimes to changes in observers, especially with regard to visual (subjective) observations. When one or more factors change gradually i.e. vegetation, the series can show a non-natural trend in the observations.

Siden 1971, har det ikke kunne undgås at ændringer af ovenstående typer i et vist omgang er indtruffet på de danske målesteder, men det har tilsyneladende ikke påvirket homogeniteten af de enkelte serier væsentligt. For at være sikker på, at alle serier i denne rapport er så homogene som muligt, har de, udover en nøje gennemgang af de enkelte til grund liggende observationer, også undergået et grundigt visuelt check, hvor de samtidig er blevet sammenlignet med andre beslægtede parametre fra samme station.

Since 1971, different types of changes have occurred at the observation sites in Denmark, but apparently these changes have not affected the homogeneity of the series significantly.

To ensure an acceptable level of homogeneity, all the series - in addition to a careful examination of the original observations - have been subjected to close visual scrutiny, under which they also have been compared with the time series for related climate elements from the same stations.

Kort, der viser placeringen af de DMI vejrstationer, der har leveret data til rapportens talmateriale.

Map showing the positions of the DMI weather stations, having delivered data to the this report.

Klimadata til Europæisk Klimaatlas

Data er præsenteret i forskellige filer: en datafil med måneds- og årsværdier, vindrose filer og endelig en fil med metadata.

Måneds- og årsværdier

Datafilen består af måneds- og årsmiddelværdier af et antal parametre (se nedenfor). Datamaterialet er baseret på perioden 1971-2000.

Der er en linie pr. station og parameter. Hver linie indeholder 13 værdier for en given parameter: 1 værdi for hver måned og 1 for året. Data er adskilt af komma (,).

Hvis data mangler, bliver der ikke angivet en værdi og det resulterer således i to efterfølgende kommaer (,,), med mindre det er sidste værdi i linien, der mangler.

Climate data for European Climate Atlas

The data are presented in different files: a data file with monthly and yearly values, wind rose files and finally a metadata file.

Monthly and yearly data

The data file consist of monthly and yearly means of a selection of elements (see below). The statistics are computed for the reference period 1971-2000.

There are one line per station and parameter. On each line are 13 values of a given parameter: 1 value every month + 1 annual value. Data are separated by a comma (,).

If data are missing, no value is present, resulting in two successive comma (,,), unless it is the last value of the line.

ACRONYM	FORMAT	CLIMATE ELEMENTS (unit)
NUM_POSTE	I5	WMO station code
RR_RRMOY	F5.1	mean total rainfall (mm)
RR_RRQ1	F5.1	lower quintile of total rainfall (mm)
RR_RRQ4	F5.1	upper quintile of total rainfall (mm)
RR_J1MOY	F4.1	mean number of rainy days with RR >= 1mm (days)
RR_J5MOY	F4.1	mean number of rainy days with RR >= 5mm (days)
RR_J10MOY	F4.1	mean number of rainy days with RR >= 10mm (days)
RR_JOGMOY	F4.1	mean number of days with thunder (days)
RR_JGRMOY	F4.1	mean number of days with hail (days)
RR_JNGMOY	F4.1	mean number of days with snowfall (days)
RR_JBRMOY	F4.1	mean number of days with fog (days)
RR_RRAB	F5.1	maximum 24h rainfall (mm)
RR_RRDAT	DD/MM/YYYY	corresponding date
T_TNMOY	F4.1	mean daily minimum temperature (Tn) (°C)
T_TNQ1	F4.1	lower quintile of the mean daily minimum temperature (°C)
T_TNQ4	F4.1	upper quintile of the mean daily minimum temperature (°C)
T_TNAB	F5.1	lowest Tn (° Celsius)
T_TNDAT	DD/MM/YYYY	corresponding date

ACRONYM	FORMAT	CLIMATE ELEMENTS (unit)
T_TXMOY	F4.1	mean daily maximum temperature (Tx) (°C)
T_TXQ1	F4.1	lower quintile of the mean daily maximum temperature (°C)
T_TXQ4	F4.1	upper quintile of the mean daily maximum temperature (°C)
T_TXAB	F4.1	highest Tx (°C)
T_TXDAT	DD/MM/YYYY	corresponding date
T_TMMOY	F4.1	mean daily mean temperature (Tm) (°C)
T_TMQ1	F4.1	lower quintile of the mean daily mean temperature (°C)
T_TMQ4	F4.1	upper quintile of the mean daily mean temperature (°C)
T_TGMOY	F5.1	mean number of frost days (Tn<= 0°C) (days)
T_TGQ1	F5.1	lower quintile of number of frost days (days)
T_TGQ4	F5.1	upper quintile of number of frost days (days)
T_TX0	F4.1	mean number of days with Tx <= 0°C (days)
T_TM18	F4.1	mean number of days with Tm >= 18°C (days)
T_TX25	F4.1	mean number of days with Tx >= 25°C (days)
T_TX30	F4.1	mean number of days with Tx >= 30°C (days)
T_TN5	F4.1	mean number of days with Tn<= -5°C (days)
VENT_J28MOY	F4.1	mean number of days with maximum wind gust >= 28m/s
VENT_J16MOY	F4.1	mean number of days with maximum wind gust >= 16m/s
VENT_FXIAB	F4.1	speed of the maximum wind gust (m/s)
VENT_DXIAB	F4.1	direction of the maximum wind gust (degree, rose of 360°)
VENT_FXIDAT	DD/MM/YYYY	corresponding date
INS_INSMOY	F6.1	mean sunshine duration (h)
INS_INSQ1	F6.1	lower quintile of sunshine duration (h)
INS_INSQ4	F6.1	upper quintile of sunshine duration (h)
INS_JI8MOY	F4.1	mean nb of days with fraction of sunshine duration >= 0.8
INS_JI2MOY	F4.1	mean nb of days with fraction of sunshine duration <=0.2

NB! All quintiles are derived from the distribution of the 30 monthly or yearly data.

Vindrose data

Vindrose data for perioden 1971-2000 er præsenteret i specielle filer (én pr. station). Dataformat kan ses nedenfor.

Wind rose data

Wind rose data for the period 1971-2000 are presented in special files (one per station). See the the data format below.

The first line: WMO Station code, number of directions (18 for Denmark) of the wind rose (Format(I5,I2))
Then one line per direction from I=1 to 18:
Line I: dir (I), FF1, FF2, FF3   (Format (F5.1, (3xF8.5)))
Where: dir(I)= I x 22.5 and FF1 (resp. FF2 and FF3) is the frequency in percents of the occurrence of wind speed in direction dir(I) for the 1.5-4.4 m/s (resp. 4.5-8.0 m/s and > 8.0m/s) ranges.
A (N+1)[th] line is added for calm winds (< 1.5 m/s):
Line N+1: dir, fcalm (Format (I5.1, F8.5))
where: dir = 0 and fcalm is the frequency in percents of the occurrence of calm winds.

Metadata
Metadata er "data om data" og filen består af den mest grundlæggende information om stationerne fx stationsnummer, navn og geografiske koordinater osv., se dataformat nedenfor.

Metadata
Metadata are "data about data" and the file consist of the basic information of the stations i.e. station number, name, geographical co-ordinates etc., see the data format below.

The format for the metadata file is as follows (one line per station):

WMO Station code, usual name of the station, postal ZIP code, name of area, latitude, longitude, altitude, insol

All data are separated by a comma (,).

insol=1 in the case where sunshine duration is measured, 0 otherwise.

The "name of area" are the name of the county.

Latitude and longitude are expressed in degrees, minutes, tenths of minutes.

Datafiler

Datamaterialet medfølger denne rapport i 10 ASCII filer:

1 datafil (**datafile.txt**)
1 metadata fil (**metadata.txt**)
8 vindrose datafiler (**windrosexxxxx.dat**)

Data er i alle filer adskilt af komma (,). På side 9 og 10 er indholdet af de enkelte filer specificeret.

Data files

Data are inclosed in this report as 10 ASCII files.

1 data file (**datafile.txt**)
1 metadata file (**metadata.txt**)
8 wind rose data files (**windrosexxxxx.dat**)

Data are in all files separated by a comma (,). On page 9 and 10 the contents of each file are described.