



Kan klimamodellerne forudsige jordens temperatur om 100 år?

Møde om klimastrategier

Den 7/12-09

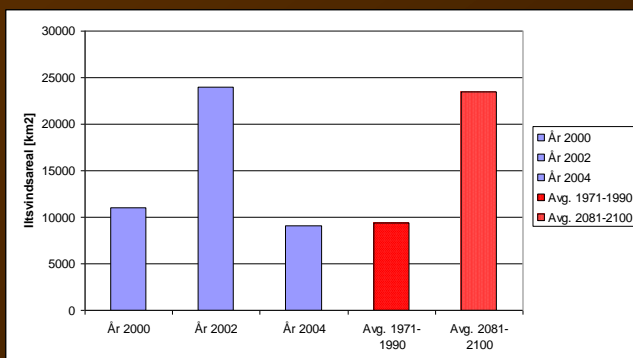
Af Karl Iver Dahl-Madsen

Vicepræsident i Akademiet for
Fremtidsforskning

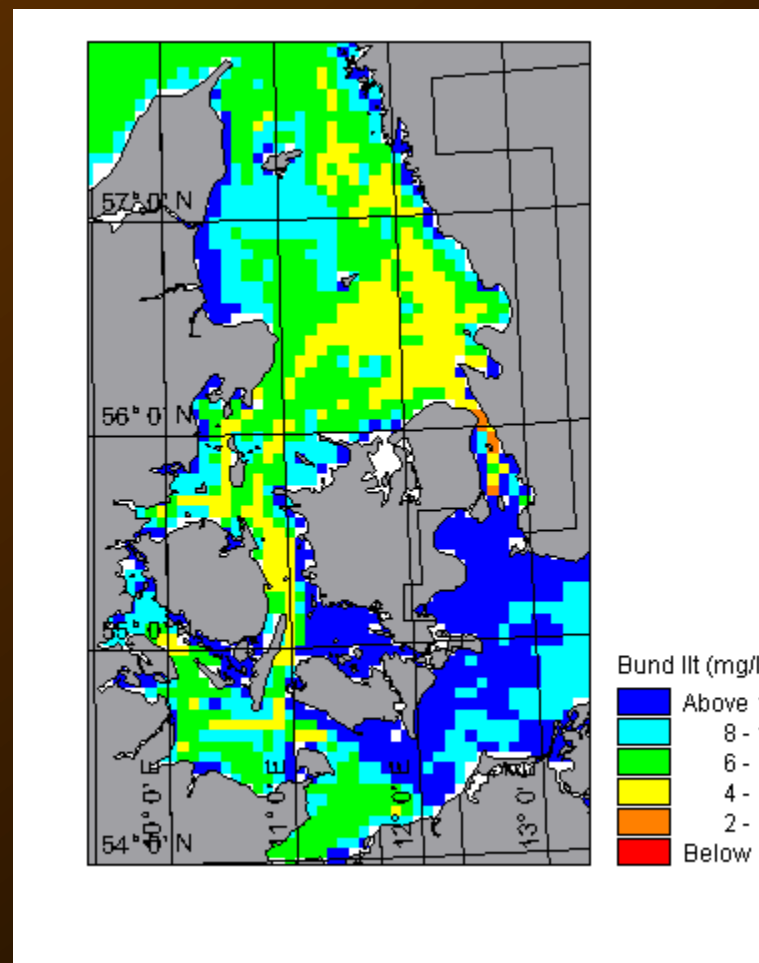


Miljømodellering

- ✘ Algevækst og iltsvind i danske søer, fjorde og kyster
- ✘ Faste forbindelser
- ✘ Landbrug & Vejret
- ✘ Vandudsigten



Iltsvind år 2100

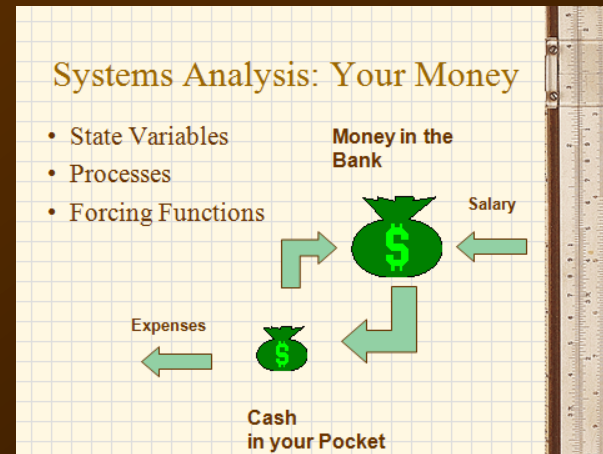


Iltsvindet, 7/12-09, 12:00



Hvad er en (klima) model

- ✉ Masse- og energibalance for hver kontrolkasse
- ✉ Og for hvert tidsskridt
- ✉ Millioner af kasser, hundredvis af tilstande sekunder til dekader
- ✉ Det kræver mere end en lille lommeregner: Supercomputere



$$\frac{\partial c}{\partial t} = u \frac{\partial c}{\partial x} + v \frac{\partial c}{\partial y} + w \frac{\partial c}{\partial z}$$

$$+ \frac{\partial}{\partial x} \left(D_x \frac{\partial c}{\partial x} \right) + \frac{\partial}{\partial y} \left(D_y \frac{\partial c}{\partial y} \right) + \frac{\partial}{\partial z} \left(D_z \frac{\partial c}{\partial z} \right)$$

+ sources/sinks + processes

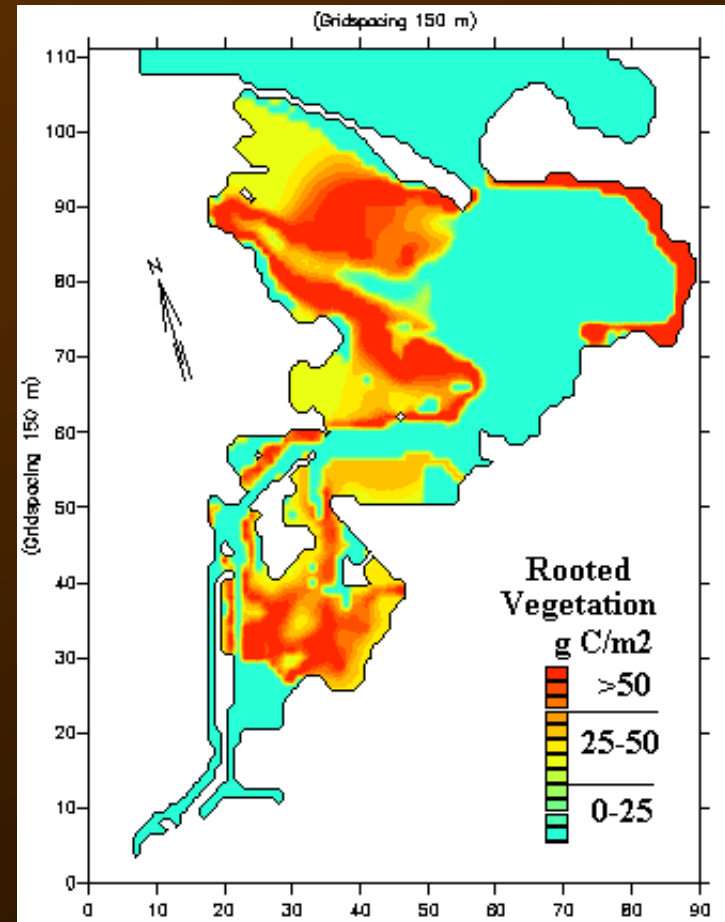
where : u, D_x, v, D_y, w, D_z

are the flows and dispersion in the x, y, z directions



Hvad er en god model?

- ✘ Giver det resultat man kan lide 😊
- ✘ Værdifri: Indeholder de rigtig årsager
- ✘ Kan beskrive fortiden & nutiden korrekt
- ✘ Kan beskrive fremtiden

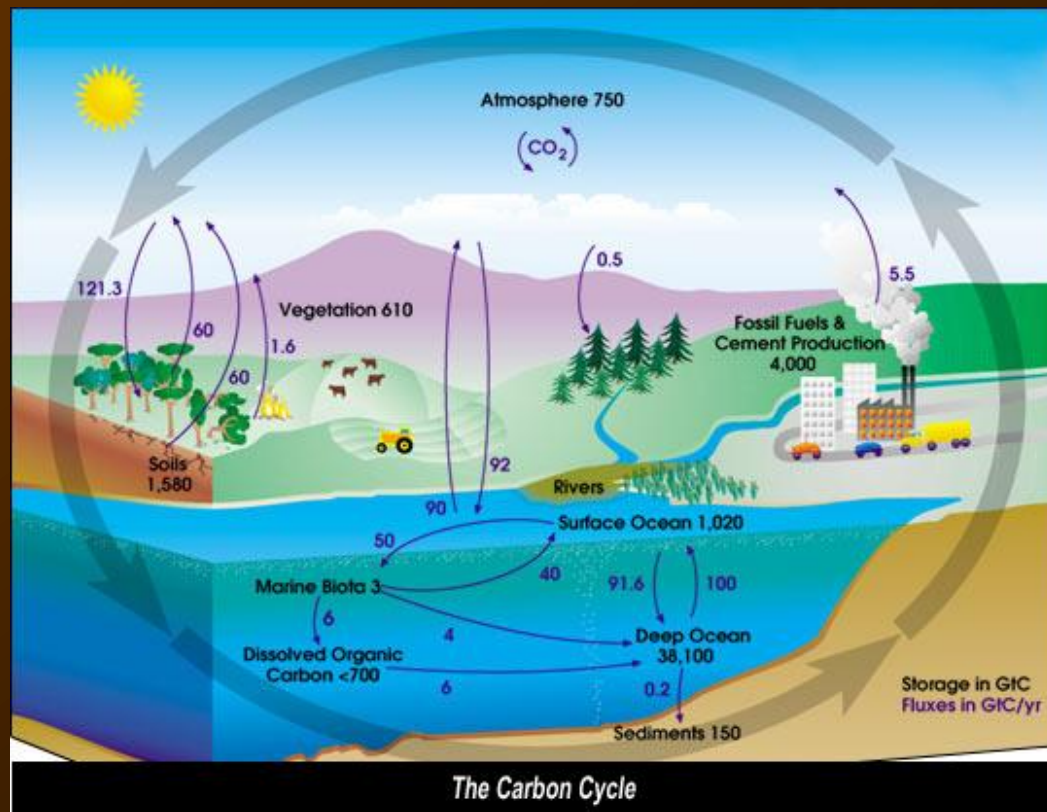


Odense fjord



Årsager: Ikke værdifri

- ☒ CO₂ over alt
- ☒ Hvad med solen, arealforbrug, intern variabilitet?
- ☒ Skyer, skala
- ☒ Hydrologi, kemi, biologi

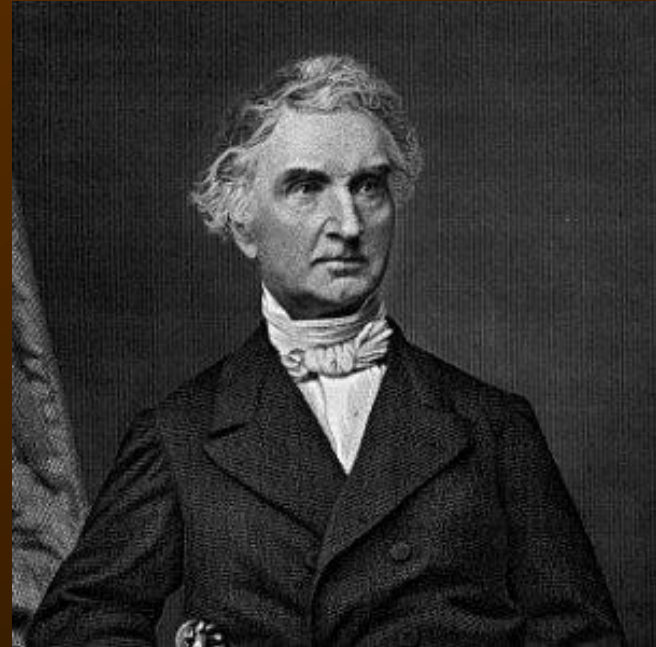


CO₂ fremmer plantevækst



Kvælstoffet

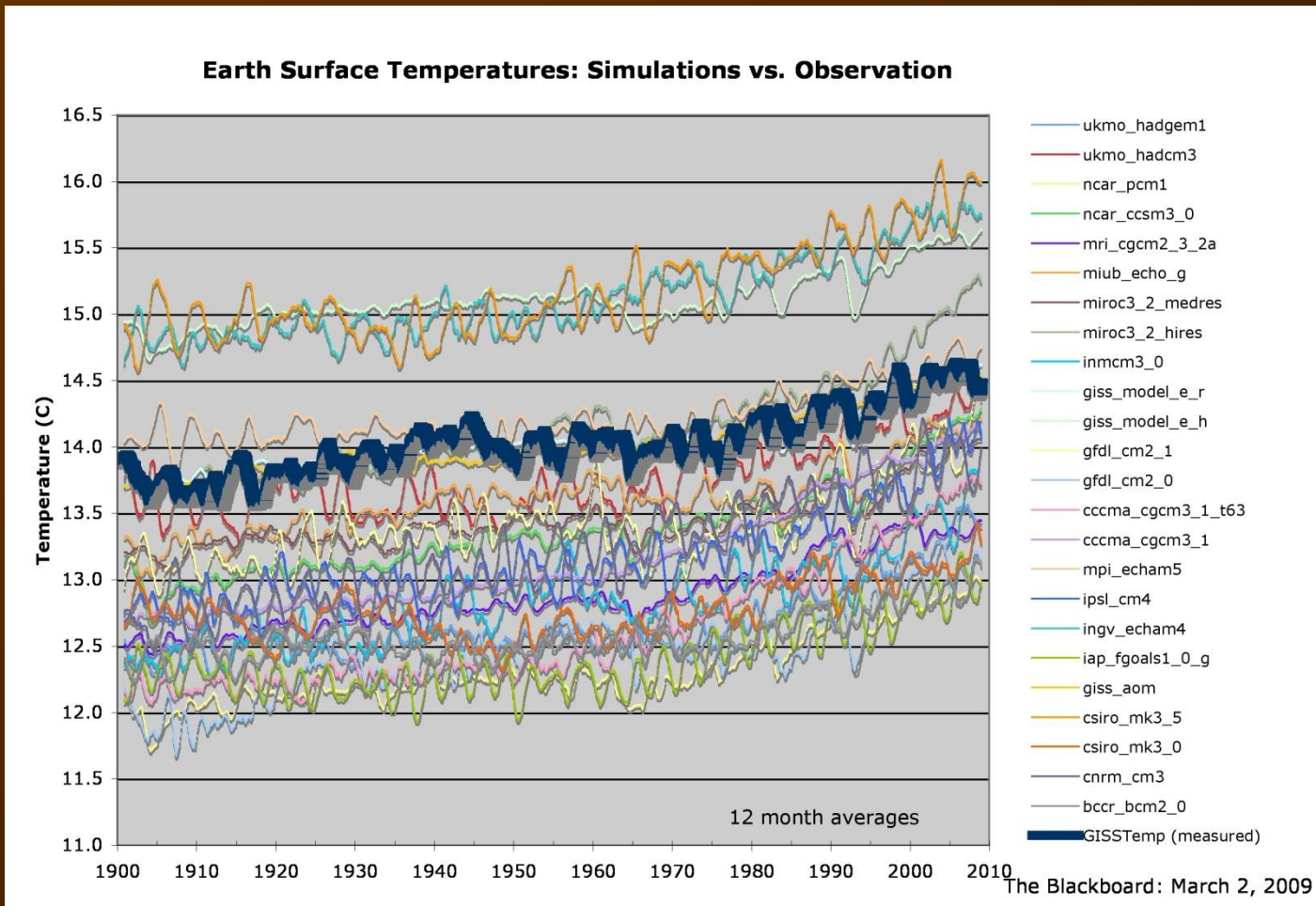
- ✉ Planter skal have næring
- ✉ Liebig fandt sin ”minimumslov” i 1800 tallet
- ✉ Vi andre har modelleret det siden 60’erne
- ✉ Klimaforskningen har først fundet ud af det nu



”For the first time, climate scientists from across the country have successfully incorporated the nitrogen cycle into global simulations for climate change”

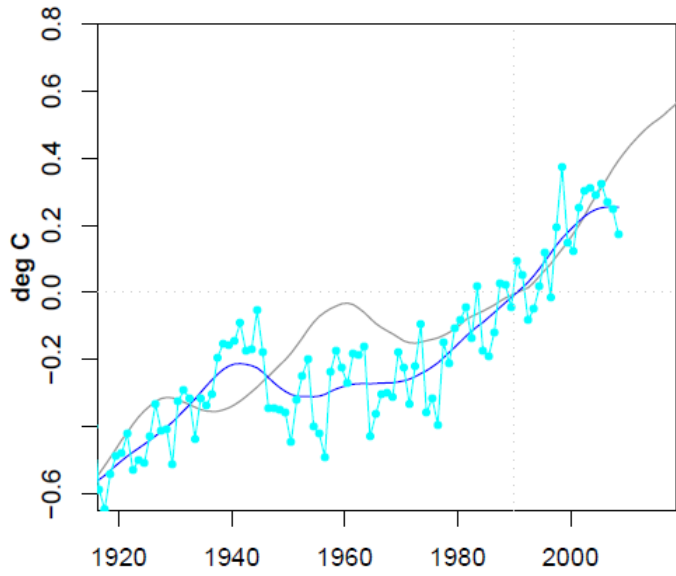


Passer modellerne med nutiden og fortiden?

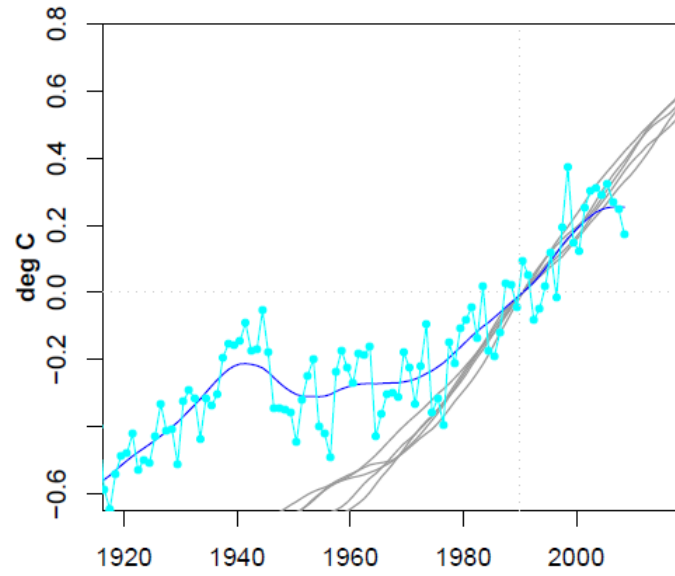


Aerosoler, regionale resultater er dårlige

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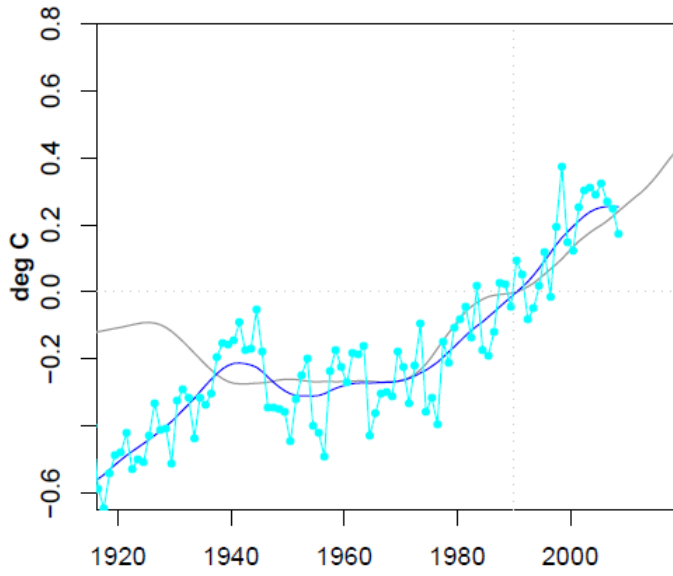


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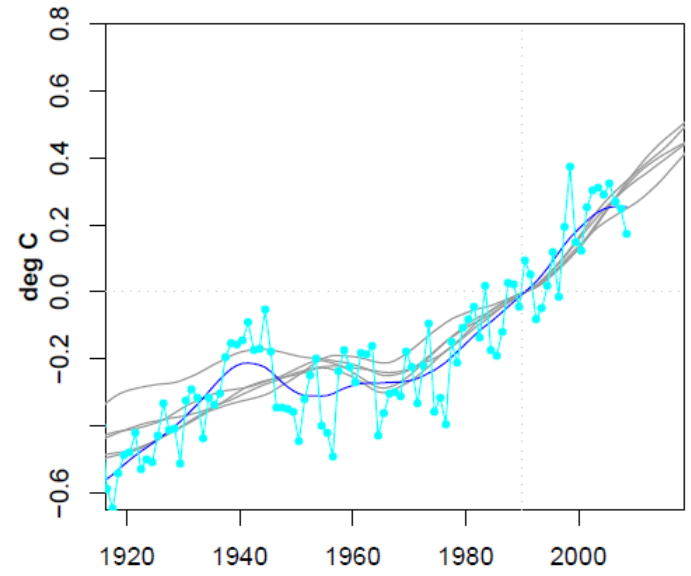
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esa1b



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giss_model_e_r sresa1b



Index

<http://www.climateaudit.org/?p=6454>



Karl Iver Dahl-Madsen:

July 3rd, 2009 at 1:29 am

Re: **Steve McIntyre (#10),**

"Inclusion in the model spaghetti graph doesn't seem to require that the model pass an SAT test"

Thanks much for comparing the individual model runs with the real world. It clearly shows that most of the models fail miserably in hindcasting and are therefore useless for forecasting. Not one of the models hindcasts really well. I had expected something like that, however the results are actually "worse than expected":). And how can IPCC accept the lumping of obviously bad models with the best ones. Bad models should be excluded by objective criteria.

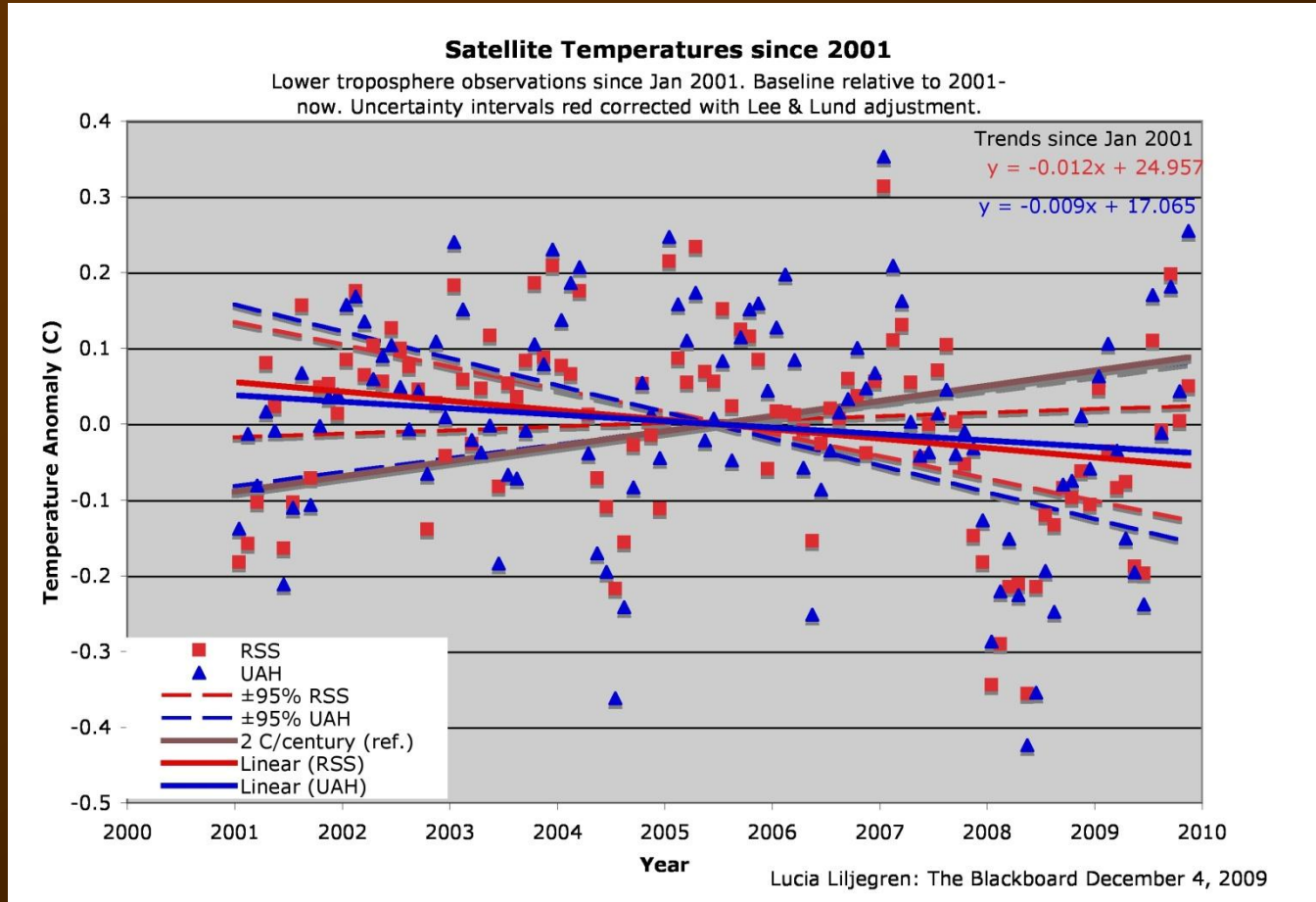
Craig Loehle:

July 3rd, 2009 at 7:42 am

Re: **Karl Iver Dahl-Madsen (#16),** We have tested our airplane design with multiple simulation models. Though some of the models indicate severe vibration, the wings coming off, or failure to lift off, we are happy to report that the average output of the models matches our wind-tunnel test reasonably well, so feel confident flying RealClimateAirlines!



Passer modellerne med fremtiden?





Isdækket på Arktis

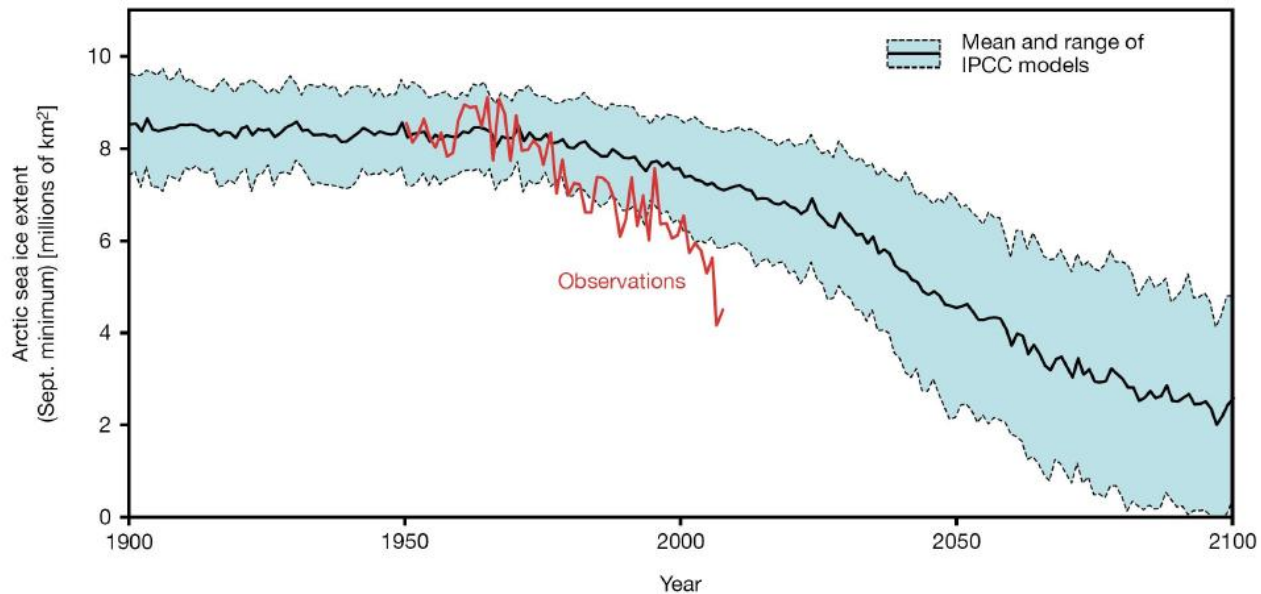
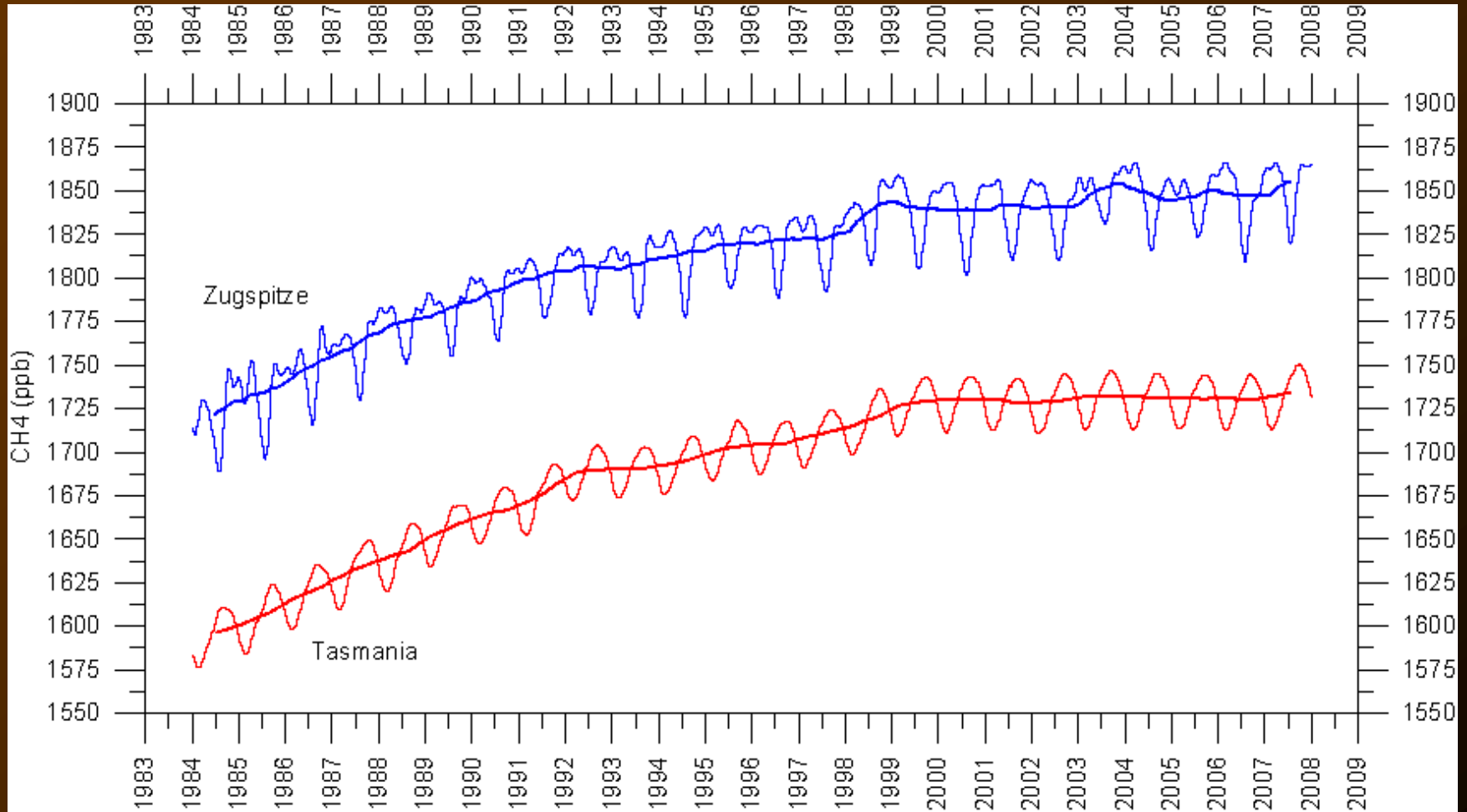


Figure 13: Observed and modeled Arctic sea-ice extent



Methanen klinger af





Kan modellerne forudsige?

K. Trenberth

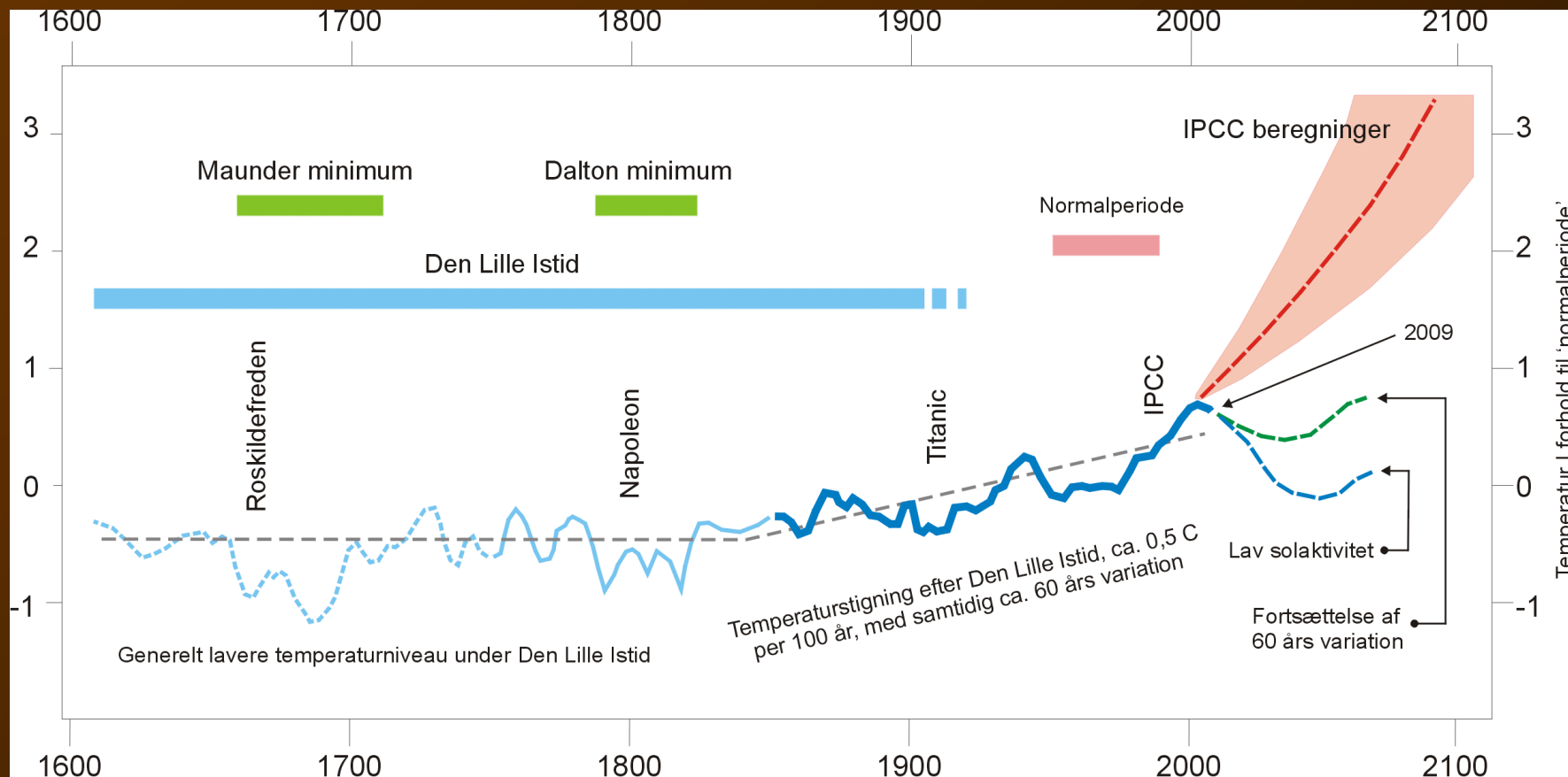
Global and regional climate models have not demonstrated skill at predicting regional and local climate change and variability on multi-decadal time scales

<http://pielkeclimatesci.wordpress.com/2007/06/18/comment-on-the-nature-weblog-by-kevin-trenberth-entitled-predictions-of-climate/>

IPCC siger korrekt, at man laver scenarier, men det bliver brugt i offentligheden som forudsigelser



Flere bud på fremtiden

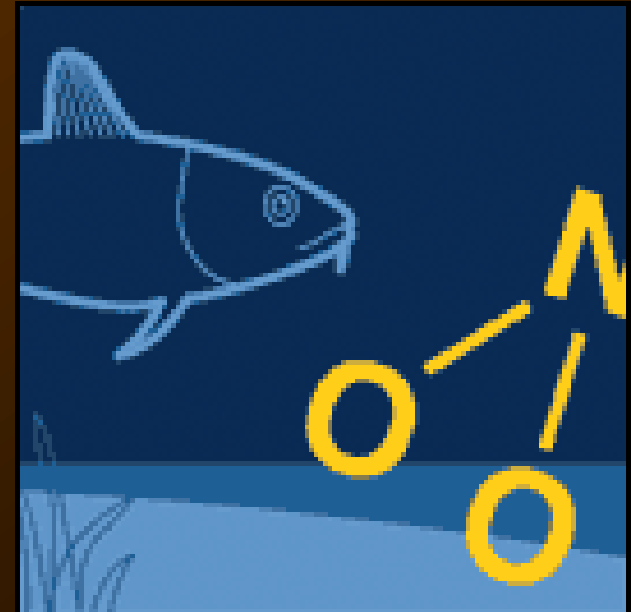


Figur fra Ole Humlum



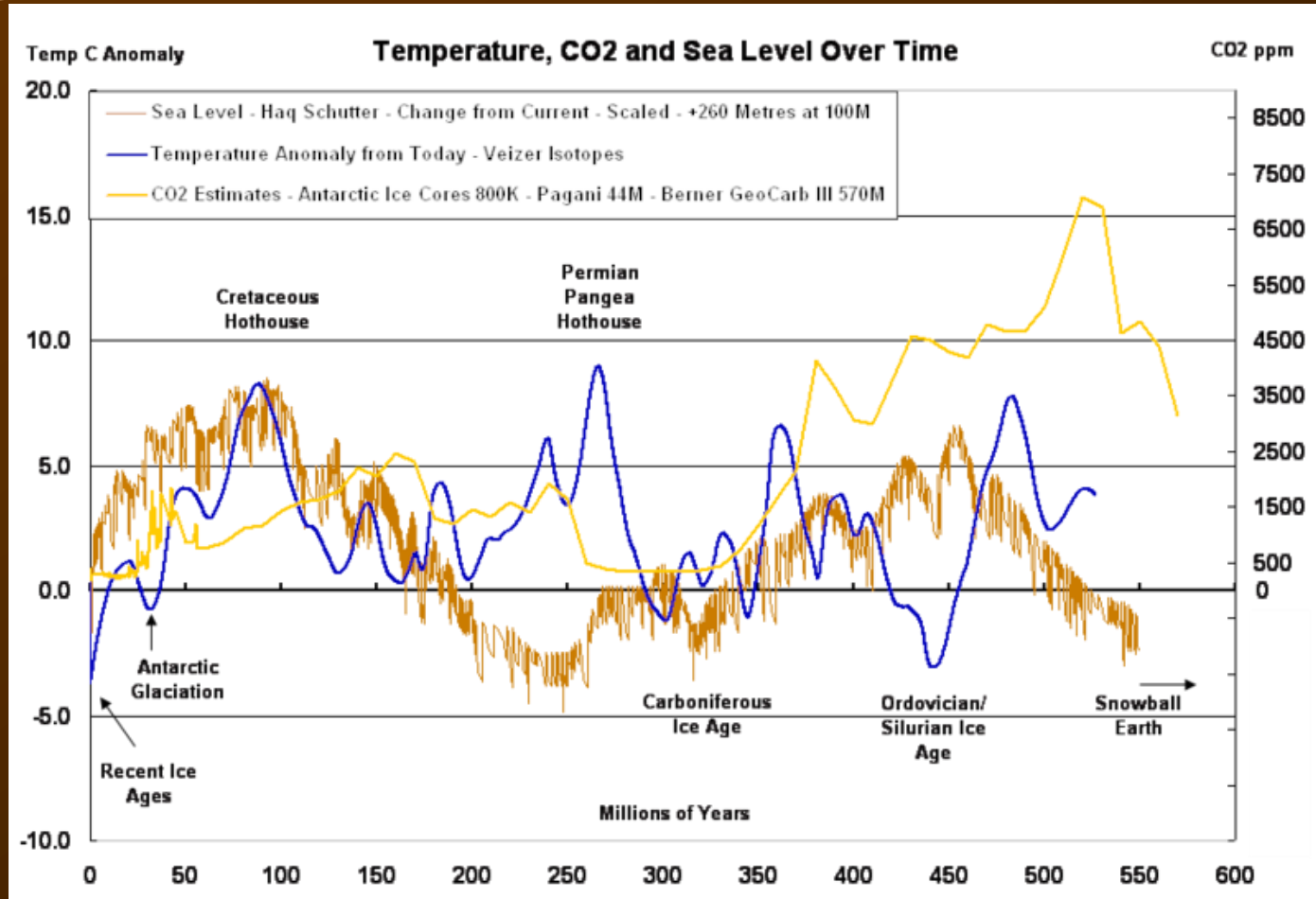
GEIA: En ny proces

- ✉ Global Environmental Impact Assessment
- ✉ Adskillelse af forskning fra vurdering af forskningen
- ✉ Pluralisme
- ✉ Færre, men bedre modelcentre
- ✉ Uafhængig revision af modellerne





Vi har brug for gode modeller



Klimaet kan ændre sig – Meget! Geo-Engineering er uundgæeligt

Infinite Divisibility

Yves Tanguy

