Primary author: **Kern-Hansen, Claus** (DMI - Danish Meteorological Institute, Data and Climate Division), ckh@dmi.dk

Abstract ID: 1O1

**From observation to climatological informations**

Founded in 1872 with the purpose to “observe the weather, disseminate these observations (to the public) and conduct research with in the field of scientific meteorology” the Danish Meteorological Institute has a long history in data-collection and -management.

From the very beginning the climatological data-management was highly prioritized.

The Climatological Department operated the Climatological Network and issued the Climatological Reports. Such a focus lasted for more than 100 years.

However as the scientific meteorology and technology developed in the decades after the Second World War, the overall focus shifted towards the new possibilities in the use of computers and numerical weather prediction. Leading to a less profound role for climatology and climatological data-management.

With the digitization of observations on a regular basis (late 1950’ies/beginning 1960’ies) and the installation of a digital database, new options were present and the focus shifted from traditional climatology to the utilization of weather observations in climatological reports and statistics.

With a historical touch the presentation will address the major issues and challenges of the climatological data management at DMI within the last decades and the present situation and challenges.

# From observation to climatological information

*(national overview, Denmark)*

Claus Kern-Hansen

Head of Data & Climate Divison

# Intentions of the presentation

to give you

- a little flavour of the **history** of climate data and management in Denmark
- snapshots of the **present day** situation and topics which will be covered in depth the coming days,
- a view of some of the major **challenges** for the years to come
- The **answer** to the Question ? – *what does the weight of 10 elephants has to do with Danish observations and climate data ?*

DMI

# Intentions of the presentation

to give you

- a little flavour of the **history** of climate data and management in Denmark
-
-
-

# The very beginning 1872

*Figur 4. Søkortarkivets bygning i Toldbodgade i København, hvor DMI havde til huse. Læg mærke til kassen, hvor det daglige vejrkort blev opslået ved indgangen.*

# 3 areas of focus

- **observe** the weather
- disseminate these observations (**to the public**)
- conduct **research** with in the field of “scientific meteorology”

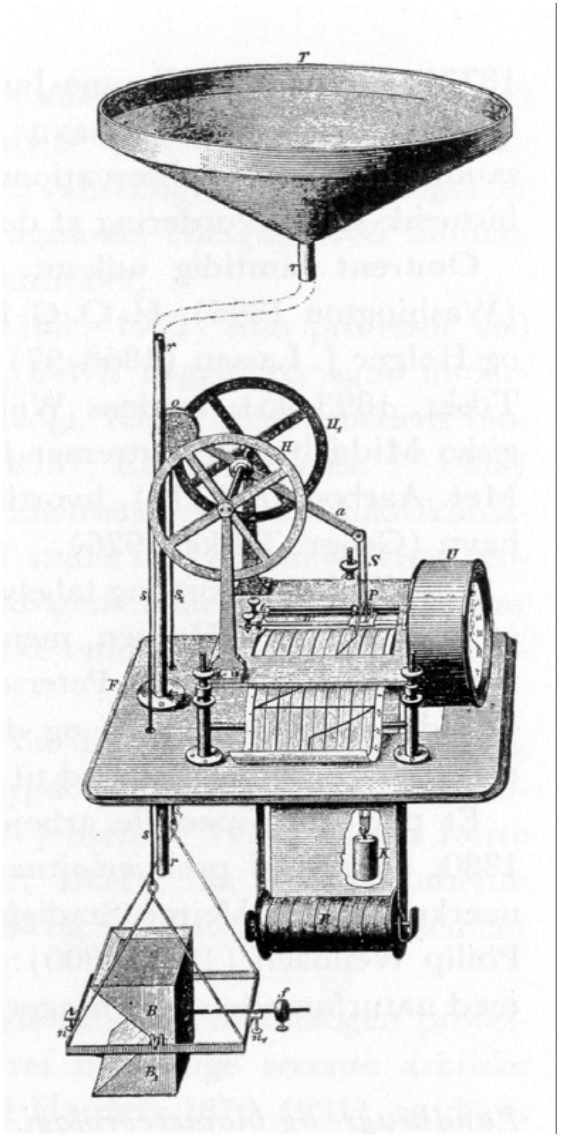
DMI

# G Rung one of the pioners

*Figur 1. Georg A. Rung (1845-1903), oprindelig officer og ansat ved DMI april 1872. Chef for Vejrtjenesten fra dens oprettelse (1883-1903) og en betydelig opfinder, til gavn for både Vejrtjeneste og Klimaafdelingen.*

- In his book from **1885 "Selfrecording meteorological instruments constructed by G Rung, deputy director of meteorological institute, captain in the danish army" (in danish)**, you can read about the thermograph, pluviograph, barograph and anemograph – instruments to automatic recording of temperature, precipitation, airpressure and windspeed

- In 1873 – one year after the foundation of MI the Institute had already 140 climate stations in Denmark, and the first climate bulletins were published in the Meteorological yearbook 1874.



# The History of the Danish Meteorological Services

1872: Establishment of the **Meteorological Institute** (1)
(under the Naval Ministry)

1926: Establishment of the **Aeronautical Meteorological Service** (2)
(under the Civil Aviation Administration)

1953: Establishment of the **Danish Defence Weather Service** (3)
(under the Danish Armed Forces)

1990: **The Weather Services fusion** -> **DMI** (1+2+3) and are placed under the Ministry of Transport

Today DMI is under the **Ministry of Climate & Energy**

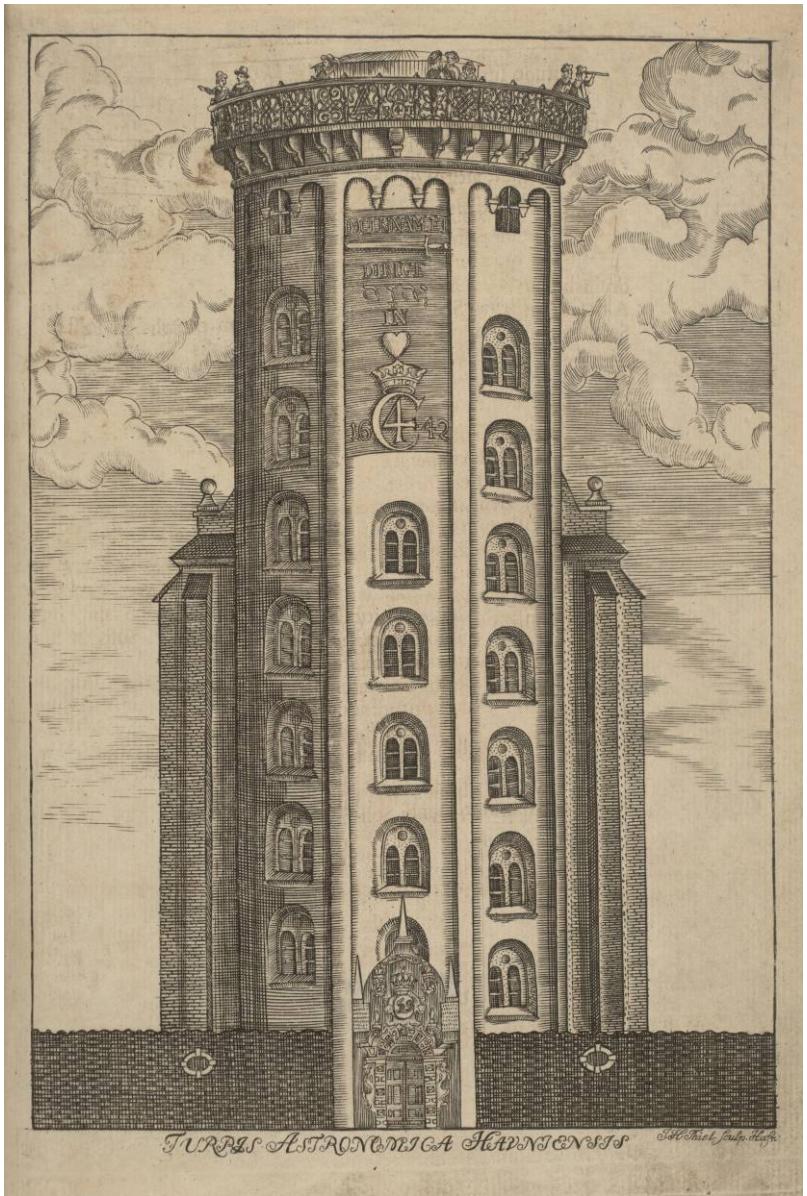
DMI

## Pre-Meteorological Institute (before 1872)

# In 1751 meteorological observations in the Round Tower in Copenhagen were initiated.

**But only data from 1767 and onwards are usable as measures of the outside air temperature ……**

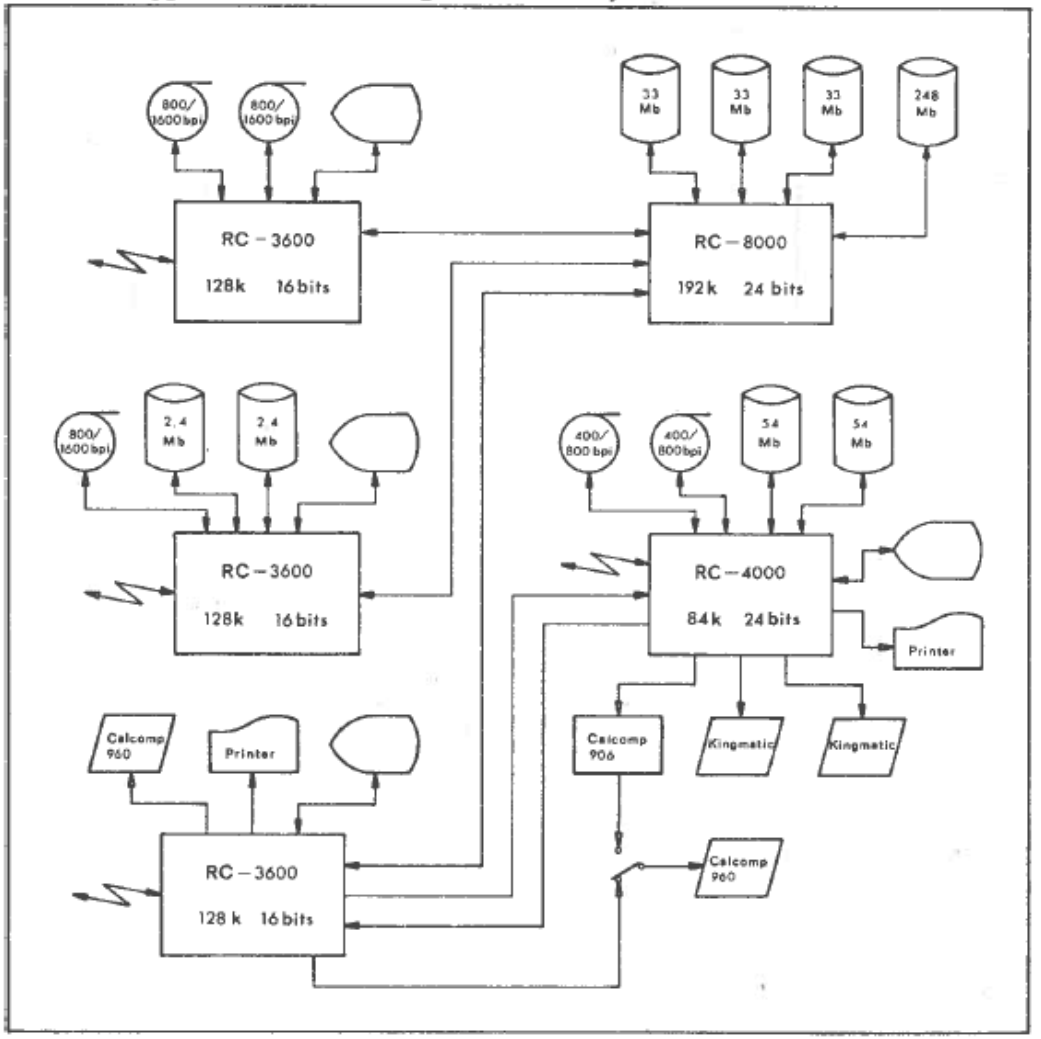
(you will get the answer on Friday….)



- However as the scientific meteorology and technology developed in the decades after the Second World War, the **overall focus shifted towards the new possibilities in the use of computers and numerical weather prediction**. Leading to a less profound role for climatology and climatological data-management.
- With the digitization of observations on a regular basis (late 1950'ies/beginning 1960'ies) and the installation of a digital databases, new options were present and the focus shifted from traditional climatology to the utilization of weather observations in climatological reports and statistics.

# The hightech computerinstal-lation at DMI 1983

EDB-anlægget ved Meteorologisk Institut januar 1983

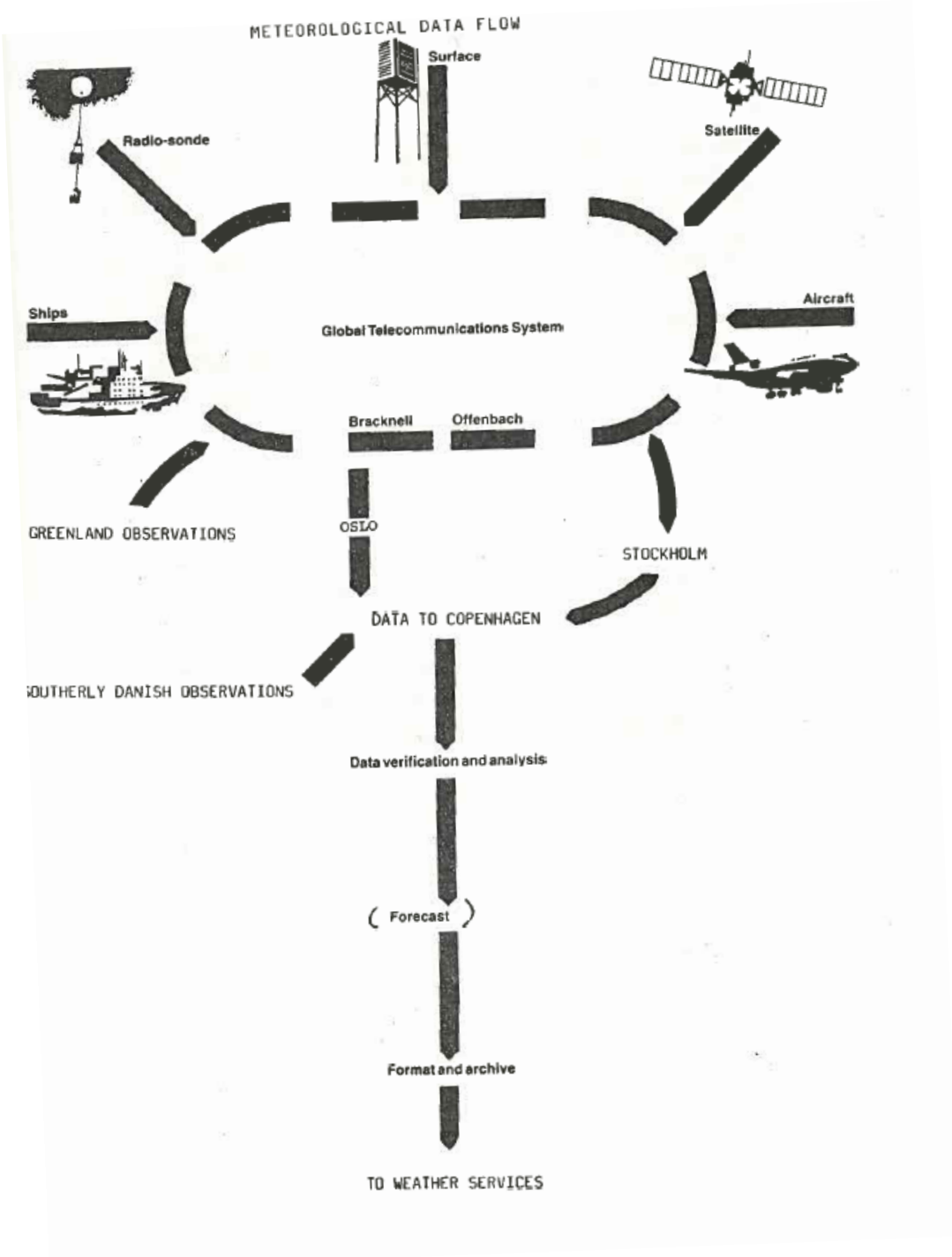



Anlægget er koblet til et RC8000 anlæg ved flyvevejrtjenesten i Kastrup. Derudover er anlægget koblet til et RC3600, et RC8000, CDC 835, CDC 750 og et CRAY-1 anlæg placeret ved det vesteuropæiske meteorologiske center i England.

# In the good old days .....

where everything were as simple as this

(the ”meteorological dataflow” = digital datamanagement, at DMI anno 1983)



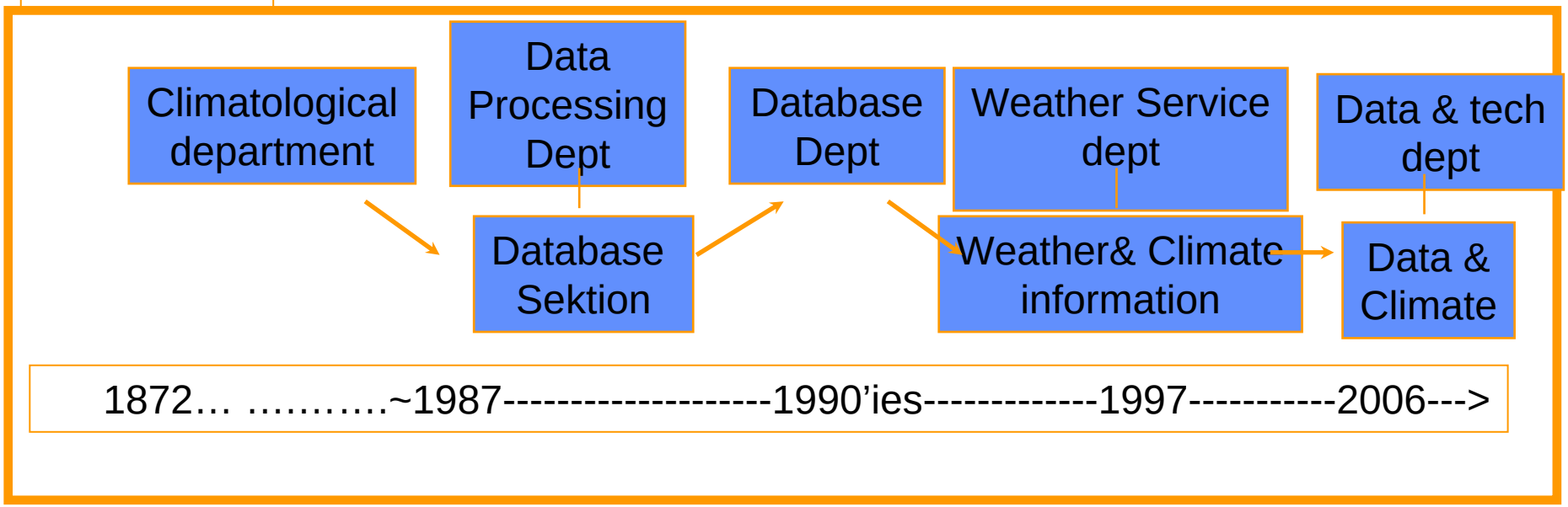
# the basis for the meteorological database at DMI.

- 1982 expert group - report
- This working group concluded on three items:
- - there was a need for such an database
- – it was recommended that it was operated by DMI
- – and paid by the users

DMI

# User driven (and financed )

Org. history climatedata:




Obs service -> 1980'ies:
Organization according to purpose (climate, weather, aeronautic, oceanographic..)
⇒Different station networks, routines, techniques and data management

• manual instrumentation (or none evaluative)

Obs service i 1980 & 90 and 00'ies :
One unified observation department
Modernisation of the station network, data management and data storage.

First Electronic database

•Automatic stations & and Remote sensing (radar satellite)

Obs service today.

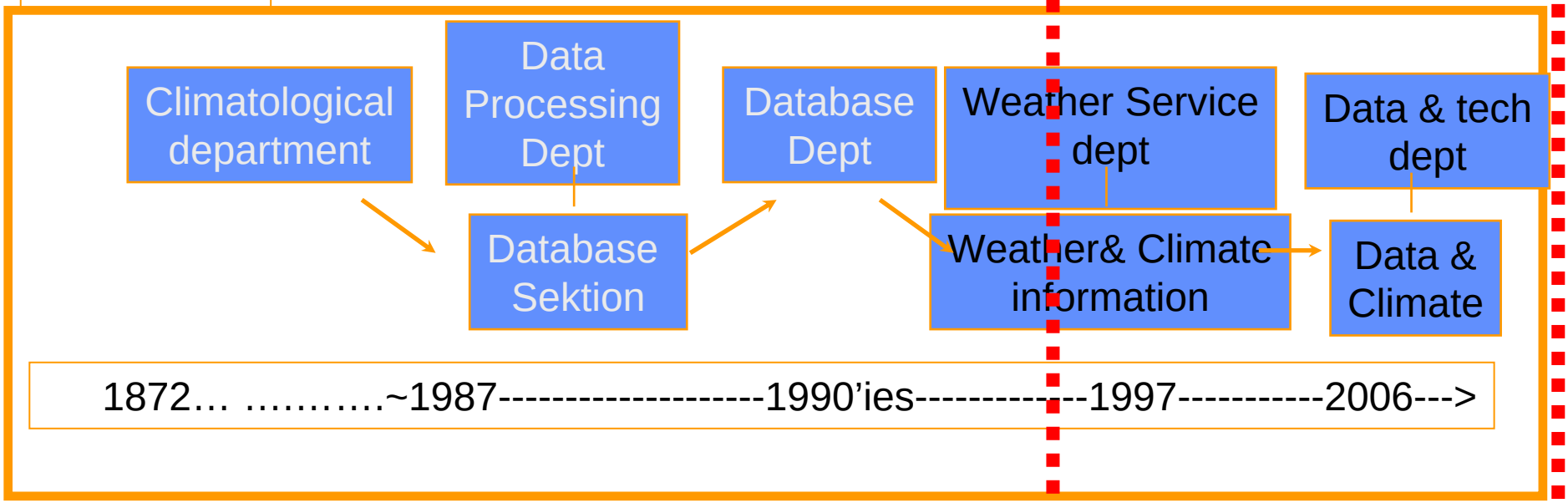
Completing the automatisation of station network
**Project on new unified databases**
Focus on increased sampling frequency
Incorporating remote sensing

# Intentions of the presentation

to give you

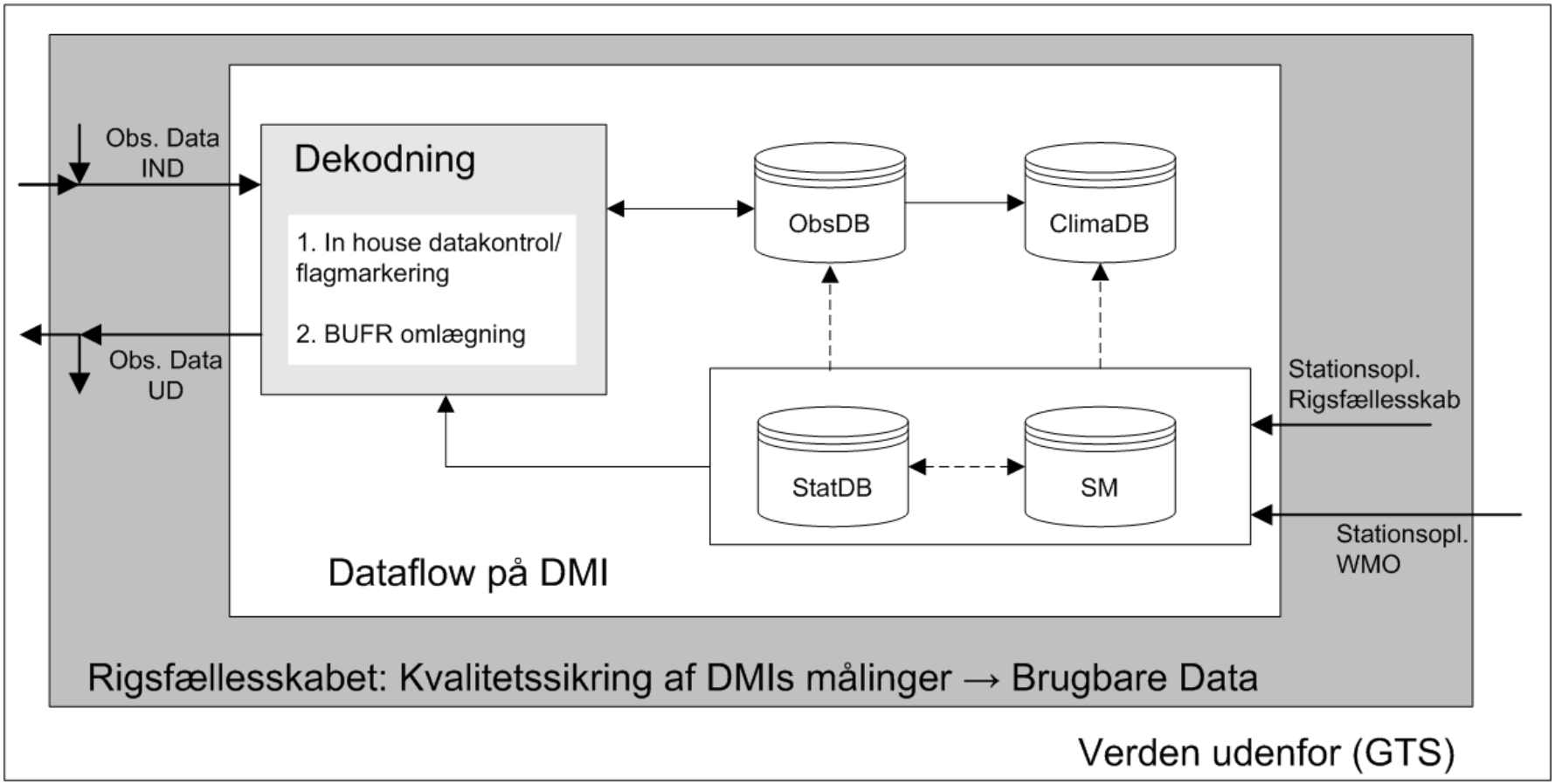
- a little flavour of the **history** of climate data and management in Denmark
- snapshots of the **present day** situation and topics which will be covered in depth the coming days,
-
-

Org. history climatedata:



# New databases:

*(to be addressed the coming days)*



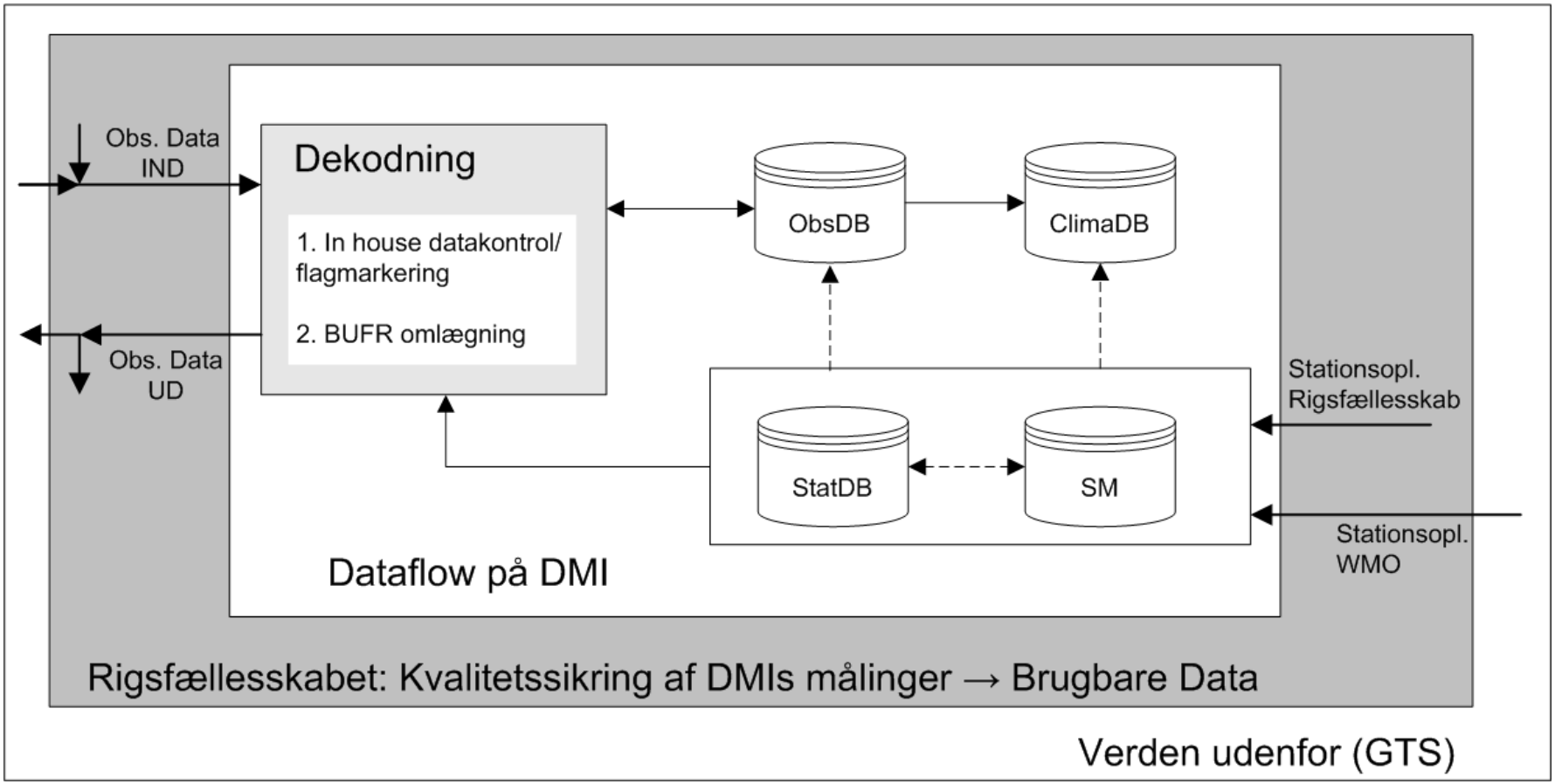
# Mapping of datatypes at DMI (2002)

- ”..,.more that 50 og 100 different types of meteorological in-data…
- …as output more that 400 different products are generated
- ….the number of operational databases are around 15
- ……unknown number of analoge data archives

DMI

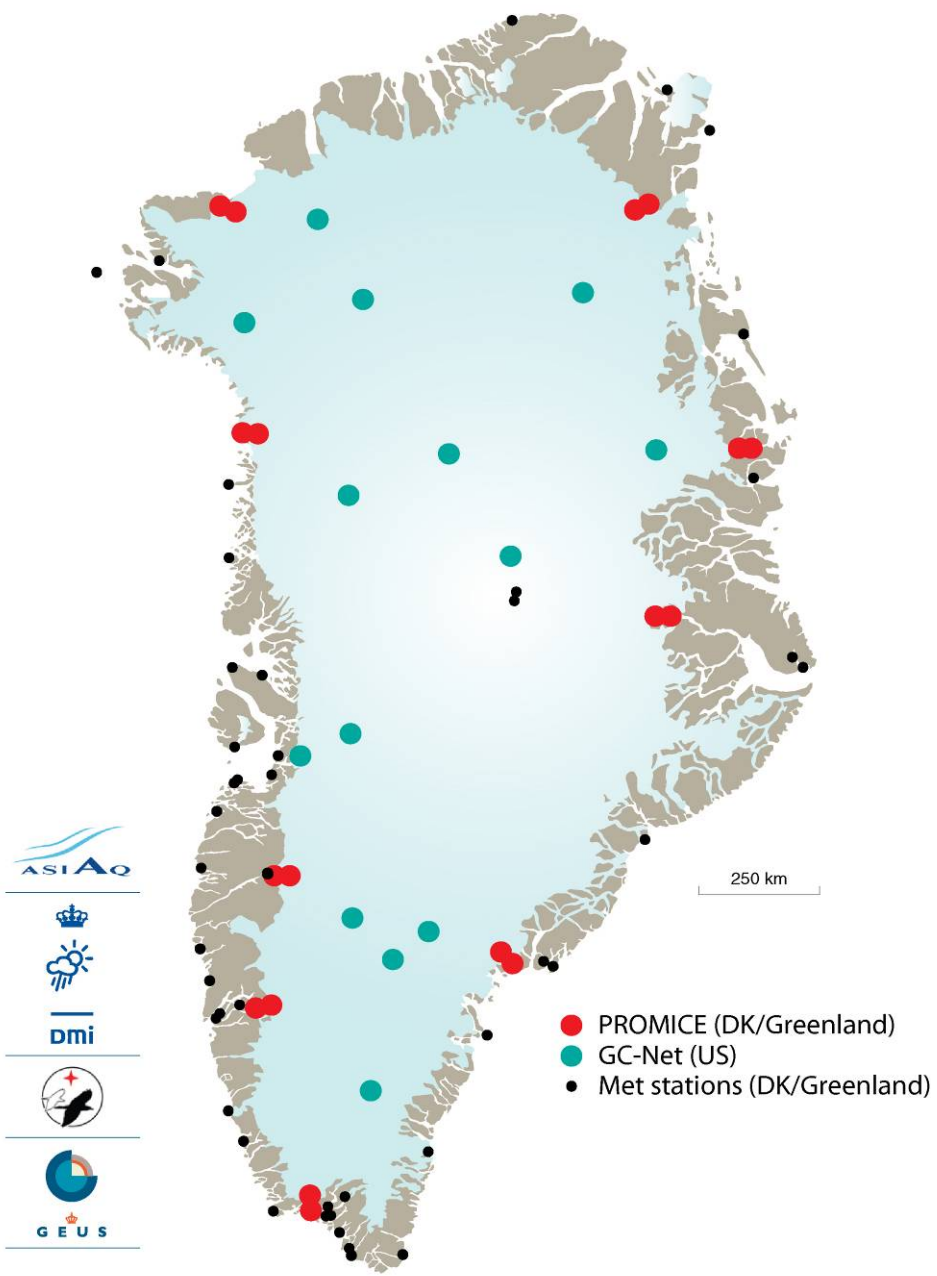
# New databases:

*(to be addressed the coming days)*



# New data, new stations

DMI



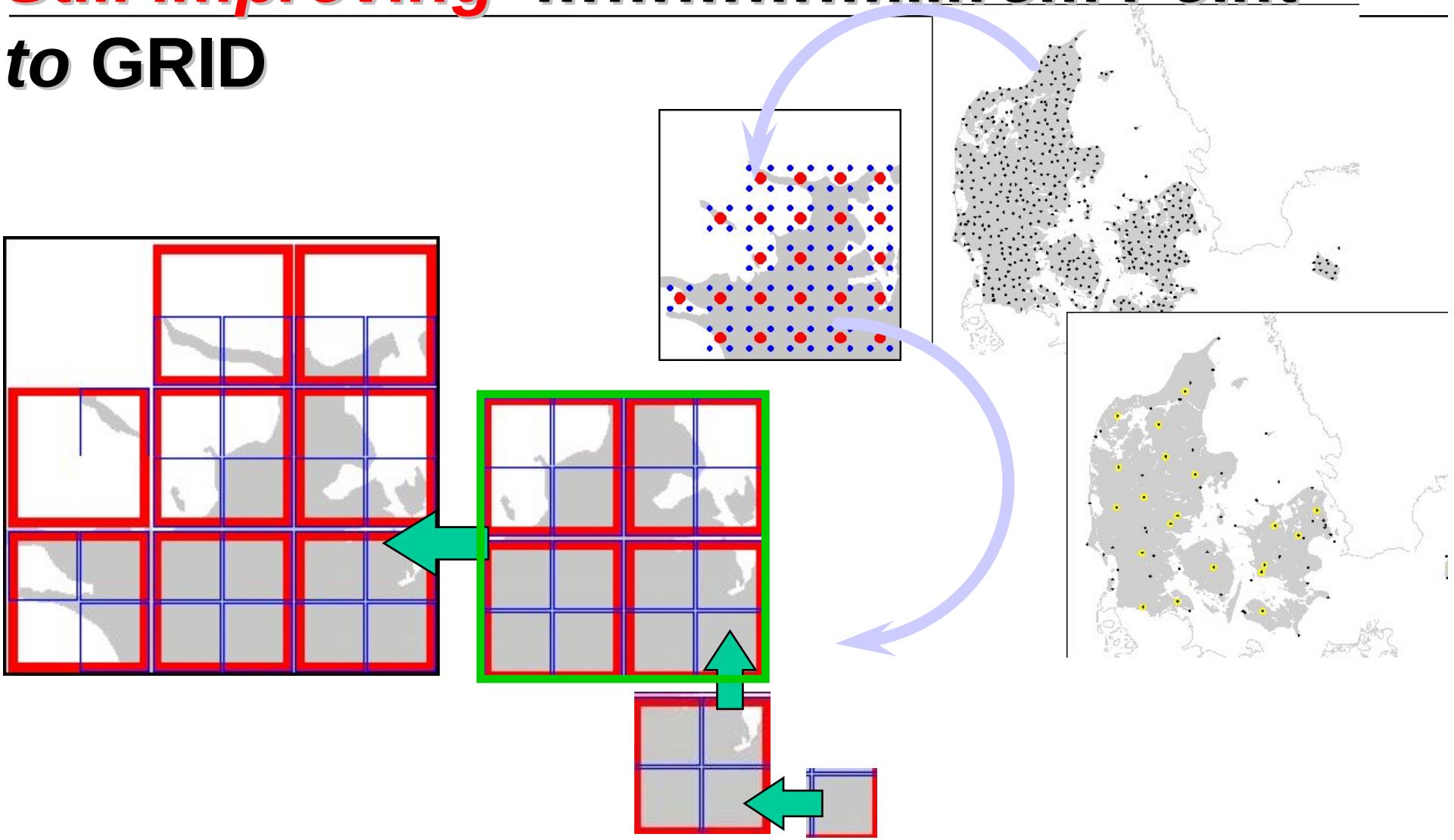

# DATA FROM STATIONS OTHER THAN NMSs

- Greenland-Denmark-U.S. Joint Committee
  Environment, Science, Technology and Health Working Group
  Report to the Plenary
  Washinton May 8, 2008:

  '

- ***The U.S. (NASA) will enhance the capabilities of its GC-NET, in cooperation with the PROMICE project (Greenlandic ASIAQ and Danish GEUS and DTU) and the Danish Meteorological Institute so that data from the instruments can be transmitted in real time to the WMO***

# *Still improving .....from Point to* GRID



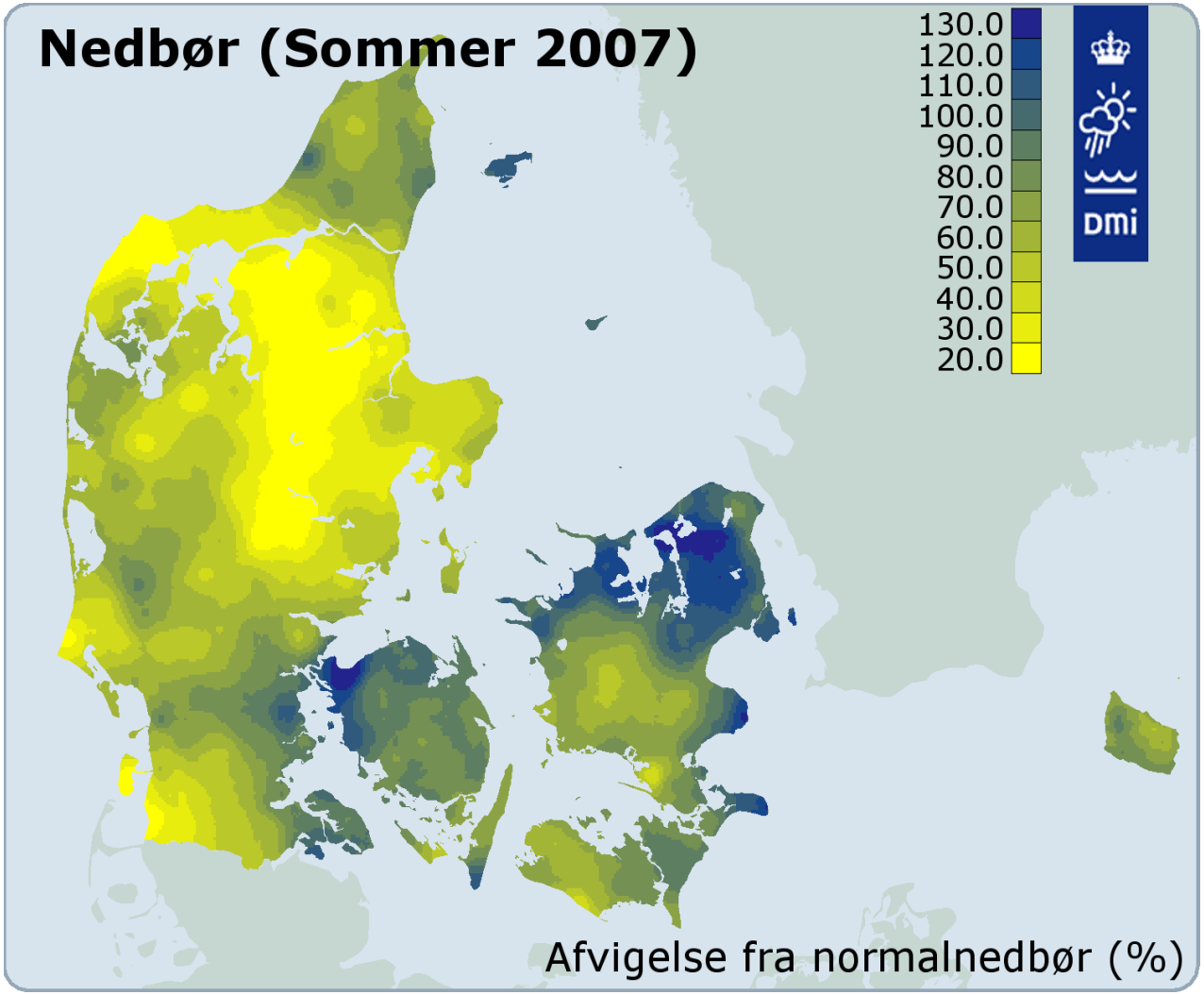
DK Country 10, 20, 40 km ->->-> **finer resolution**
Daily (24 h values), complete timeseries
Limited set of parameters (N,T,Ep,Rs)
Limited history (1981-; 1990- )

# Our main window to the outside world
# 24-7 dmi.dk

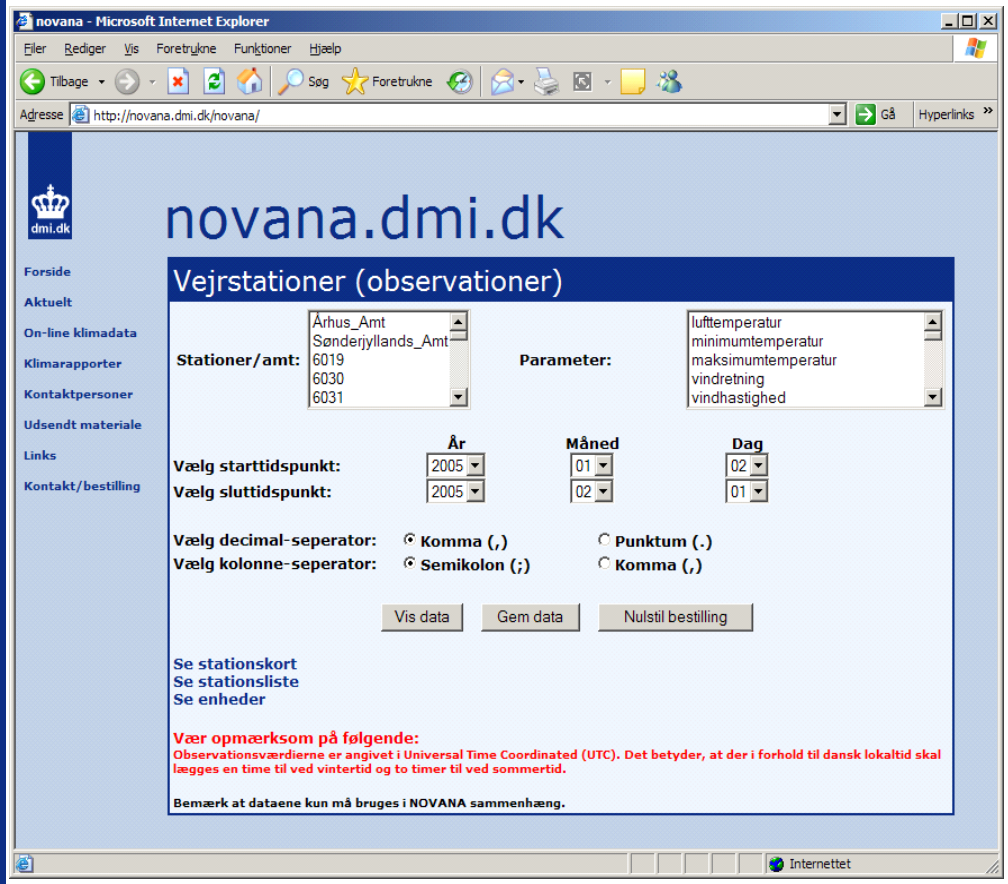
# Ever increasing requirements

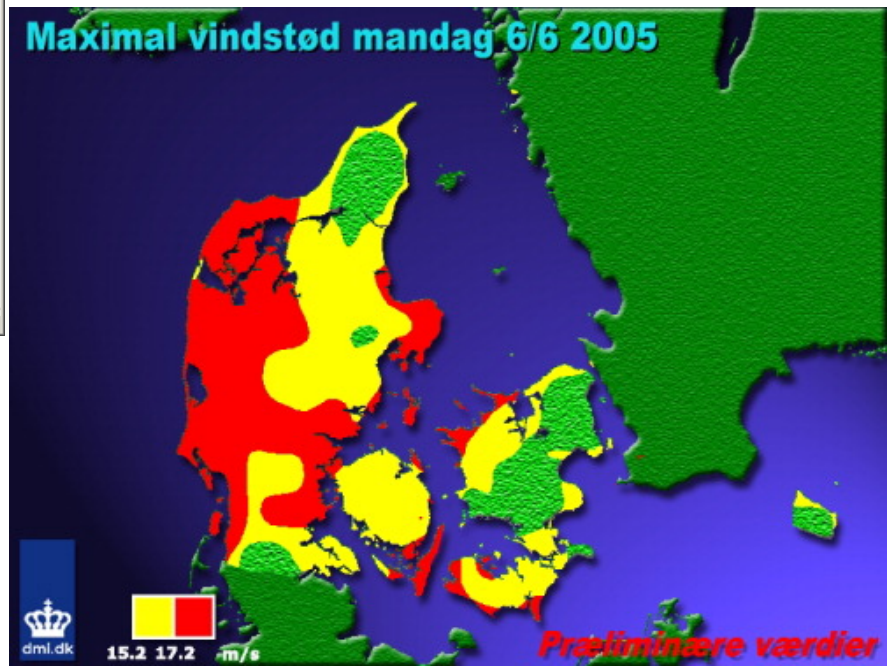
## Presentation...presentation...presentation

*(without sacrificing the scientific & technical quality)*

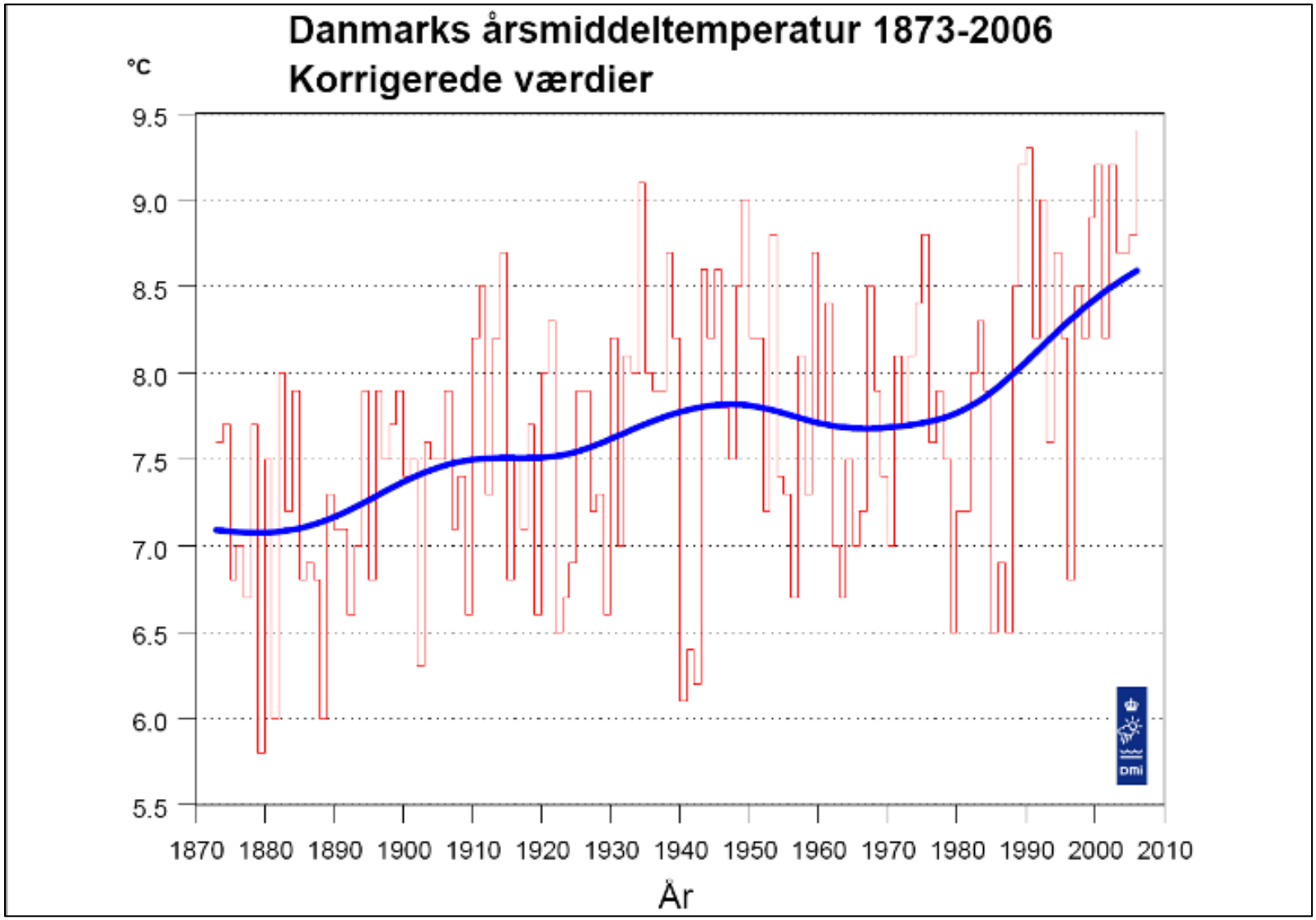


# Customized (self) services



# Maintaining and constantly updating the climatological overview



# ...and Long timeseries

with metadata & dokumentation

**Updated once / year:**

**Annual**

**Monthly**

**Daily**


DMI
Ministry of Transport and Energy

Technical Report 07-06

DMI monthly Climate Data Collection 1768-2006, Denmark, The Faroe Islands and Greenland

John Cappelen, Ellen Vaarby Laursen, Jørgensen and Claus Kern-Hansen

www.dmi.dk/dmi/tr07-06

Copenhagen 2007

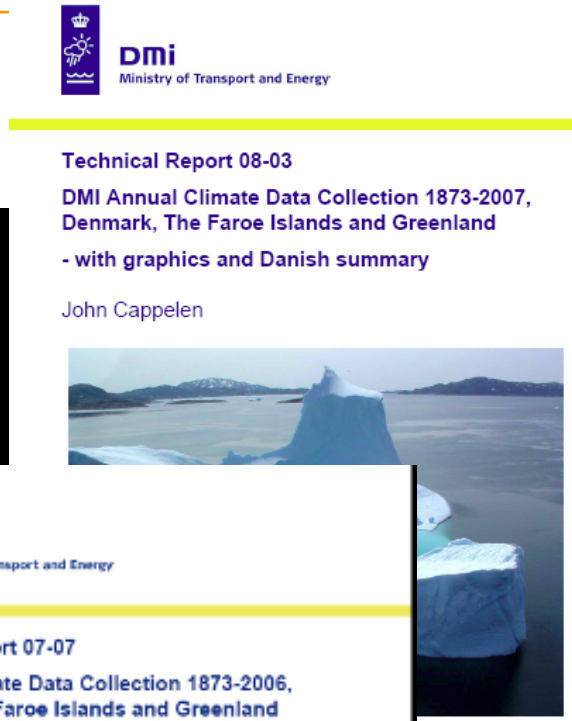

DMI
Ministry of Transport and Energy

Technical Report 07-07

DMI Daily Climate Data Collection 1873-2006, Denmark, The Faroe Islands and Greenland

- including Air Pressure Observations 1874-2006 (WASA Data Sets)

John Cappelen, Ellen Vaarby Laursen and Claus Kern-Hansen



DMI
Ministry of Transport and Energy

Technical Report 08-03

DMI Annual Climate Data Collection 1873-2007, Denmark, The Faroe Islands and Greenland

- with graphics and Danish summary

John Cappelen

# The ”core values” of climate data management

- We serve the present
- We pre-serve for the future

DMI

# Intentions of the presentation

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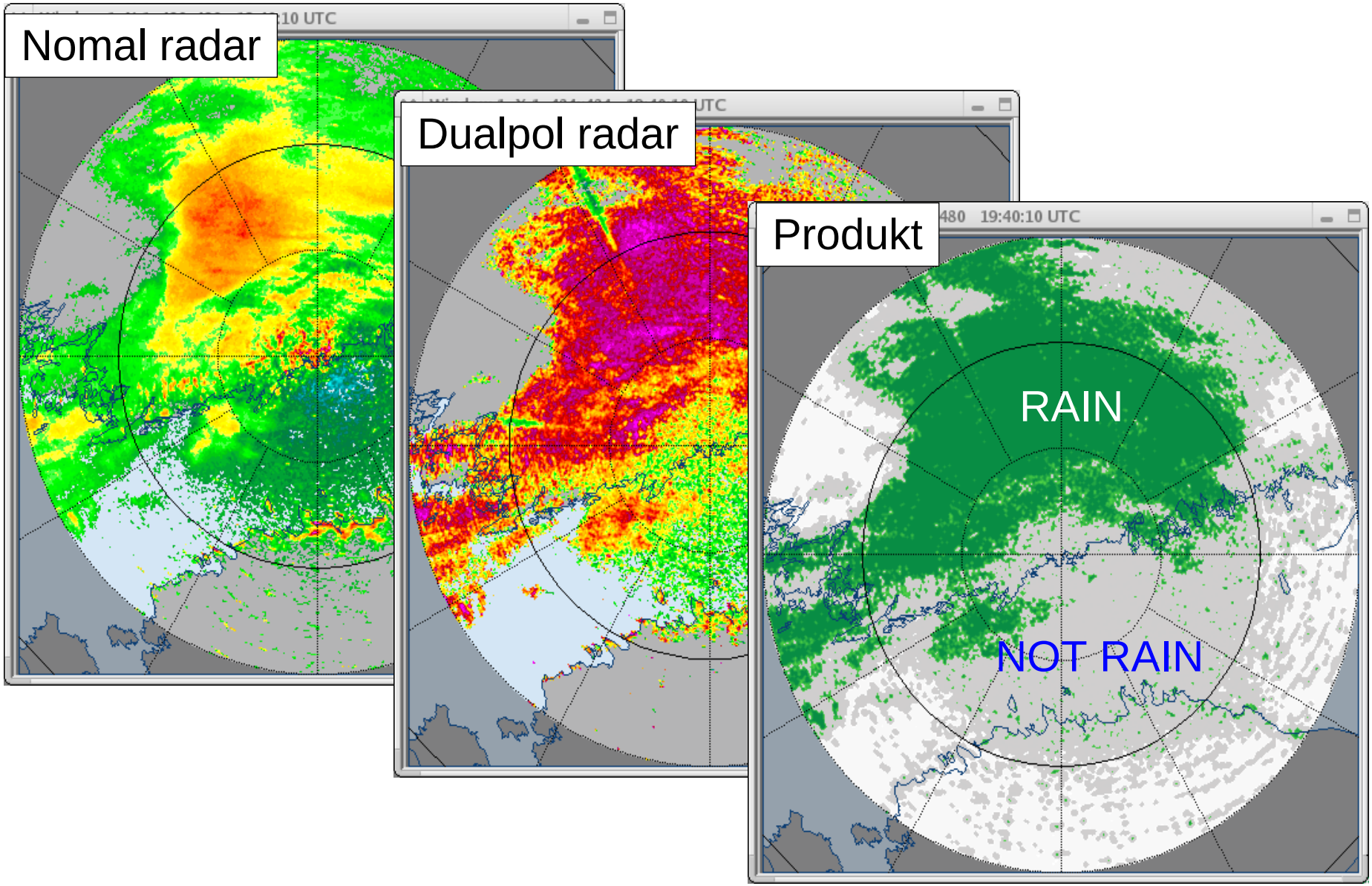
- a view of some of the major **challenges** for the years to come
-

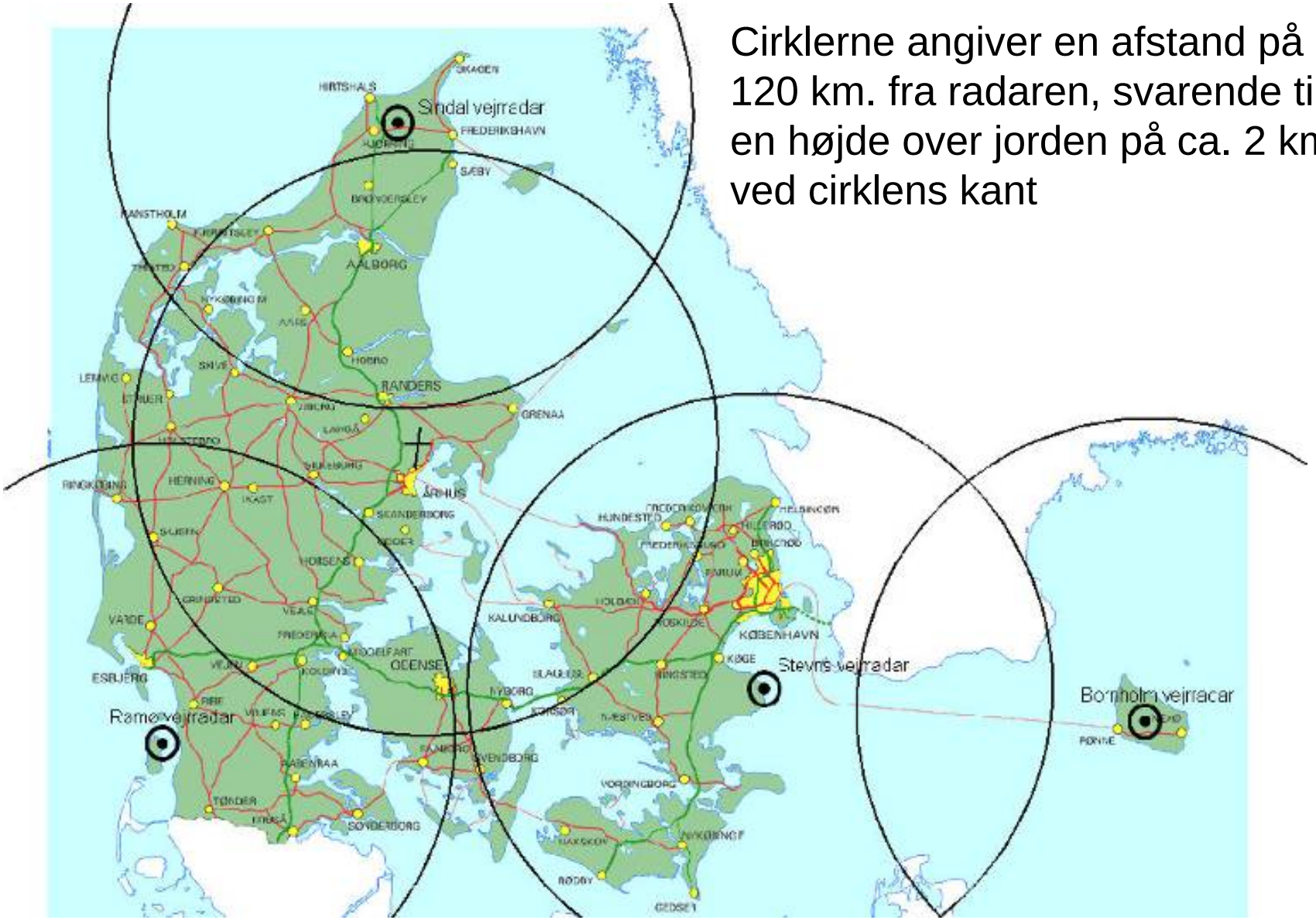
DMI

# Integration of remote sensing in data products



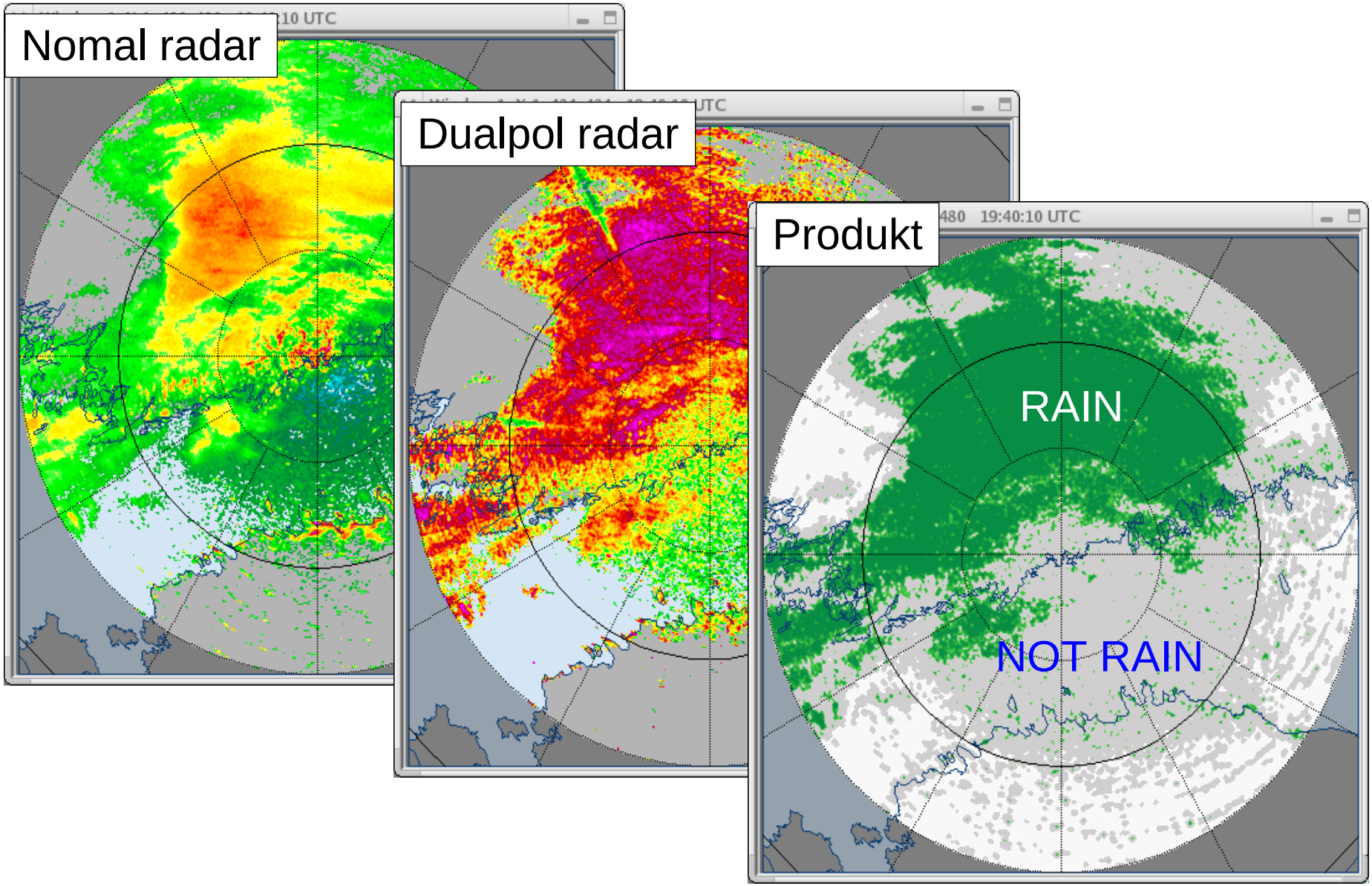
# Radar (Vejrradar DK)

# Weather radar coverage anno 2009

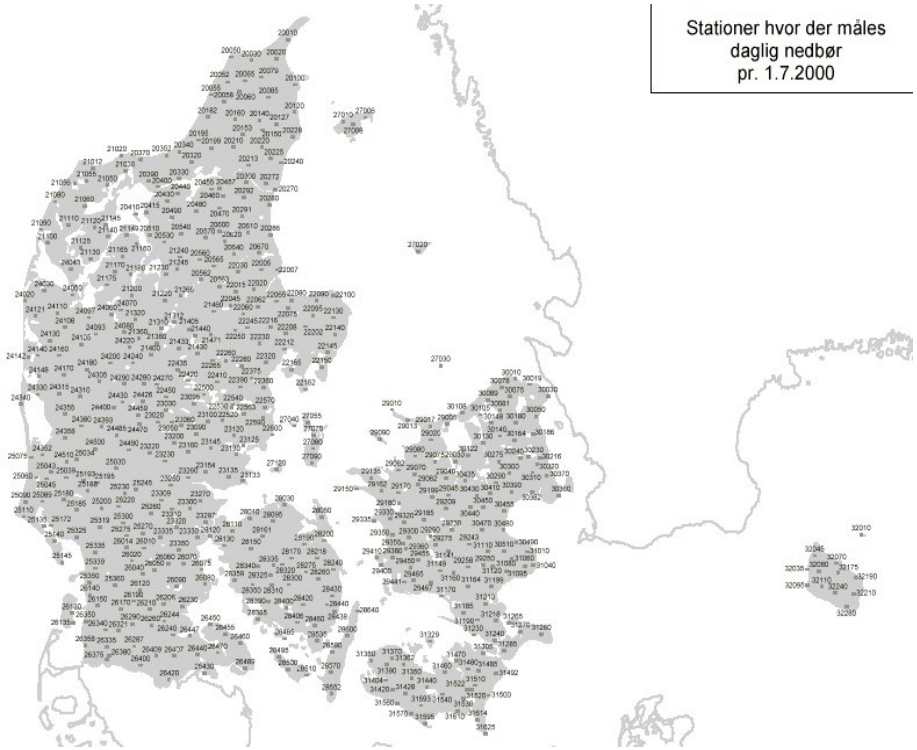



Cirklerne angiver en afstand på 120 km. fra radaren, svarende til en højde over jorden på ca. 2 km. ved cirklens kant

# Substituting in-situ measurements with remote sensing data in data products



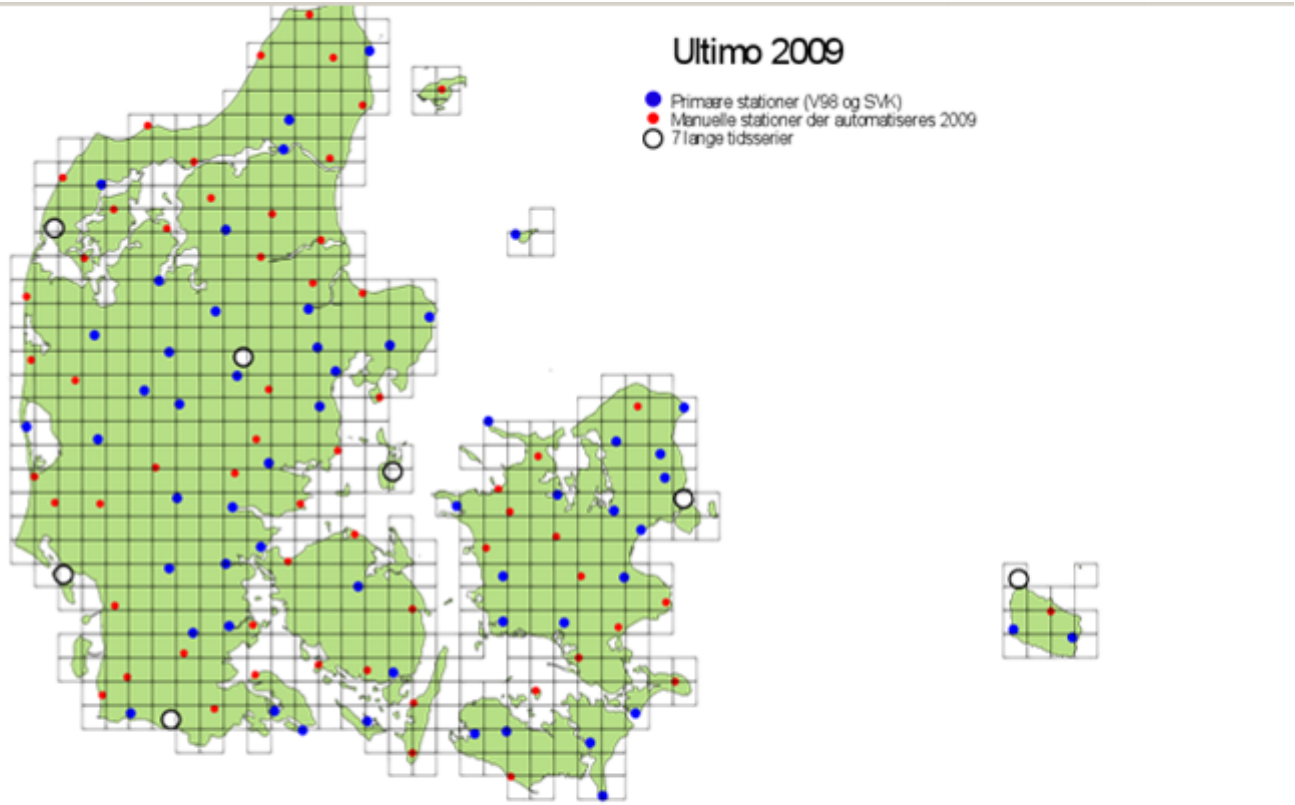
# Hellmann – the backbone in danish precipitation measurement




500 stations ~ 1 per 10x10 km; 08-08 24h sum; daily report per Telephone

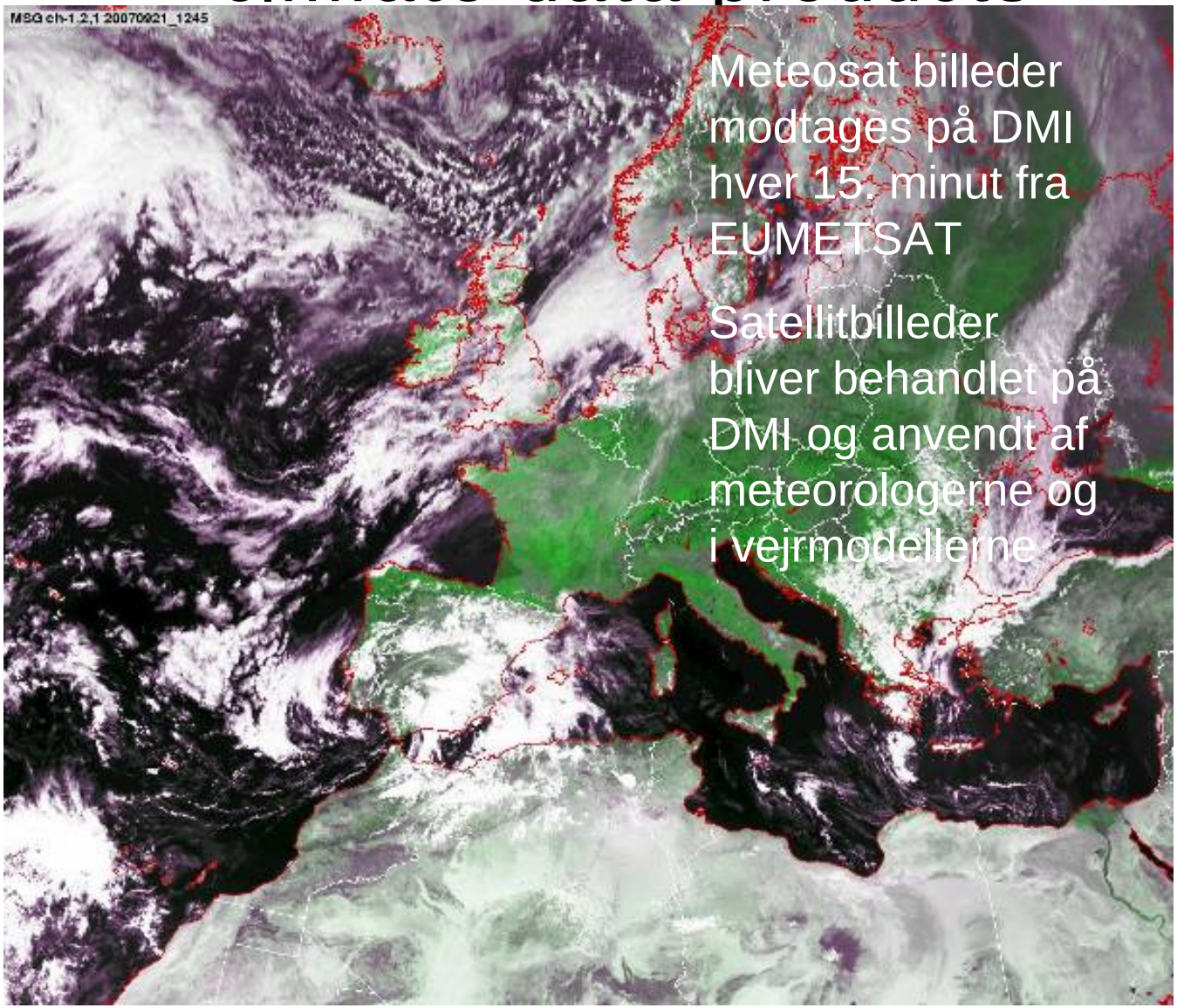
??: 1000 gauges + 500 observers (payroll)

# By the 1. of January 2010…..
# Fully automated but less that 25 % of the point values

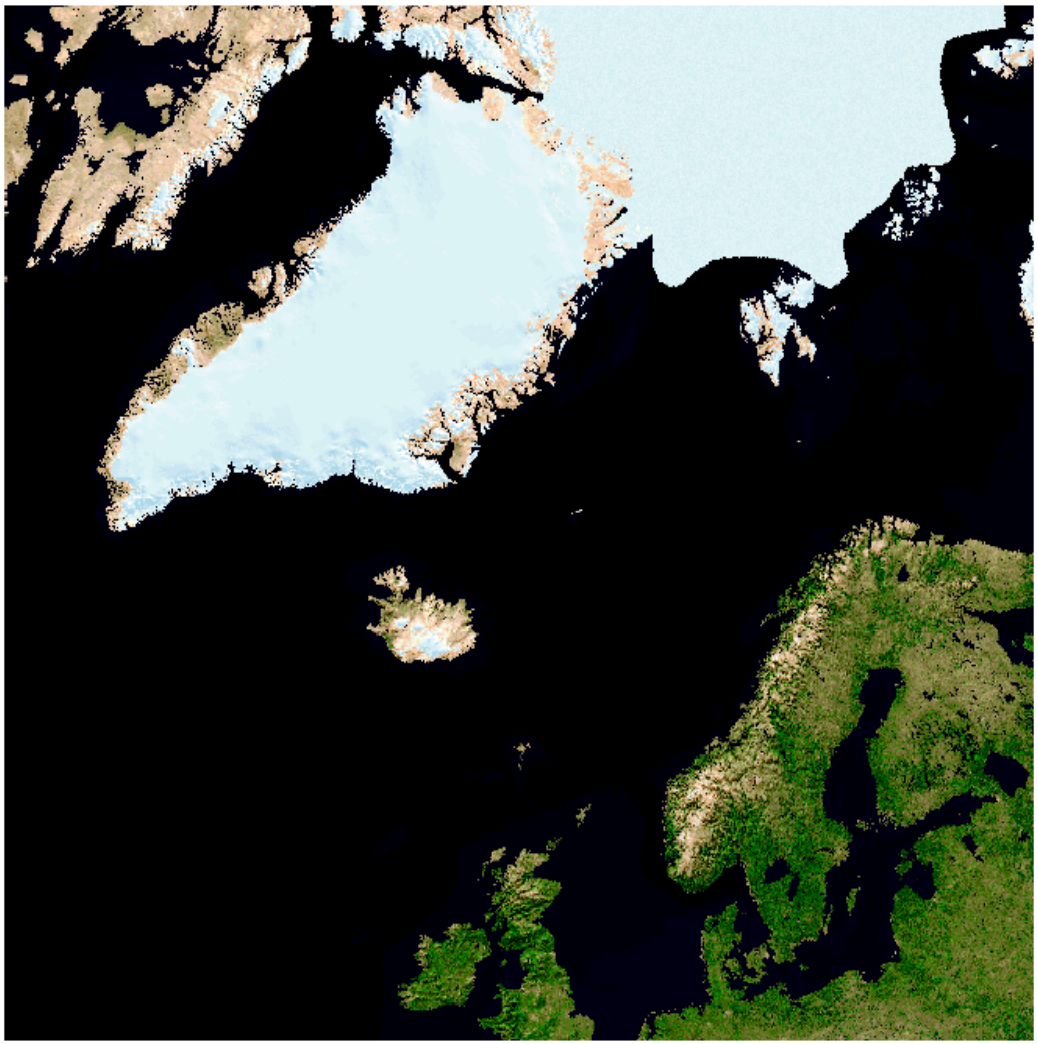



| | | | Heraf indgår | | | | | |
|---|---|---|---|---|---|---|---|---|
| Net | Beskrivelse | Antal målere i alt | V98 / Synop | SVK | 7 lange | Snow-man | Alm. Helman | Nyop-rettelse |
| A1 | Primær net ultimo 2009 "Need to have" | 122 | 22 | 34 | 7* | 17 | 42 | |

# Utilization of SAFs and other satellite data products in the climate data products



# From ”Climatological data” to Climate change indicators



# From ”Climatological data” to Climate change indicators

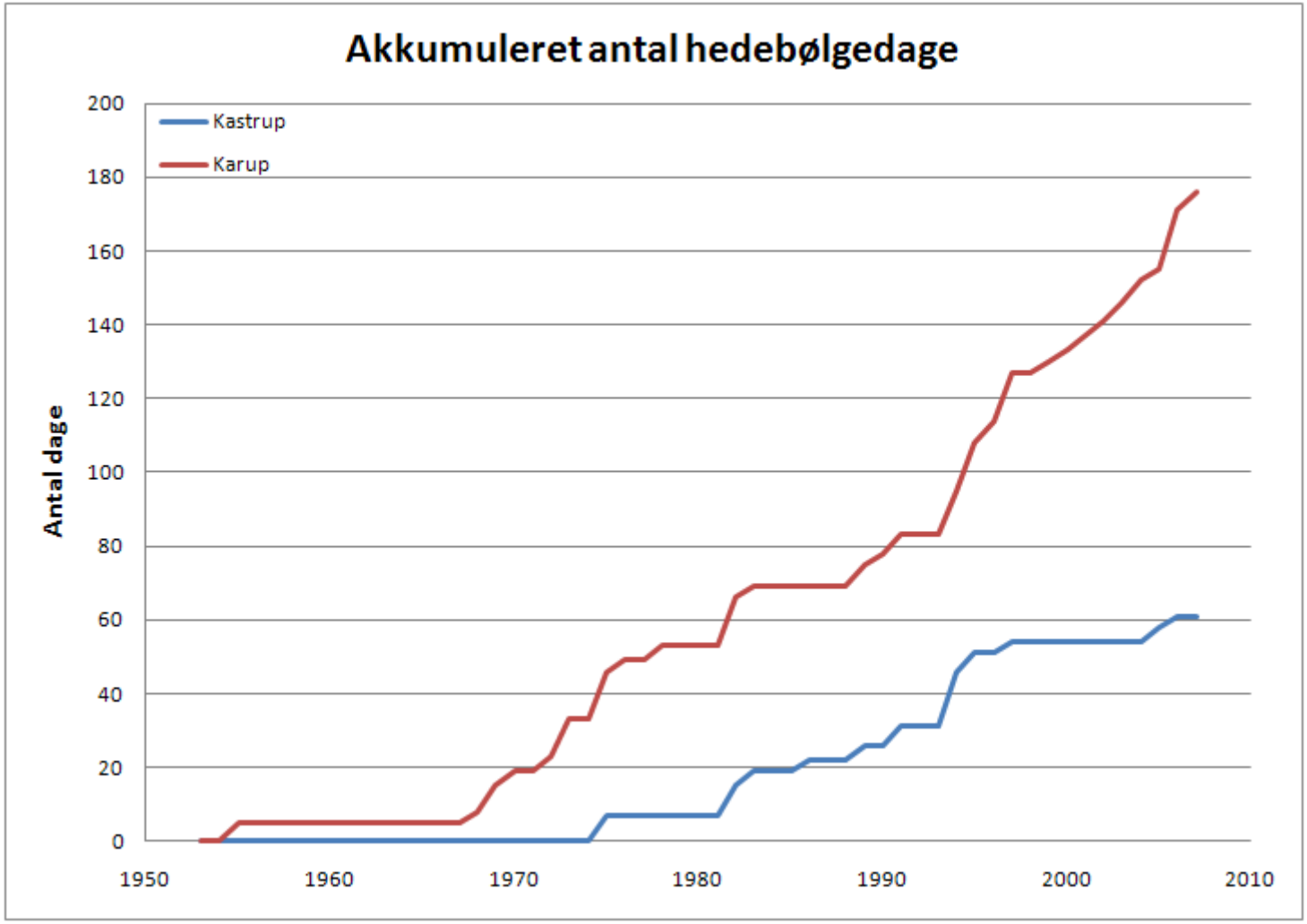
- International (like GCOS; ECA&D, WMO…..

as well as

- At a National level (new Danish national program for climate change monitoring)

DMI

# Heatwaveindex




Inland

Costal

location

Hedebølgeindex & Grafik DMI

# airtemperatur -> Drought index

Foto Claus Kern-Hansen

**and agriculture**

*…….from a beautiful summer day to drought and the need of irrigation*

# Headlines.....

**Landbruget oplever den værste tørke i 49 år !!!** (tv2.dk 10-06-08)

**Ikke siden 1959 har det danske landbrug oplevet en så omfattende tørke så tidligt på året, som vi oplever nu - og afgrøderne har på grund af tørke taget uoprettelige skader.**

**...worst draught in 49 years.....**

**Værste tørke så tidligt på året**

Sådan lyder det fra planteavlskonsulent Bjarne Risvig fra landscenteret for Dansk Landbrugs-rådgivning.

.....**uoprettelige tørkeskader -** og det anslås, at **landmændenes tab kan løbe op omkring 2 mia. kr.**

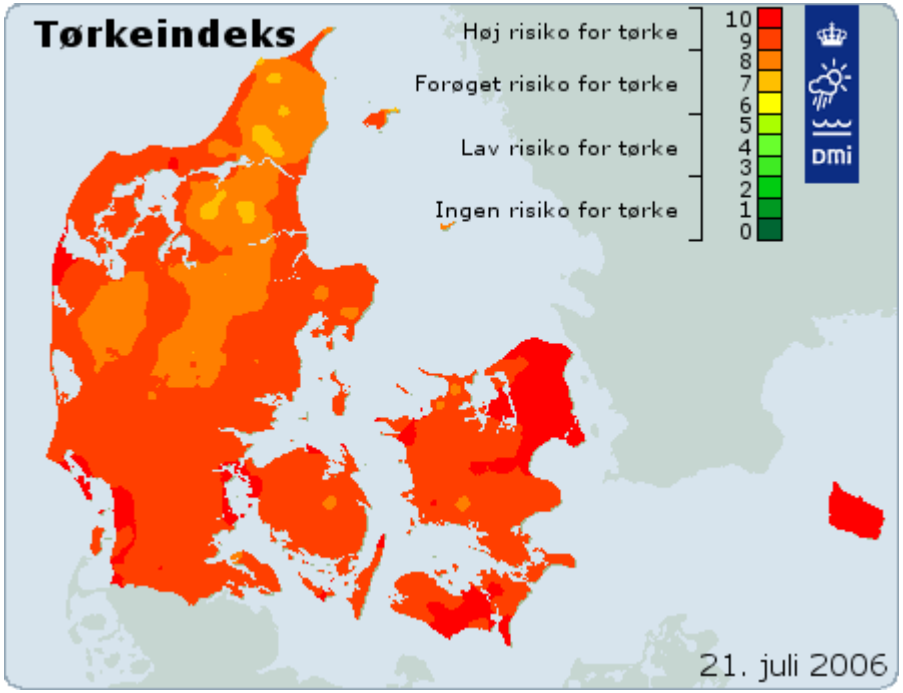
**...estimated loss of 2 billion DKK due to the draught.....**

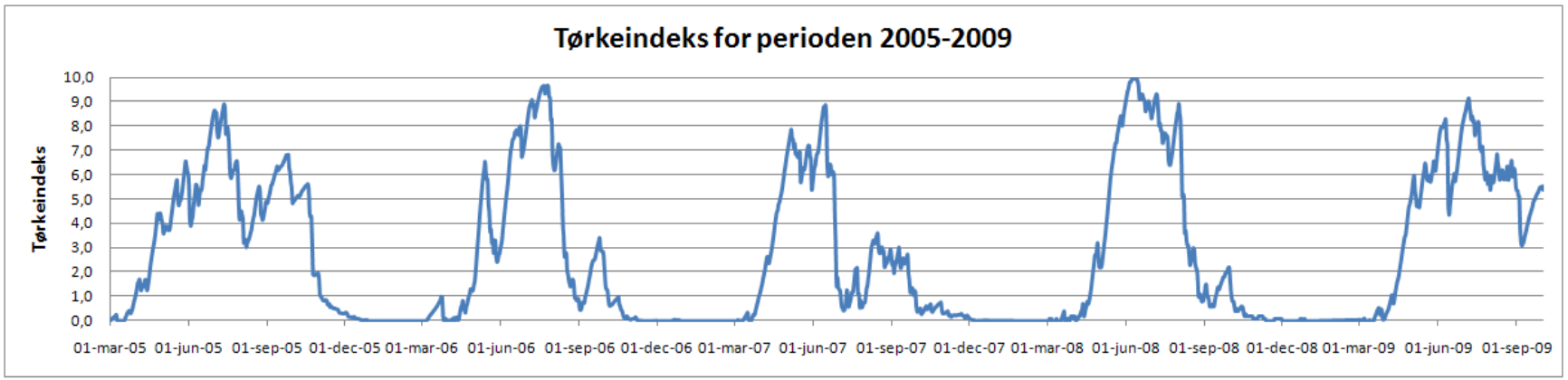
..... tøver ikke med at kalde tørken for **helt usædvanlig og tidlig** - og det vil uden tvivl få **store konsekvenser.**

**...afgrøderne efter mere end en måneds tørke har fået uoprettelige skader, der vil betyde et mindre udbytte fra de danske marker.**

DMI

# Draugtindex




Grafik & Tørkeindex DMI

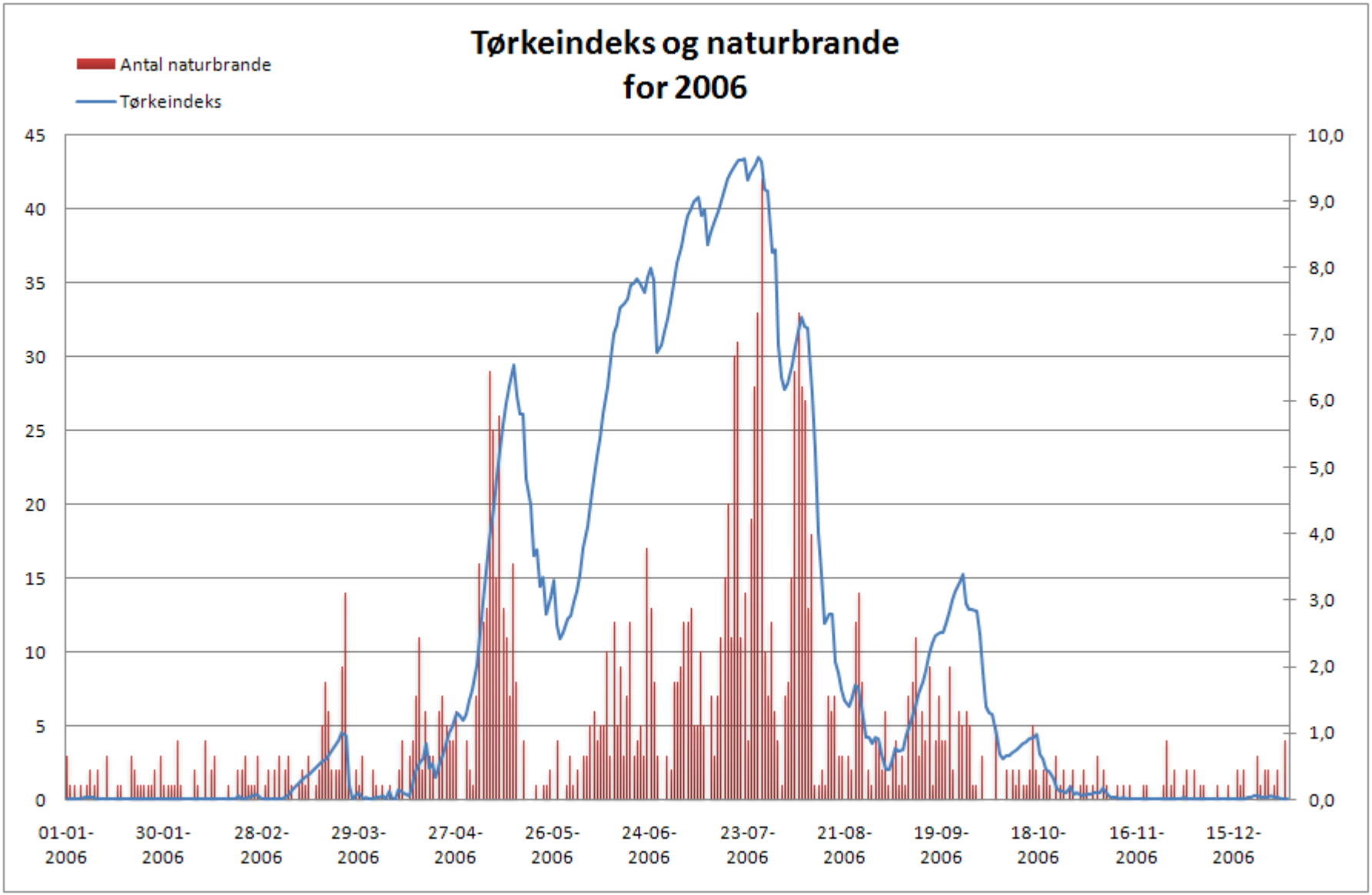
# airtemperatur -> Drought index

**and nature fire**

***Skovbrand***
*Foto: scanpix*

***Markbrand ved Nysted***
*Foto: Margit Olsen .*
www.folketidende.dk

# Draught index and number of nature fires in 2006




Grafik & Tørkeindex DMI - Kilde antal naturbrande: Beredskabsstyrelsen

# The new focus
# CLIMATE SERVICES

WCC · 3 Geneva, Switzerland, 31 August–4 September 2009
Geneva International Conference Centre

UN SYSTEM DELIVERING AS ONE ON CLIMATE KNOWLEDGE

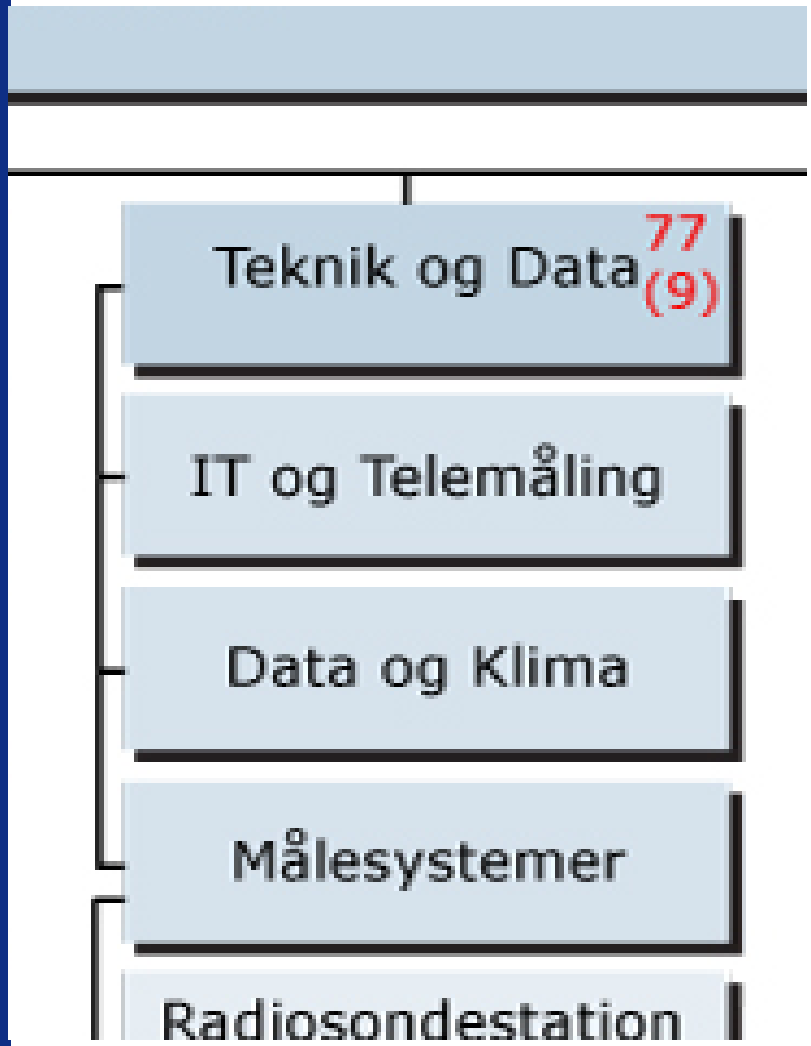
**WORLD CLIMATE CONFERENCE – 3**

**31 August – 4 September 2009, Geneva, Switzerland**

**Global Framework for Climate Services**

DMI

# The largest challenge



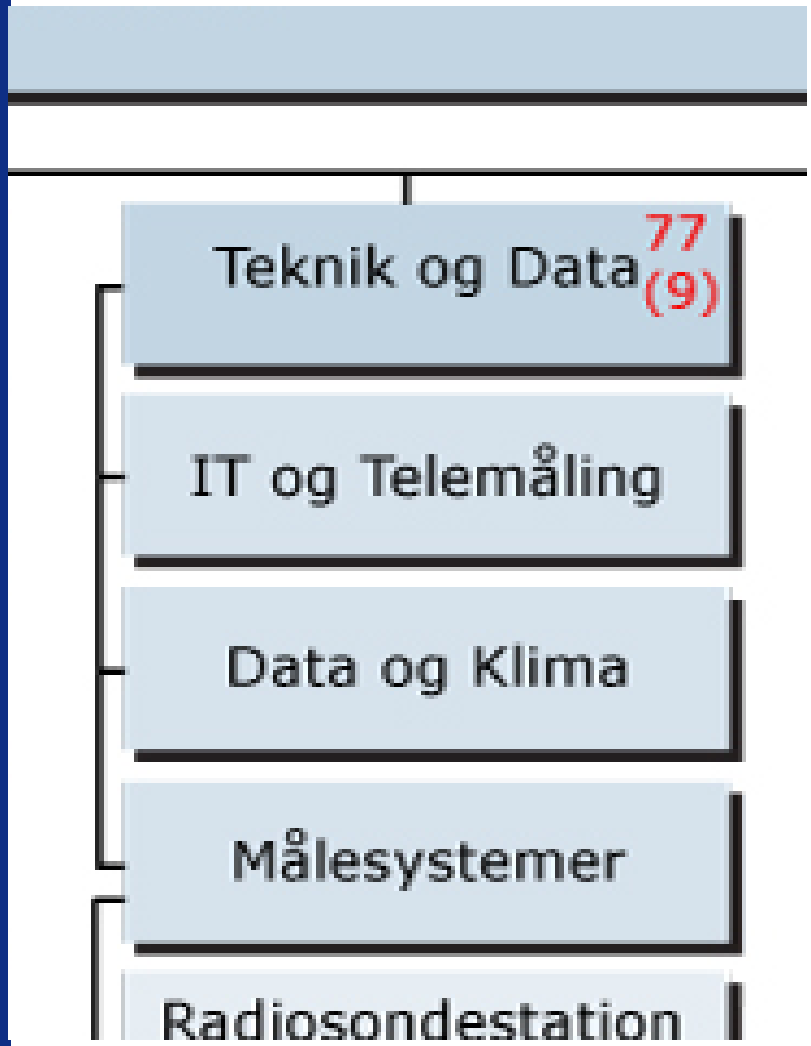

Tech & Data Department

IT & Remotesensing Div

Data & Climate div

Measuring systems div

# The largest challenge




Tech

IT &

Data

Meas

Is to utilize our new organization i order to implement a Total Quality Management concept across the different divisions, to ensure not only that all working processes are describes but too that responsibility is taken for each part of the work from planning a measuring station until the final quality assured data are stored for the future generations or the product is delivered to the customer.

That is the real challenge

And (now) we got the organization to facilitate it.

# Intentions of the presentation

to give you

- a little flavour of the **history** of climate data and management in Denmark
- snapshots of the **present day** situation and topics which will be covered in depth the coming days,
- a view of some of the major **challenges** for the years to come
- The **answer** to the Question ? – *what does the weight of 10 elephants has to do with Danish observations and climate data ?*

DMI

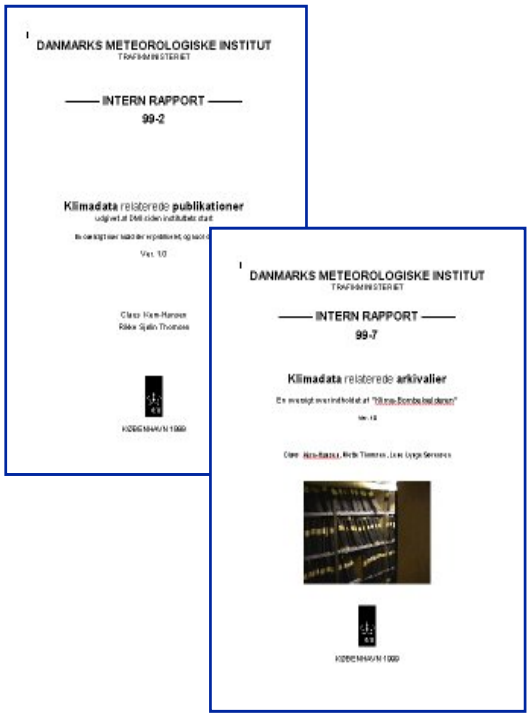
# Historical data – DATAMINING

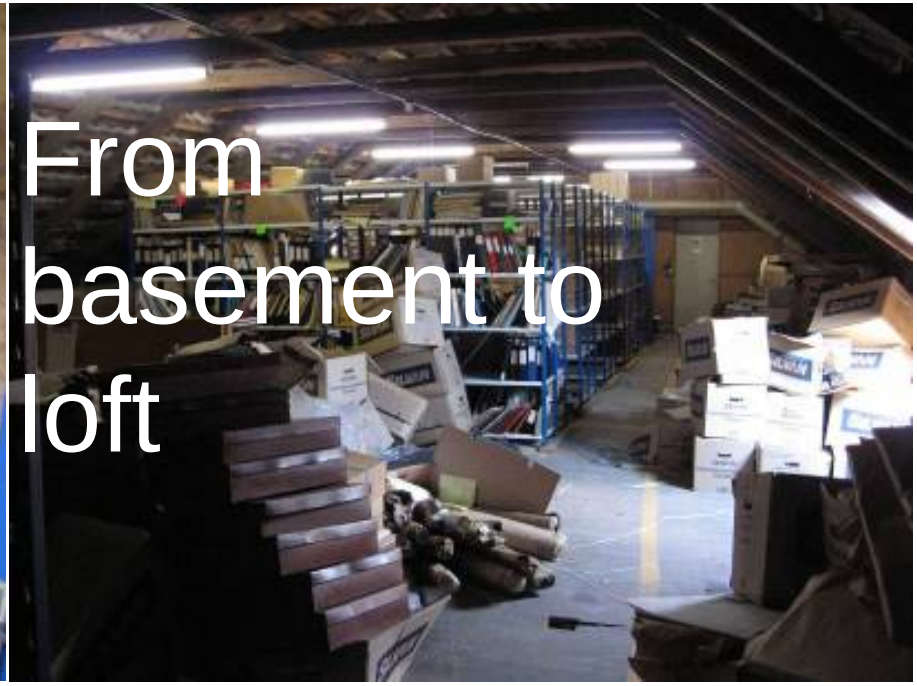
availability  ? Effort needed ? Customer ? Archive facilities ?

PUBLICATIONs

OBSBooks

DIGITALT



From basement to loft


DMI

in 2006 cleaned up and organized all analogue archives

DMI

- and deposited the major part at the national archives

# And this is where the elephant comes into the picture

- 1422 m2 cleared (including other things than archives)
- 1677,6 shelf meters
- Of this 300 shelf meters deposited
- and~ 100 meters kept as active archives at DMI

- Clearing/dumped 50,5 tons
- Deposited ~15 tons
- Discarded archives ~25 tons

- Total 90 –100 tons
- Elephant:
- 10.000 kg

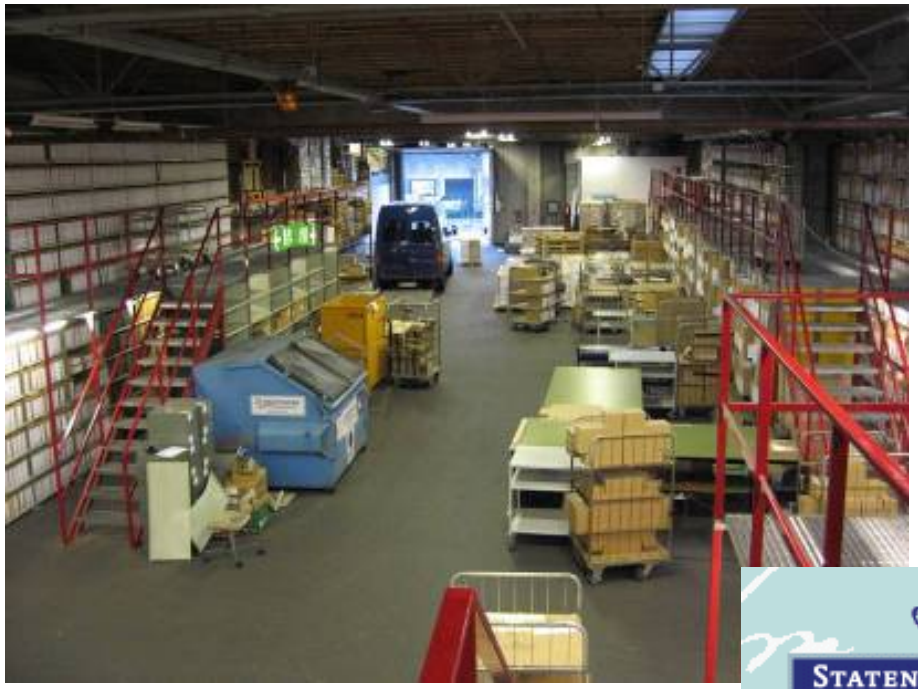

300 shelf meters
3300 boxes
990.000 pieces of paper
~15 tons
17.8 m3

DMI

# Would we recomend it ?

- It is not funny
- It is heavy
- It is dirty
- It is expensive
- ..... but it is very satisfying and relieving knowing that the heritance from Rung and others are now cleaned, preserved and kept in a professional archive
- – and available (within two days) if and when we want to hold them.

DMI



STATENS ARKIVER

RIGSARKIVET

DMI

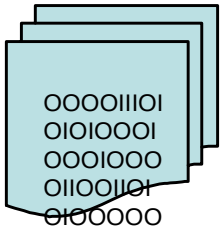
…and that may be called another kind of data-management

Thank you for your attention


DMi

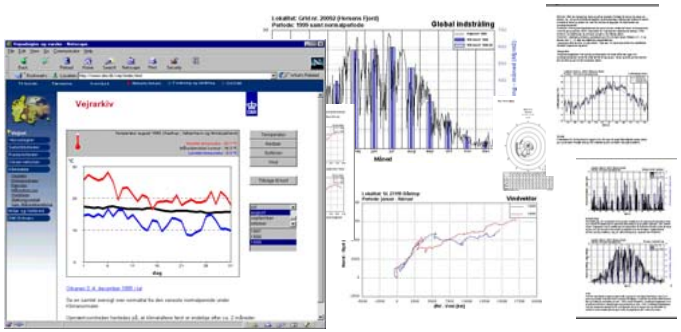
# Data & Climate Division at DMI

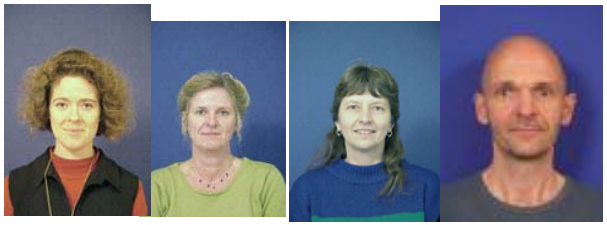
## Datamanagement




## Climatological analyses

## Data & Climate information

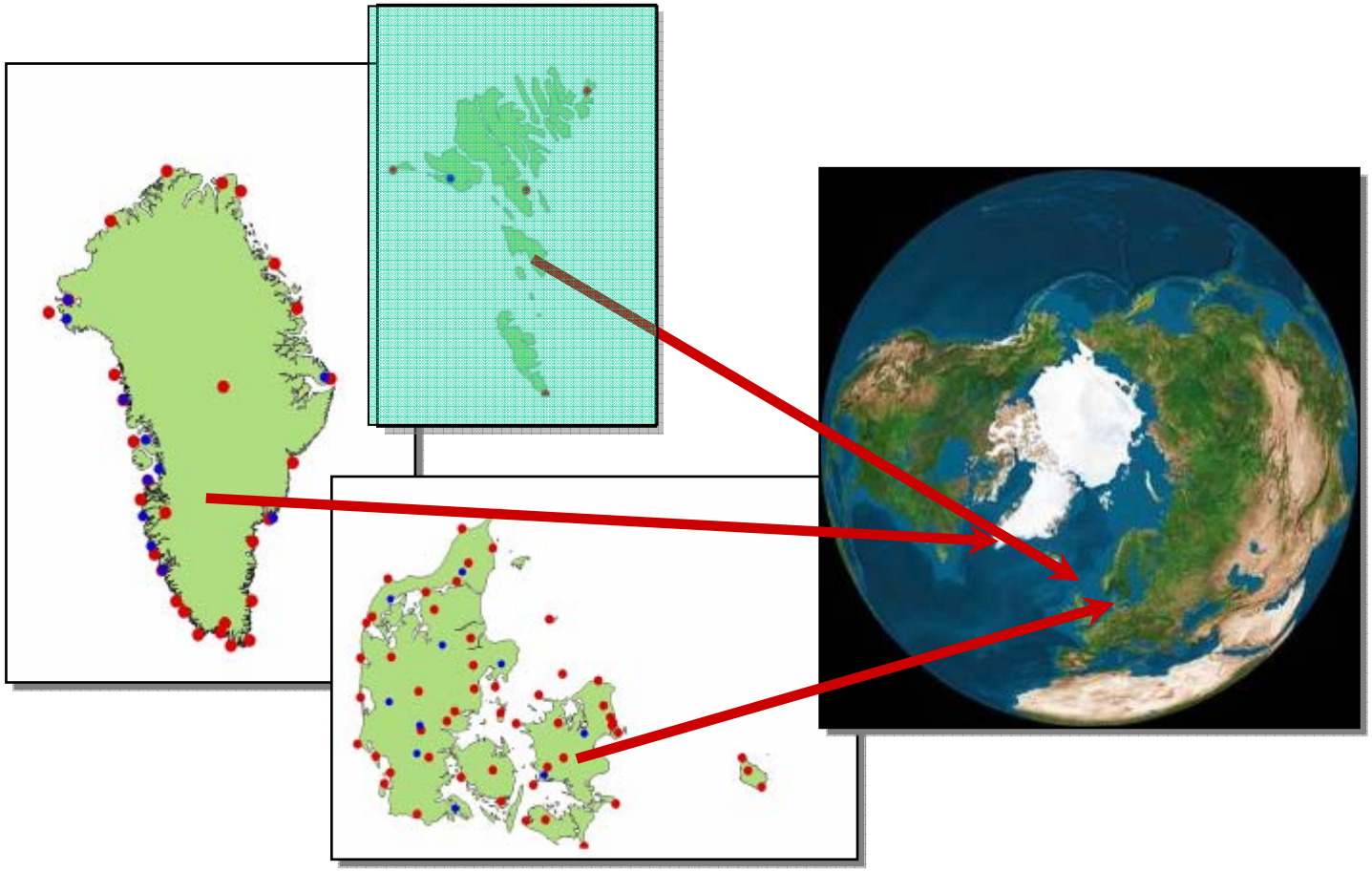


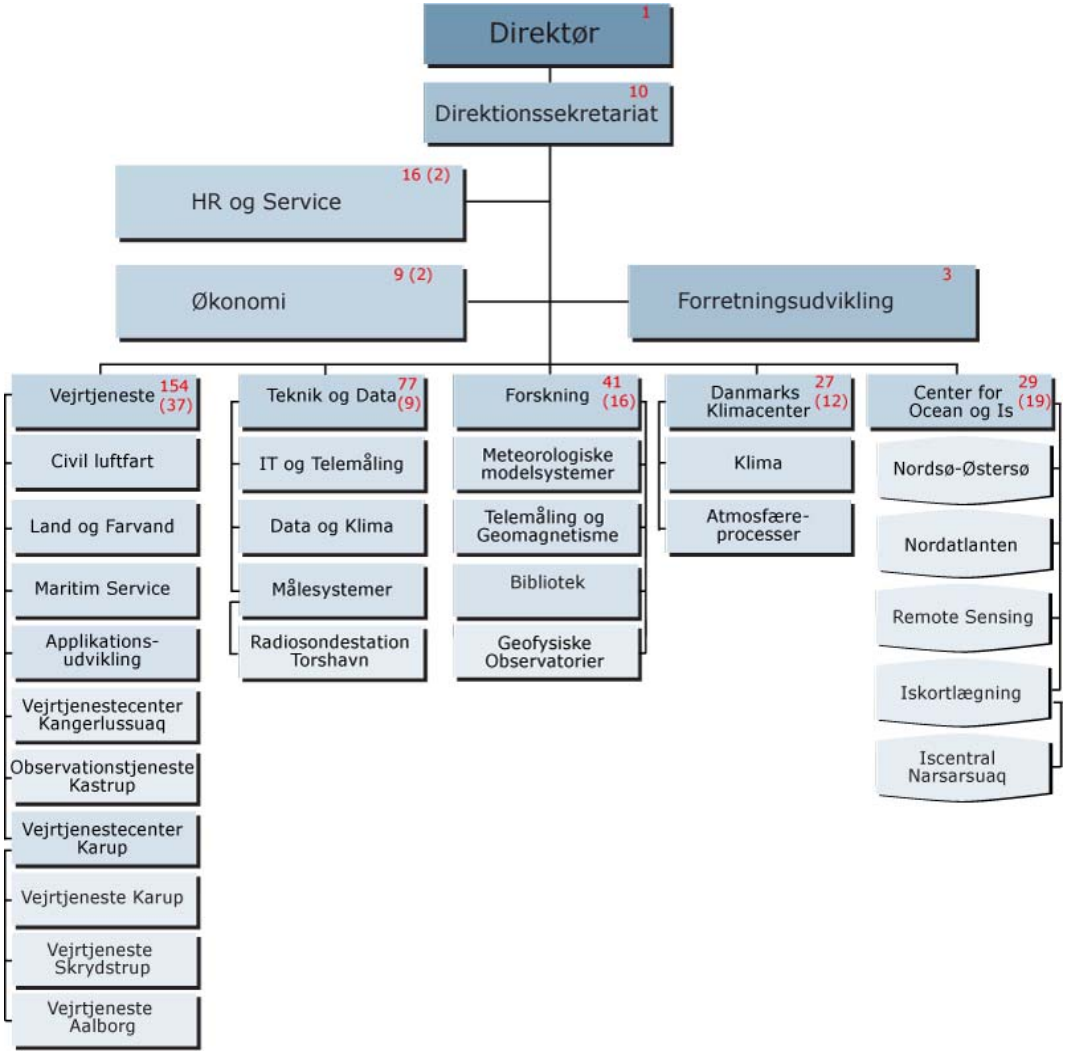



## Project & Datatype key

- DMI's area of responsibility comprises Denmark, Greenland and the Faroe Islands
- This geographical area including surrounding waters and airspace are larger than any other West-European country

# Geographical responsibility & DMIs meteorologiske målestationer




Direktør 1
Direktionssekretariat 10
HR og Service 16 (2)
Økonomi 9 (2)
Forretningsudvikling 3
Vejrtjeneste 154 (37)
Civil luftfart
Land og Farvand
Maritim Service
Applikations-udvikling
Vejrtjenestecenter Kangerlussuaq
Observationstjeneste Kastrup
Vejrtjenestecenter Karup
Vejrtjeneste Karup
Vejrtjeneste Skrydstrup
Vejrtjeneste Aalborg
Teknik og Data 77 (9)
IT og Telemåling
Data og Klima
Målesystemer
Radiosondestation Torshavn
Forskning 41 (16)
Meteorologiske modelsystemer
Telemåling og Geomagnetisme
Bibliotek
Geofysiske Observatorier
Danmarks Klimacenter 27 (12)
Klima
Atmosfære-processer
Center for Ocean og Is 29 (19)
Nordsø-Østersø
Nordatlanten
Remote Sensing
Iskortlægning
Iscentral Narsarsuaq