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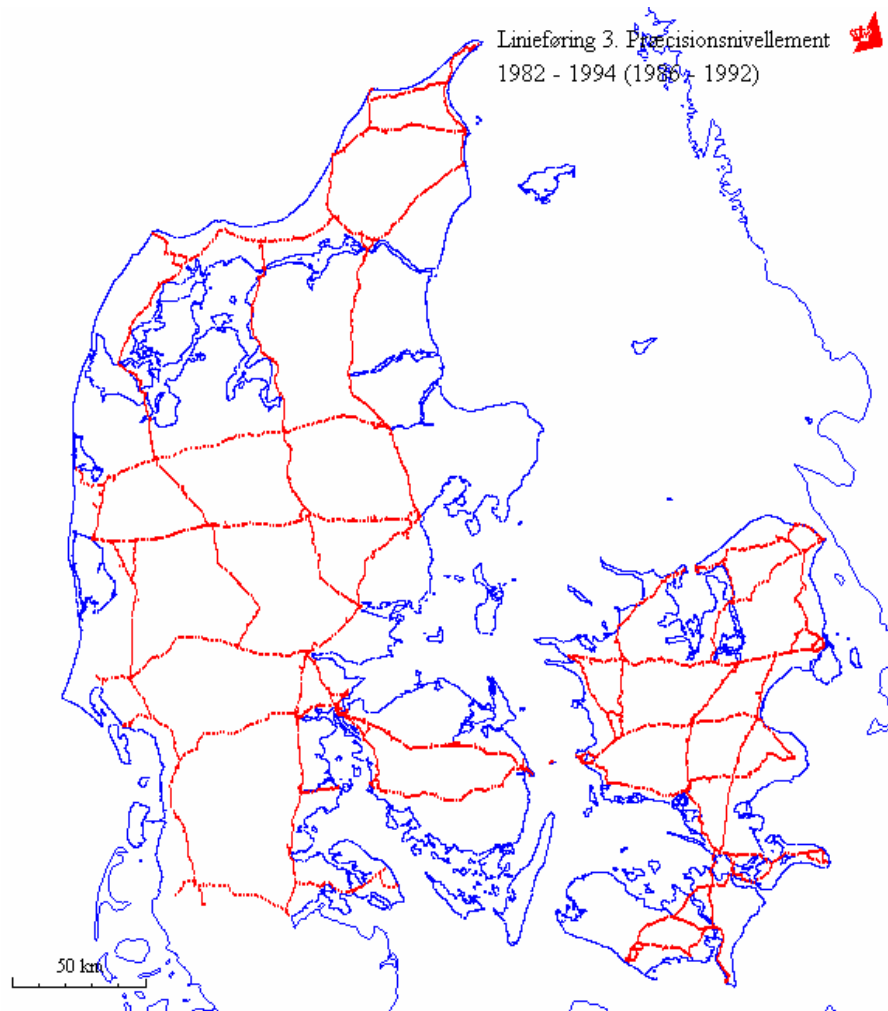
# Introduction of the Vertical Reference to the User

NGK Workshop

“The Establishment of a New Vertical Reference for Iceland”

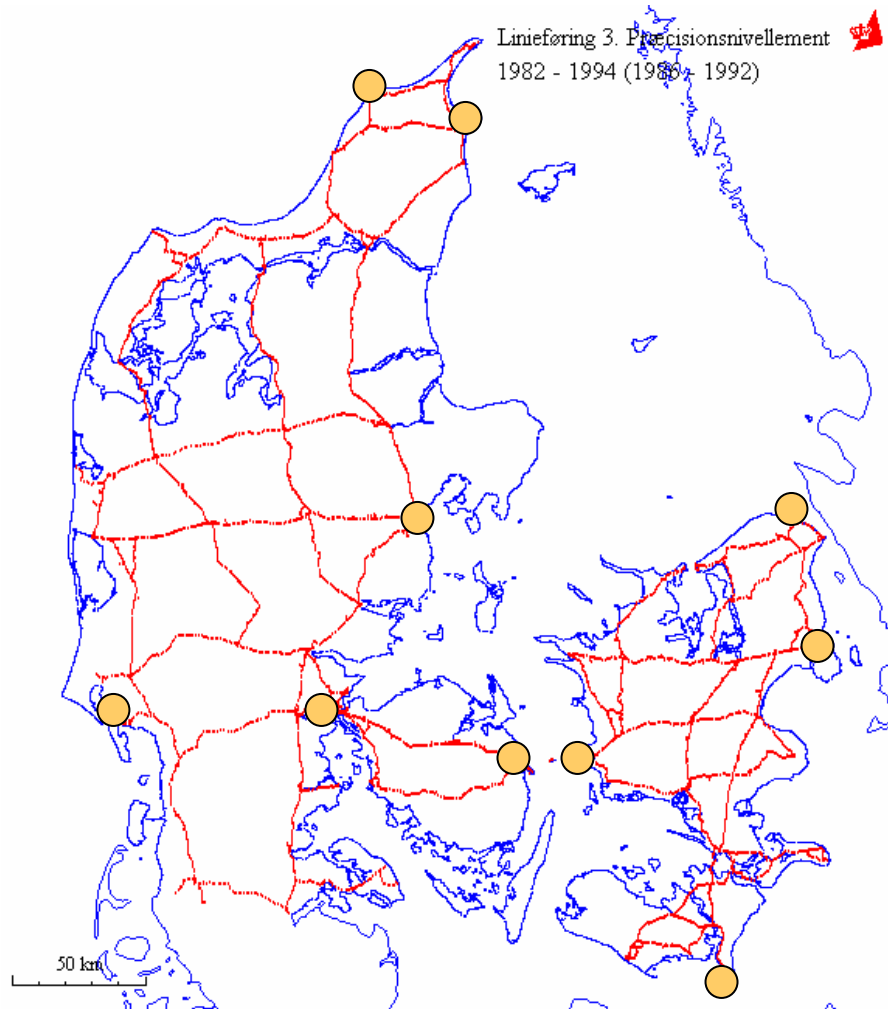
June 15<sup>th</sup>-16<sup>th</sup>, 2005 in Reykjavík, Iceland

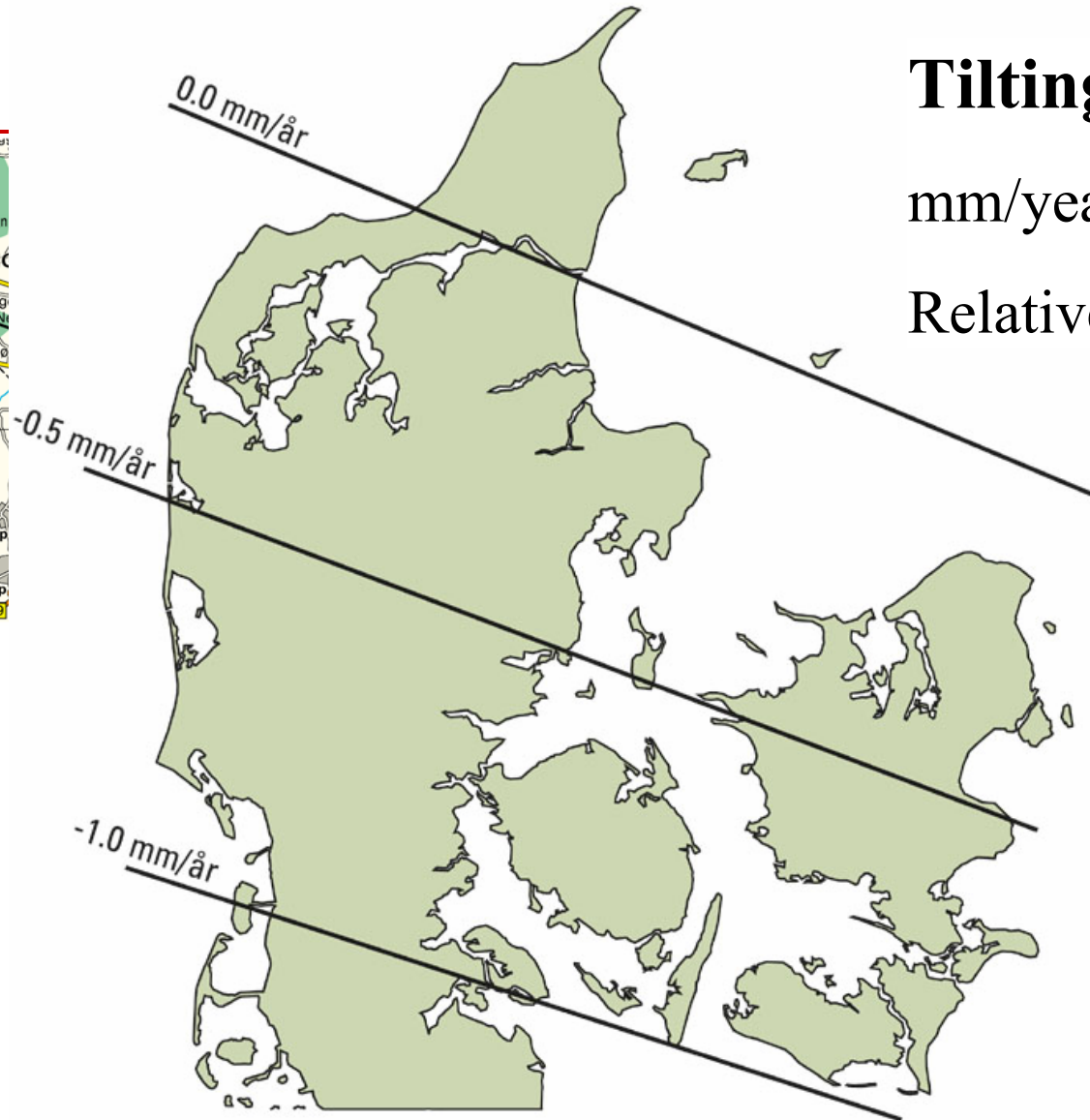
# 3. Precise levelling 1982 - 1994



Net

# Tide gauges



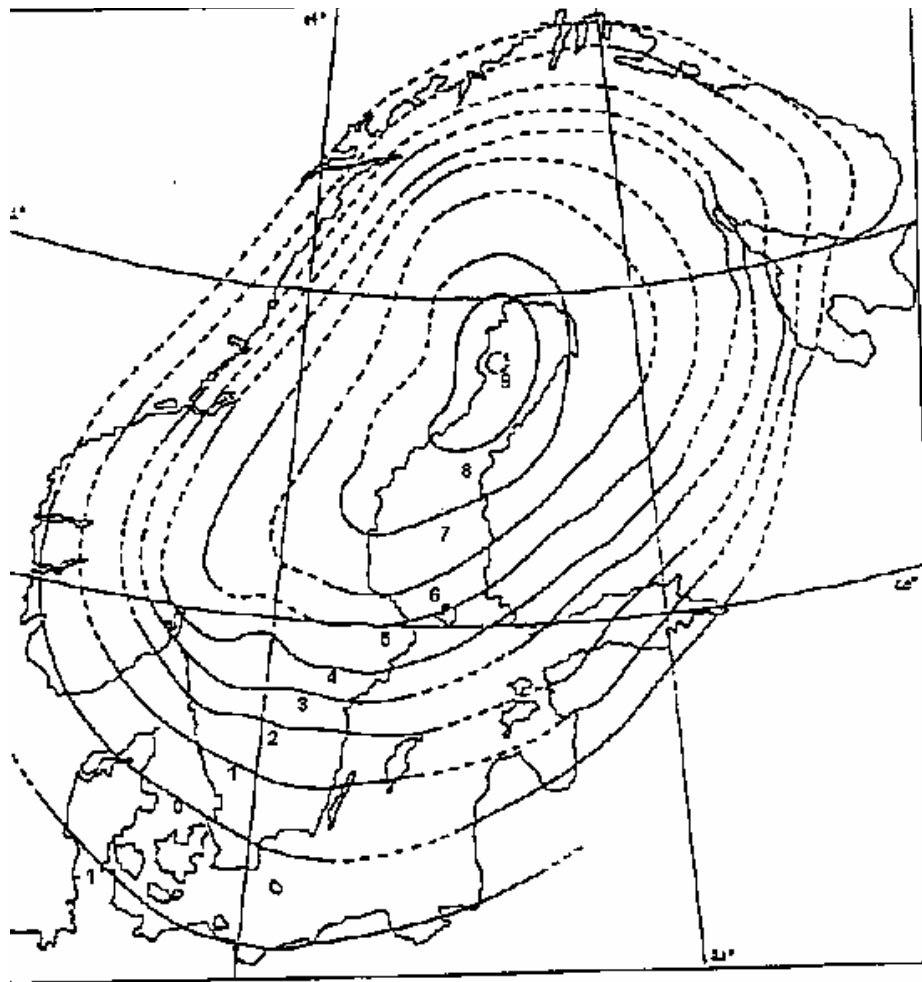


# Tilting

mm/year

Relative to the mean sea level

# Uplift



Uplift in Scandic  
1892-1991 i mm/year.  
(Martin Ekmann)

# Recommendation of user-WG

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## 1999:

- Name of the new height system should be DVR90 – not DNN
- Decision of a date where DVR90 heights will be available for users. WG suggested 1<sup>st</sup> January 2001
- Period of transition of max. 2 years



# Log book of Real Life

---

## 2005:

- Height benchmarks were re-calculated in DVR90 in 2001
- DVR90 heights of benchmarks were made available to users 27<sup>th</sup> of May 2002
- Period of transition until 1<sup>st</sup> of January 2005
- National implementation in all height data 1<sup>st</sup> January 2005
- No further maintenance of the old height system
- Historical heights in the old height system are still available.



# System 2000

Nye Referencesystemer:

- \* EUREF89 (UTM32 og Kp2000)
- \* DVR90 (højdesystem)

Ny geoide

3D fikspunktnet

Transformationer



# System 2000 - Hearing

---

- KMS sent out a hearing in 2000 and another one in 2001 among all interest groups for consideration of KMS's plans of introducing the System 2000.
- Concerning DVR90, all users agreed on the implementation plans from the working group.  
**Warning of misunderstandings.**

# Benefit from implementation of DVR90

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- One common and unambiguous reference for heights in Denmark (not several old systems)
- Effective use of GPS for height determinations
- Increased security, ex warning of storm flood, and dikes of sufficient height
- An unambiguous connection to a common European height system, so that sea level rise because of green house gas can be registered.

# Take care of height systems




VALDEMAR - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History Print

Address <http://valdemar.kms.dk/cgi-valdemar/valdemar?>

## Valdemar 2.52 - fikspunktoplysninger



**DVR90, Dansk Vertikal Reference 1990:**  
I årene 1982-1994 gennemførte Kort & Matrikelstyrelsen det 3. danske præcisionsnivelement. Præcisionsnivelementet blev sat i forbindelse med Meteorologisk Instituts vandstandsmålere. Ud fra nivelementet og Vandstandsregistreringerne er DVR90 fastlagt. Nyt gældende landsdækkende højdesystem introduceret 27. maj 2002.

<b>Land, Region:</b> <input checked="" type="radio"/> Danmark <input type="radio"/> Færøerne <input type="radio"/> Grønland	<b>Koordinatsystem (2 dim.)</b> <input type="radio"/> System 34 <input type="radio"/> UTM ED50 <input type="radio"/> Geo ED50	<b>Kotesystem</b> <input type="radio"/> DNN (GM91, GI44, KN44) <input type="radio"/> G.M.1891 (Jylland) <input type="radio"/> G.I.1944 (Øerne) <input type="radio"/> K.N.1944 (København) <input type="radio"/> Lokalt (Øvrige øer) <input type="radio"/> DVR90 (Danmark) <input type="checkbox"/> Med lokationskoordinater
<b>Hvordan søges:</b> <input type="radio"/> Punktnumre <input type="radio"/> Sognenumre <input type="radio"/> Herredsnumre <input type="radio"/> Kortbladsnummer <input type="radio"/> Polygon ved hjørnekoordinater <input type="radio"/> Kvadrat ved centrumskoordinater <input type="radio"/> Kvadrat med station som centrum <input type="radio"/> Kvadrat ved klik i oversigtskort <input type="radio"/> Polygon i fil	<b>Koordinatsystem (3 dim.)</b> <input type="radio"/> UTM E EUREF89 <input type="radio"/> Geo E EUREF89 <b>Advarsel!</b> Anvendelse af 3D koordinater, klik her	

**Bemærk: Mandag den 27. maj 2002 introduceres et nyt højdesystem i Danmark, DVR90. Koter i det gamle system, DNN og koter i det nye system, DVR90 kan ikke anvendes sammen. Koteoplysninger bør derfor fremover ikke afgives eller modtages uden samtidig systemangivelse.**

javascript:myVoid() Internet National Survey and Cadastre

# Warning



## Fikspunktbeskrivelse

Udskrevet 27/03-2003 12:01

## Kort & Matrikelstyrelsen

RENTEMESTERVEJ 8, KØBENHAVN NV  
Tlf. 35 87 50 50 • Fax 35 87 50 54



Punkt nr. 119-18-09075	Afmærkning: Bolt. 0.25 m over terræn.
Koordinater	Prins Buris Vej 37. Mejdal By. Over for Bregnevej. Mejdal Børne- og Ungdomscenter. Punkt i V. gavl. 3.45 m fra SV. hjørne. 0.08 m over sokkel.
UTM32 EUREF89	
S34J	Ikke GPS egnet.
	Kortblad 1115 II NV      Stedangivelse U32/EUREF N 6 244 891 m E 477 923 m
	Udfærdiget 1998

Koter	
OBS!! DVR90 OBS!!	
Kote =	19.543 m
Målt år	1998 NYT SYSTEM

G.M.1891	
Kote =	19.636 m
Målt år	1998/1991

Koter fra det nye system kan ikke bruges sammen med koter fra det gamle system

Skitserne er tegnet i varierende målestok, og de anførte mål er taget langs jordsoverfladen.

## Koter

OBS!! DVR90 OBS!!

Kote = 19.543 m

Målt år 1998 NYT SYSTEM

G.M.1891

Kote = 19.636 m

Målt år 1998/1991

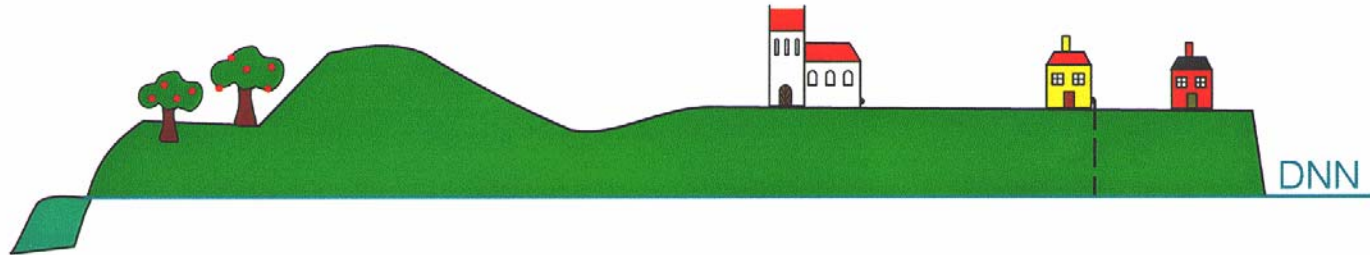
OF THE ENVIRONMENT

National Survey  
and Cadastre

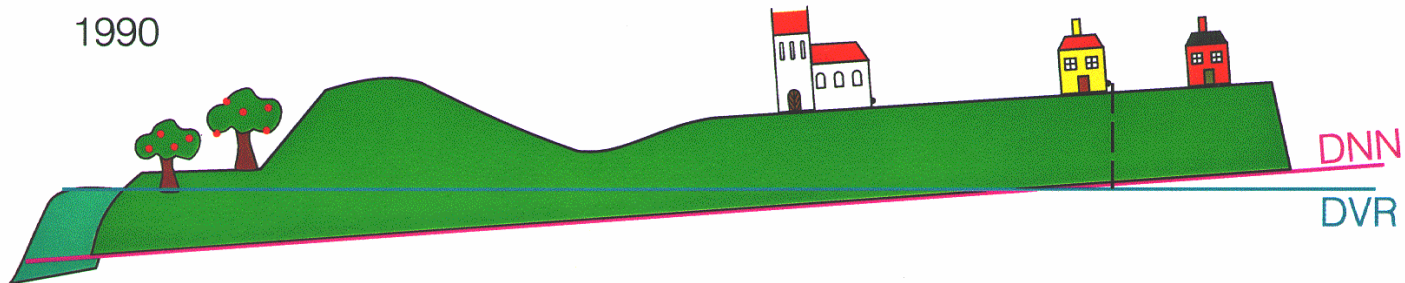
# Tilting of Denmark



1891

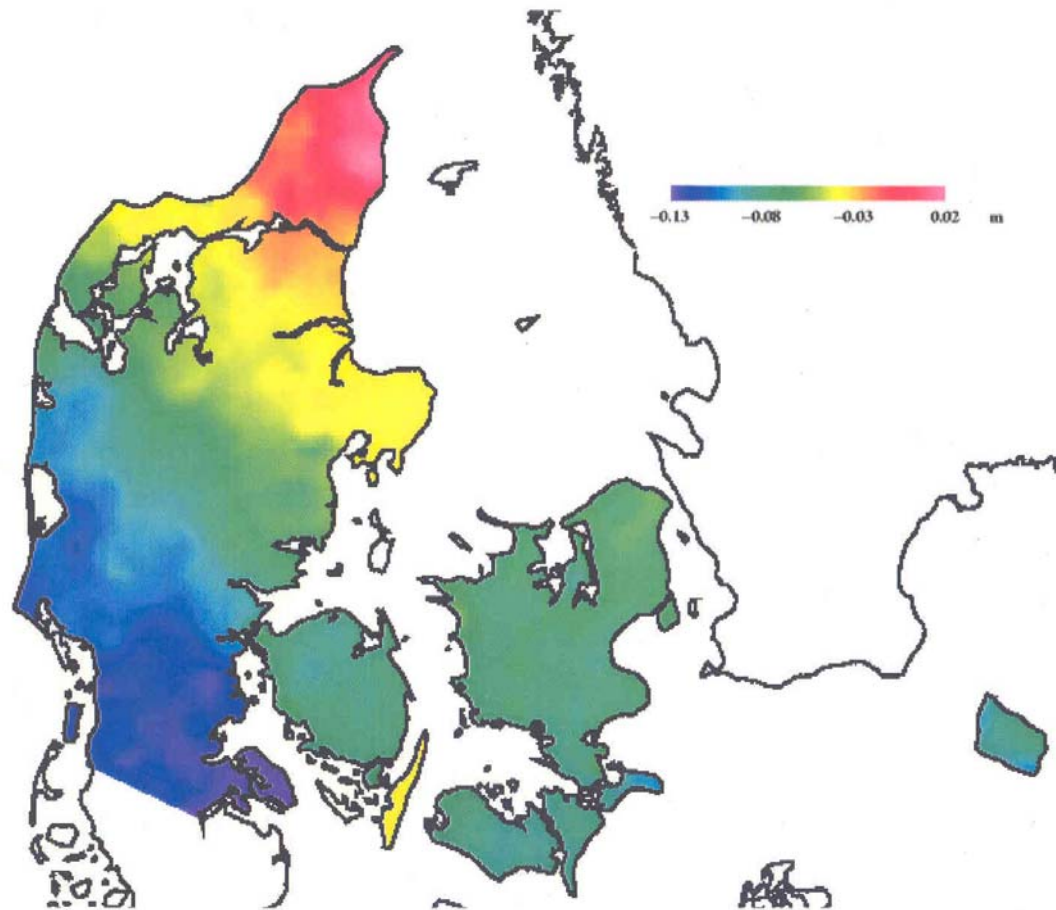


1990



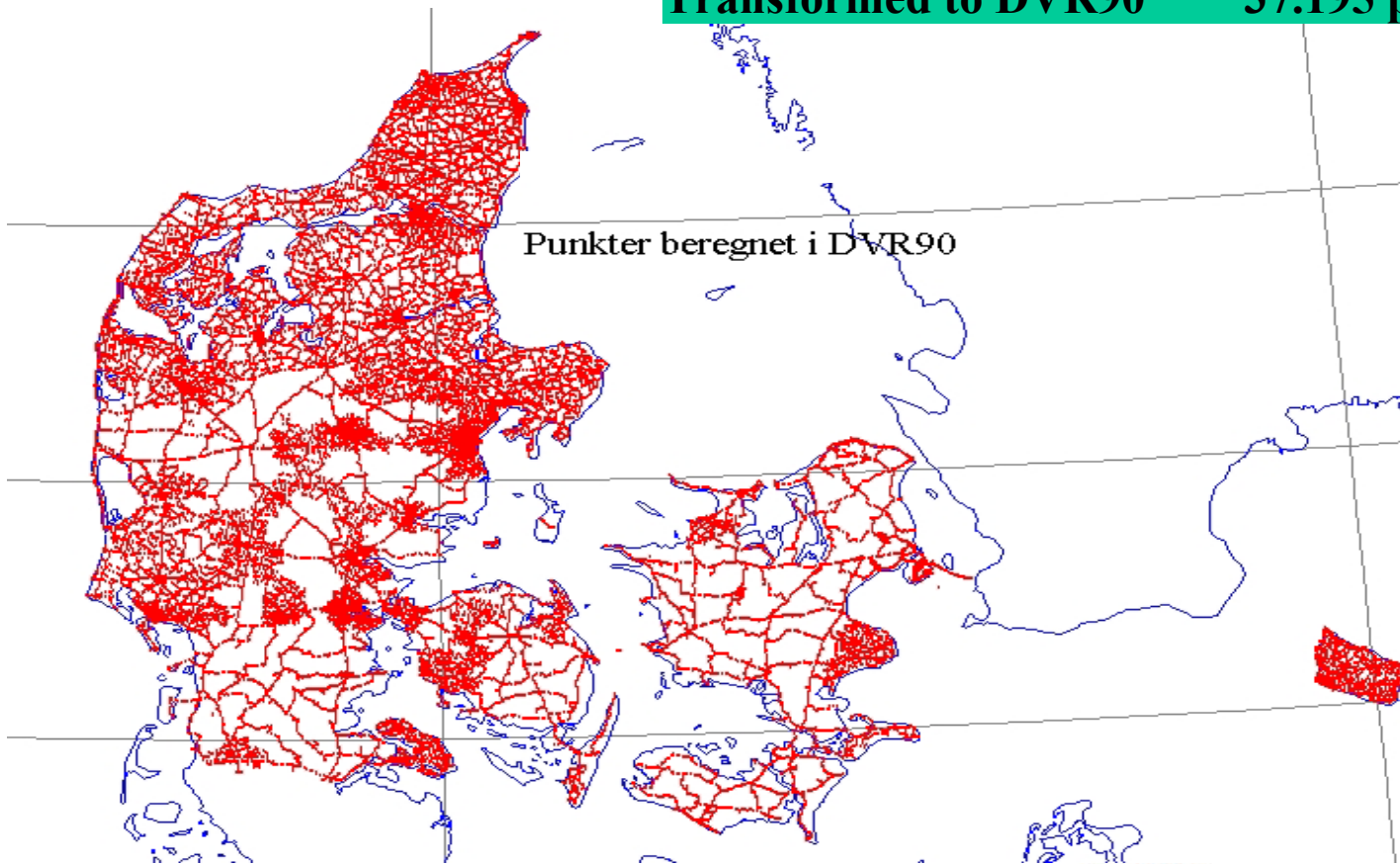
# Change of heights from DNN to DVR90

---



# Calculations of bench marks in DVR90

<b>Calculated in DVR90</b>	<b>47.262 pkt.</b>
<b>Transformed to DVR90</b>	<b>37.195 pkt.</b>



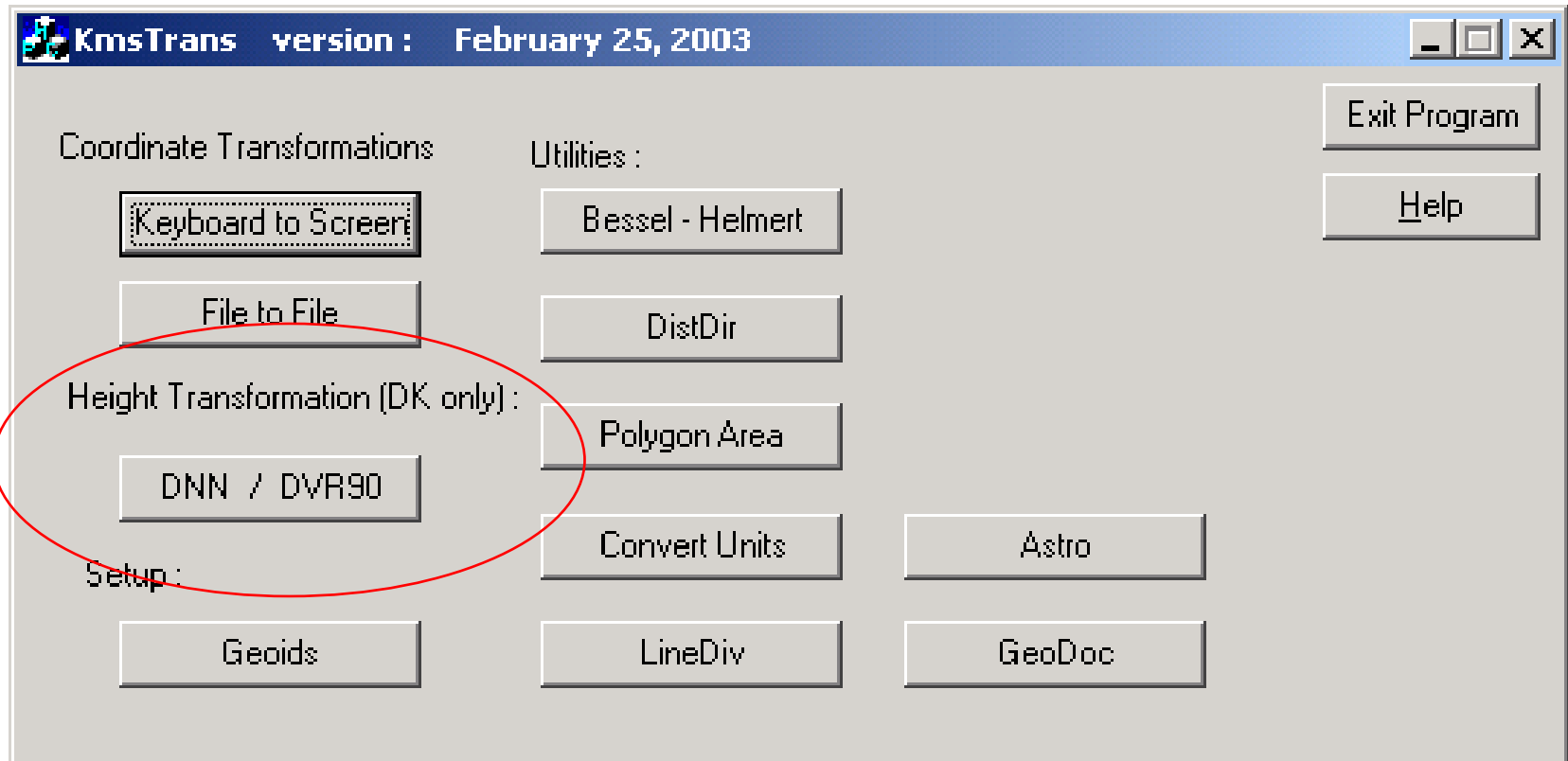
# Bench marks calculated or transformed

---

- All height bench marks has a DVR90 height
  - *Calculated* directly in DVR90 or *Transformed*
- Calculated DVR90 heights are available to the bench marks involved in levellings later than app. 1985
- Bench marks heights have been transformed if no observations were available
- Transformed or calculated is not important for the quality
- The Year of levelling gives an idea of the height quality



# Down-load of KMS trans



# Transformation possibilities for change of heights

The screenshot displays the KmsTrans software interface, version February 25, 2003. The main window is titled "KmsTrans" and contains several panels. The "Height Trans Dialog" panel is active, showing options for "Height Transformation (DK only):" with "DNN / DVR90" selected. Below this, there are radio buttons for "DNN -> DVR90 (c)" and "DVR90 -> DNN (r)". The "File Viewer" panel shows the output of the transformation, including a table of converted heights. A red circle highlights the "DNN / DVR90" button in the dialog, and another red circle highlights the "DNN -> DVR90 (c)" radio button. A third red circle highlights the value "20.012 m" in the table. A fourth red circle highlights the value "19.924 m" in the table.

Coordinate Transformations

Keyboard to Screen

File to File

Height Transformation (DK only):

DNN / DVR90

Setup:

Geoids

Height Trans Dialog

Input K:\V...  
Output K:\C...

DNN -> DVR90 (c)  
 DVR90 -> DNN (r)

Height Lines read :  
Heights converted :

File Viewer

Input File Output File Log File

Conversion of Heights from DNN to DVR90

Input from : K:\Geodata\pip.txt  
Output to : K:\Geodata\pap

#utm32Ned50

1 001	6 240 996.785 m	479 340.836 m	19.924 m
1 002	6 128 456.592 m	522 749.196 m	20.904 m
1 003	6 130 868.167 m	595 096.463 m	21.970 m
1 004	6 154 180.064 m	693 971.061 m	23.113 m
1 005	6 068 971.061 m	661 012.862 m	24.110 m

-1 z

File Viewer

Input File Output File Log File

#utm32Ned50

1 001	6 240 996.785 m	479 340.836 m	20.012 m
1 002	6 128 456.592 m	522 749.196 m	21.026 m
1 003	6 130 868.167 m	595 096.463 m	22.051 m
1 004	6 154 180.064 m	693 971.061 m	23.113 m
1 005	6 068 971.061 m	661 012.862 m	24.110 m

OK Help

OK Help

# Also simple possibilities

Kort & Matrikelstyrelsen - Forskelle mellem DVR90 og DNN - Microsoft Internet Explorer

Address: [http://www.kms.dk/C1256AED004E87BA/\(AllDocsByDocId\)/0663ED8EBCD79EE1C12568C1003C3B88?open&page=referencenet&omr=ERVGRUNDLAG](http://www.kms.dk/C1256AED004E87BA/(AllDocsByDocId)/0663ED8EBCD79EE1C12568C1003C3B88?open&page=referencenet&omr=ERVGRUNDLAG)

Produktkatalog | Hjælp | Indtast søgeord Søg

Mest til fritid | Mest til arbejde | Forskning & udvikling | Samarbejder | Om Kort & Matrikelstyrelsen

## Kort og geodatagrundlag

Forside • Kontakt • English

### Kort & geodata grundlag

- Adressekoordinater
- Begreber og definitioner
- Det danske kvadråtnet
- Matriklen
- Referencenet
  - Anvendelse af GPS
  - Geoide
  - System 2000
  - Transformation
- Topografi
- Find din kundeconsulent

### Forskelle mellem DVR90 og DNN

#### Øversigt over forskellen i de enkelte kommuner

**Forskel:** En negativ kote-forskel betyder at området har sat sig igennem årene. DVR90 koten er således mindre end DNN koten i det meste af landet, dog undtaget Nordjylland. Dvs. at nulpunktet er hævet i det meste af landet.

Ved omregning fra det ene til det andet system anvendes forskellen for kommunen fra oversigten således:

*"Gammel kote plus forskel med fortegn = ny kote".*  
*"Ny kote minus forskel med fortegn = gammel kote".*

**Varians:** Udtryk for afvigelse inden for kommunen. En langstrakt kommune Nord-Syd vil typisk have en stor varians, fordi Danmark er vippet Nord-Syd. Variansen er opgivet i mm.

Kommune navn	Forskel (DVR90 minus DNN)	Varians (mm)
Aabenraa	-0.123 m	2
Aabybro	-0.016 m	9
Aakirkeby	-0.087 m	4
Aalborg	-0.021 m	6
Aalestrup	-0.043 m	3
Aarup	-0.085 m	4
Aaskov	-0.091 m	4
Albertslund	-0.070 m	1
Allerød	-0.061 m	1
Allinge-Gudhjem	-0.083 m	5
Arden	-0.040 m	3
Assens	-0.072 m	6
Augustenborg	-0.133 m	3
Åulum, Haderslev	-0.074 m	7

Udskriv

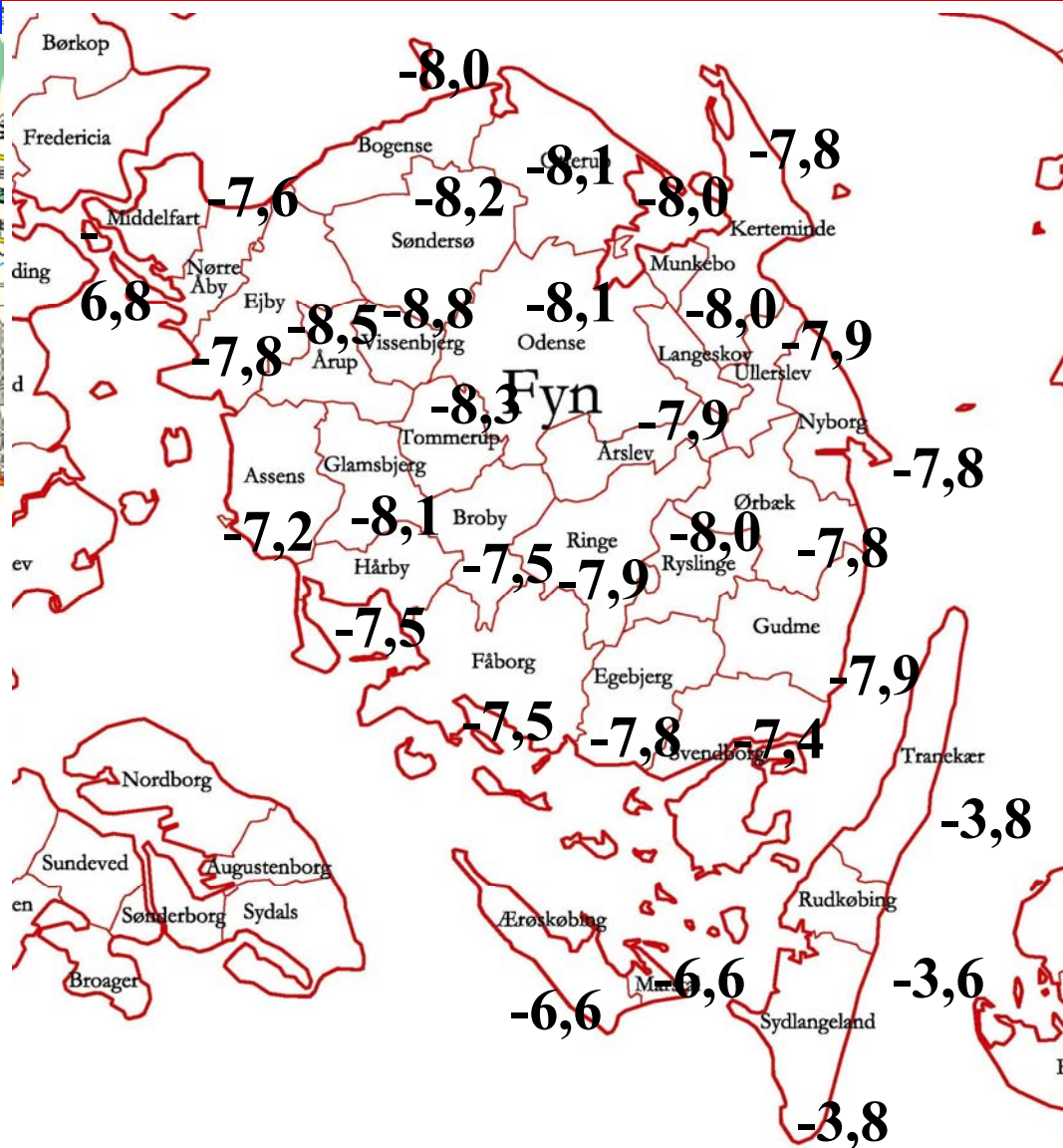
Læs mere

- [EUREF89](#)
- [De nye kortprojektioner](#)
- [UTM/EUREF89](#)
- [Kp2000](#)
- [DVR90 Nvt højdesystem](#)
- [Forskel DVR90-DNN](#)
- [Status omlægning til DVR90](#)
- [Omlægning af Data](#)
- [Nyt fikspunktnet](#)
- [Høringer](#)
- [Brochurer](#)

**Relaterede sider**

- [Rådet for Danmarks Geografiske Referencenet](#)
- [Pilotprojekt om System 2000](#)

# Difference DNN – DVR90



*Fyns amt*

*Negativ fortegn betyder  
at området "har sat sig"*

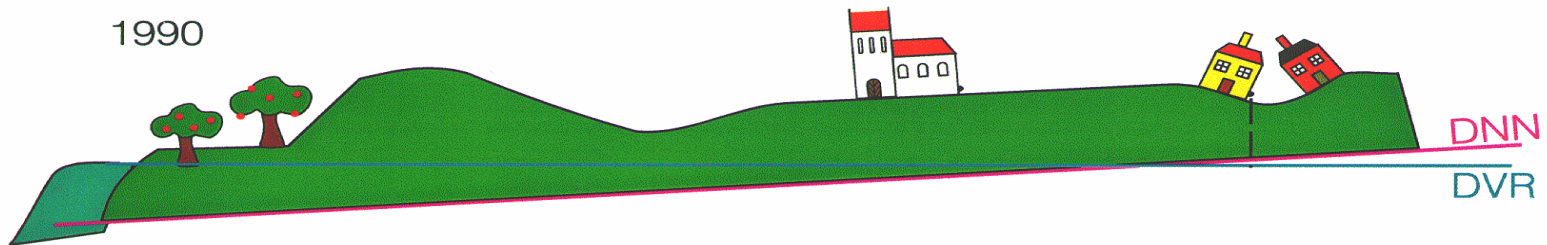
# Local settlements is not a part of DVR90

---

- The national transformations developed by KMS (KMSTrans) is used between height systems....
- BUT it can not solve problems due to local settlements, where no new measurements have been performed.....



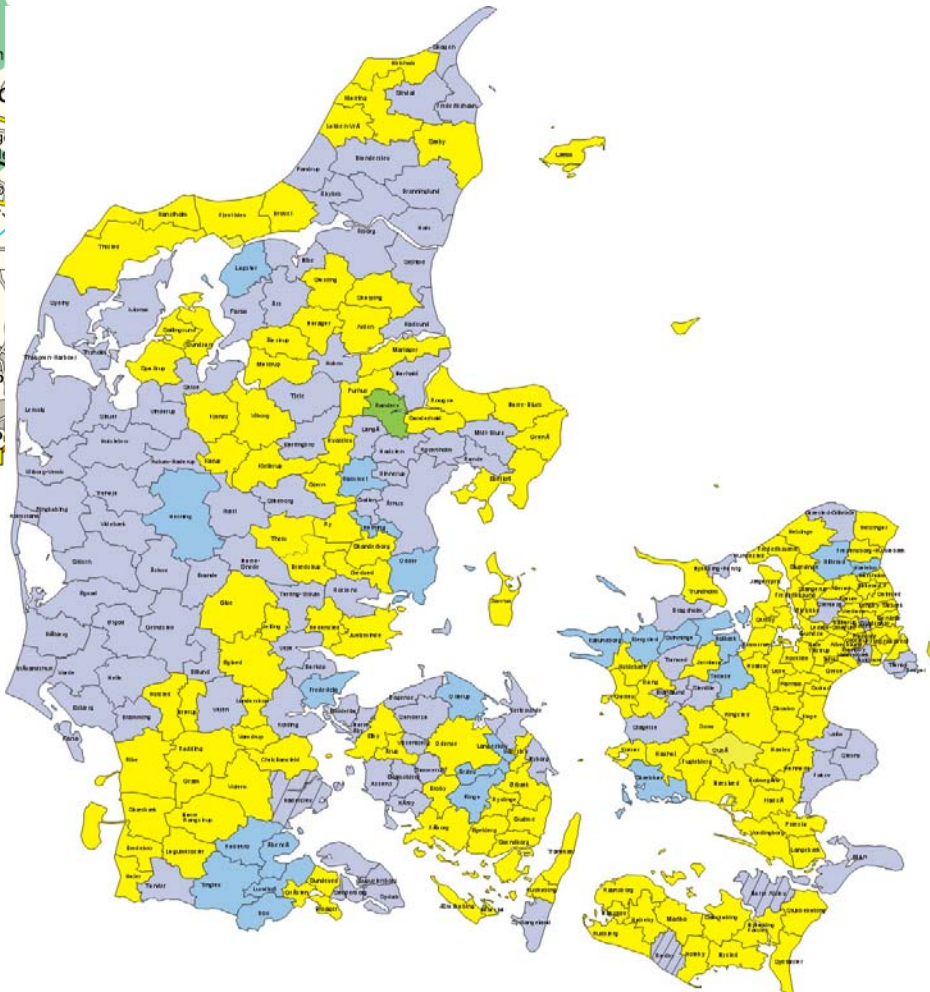
# Local settlements





## STATUS HØJDENET 3-2-2005

-  105 afsluttede projekter
-  26 igangværende projekter + Vestsjællands Amt
-  1 Kommunalt udført projekt
-  Delprojekt

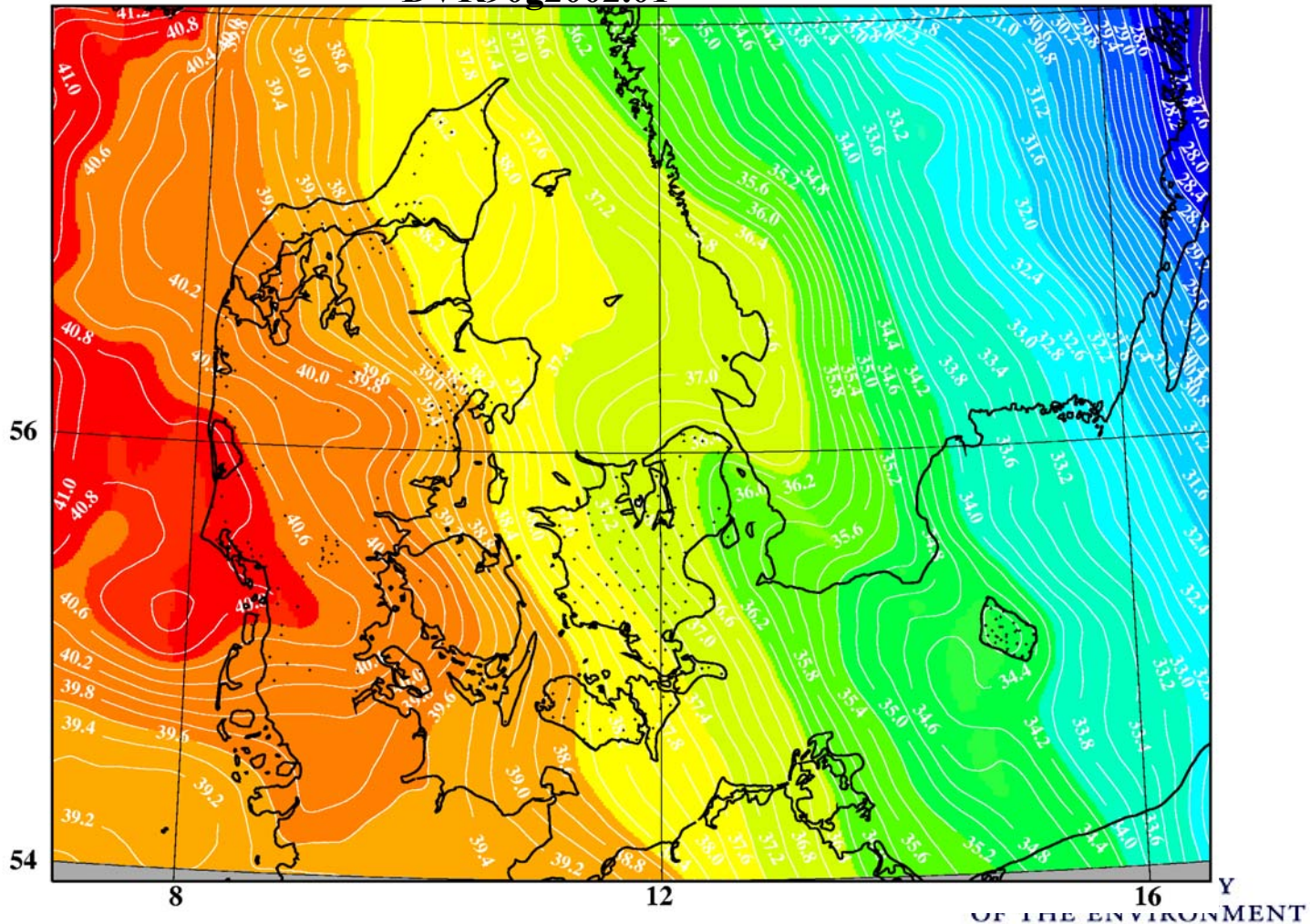


Kort & Matrikelstyrelsen

# Fitting of the geoid to DVR90

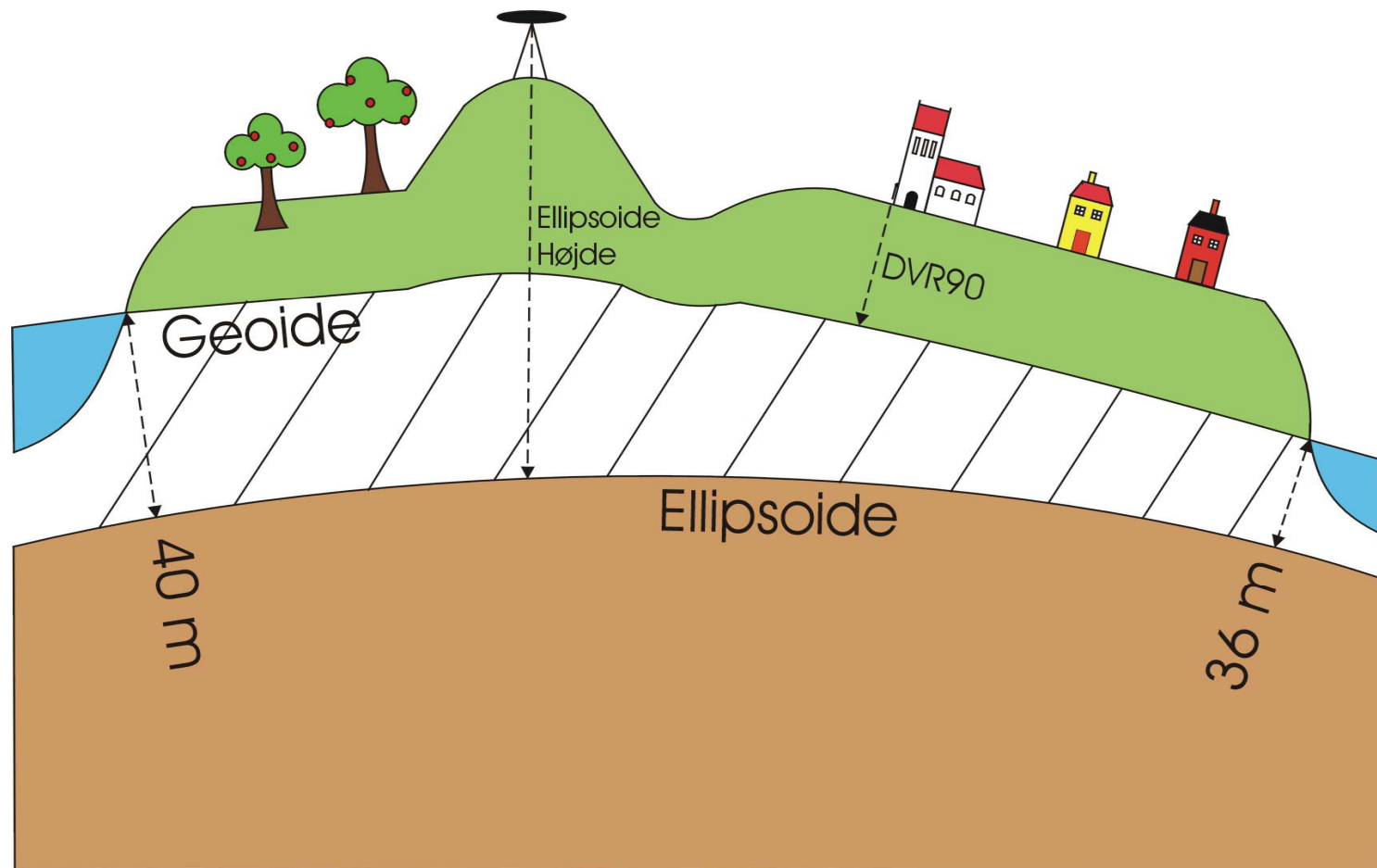


DVR90g2002.01





# Use the correct geoid model - DVR90g2002.01





# The new geoid – DVR90g2002.01

---

- GPS can be used for height determination in DVR90, Geoid error is less than 1-2 cm
- Earlier geoids are fitted to the old DNN's
- Be careful – choice of geoid model gives either heights in DNN or in DVR90

# Geoide-model and heights in correct system

**Keyboard To Screen Transformation**

Main System : Geographical coord, EUREF 89 (=WGS84), Ellipsoid Heights

Slave System : UTM zone 32, EUREF 89 (=WGS84), DVR90 Heights

Write Data to File

Main System	Latitude	Longitude	Ellipsoid Height
geoEuref89	55 10 12.00003 sx	10 49 12.00003 sx	136.082 m

Slave System	Northing	Easting	DVR90 Height
utm32Neuref89	6 115 220.637 m	615 923.207 m	97.077 m

Swap Main/Slave

Region

- Danmark
- Færøerne
- Grønland

Units for Geogr. Coor

- sx (ddd mm ss.ssss)
- nt (ddd mm.mmmm)
- dg (ddd.dddddddd)
- rad

Geooid Name: **dvr90g2002.01**

Geooid Height: 39.005 m (euref89)

Help Close Dialog



# Implementation of DVR90

---

Some municipalities decided to change to the new height system 1<sup>st</sup> of January 2005

KMS made a plan:

- Implementation of a new height system has to be coordinated in large areas
- No one can see the difference between heights in two different systems
- The aim was to ensure that all heights would be exchanged in DVR90 from 1.1.2005

# Common aim (1)

---

May 2004

- The common aim for **The Interest and Member Organisation for municipalities (KL), Council of Municipality Technical Chiefs and National survey of cadastre (KMS)** regarding use of System 2000 in the municipalities:



# Common aim (2)

---

- That height data will be transformed to DVR90 during the year of 2004 thus all exchanges of height data will be done in DVR90 from 1<sup>st</sup> of January 2005
- That as many as possible have transformed X,Y data to UTM/EUREF89 during the year of 2005, and that all data will be structured in a way that makes it possible to exchange data in UTM/EUREF89 from 1<sup>st</sup> of January 2006.



A vertical map strip on the left side of the slide shows a portion of the Helsingør region in Denmark. It includes labels for various locations such as Valby, Valby Hegn, Helsingør, Neilinge, Høje, Alsonderup, Nejedø, and Tulstrup. The map also shows roads, water bodies, and some specific markers.

# DVR90 is implemented in DK

---

- Risk of misunderstandings **PAS PÅ KOTEN!**
- Mark the data (Stamp data, through out the old papers and files)
- Always use a height reference:
- KMS provided bench marks heights in DVR90 & URL-addresses
- DVR90 – et fælles ansvar!



# DVR90 is implemented in DK


---

- Risk of misunderstandings **PAS PÅ KOTEN!**
- Mark the data (Stamp data, through out the old papers and files)
- Always use a height reference: **7,12 m / DVR90**
- KMS provided bench marks heights in DVR90 & URL-addresses

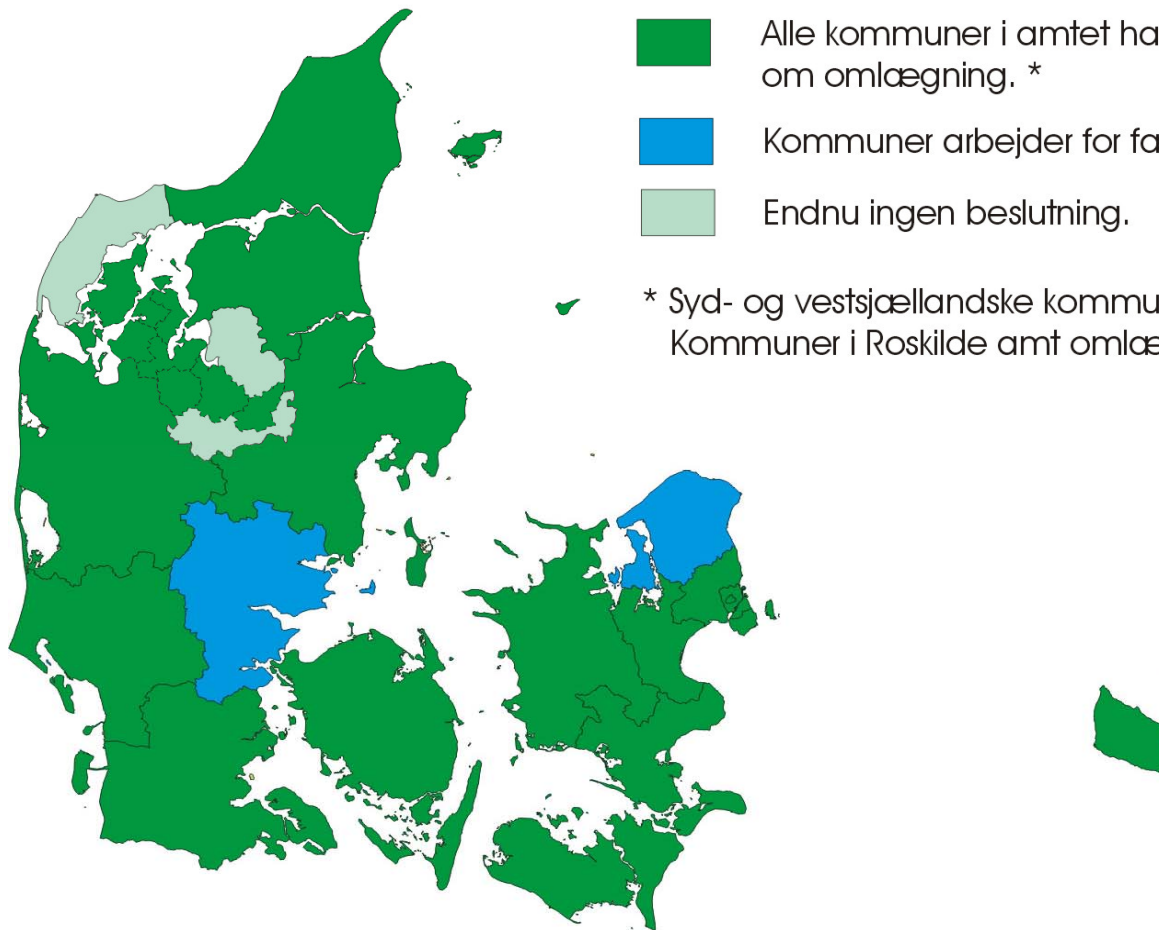


# Municipalities' decisions to change to DVR90

## Kommunernes omlægning til DVR90 pr. 1.1.2005.

-  Alle kommuner i amtet har truffet fælles beslutning om omlægning. \*
-  Kommuner arbejder for fælles beslutning.
-  Endnu ingen beslutning.


\* Syd- og vestsjællandske kommuner omlægges 1-04-2005.  
Kommuner i Roskilde amt omlægges i 2005.

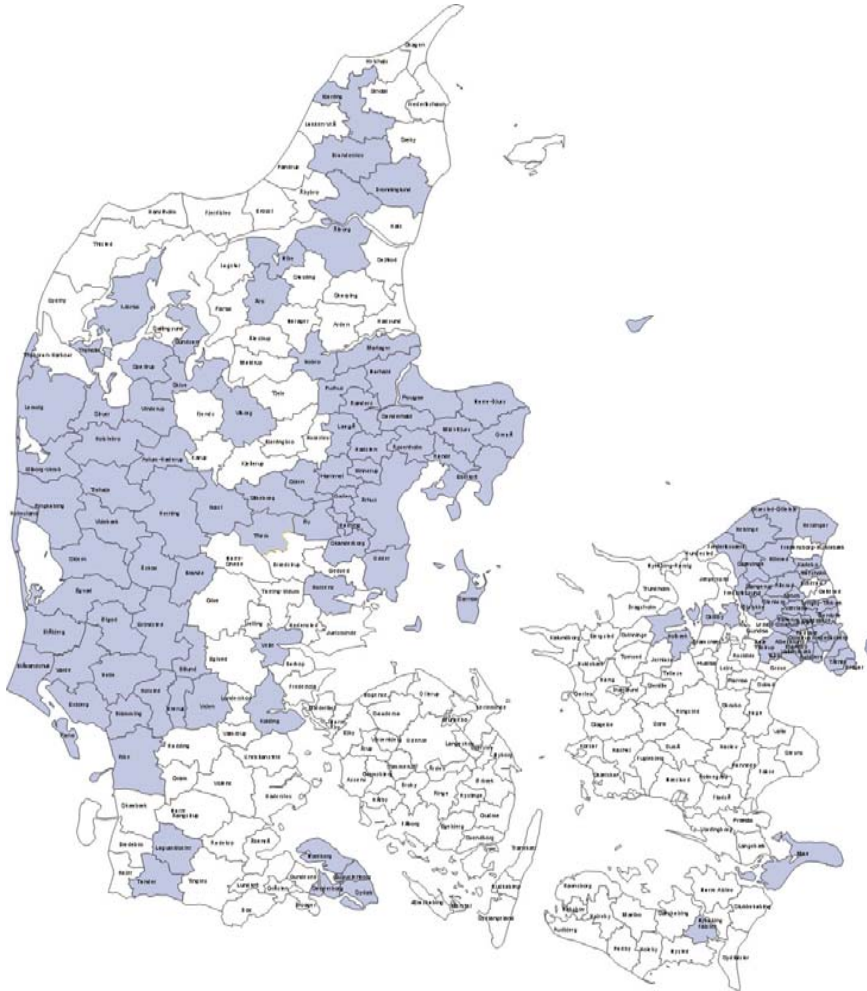


# DVR90 in use in the municipalities

STATUS DVR90 3-6-2005

 Data has been transformed

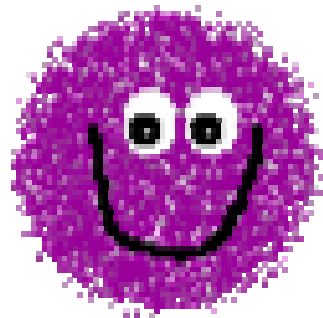
 Data is not transformed yet





---

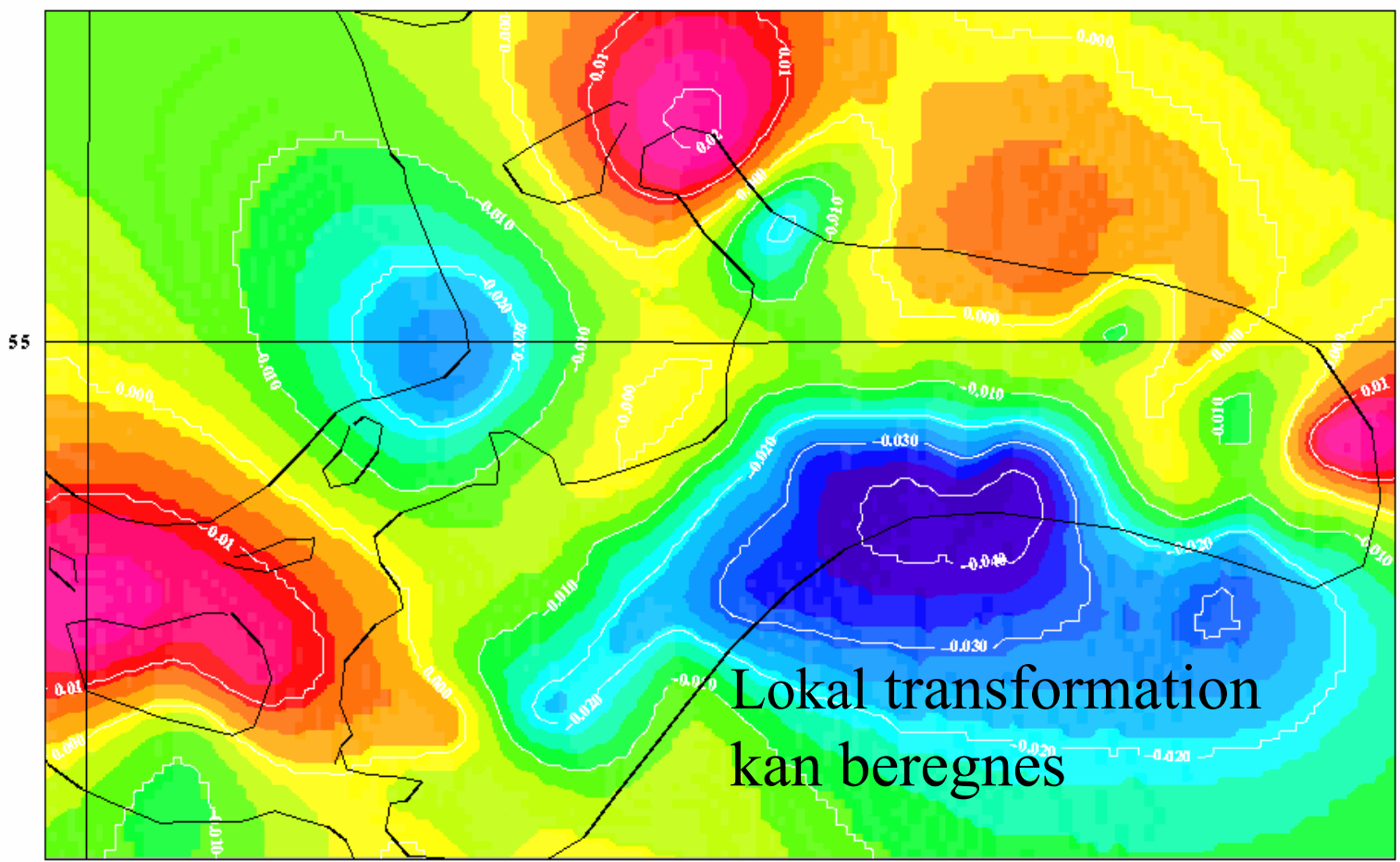
# Thank you for your attention



# Modelling of local change

## Ændring fra gl. DNN til ny DNN

Højdeændring i DNN GI44 fra 1950 - 2000



12

-4 cm

+2 cm

# Højdetransformationerne

---

## Landsdækkende

- Grid 5x5 km
- DNN-DVR90
- KMS-trans

## Lokal

- Grid 200x200 m
- Gl. DNN – Ny DNN
- Rekvireres fra KMS efter højdenetrenovering

Alternativ:

Cowi trekant-trans.