



**5 March 2012 –**

The first day of the European Surveyor  
and Geoinformation

500th Anniversary of the birth of  
Mercator

**Mercator and the challenges for  
the modern European Surveyor**

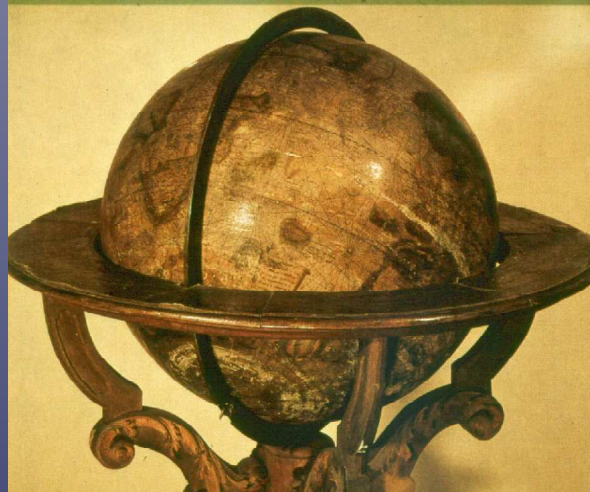
**Jens Riecken, DVW-Vice President**

Bonn, Germany

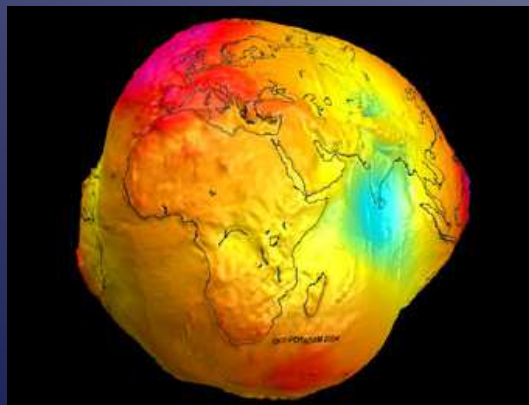


Mercator Duisburg

**Flat surfaces are needed so that people could carry maps with them**



Globe 1541



Listing: „Geoid“ 1873

the Earth's surface is curved and so it is not possible to represent on a flat surface with out some distortions

**Mercator (1512-1594)**



# Mercator = INSPIRE\* in the 16<sup>th</sup> century

\* Infrastructure for Spatial Information in Europe



Map of the World, 1569

Mercator projection

- the base for modern navigation
- is a cylindrical projection: preserves direction (angles from a point on a line to another point are portrayed correctly in all directions).



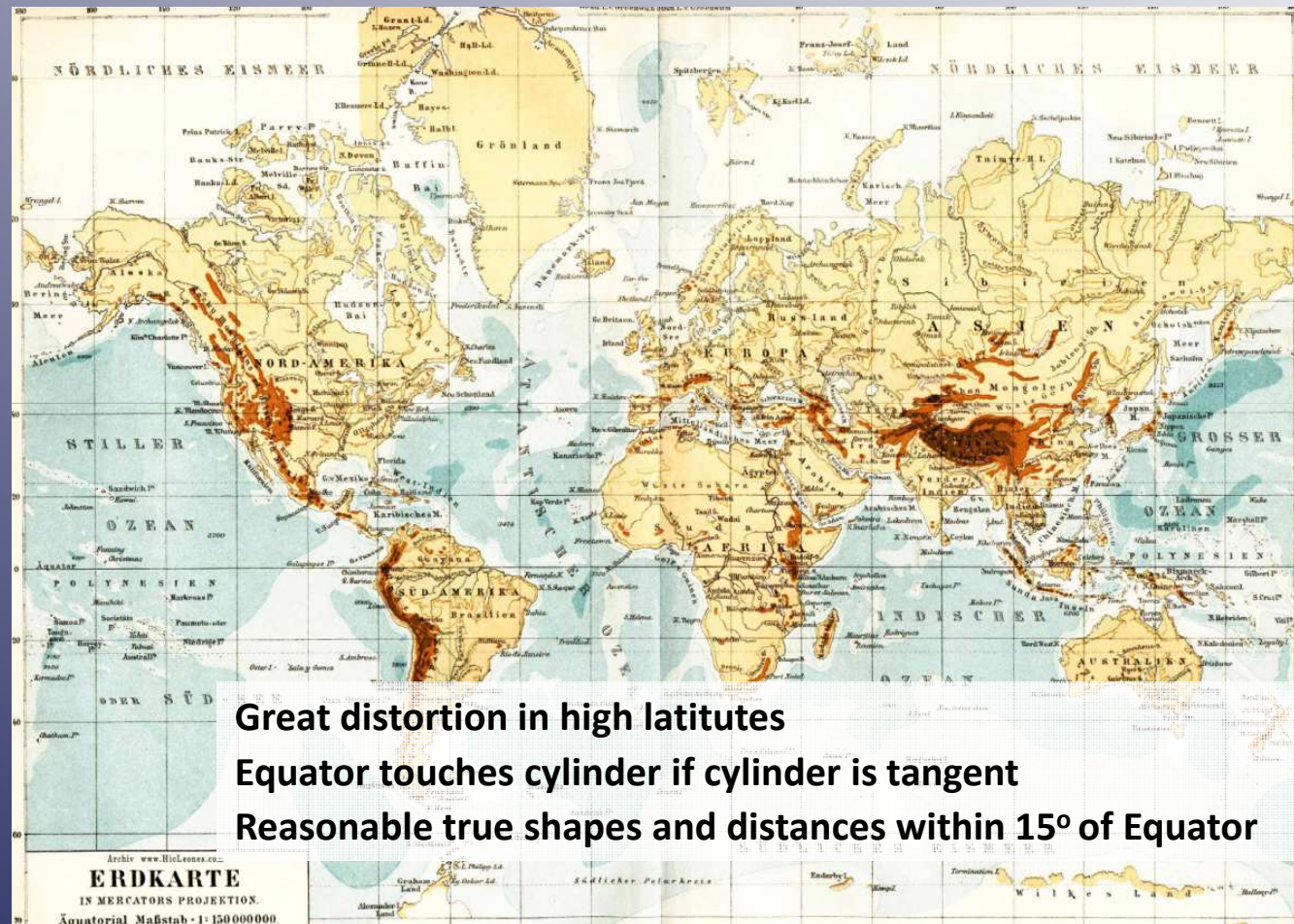
Mercator Brussels



# Problem with the Mercator projection



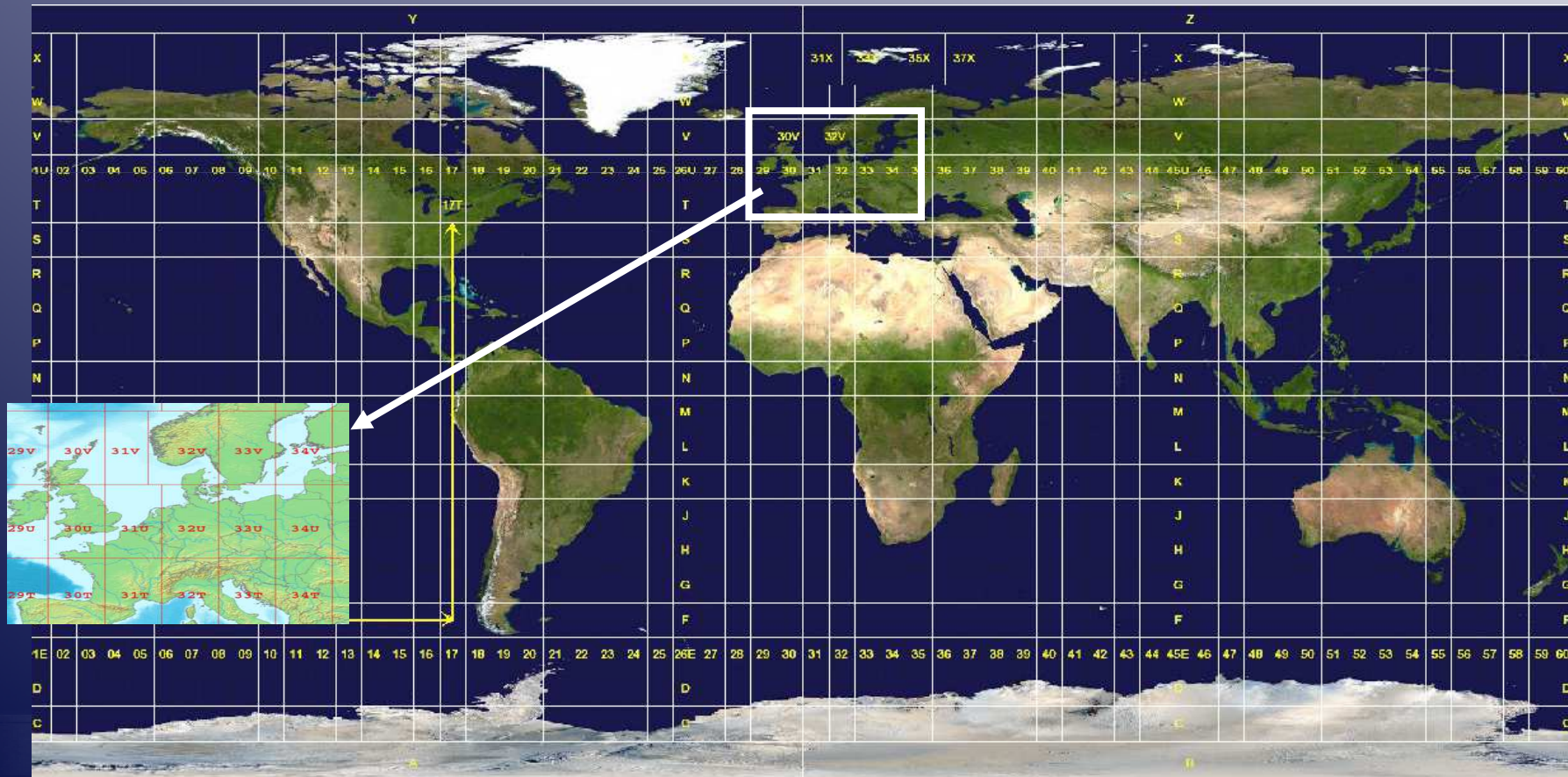
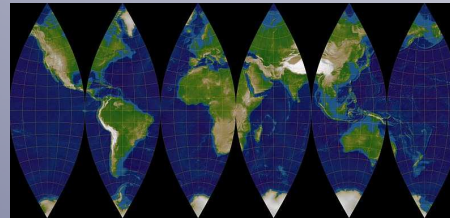
Map of the Earth, Mercator projection, 1:150.000.000



Greenland is presented as large as Africa. In reality Africa's area (30,3 Mkm<sup>2</sup>) is more than 13 times bigger than Greenland (2,2 Mkm<sup>2</sup>).



# Universal Transverse Mercator (UTM)

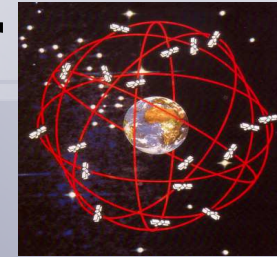






# 500 years Mercator

(L, B)



1986: first civil use of GPS in Europe

(x, y, z)



(t)



(L, B, t)



(x, y, z, t)



1550

1750

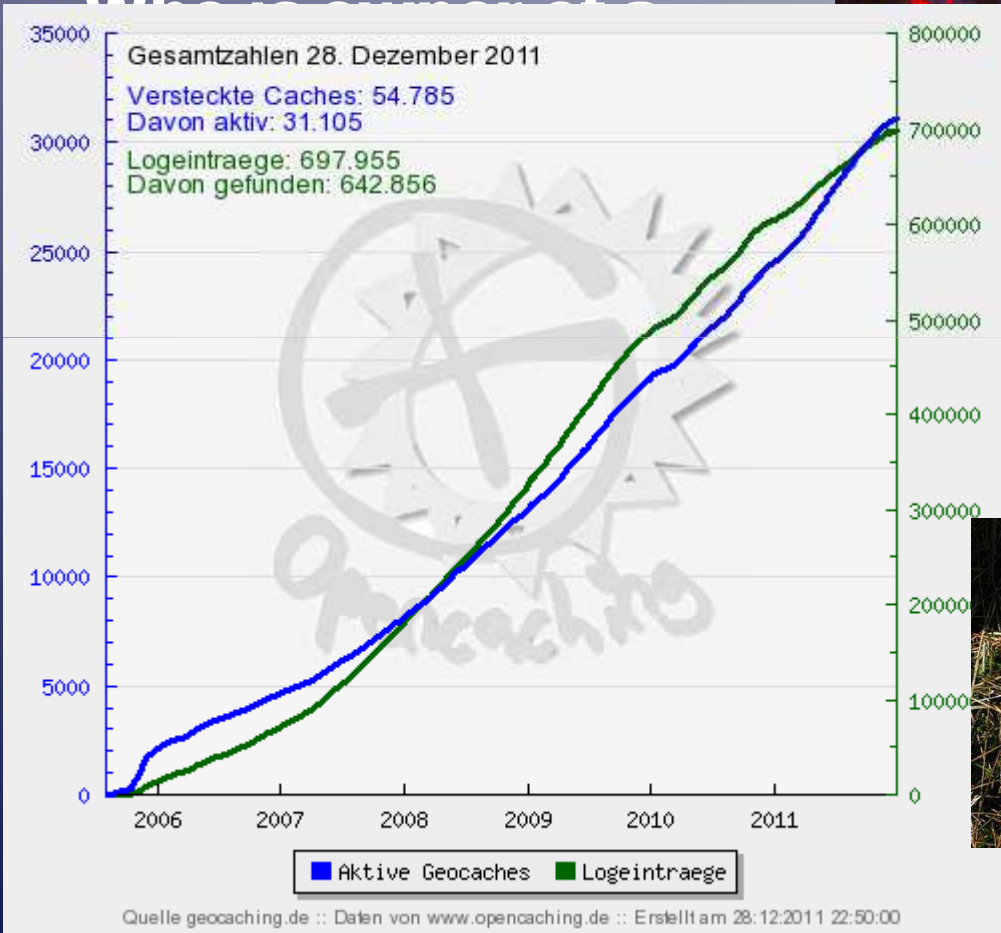
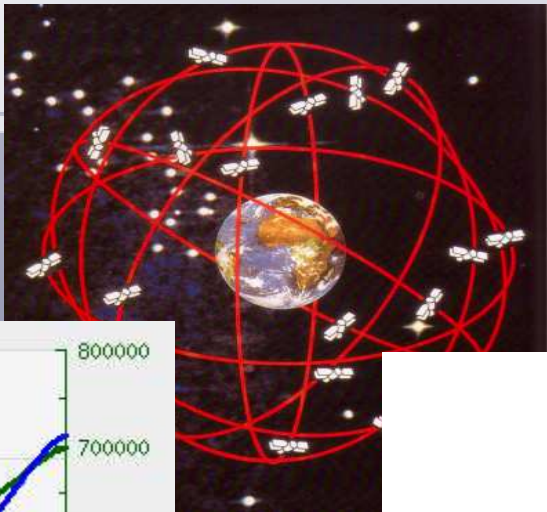
1900

2000

2010



# Navigation today -part of daily life?

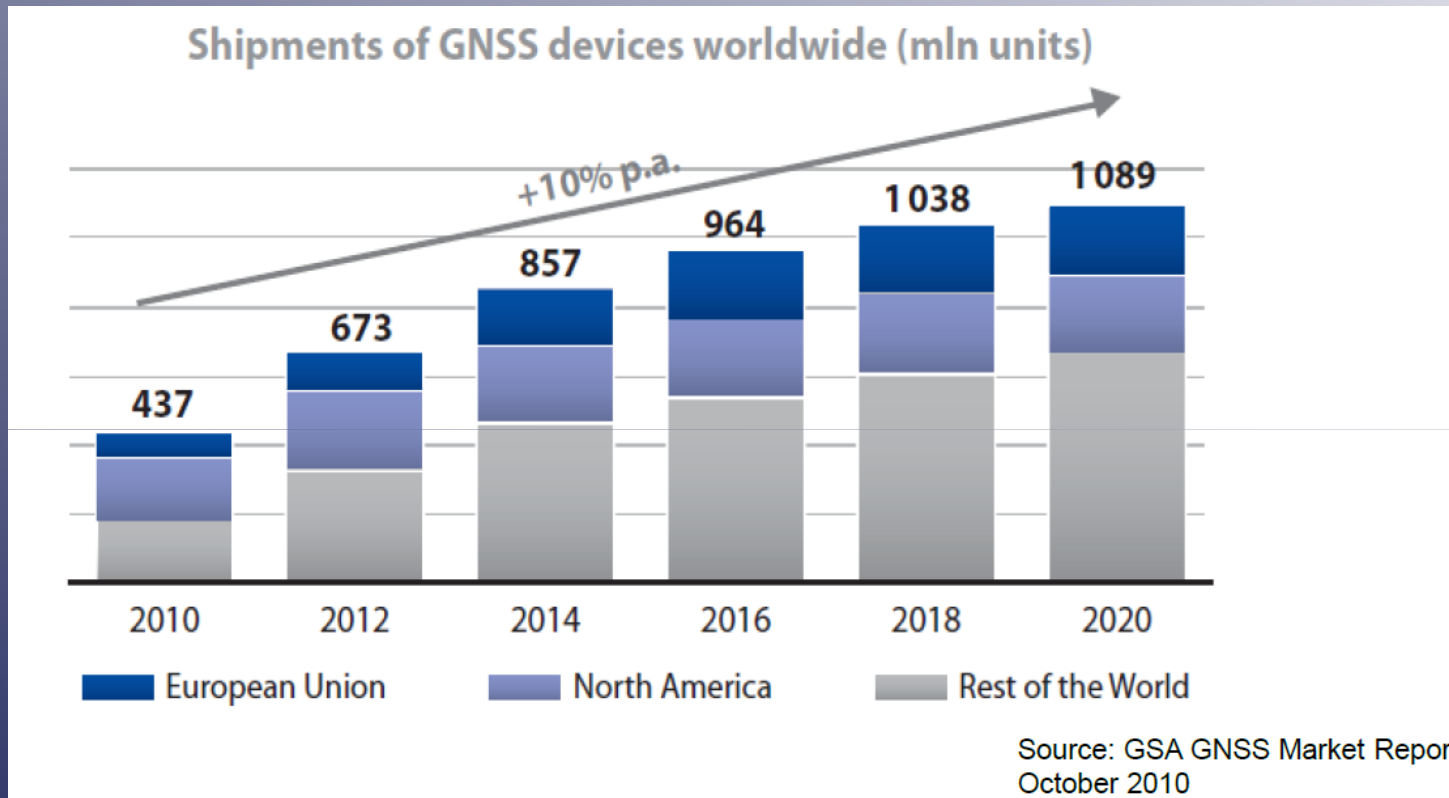


o, GLONASS, CO





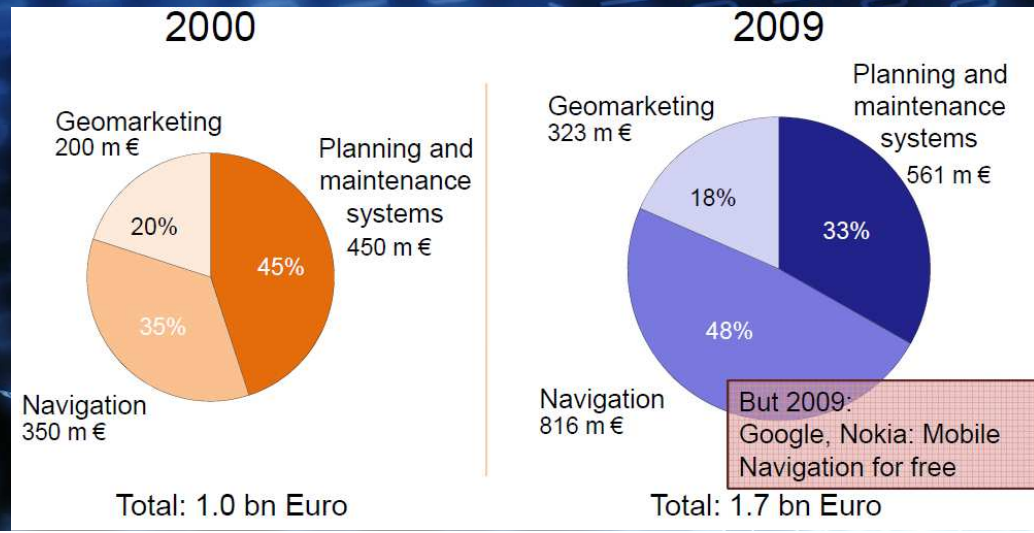
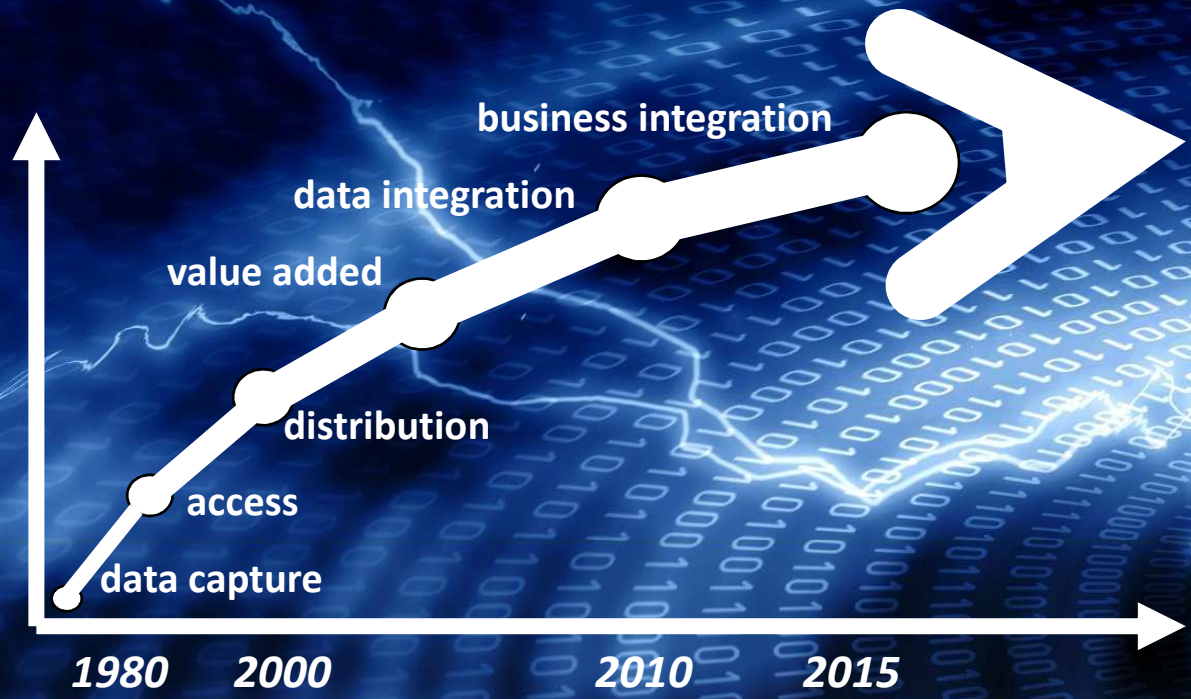
# Navigation today – a huge market



According to the GSA report, the market for GNSS will grow significantly over the next decade, at a compound annual growth rate of 11%, reaching some €165 billion for the core GNSS market in 2020. Delivery of GNSS devices will exceed one billion per year by 2020.



# The value of digital spatial information

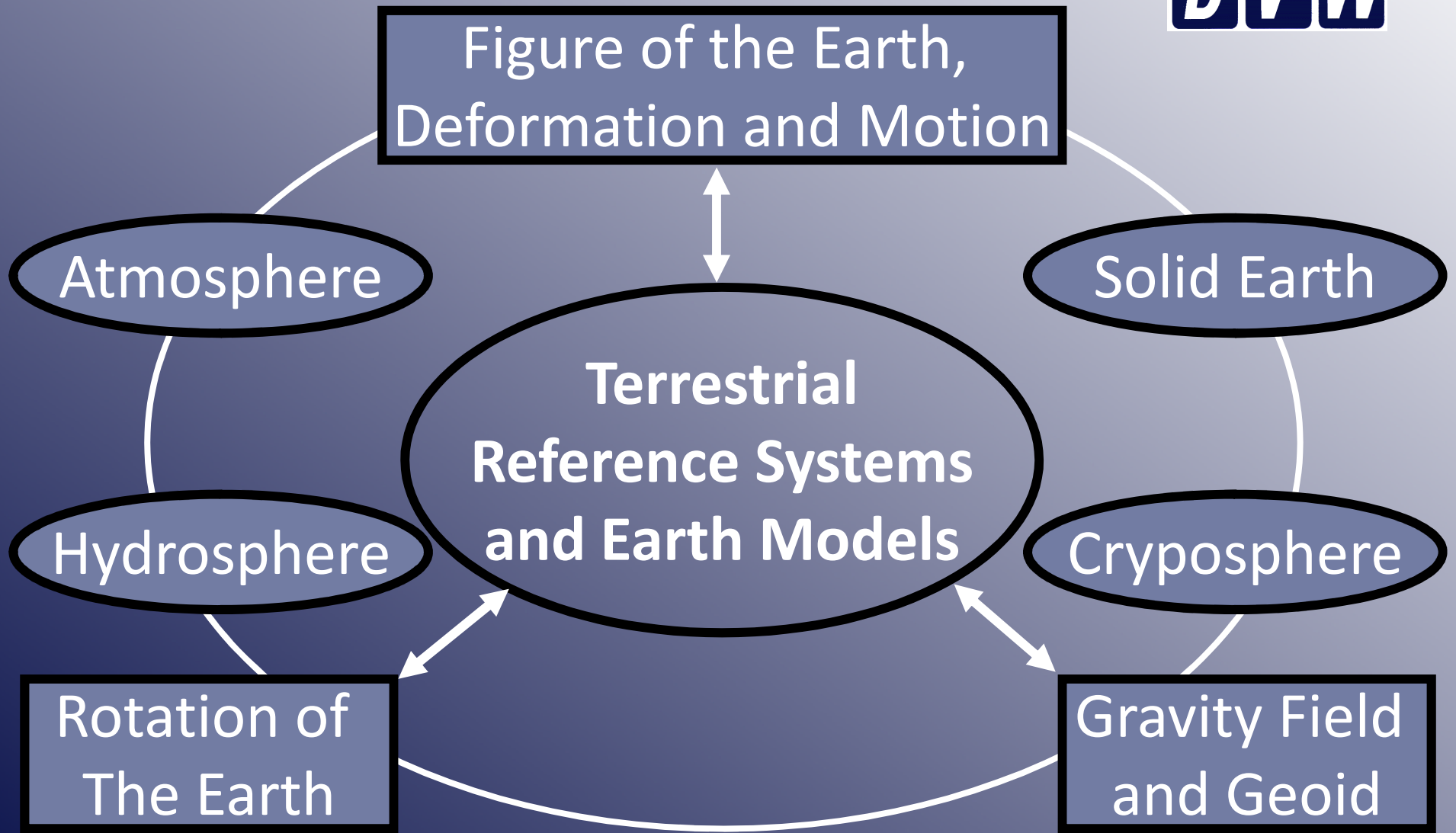


source: micus 2001/2010





# Tasks of surveying and geodesy





# Coordinate Reference System (CRS)

## Definition of ETRS89



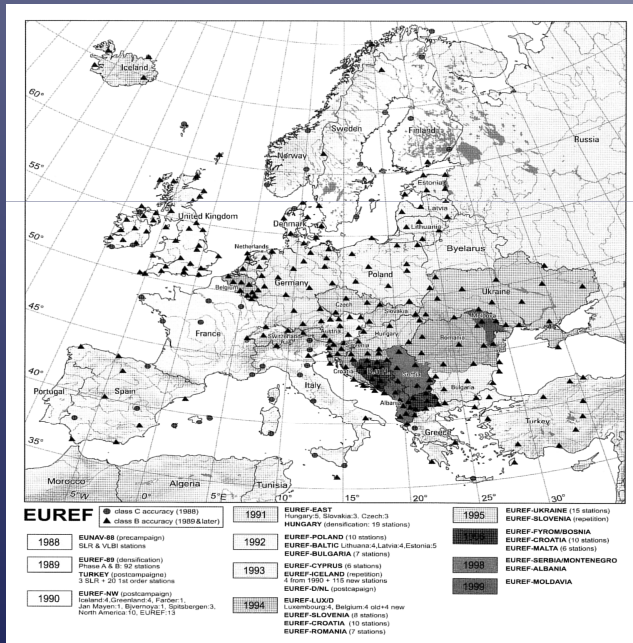
- The apparent intention of the definition obviously was to have a European reference system which minimizes changes of coordinates with time over a large part of the European continent.
- According to its definition the European Terrestrial Reference System 1989 (ETRS89) is fixed to the stable part of the Eurasian Plate and is coincident with ITRS at the Epoch 1989.0. (Resolution No 1, Firenze, 1990).
- The definition does not specify the actual area of the "stable part", and it is unclear whether "fixed" is meant in a three-dimensional sense or in the horizontal direction only.
- The resolution also mentions that “for most applications, the coordinates will have no time variation”.



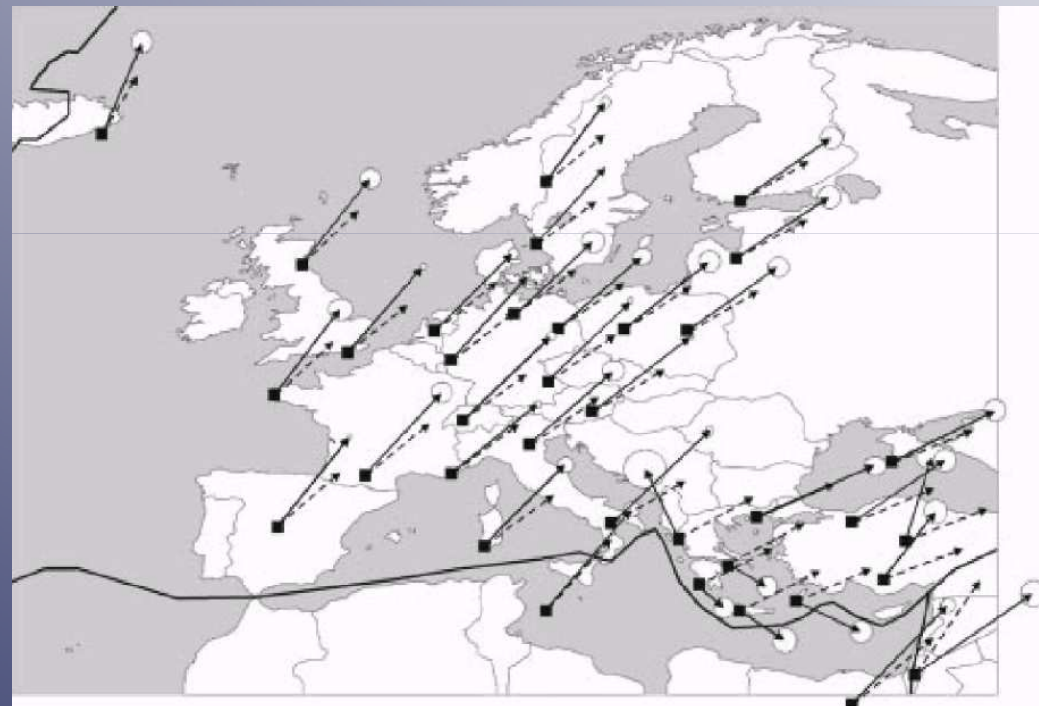
# Geodetic Reference Frame (CRS) - challenges today



Coordinates are fixed – no they aren't!



EUREF/ETRS-Permanent stations  
in Europa (BKG 2006)



Source: Ihde, BKG

# Geodetic Reference Frame (CRS) - challenges today



Coordinates are fixed – no they aren't!



Donatussprung (North-Rhine Westphalia)

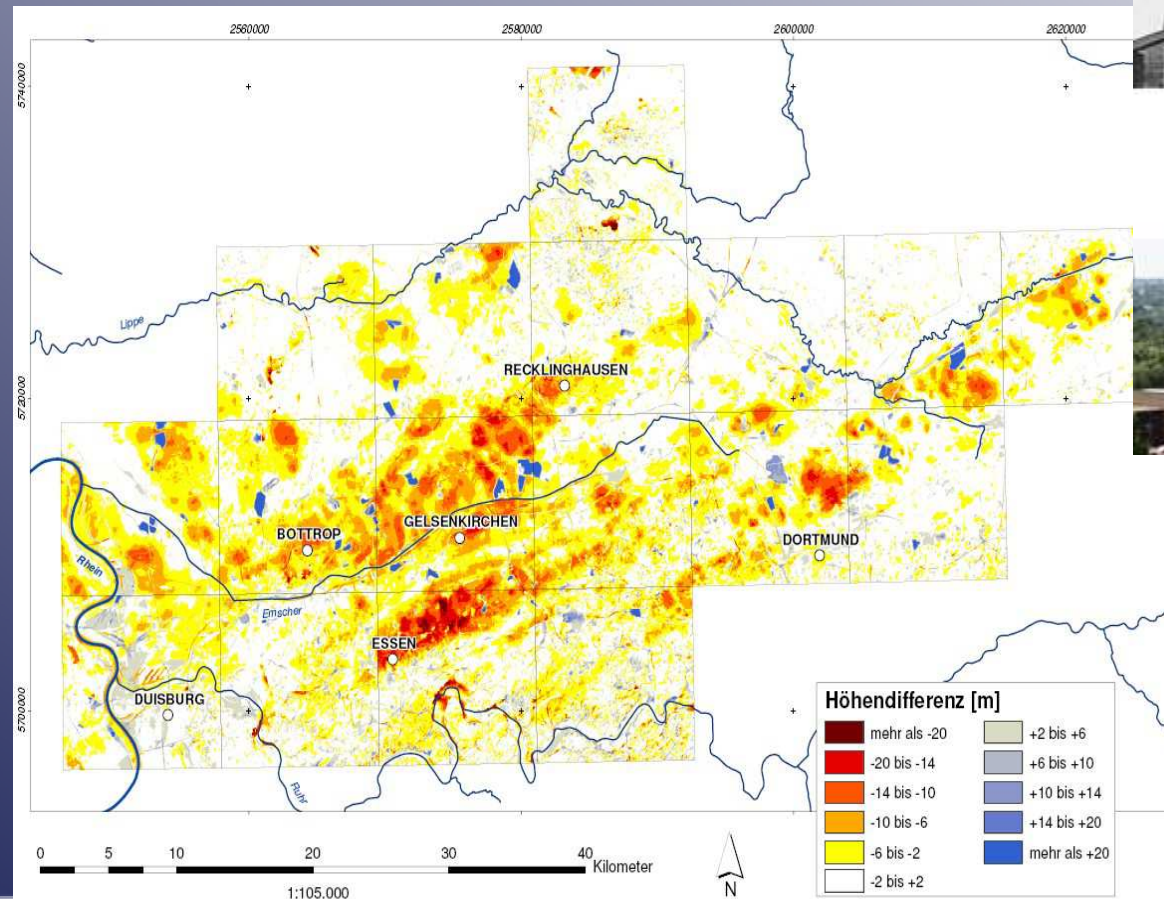


# Geodetic Reference Frame (CRS) - challenges today



Coordinates are fixed – no they aren't!

ground  
movements  
in the Ruhr  
area  
ca. 1900 -  
2010



Vertical  
movements  
could cause  
up to 20%  
horizontal  
movements

# Geodetic Reference Frame (CRS) - challenges today



Coordinates are fixed –  
no they aren't!

open  
mining  
1910 –  
ca. 2050





# Global Change

## - a challenge for the surveying profession



**Global change** refers to planetary-scale changes in the Earth system. The system consists of the land, oceans, atmosphere, poles, life, the planet's natural cycles and deep Earth processes. These constituent parts influence one another. The Earth system now includes human society, so global change also refers to large-scale changes in society. (Wikipedia)

“observe, describe and interpret processes in time and space”

$(x, y, z, t)$

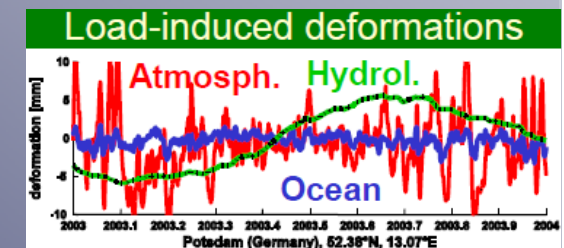
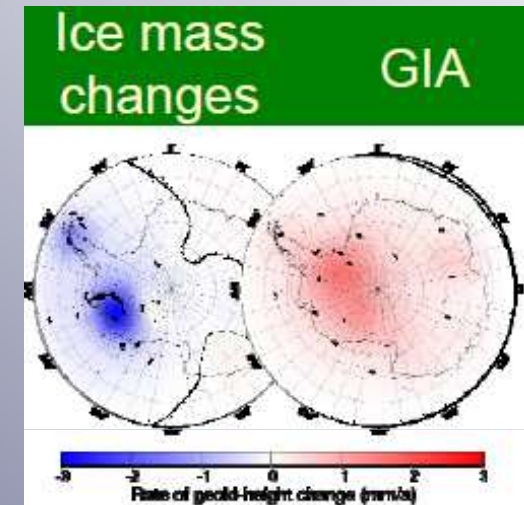
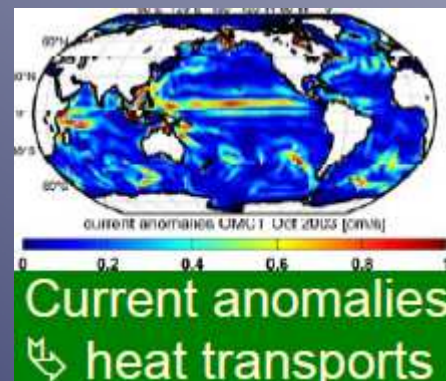
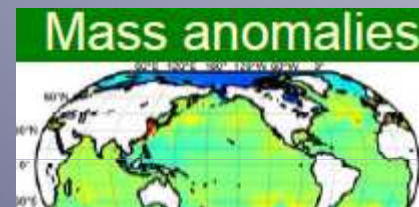
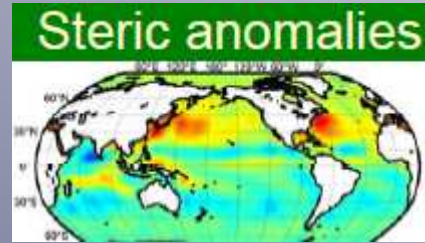


# Global Change - a challenge for the surveying profession



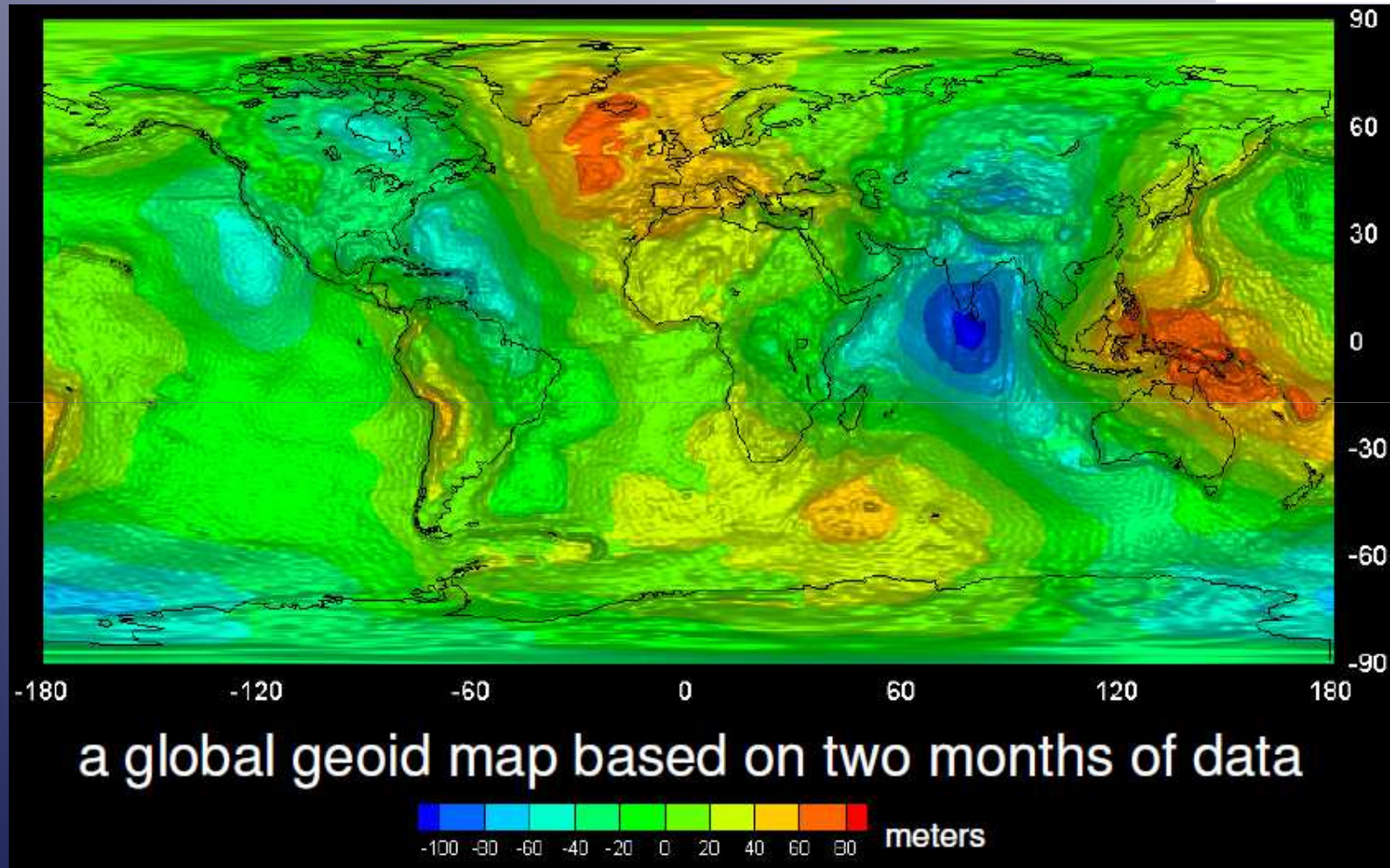
“observe,  
describe and  
interpret  
processes  
in time and  
space”

$(x, y, z, t)$





# Monitoring & modeling the Earth system



Quelle: Haagmans (ESA), Intergeo 2010

# Mercator and the challenges for the modern European Surveyor



Mercator has seen the world as a whole and harmonised the geographical presentation. The Mercator projection founded the base for modern navigation. With the atlas the geographical knowledge of the world was shared.

Today a further demand for harmonisation occurs. Satellite missions allow a new view on our planet. We do focus the global change and we have to give answers.

It is the “job” of the surveying profession to observe, describe and interpret processes in time and space.

Mercator was a European scientist, surveyor and geographer with a fundamental contribution to this task. With Mercator the success story of European harmonisation started.