

# Lidt om klimaforskning

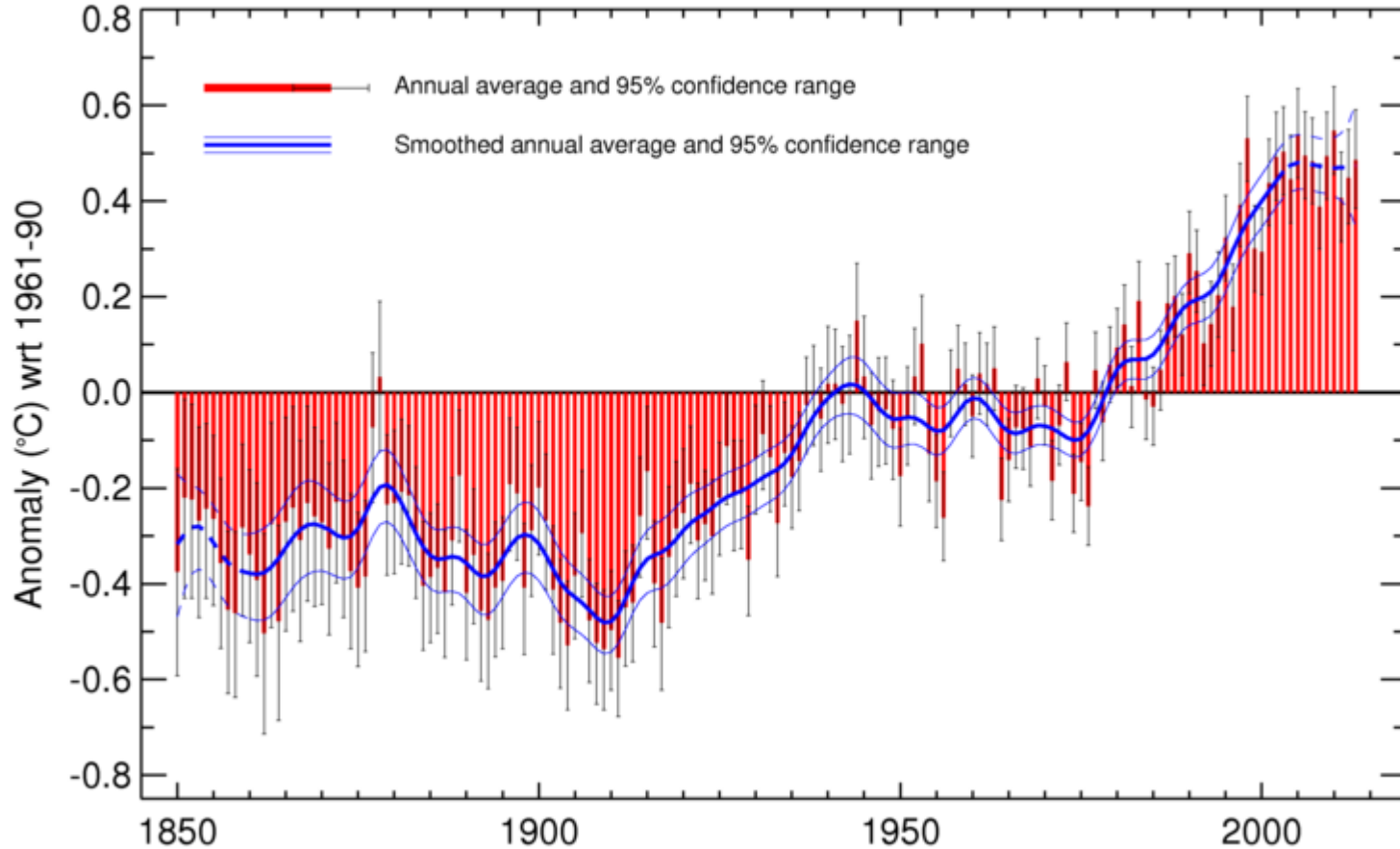


Henrik Svensmark,  
Space DTU

# Global temperature



Global average temperature 1850-2013  
Updated from Morice et al. 2012



# Antallet af isbjørne rasler ned

Bestanden af isbjørne i dele af Arktis er næsten halveret i de første 10 år af dette århundrede.



## Polar bear population in frozen sea north of Alaska falls 40% in 10 years

- Study finds number of bears in south Beaufort Sea down to 900 in 2010
- Scientist: report confirms we are on 'wrong path' on greenhouse gases



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## The New Zealand Herald

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## Polar bears lose about 40pc of their population in the Arctic

5:06 PM Wednesday Nov 19, 2014

Climate Change Environment Oceans

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Steve Amstrup holding triplet polar bear cubs in Prudhoe Bay, Alaska. Photo / AP

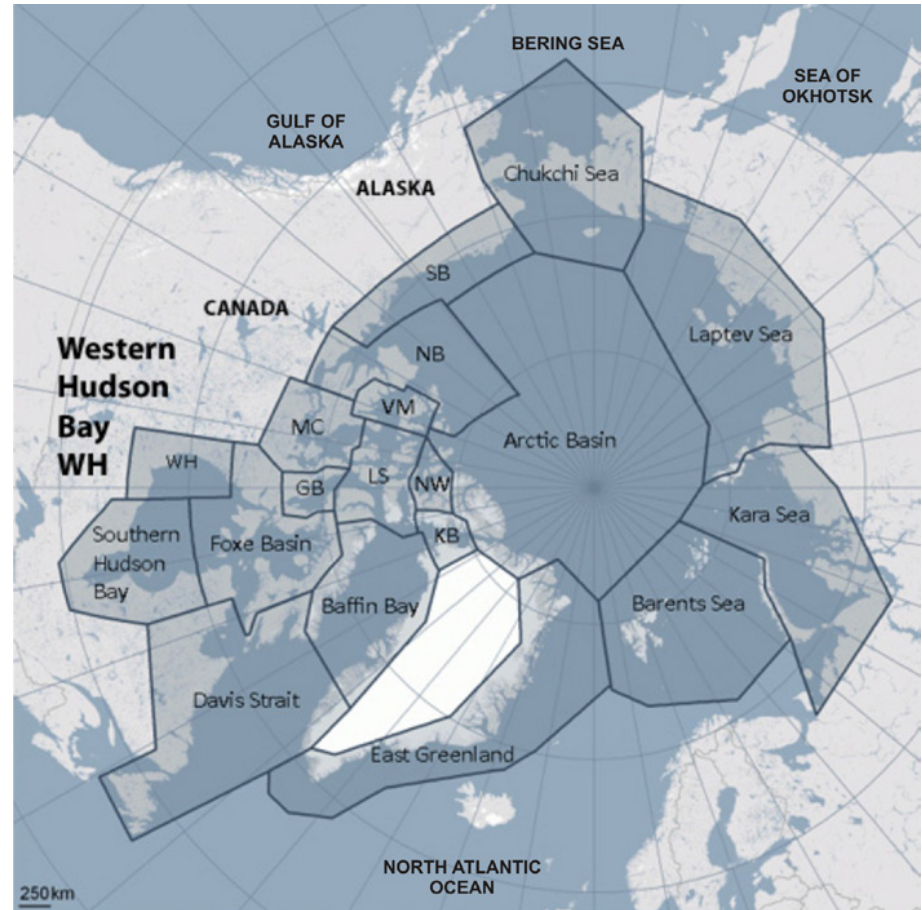
Polar bears in the Arctic suffered sharp declines in the first decade of this century, losing about 40 per cent of their population, according to US and Canadian scientists.

Der er blevet langt færre isbjørne i den frie natur i de senere år. Amerikanske og canadiske forskere, der holder snor i bestanden i et område ved **Alaska**, siger, at bestanden her er faldet med 40 procent i de første 10 år af dette århundrede. Forskerne siger, at de værste år for isbjørne i den sydlige del af Beaufort Havet, der ligger ved Alaska, var i perioden fra 2004 til 2007. **Da var isen så tynd, at det var uhyggelig svært for isbjørnene at finde sæler, de kunne æde.**

# Antal isbjørne

The International Union for the Conservation of Nature estimated in 1966 that there were 10,000 polar bears in the world

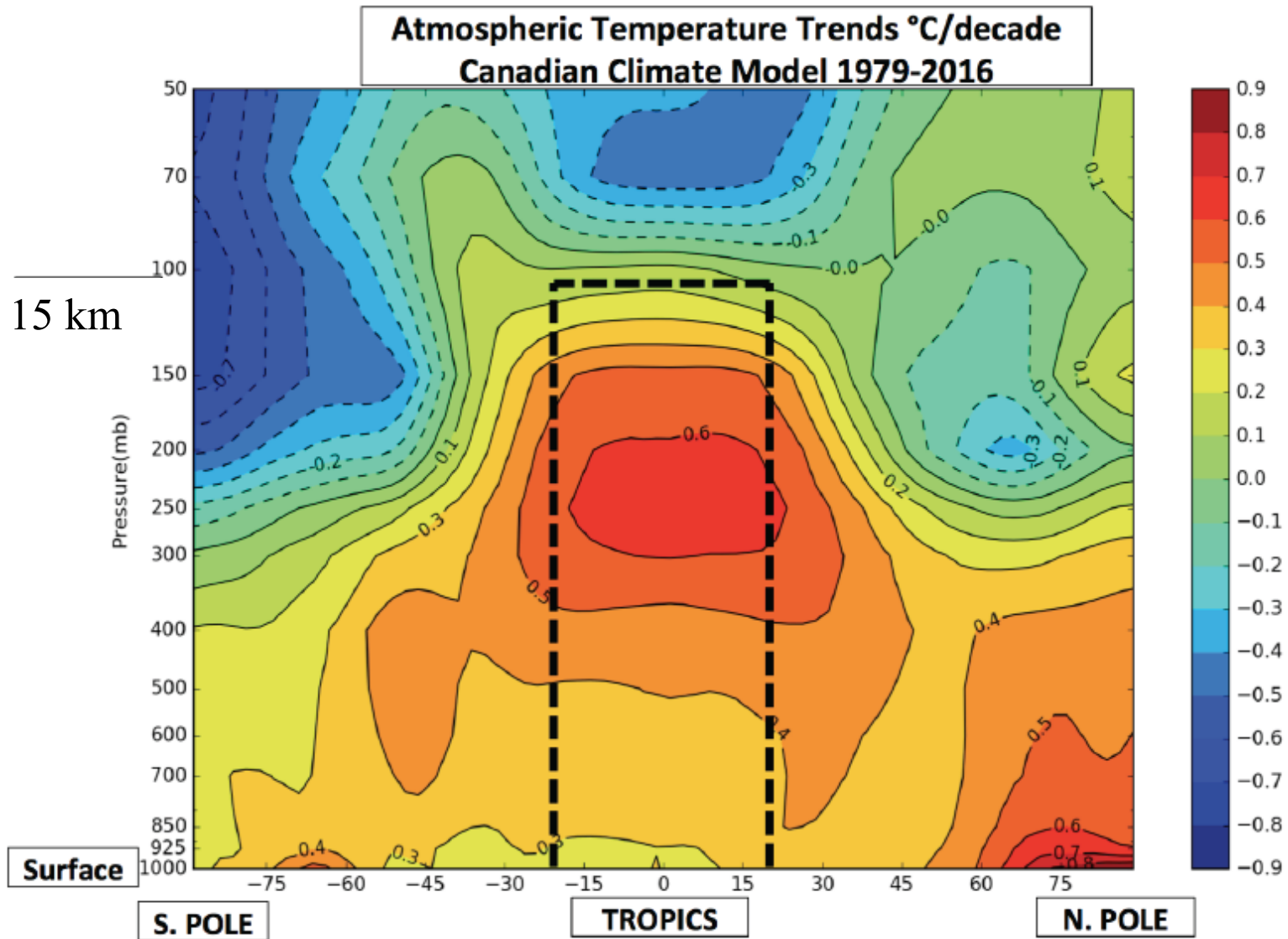
In 2006, the same source estimated that the population had risen to 20,000-25,000 bears.



# Climate-super-computers

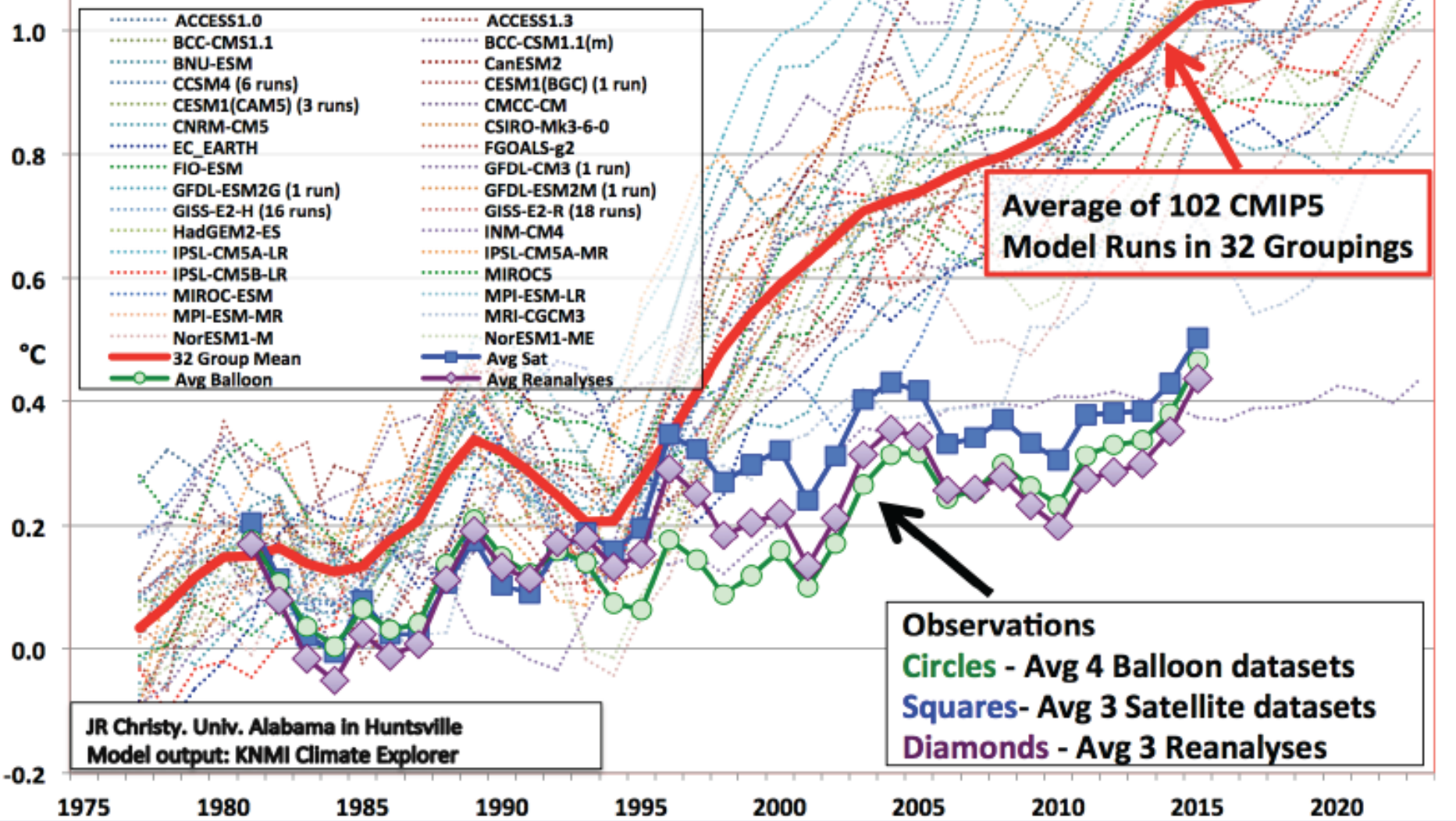


# Drivhusteoriens forventede effekt



# Tropical Mid-Tropospheric Temperature Variations Models vs. Observations

5-Year Averages, 1979-2016 Trend line crosses zero at 1979 for all time series

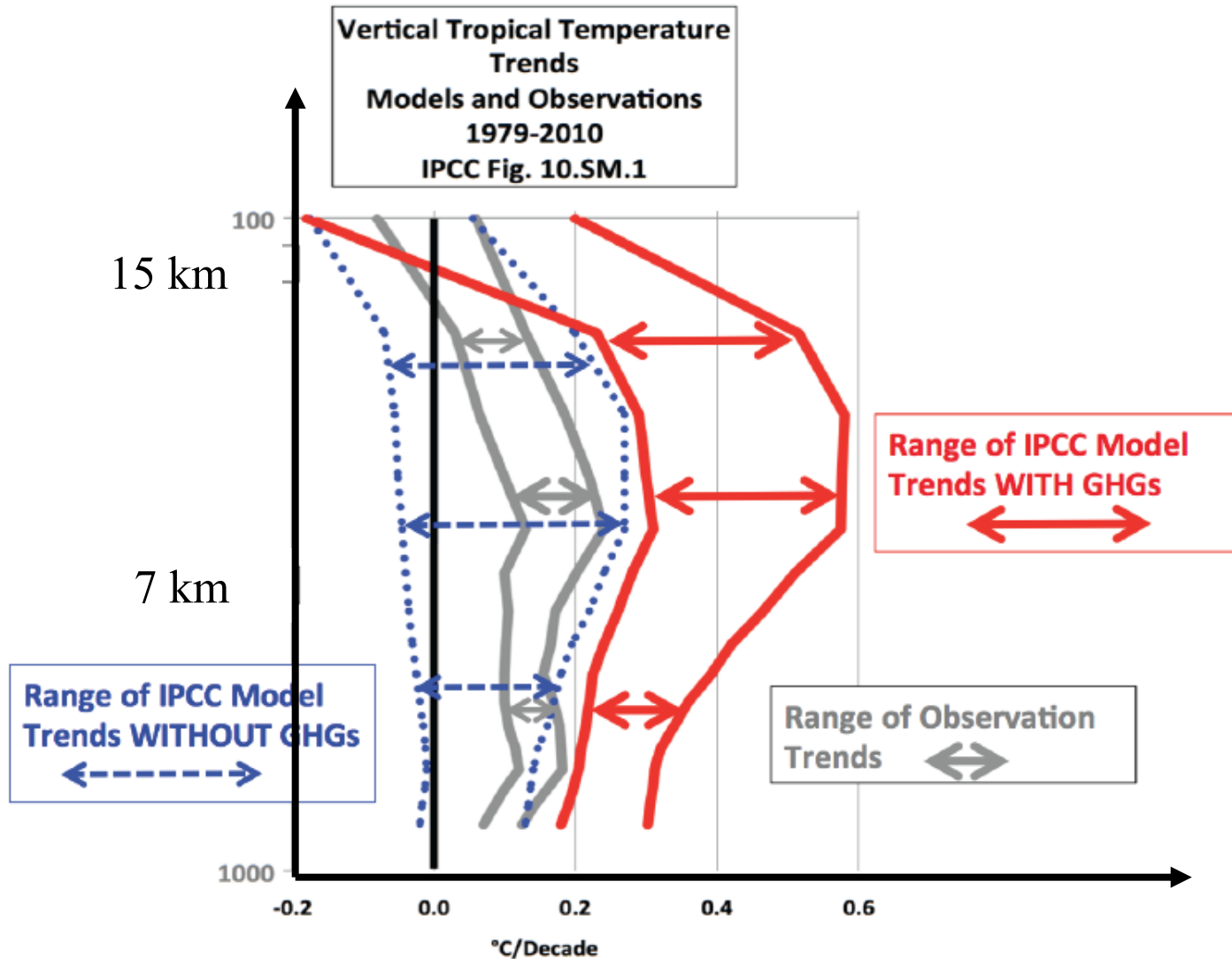


**Average of 102 CMIP5  
Model Runs in 32 Groupings**

**Observations**  
**Circles - Avg 4 Balloon datasets**  
**Squares- Avg 3 Satellite datasets**  
**Diamonds - Avg 3 Reanalyses**

JR Christy, Univ. Alabama in Huntsville  
Model output: KNMI Climate Explorer

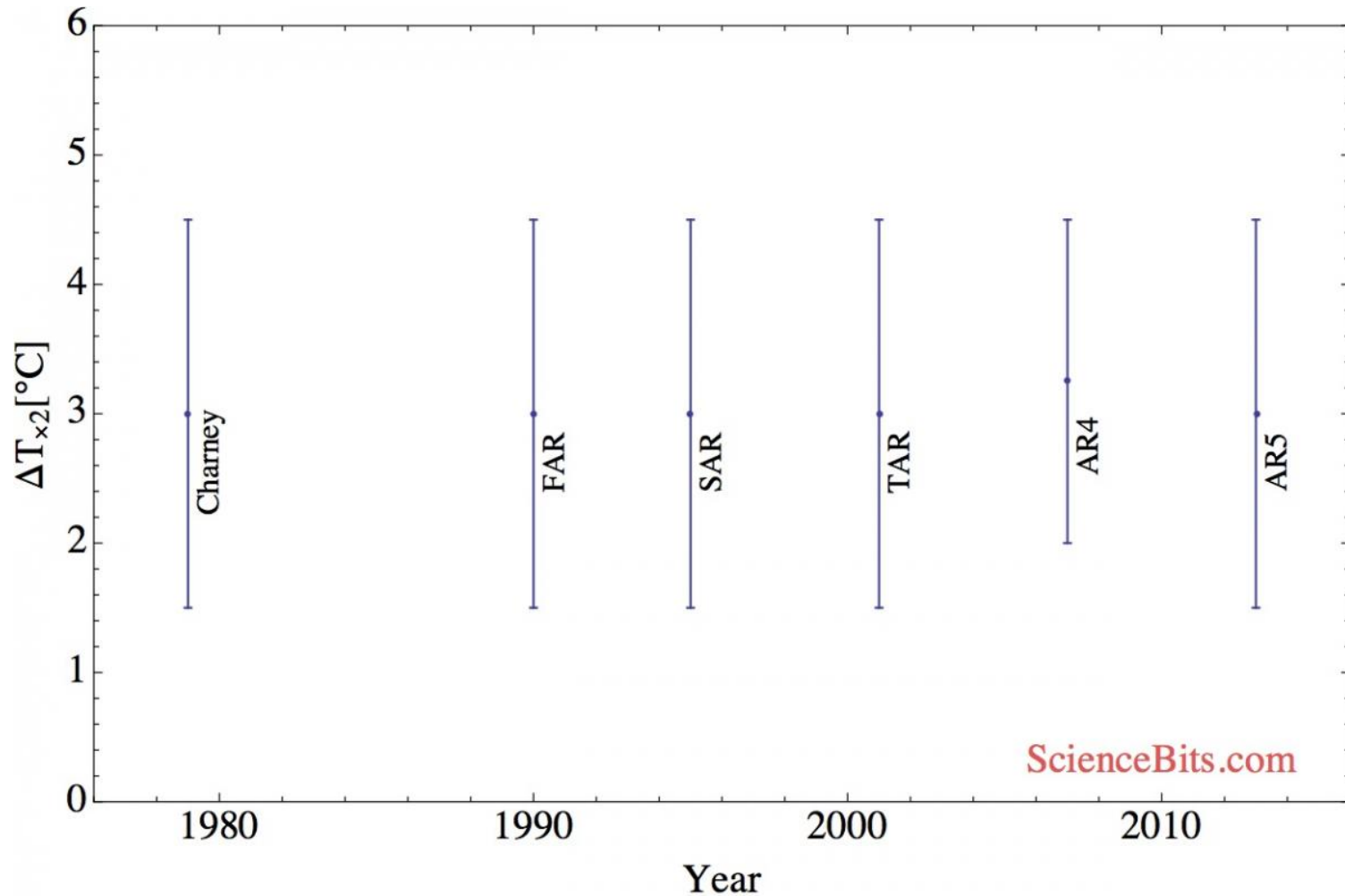
# Temperaturtilvækst i troperne





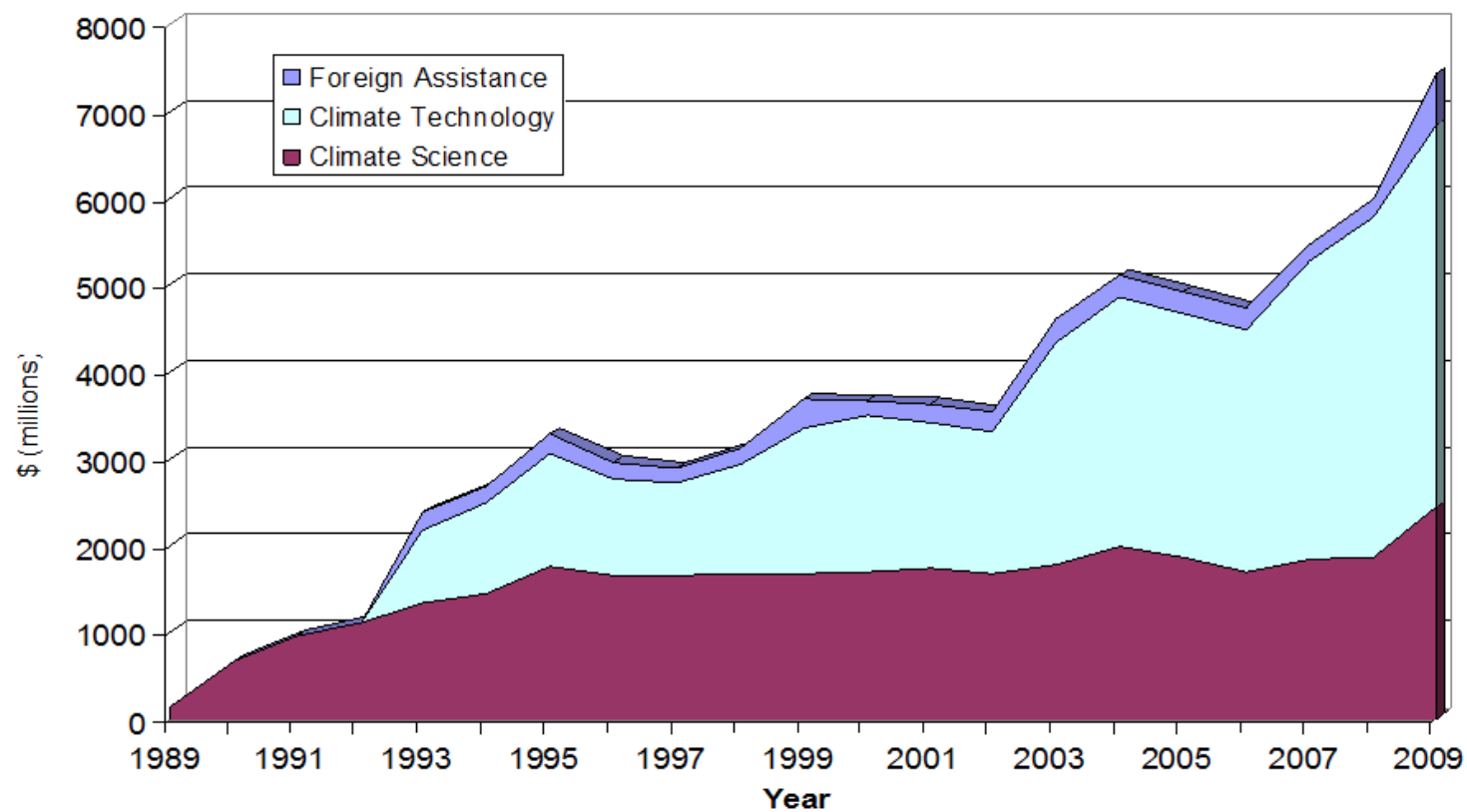
# Klimafølsomhed gennem tiden

## 2xCO2

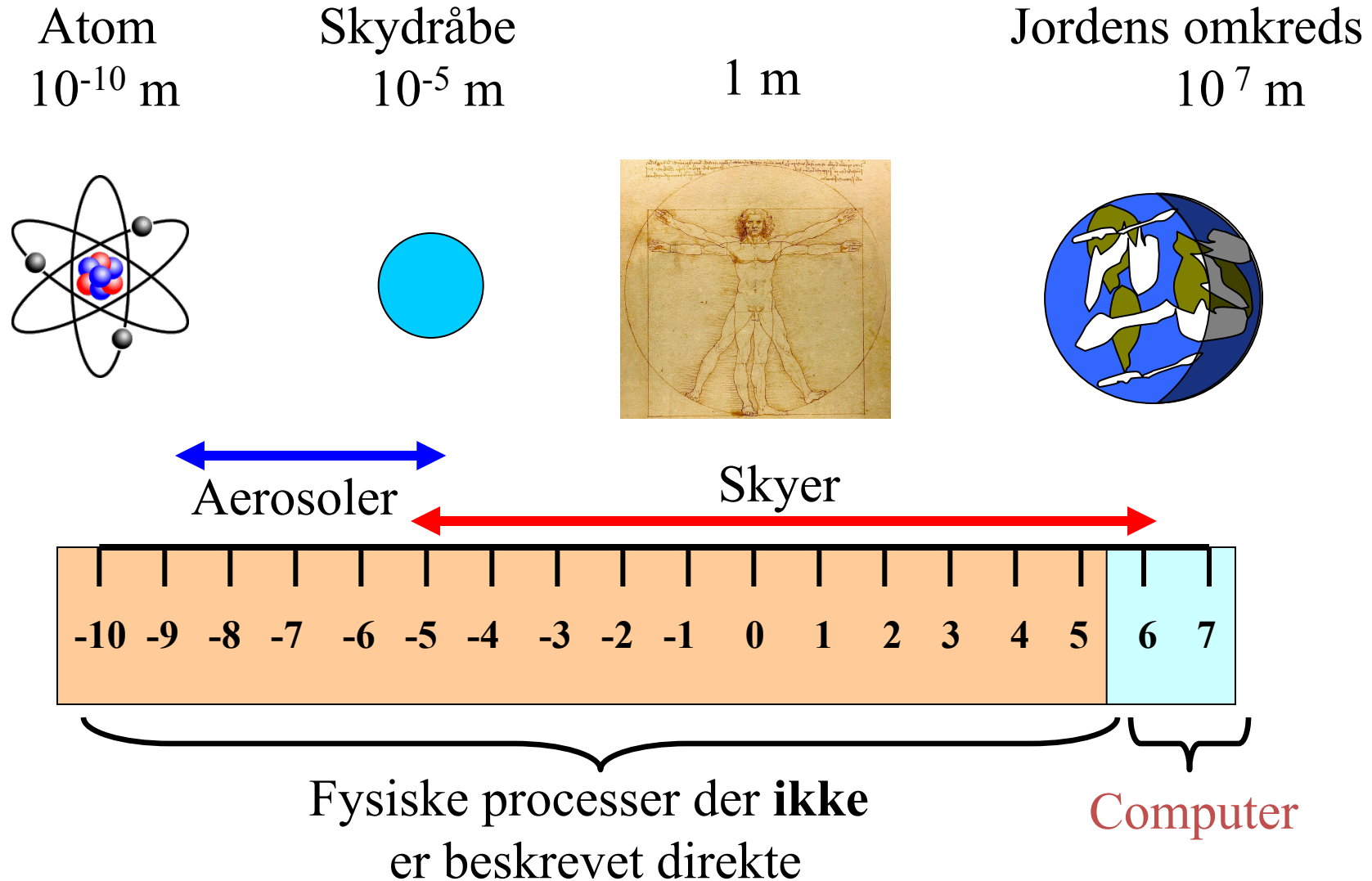


ScienceBits.com

## US Government Climate-Related Expenditure



# Fysiske processer i klimasystemet



# Ekstremt vejr

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Home > News > World > Extreme weather hits Europe - scientists blame climate change



euronews.

ITALY

**Extreme weather hits Europe - scientists blame climate change**

# The Telegraph

## Extreme weather 'could become normal', warns World Bank report

World leaders must take action to reduce the risk of climate change, the World Bank Group president says

9:01PM GMT 23 Nov 2014

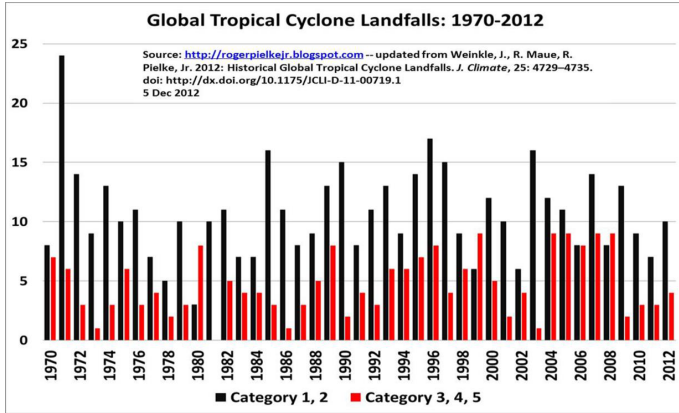
Extreme weather events currently only seen once in hundreds of years, if ever, could become the “new climate normal” as a result of global warming, scientists have warned.



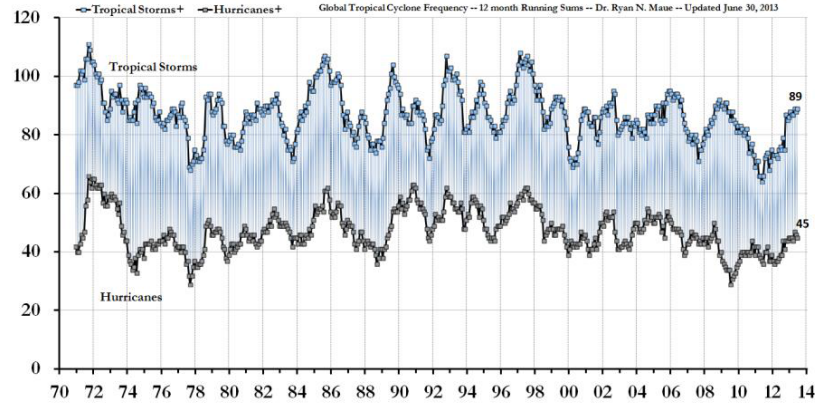
# Er der flere ekstreme hændelser?

- **It is misleading, and just plain incorrect, to claim that disasters associated with hurricanes, tornadoes, floods or droughts have increased on climate timescales either in the United States or globally. It is further incorrect to associate the increasing costs of disasters with the emission of greenhouse gases.**
- Globally, weather-related losses (\$) have not increased since 1990 as a proportion of GDP (they have actually decreased by about 25%) and insured catastrophe losses have not increased as a proportion of GDP since 1960.
- **Hurricanes** have not increased in the US in frequency, intensity or normalized damage since at least 1900. The same holds for tropical cyclones globally since at least 1970 (when data allows for a global perspective).
- **Floods** have not increased in the US in frequency or intensity since at least 1950. Flood losses as a percentage of US GDP have dropped by about 75% since 1940.
- **Tornadoes** have not increased in frequency, intensity or normalized damage since 1950, and there is some evidence to suggest that they have actually declined.
- **Drought** has “for the most part, become shorter, less frequent, and cover a smaller portion of the U. S. over the last century.”<sup>2</sup> Globally, “there has been little change in drought over the past 60 years.”<sup>3</sup>
- The absolute costs of disasters will increase significantly in coming years due to greater wealth and populations in locations exposed to extremes. Consequent, disasters will continue to be an important focus of policy, irrespective of the exact future course of climate change.

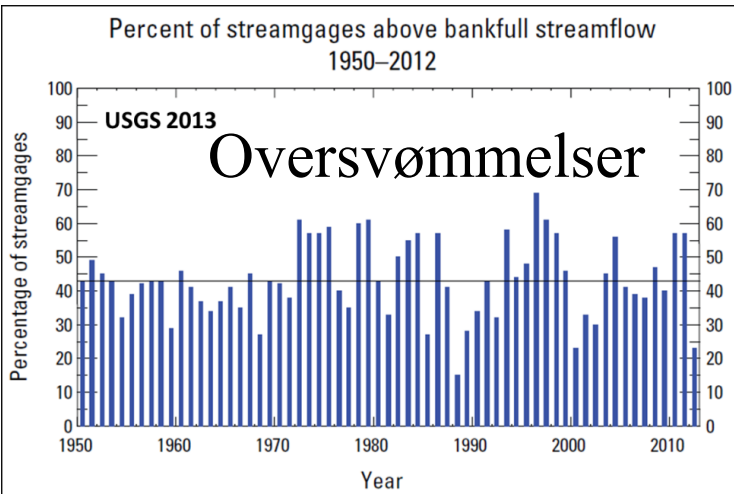
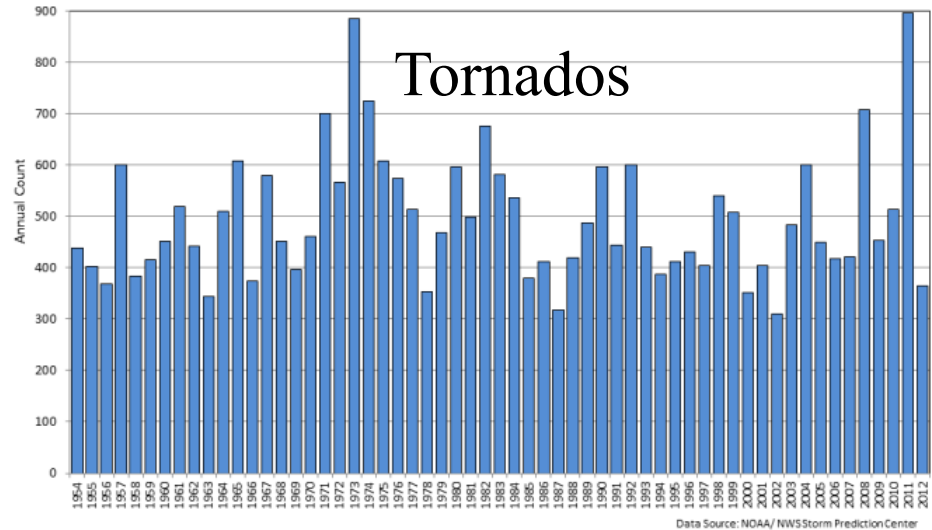
# Tropical cyclones



# Tropical storms



U.S. Annual Count of EF-1+ Tornadoes, 1954 through 2012



# Den Lille Istid 1300-1850



Hendrick Avercamp

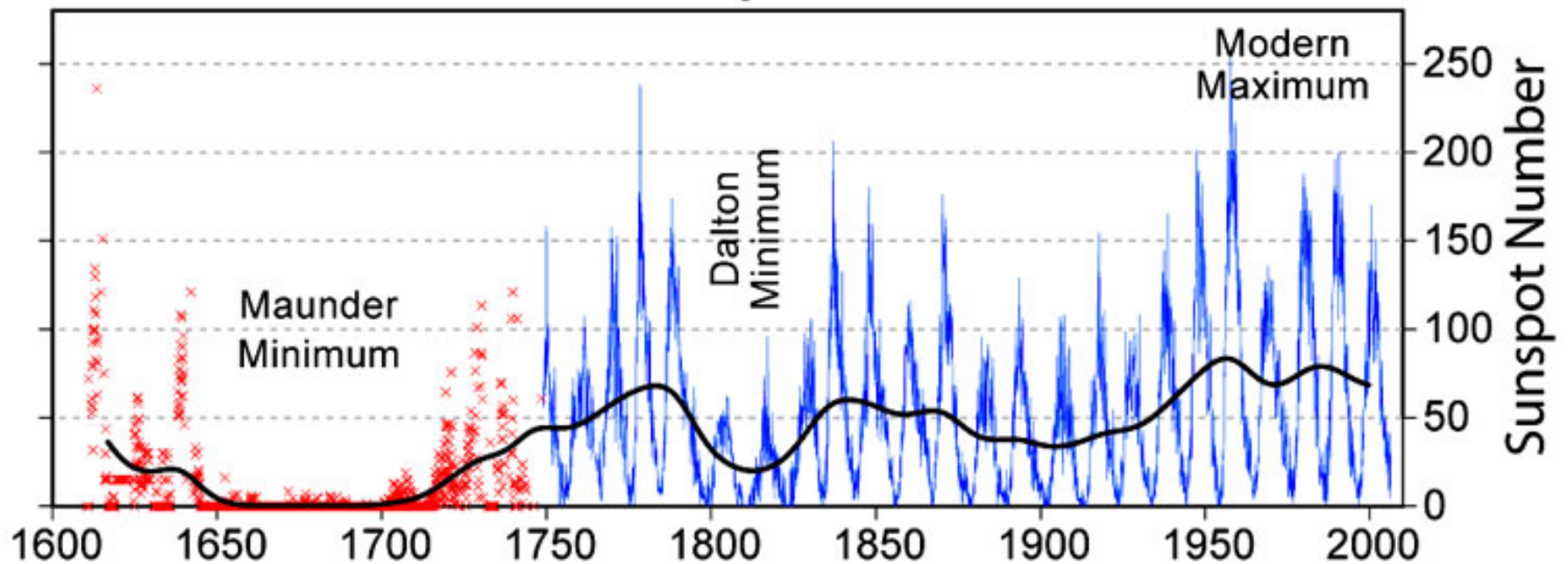


# Solar activity

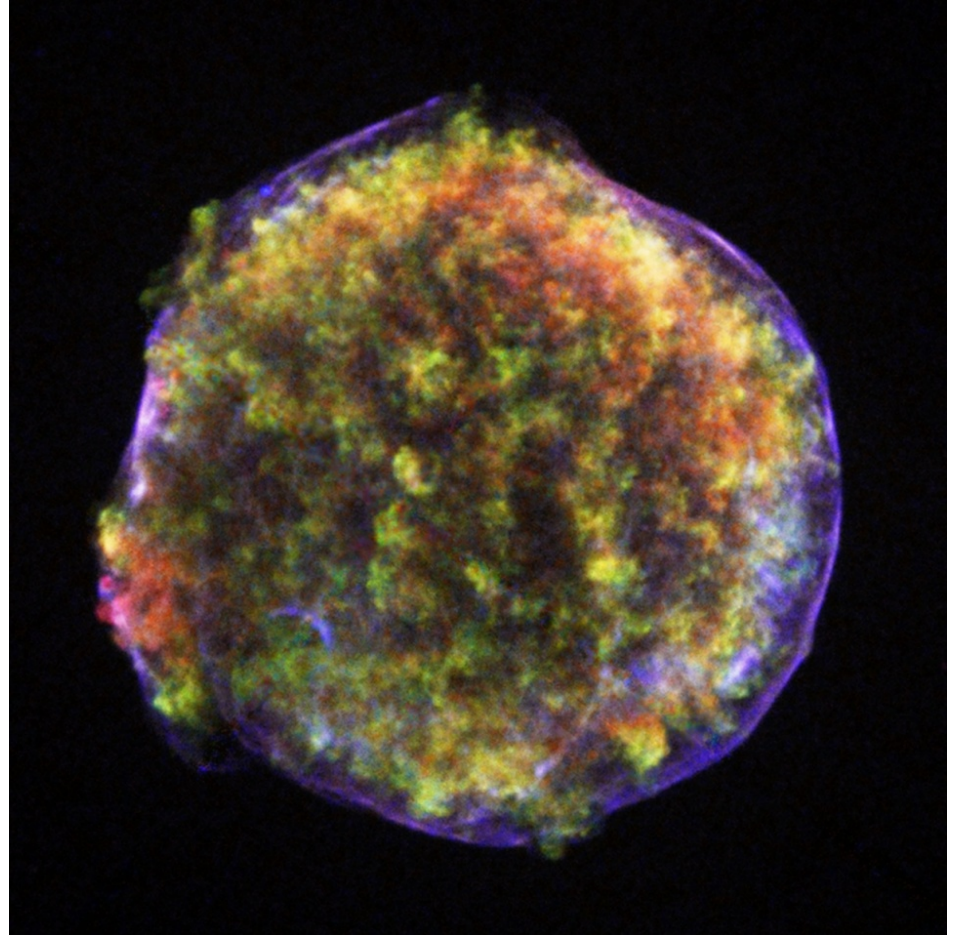




## 400 Years of Sunspot Observations

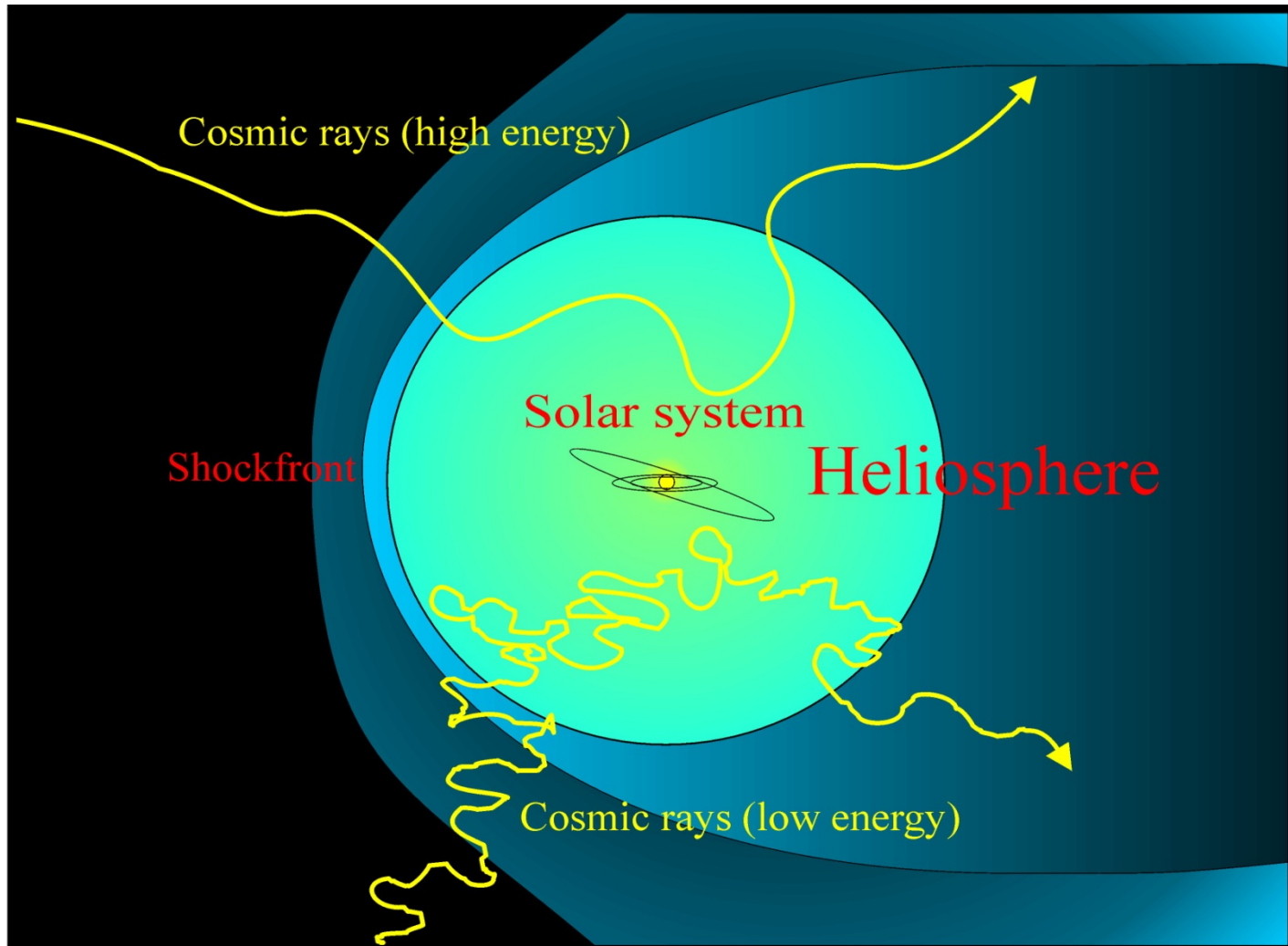


# Tycho Brahe super nova 1572

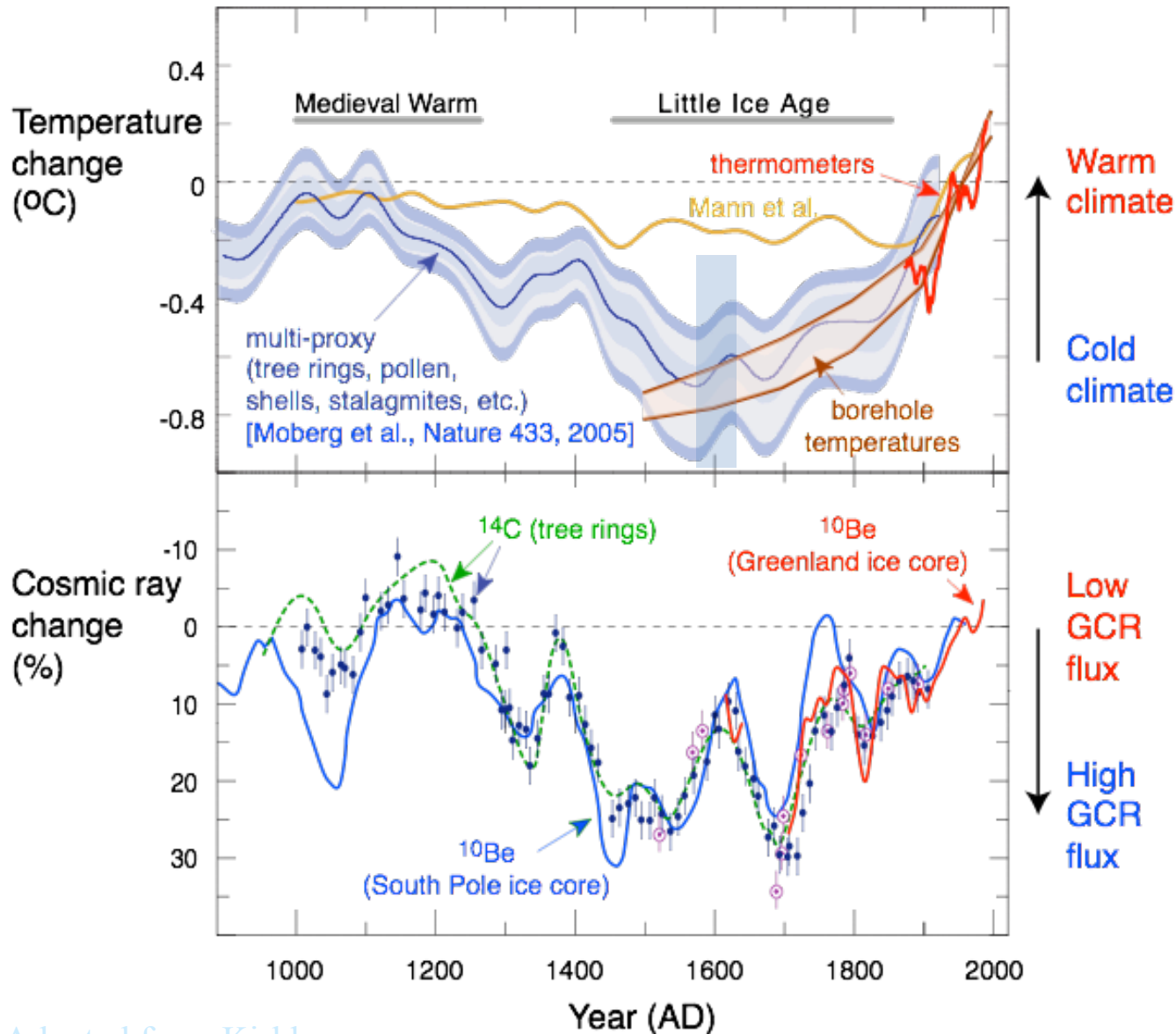


# What are Cosmic Rays?

## Heliosphere, Cosmic Rays and Solar Activity



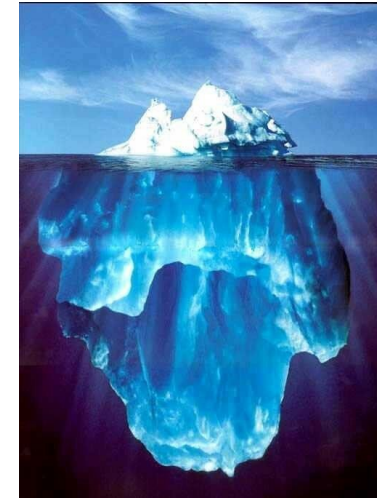
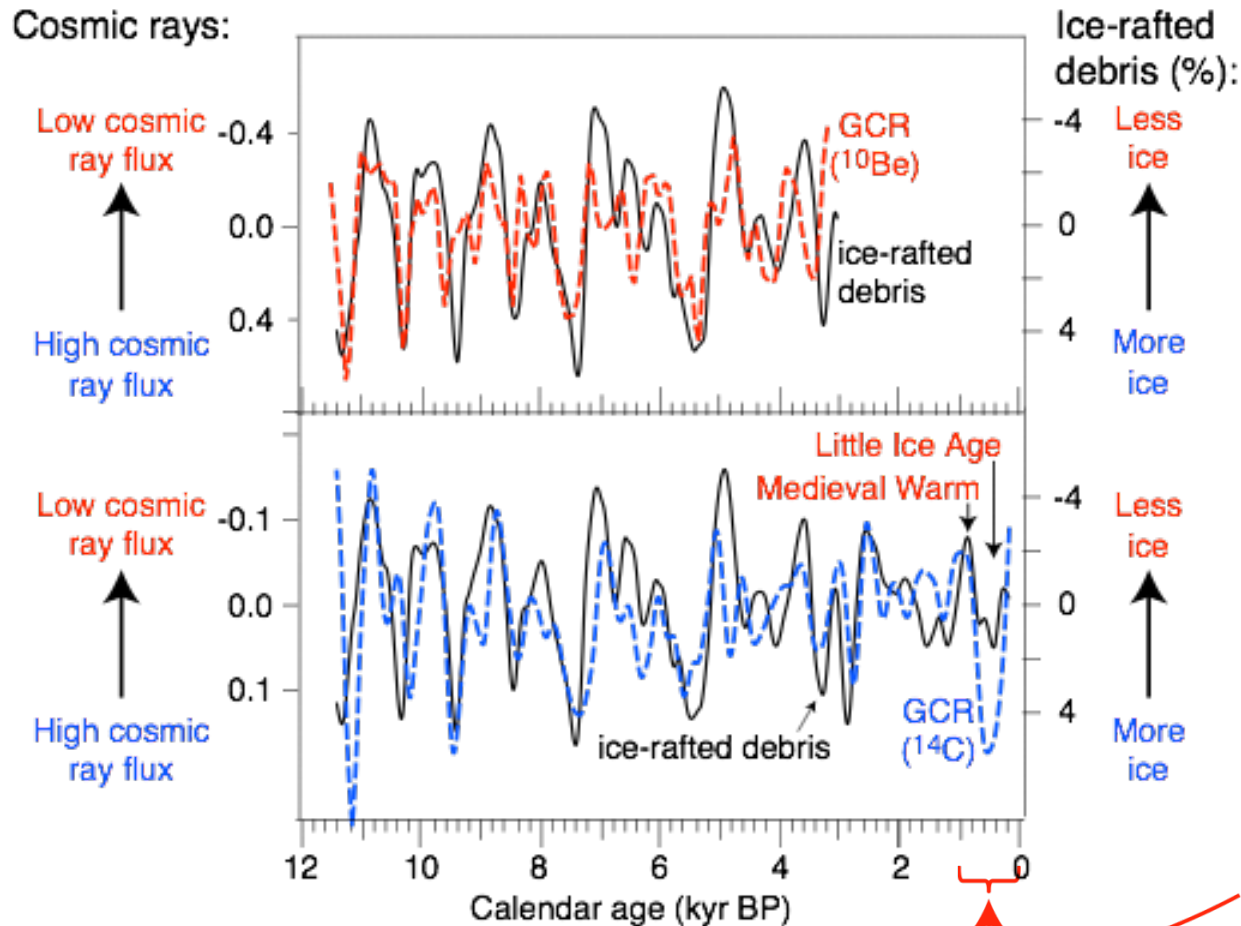
# Cosmic rays and climate over the last millennium



”Since everybody thought that the continuous crop failure was caused by witches from devilish hate, the whole country stood up for their eradication”  
Johann Linden Travis  
ca. 1590

# Cosmic rays and climate over the last 10,000 years

Bond et al, Science 294, 2001

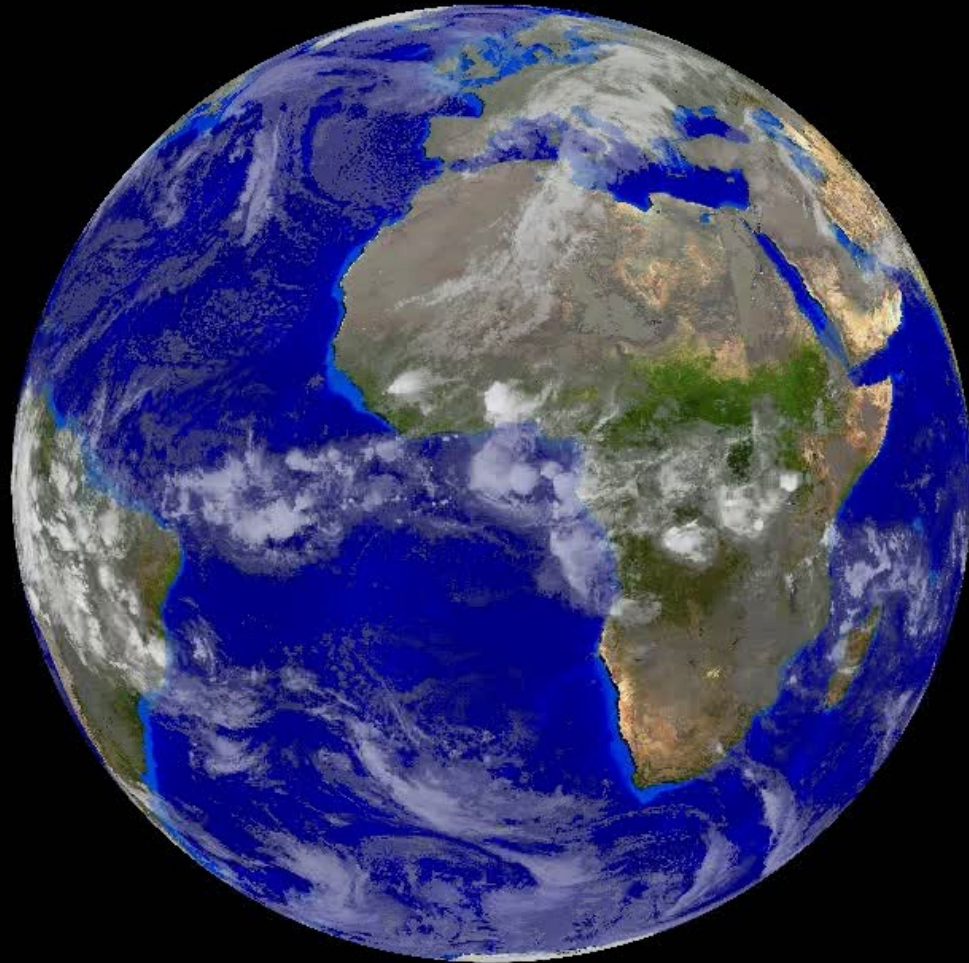


According to icecores  
CO<sub>2</sub> levels has been  
constant ~280 ppm

Last 1000 years  
Little Ice Age

- Little Ice Age is merely the most recent of a dozen such events during the last 10,000 years

# How can STARS influence Climate?



1

McIDAS

Net effect of clouds is to cool the Earth by about  $30 \text{ W/m}^2$

# Solar activity

C3 1998/05/01 01:44





# AERONET, SSM/I, MODIS and ISCCP data for 5 strongest Forbush decreases

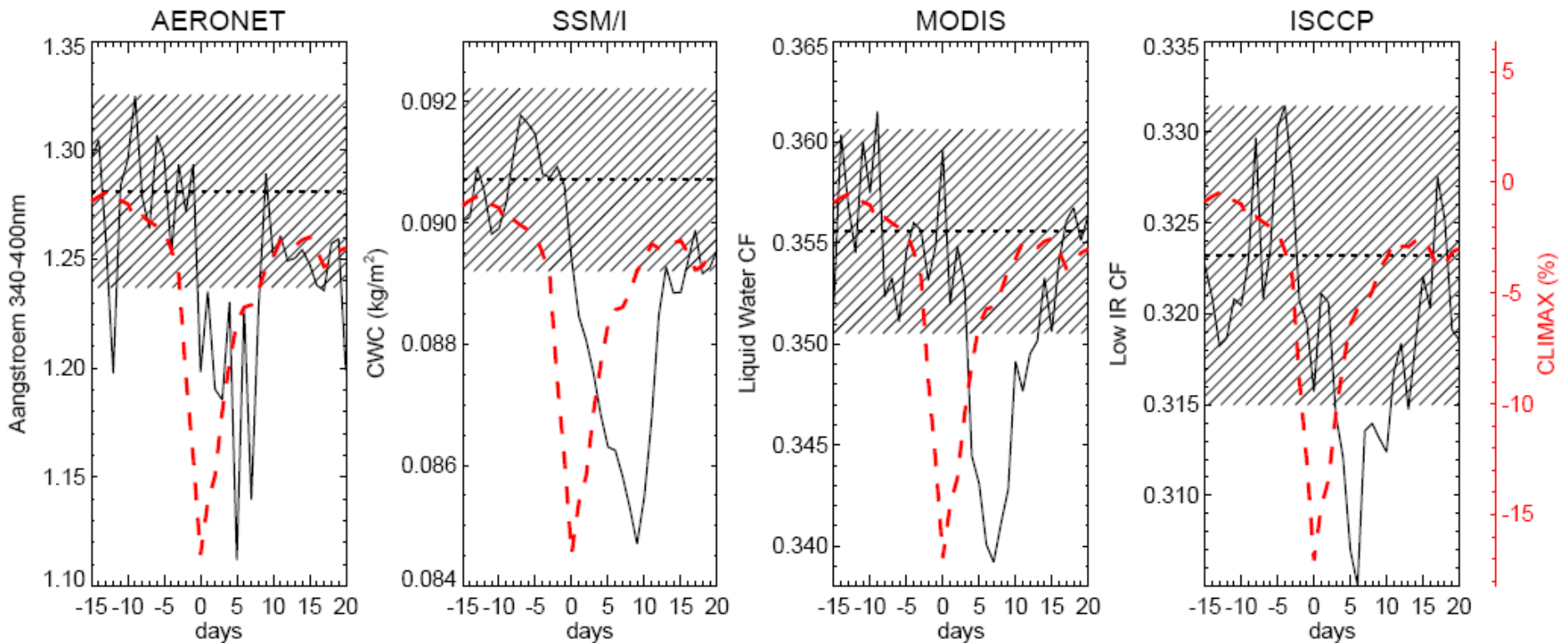
Aerosols

Clouds

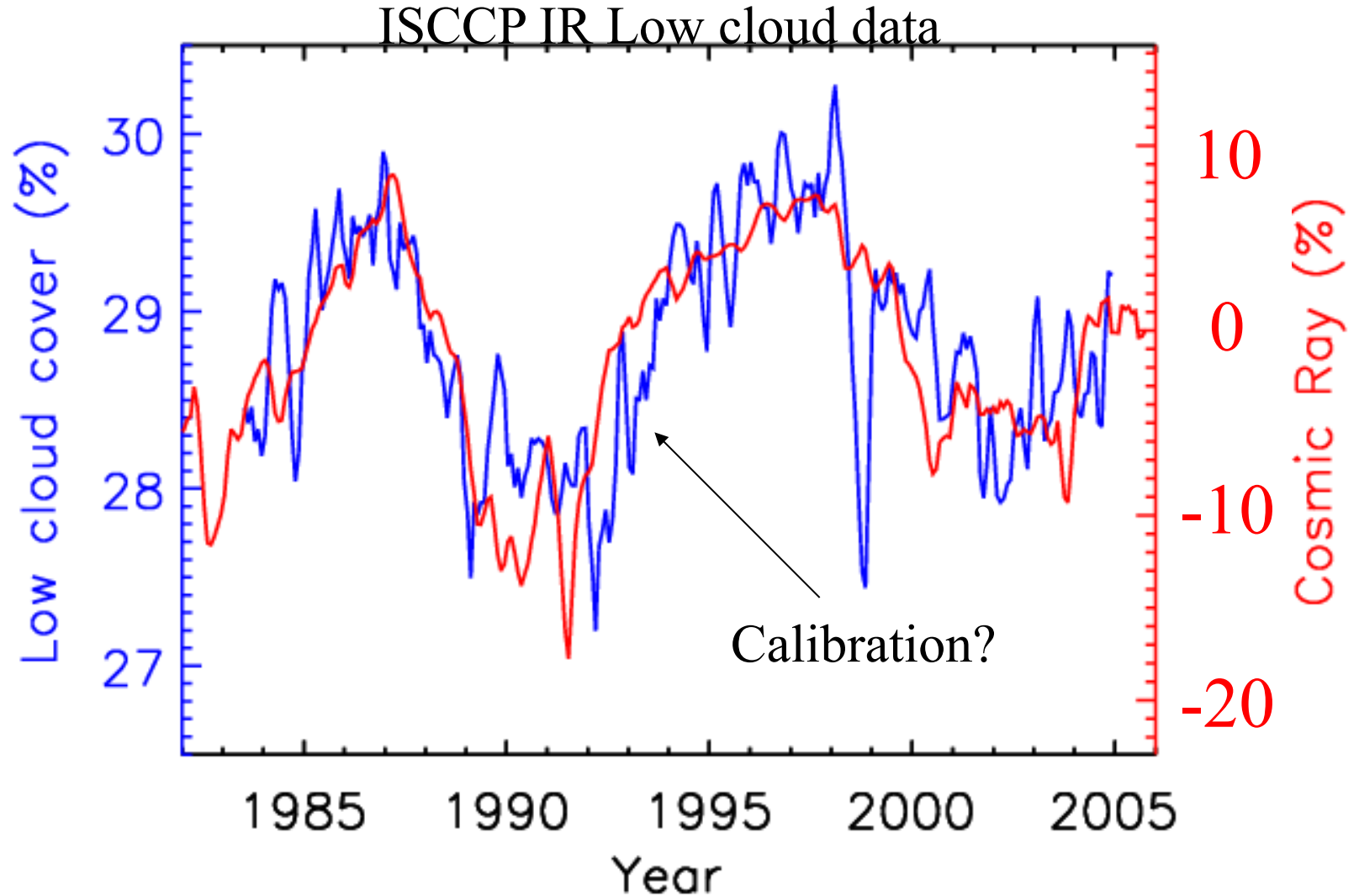
Liquid water

Liquid cloud fraction

Low Clouds



# Link between Low Cloud Cover and Galactic Cosmic Rays? Solar cycle variation



# Reaktioner på Sol teorien

## KÆTTERNE PÅ LYNGBYVEJ

på DMI's renommé

Berlingske Tidende, 1. sektion, torsdag 18. juli 1996

### Dansk bombe under klimaet

Information 19. juli 1996

Skærpet klima-indsats trods dansk 'bombe'

POLITIKEN Fredag 19. juli 1996

Til kamp mod CO<sub>2</sub>-udslip

Jorden piskes af solvinden

Berlingske Tidende, 1. sektion, fredag 19. juli 1996

Dansk klima-forskning forvirrer

Jordens klima fortsat en gåde

Auken vil se tiden an

F R E D A G  
19. JULI 1996

Skarp FN-kritik af danske klima-forskere

Solpletter skyld i varmere klima

MORGENAVISEN  
Jyllands-Posten

FREDAG DEN 19. JUNI 1996

weekendavisen

Klimaforandringen. Fanden var løs, da to danske forskere fremlagde nye »resultater«.

Anfægt ikke CO<sub>2</sub>-faren!

Information 20. juli 1996  
Leder

Kuling over DMI

Berlingske Tidende, 1. sektion, søndag 21. juli 1996

Magnetfelt giver udsving i temperatur

MORGENAVISEN  
Jyllands-Posten

... går af drivhusteorien

Drop CO<sub>2</sub>-afgift

AF AAGE BRUSGAARD  
MF, miljøordfører (FRP)

Forskere sår tvivl om CO<sub>2</sub>-effekten

# Er solteorien nu død igen?



SCIENTIFIC AMERICAN

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## Cosmic Rays Not Causing Climate Change

Cosmic rays can have played at most a very small part in global warming, new research finds

2000

By Paul Brown, The Daily Climate on November 11, 2013 15

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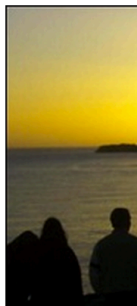
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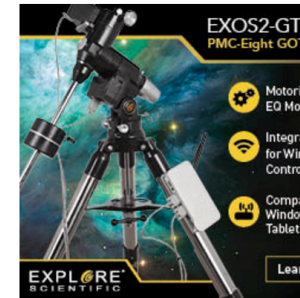
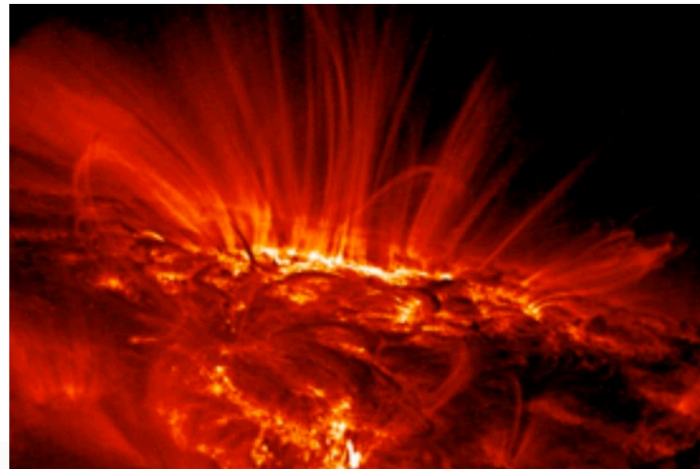
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Sun 'mi  
climate



Human action is Sun

By environment correspondent Alex Kirby



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global warming may have been overestimated, a study suggests.





**Solteorien**

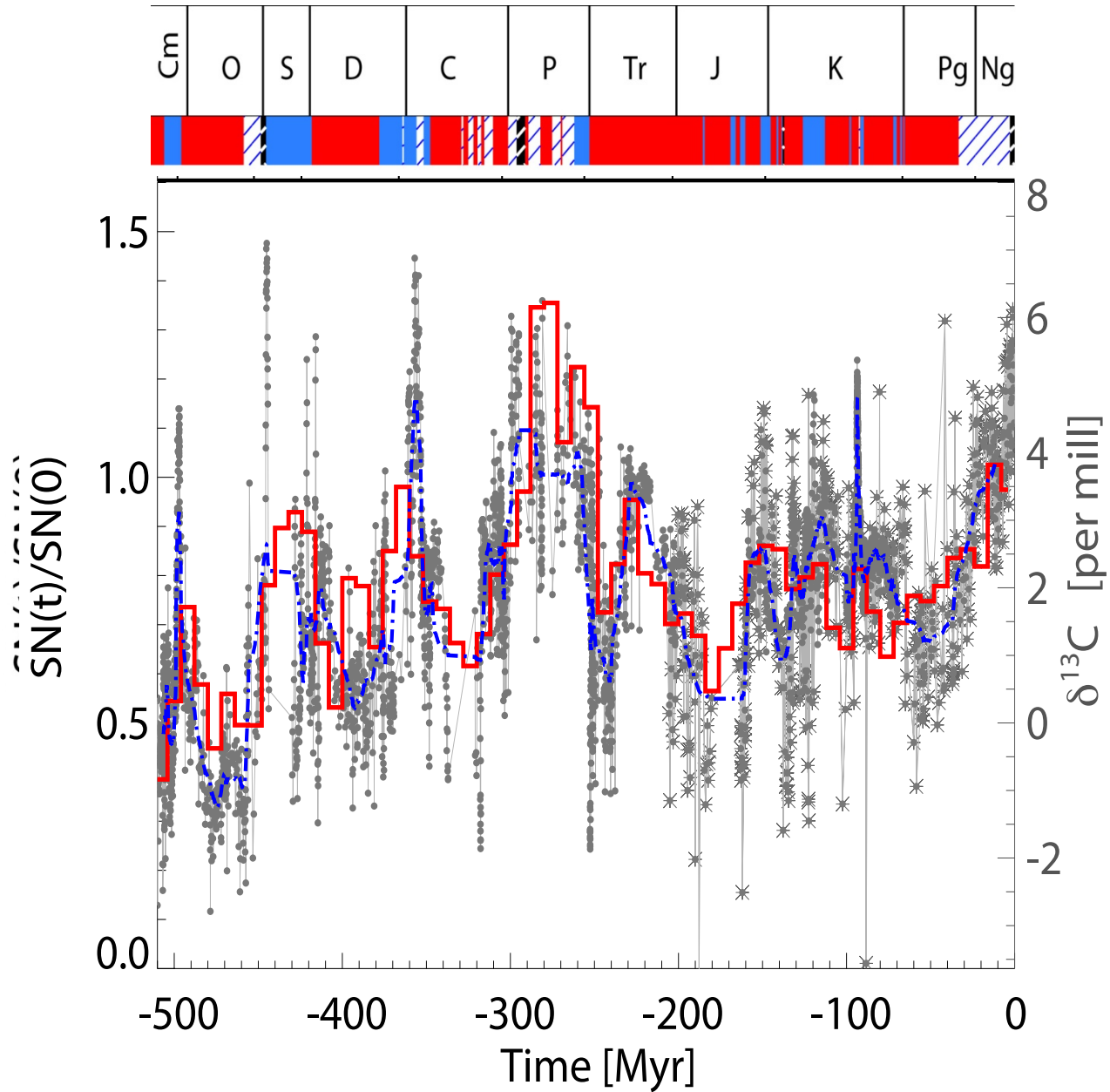
**1996 – 2017**

**Undskyld vi forstyrrede**

**Our Milky Way is a Spiral galaxy**



# Carbon 13 and super nova activity



## **Konklusion**

**Der er stadigvæk uløste videnskabelige problemer ved drivhusteorien:**

**Et vigtigt område er betydningen af skyer i et fremtidigt klima**

**Ændringer i Solens aktivitet påvirker Jordens klima og det er vigtigt at forstå hvordan det sker.**