Lies, Damned Lies and Modelling

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Talk to Hexham Rotary Club

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Modelling

Lego Star Wars

Lego Porsche

Lego Buildings

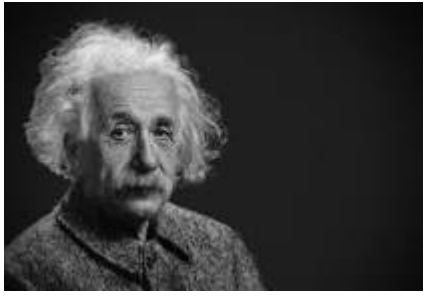
Modelling is well-established in Science

The Universe

Isaac Newton
1642-1727

Classical Models

Albert Einstein
1879-1955



Relativity
Quantum Mechanics

Richard Feynmann
1918-1988

Refined Einstein's theories

How are models tested?

Empirically: How well do they describe the real-world?

By observation or experiment

Theoretically: Internal consistency (model-checks)

Does not mean they describe the real-world

Are Models capable of Mathematical Proof?

No!

Kurt Gödel
1916-1978

Close friend of Einstein in Princeton, USA

Both refugees from Nazi Europe

Proved that any axiomatic system is:
Undecidable
Incomplete

Axiom = assumption

All models have assumptions

Data Modelling Today

- Many IT systems are based on models
  - Relational Data Model for databases
  - Many flow-type diagrams for systems analysis
- NR spent 40 years professionally in data modelling
  - Gives a handle on how a business works
  - Leads to implementation with internal consistency
  - Prototyping (Mock-ups) is a popular technique in computing (empirical testing against real world)
- But it's an incomplete view of the Real World
  - There may be serious mismatches and invalid assumptions
  - The coverage of the model may be inappropriate
  - Humility is required!

Models that Forecast

- A fairly recent development
- Assisted by power of computers today
- How do you test empirically?
- Are we still in a scientific domain?
- Worry of a socio-political dimension
  - Driving policy

Looking Forward is Problematic

Optimistic Mining Companies: “A miner is an optimist with a hole in the ground”

Cautionary Note Regarding Forward-Looking Information

This press release contains forward-looking statements … Such statements include, without limitation, statements regarding the future results of operations, performance and achievements of the Company, including the timing, content, cost and results of proposed work programs, the discovery and delineation of mineral deposits/resources/ reserves and geological interpretations. Although the Company believes that such statements are reasonable, it can give no assurance that such expectations will prove to be correct. … All of the Company's public disclosure filings may be accessed via www.sedar.com and readers are urged to review these materials, including the technical reports filed with respect to the Company's mineral proper

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Correct Forward Predictions

- Will make you very rich
  - Bet on horses and dogs
  - Bet on stock and commodity markets
  - Anticipate societal changes
- Bet definition:
  - Risk a sum of money or valued item against someone else's on the basis of the outcome of an unpredictable event such as a race or game

Economic Models

- The dismal science
- Forecasting supply and demand balances
  - How will people behave?
  - Difficult!
- Time-frames may be short where GroupThink prevails

The 2007-2008 Financial Crash

- Banks used models to give their current and forecast positions with debts/liabilities
  - Banks held many securitised assets
    - Bundles of securities of varying quality with some subprime, all valued within limits
- When the subprime assets crashed
  - The value of subprime went close to zero, below the lower limit of anticipated value
  - Many assumptions in the models were not understood
  - Some of the banks were flying blind with their models unable to cope with values out of range
  - A massive bailout took place, wiping out many shareholders and bondholders
- Obviously relaxation in standards and over-lending were major causes of crash
- But the models gave rise to complacency and contributed to the loss of control
  - GroupThink (common assumptions) is a frequent theme in model failures

Epidemiology

- Similar to economics in some respects
  - Hard to anticipate human (host) behaviour
    - Action can be taken to mitigate disease spread
- Record of models in predicting outcomes is controversial
- Media don’t understand science
  - Focus on sensational upper-bound numbers than on mean or lower bounds
- Novel diseases have to be countered quickly
  - Assumptions have to be formulated early-on and revised continually

Covid Features 1

- Model ranges for outcomes were often very large
- Media and politicians focused exclusively on upper bounds
- Some assumptions were obviously wrong:
  - Vulnerability to Covid was irrespective of person, partly using Spanish flu as guide (Ferguson May 2020)
    - In the real world, old people and those with comorbidities were much more vulnerable than young fit people
  - Incorrect assumptions led to whole country being locked down rather than just vulnerable people being protected as in Sweden
  - Lockdown files show politicians did not want to adjust to new knowledge as loss of face (e.g. reducing isolation from 14 to 5 days, suggested by Whitty)

Covid Features 2

- Maybe first lockdown was justified as we learnt more about the virus but second lockdown, where models fed old data, more questionable
  - Data 3 weeks out of date, peak had already passed
  - Mortality down from initial estimate 1.0% to 0.3% (same as flu)
- Coverage of real world by models was limited
  - No account taken of effects on economy, mental health, school children and future capability of NHS
    - So we have a poor economy, high taxation and inflation
    - High levels of mental health problems in young people
    - School children behind on educational progress
    - Record NHS waiting lists leaving people in discomfort with excess mortality and preventing many from working, lowering productivity

Covid Omicron Modelling

We model the potential consequences of the Omicron SARS-CoV-2 variant on transmission and health outcomes in England, with scenarios varying the extent of immune escape; the effectiveness, uptake and speed of COVID-19 booster vaccinations; and the reintroduction of control measures. These results suggest that Omicron has the potential to cause substantial surges in cases, hospital admissions and deaths in populations with high levels of immunity, including England. The reintroduction of additional non-pharmaceutical interventions may be required to prevent hospital admissions exceeding the levels seen in England during the previous peak in winter 2020–2021. [CMMID, London School of Tropical Medicine]

This alarmist model ignored evidence from South Africa, readily available at the time, that Omicron was milder than earlier variants, although more infectious

Inexcusable failure to adapt the model to real-world data

Fortunately another lockdown was not initiated

Global Warming

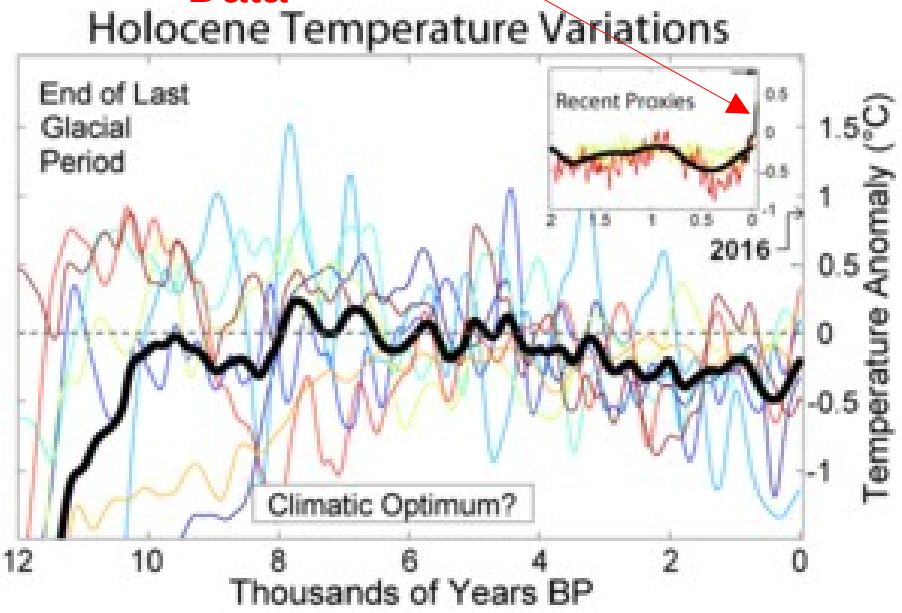
- Climate Change – preferred term today - is not a valid hypothesis
  - The climate is always changing on Earth!
- The most controversial forward modelling to date
- Amazing effort put into the modelling
- No doubt the planet is in a bad way:
  - Deforestation
  - Biodiversity crisis
  - Human population putting immense strains on resources
  - Pollution
- But global warming data modelling is maybe not the science claimed
  - Everyone accepts the planet is warming slowly
  - Is the modelling done according to scientific principles and with integrity?

Verifying Model of Global Warming

- Cannot verify forward projections as no experimental data available
- Hindcasting is possible
  - Applying model to the past
  - Beware of curve fitting
  - ‘Form’ in betting circles
- In practice verification seems to also comprise GroupThink
  - 97% of scientists agree with us
- But science is not built on majorities
- Increasing number of scientific papers raise doubts and questions

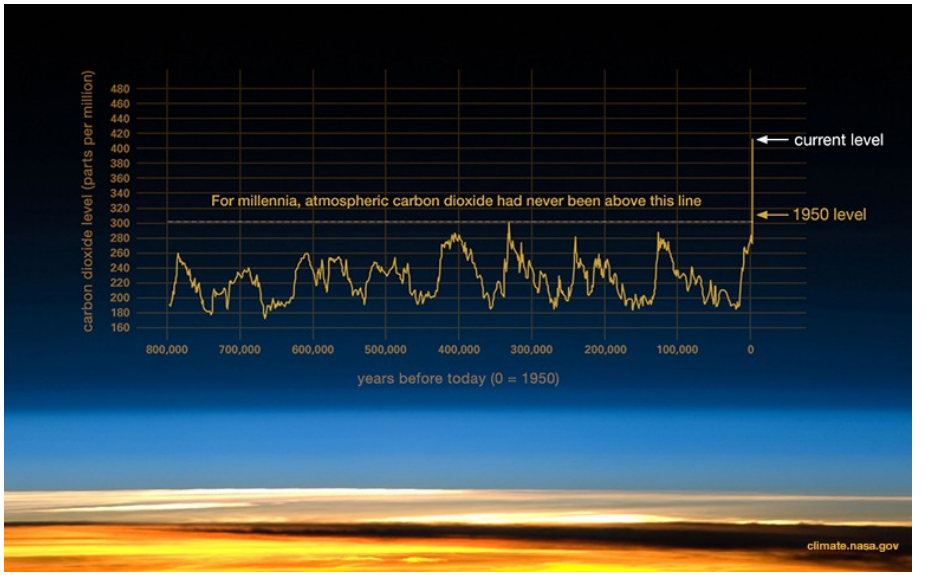
Holocene Climatic Optimum
Real-world Data

Misleading Additional Data



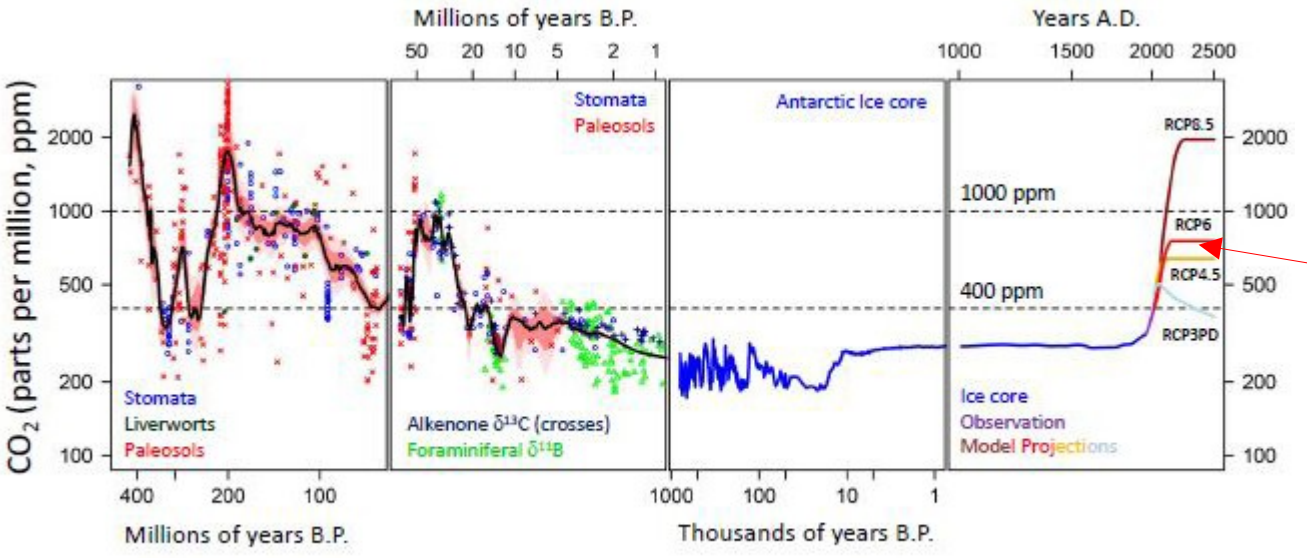
Since end of last ice age warmer than now 8,000 years ago when Carbon Dioxide lower. Cause: orbital changes,insolation?

Carbon Dioxide since 800,000 years ago



Low carbon dioxide in ice ages, now highest in 3m years

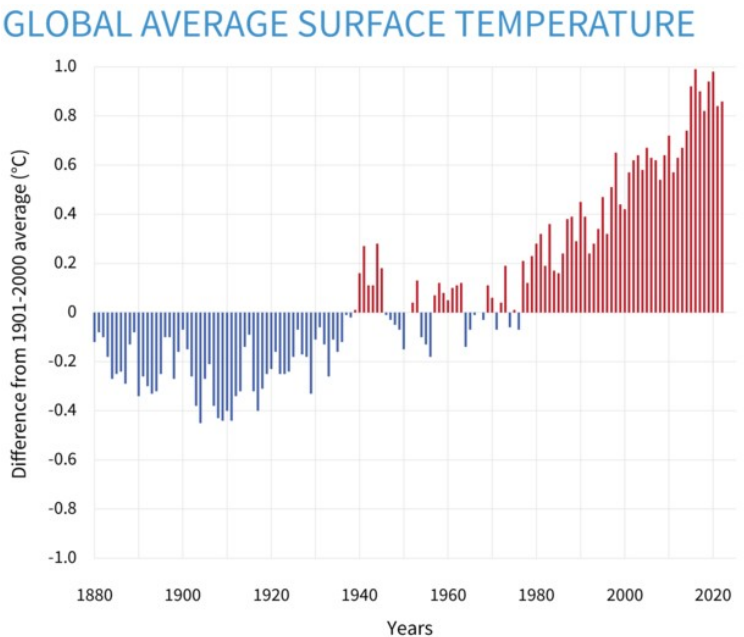
Carbon Dioxide over Millions of Years – Real-world Data



Projections

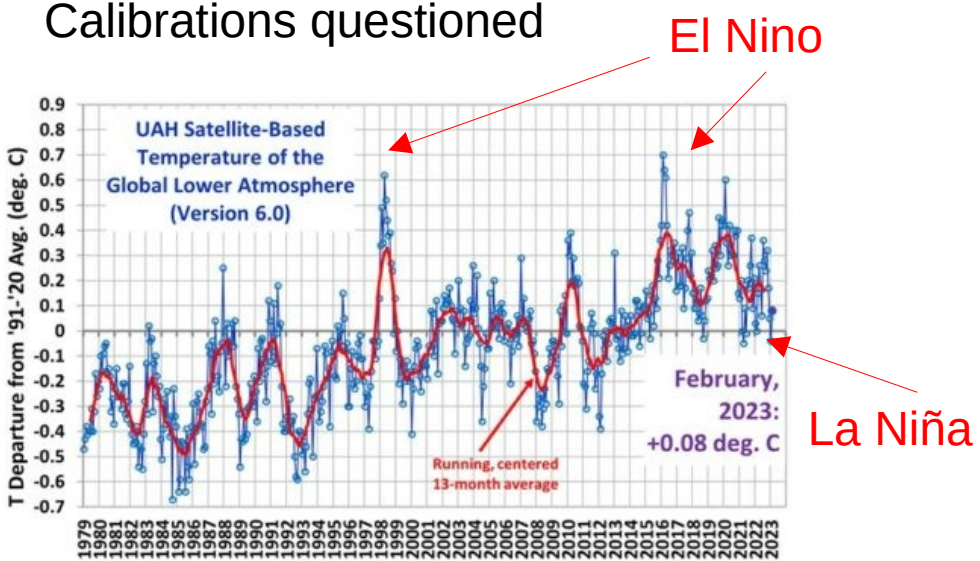
Temperature Proxy Records
Real-world Data

NOAA – ground thermometer stations
Urban heat effect



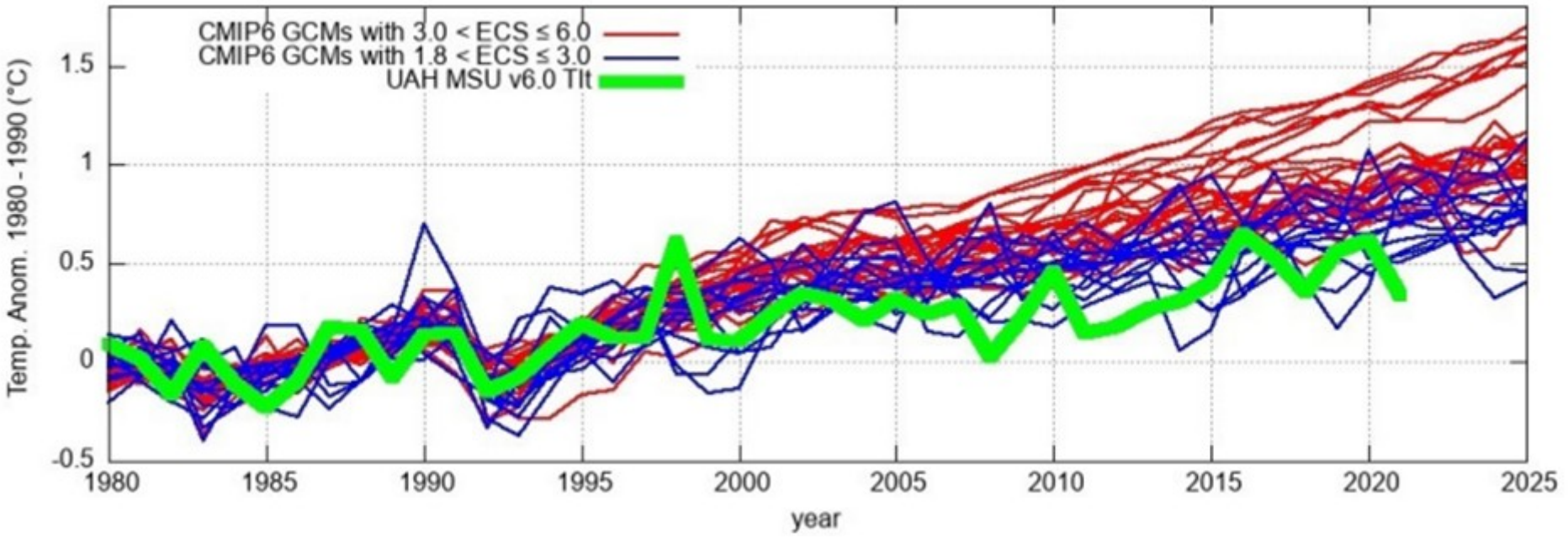
+0.18C per decade recently

Satellite – microwave (all of planet)
Calibrations questioned



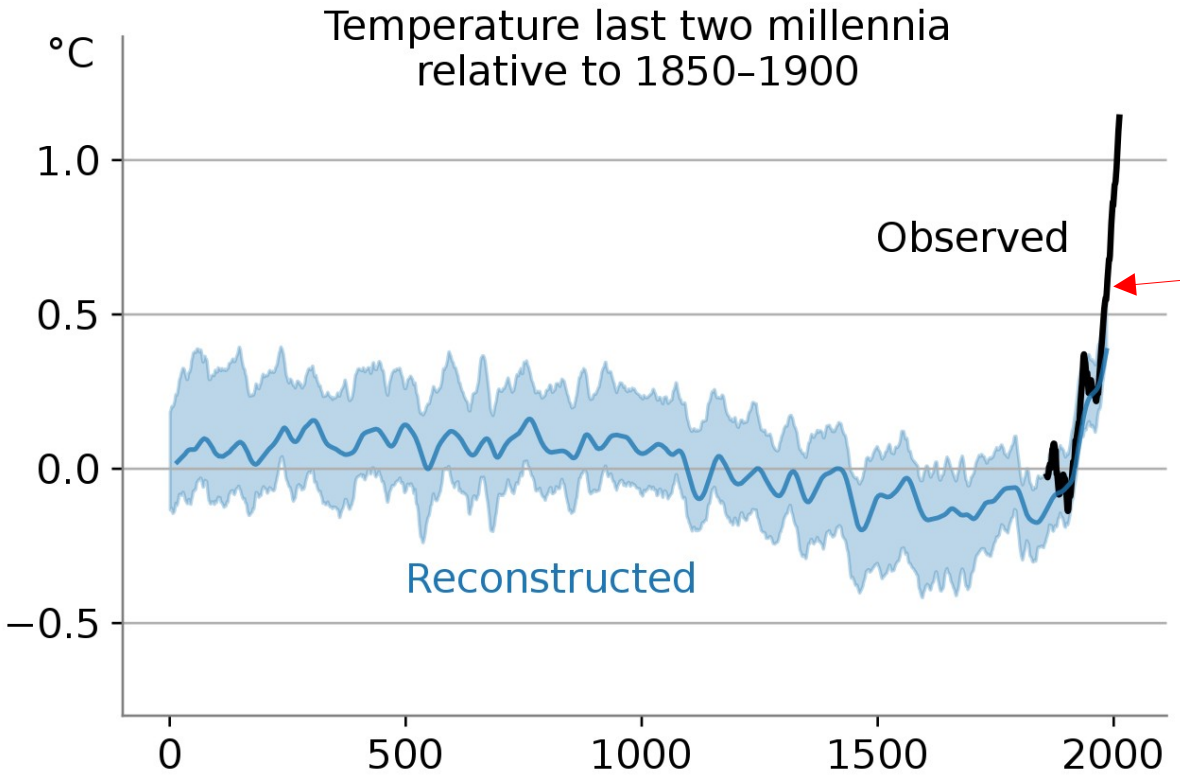
+0.13C per decade

Model Predictions vs. Satellite Proxy



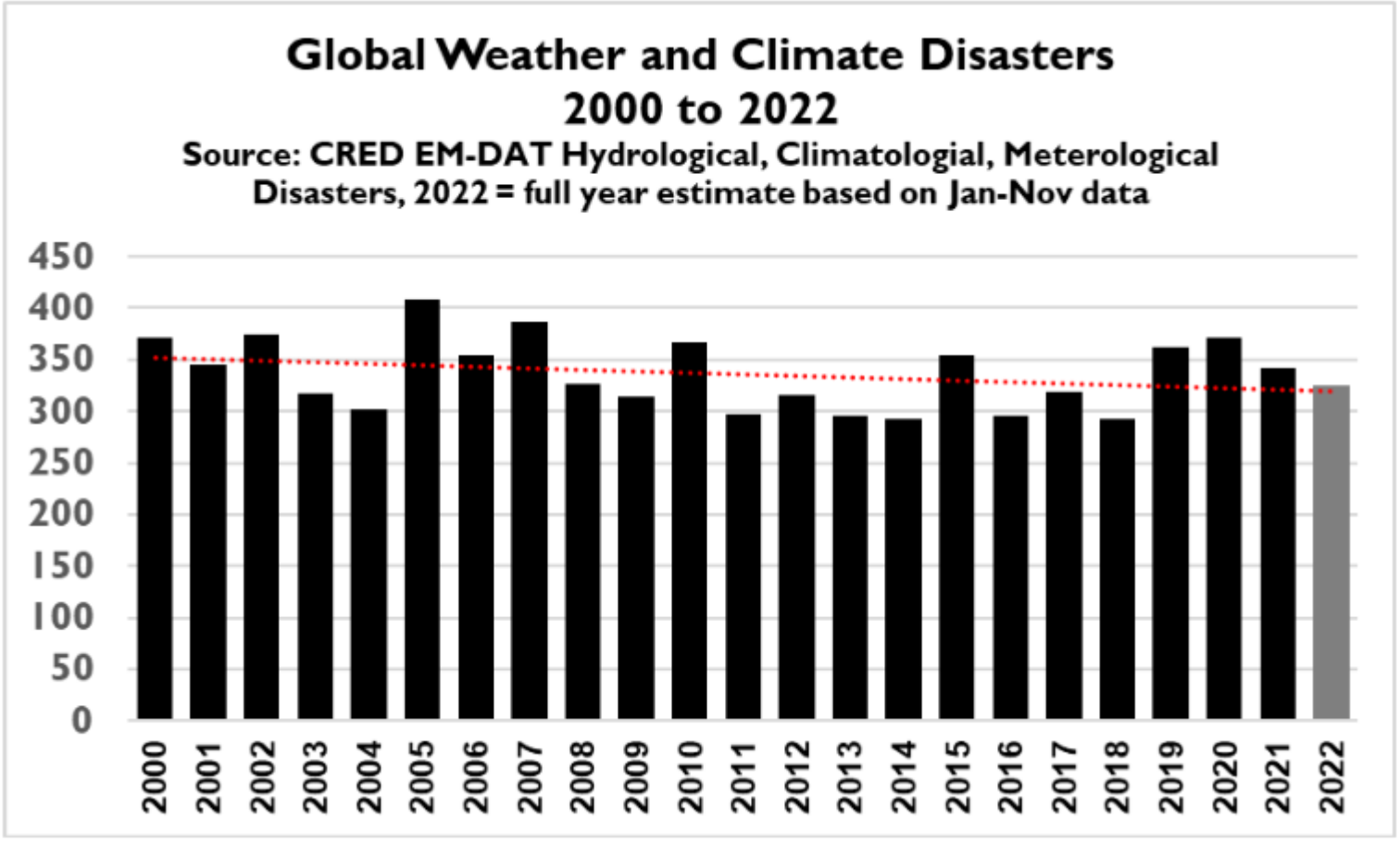
Composite Temperature Proxies - Real World Data

Hockey Stick of Mann

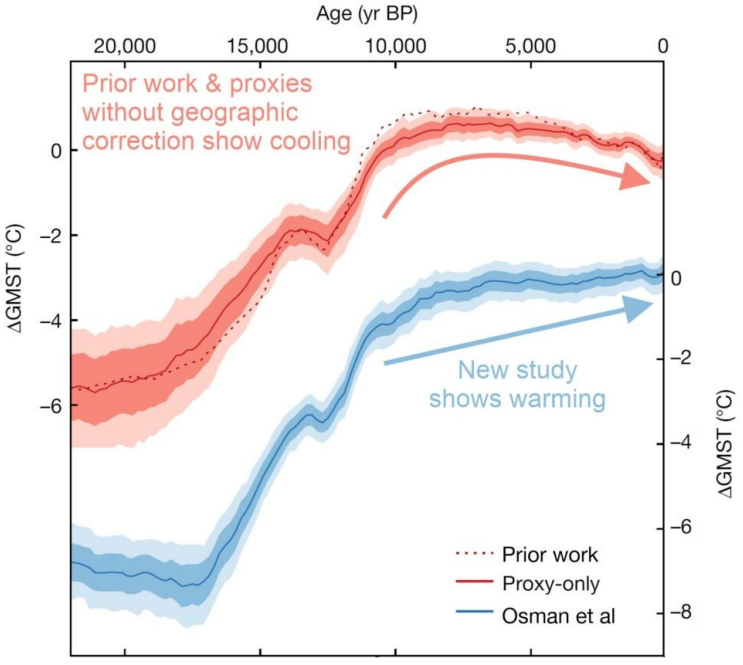


Misleading Additional Data - Different Type

Weather Disasters

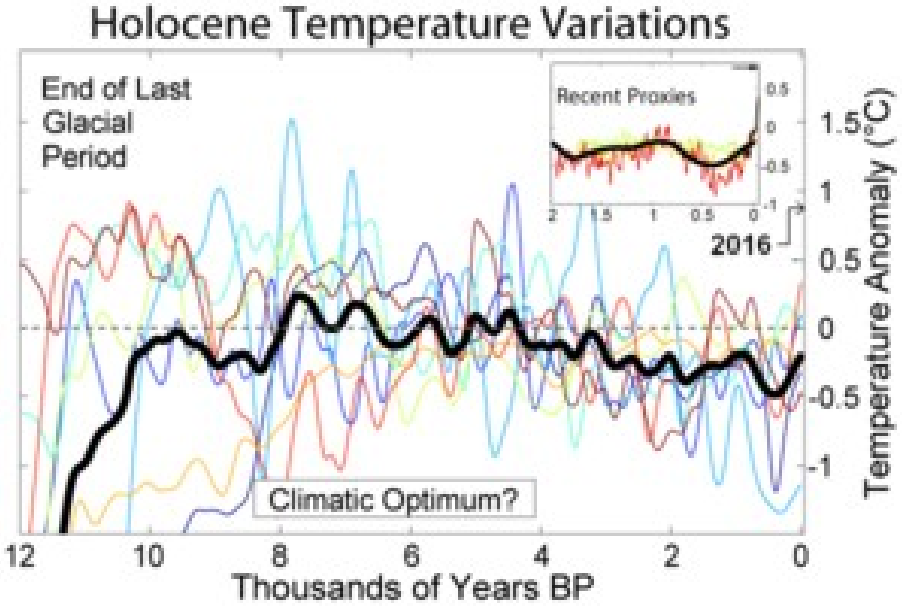


Revised Real-world Data (on left from right)



Revised

Removes Holocene Climatic Optimum



First Study

Much evidence for Climatic Optimum from fossil, cave, ice and sediment records

Global Warming Models/Agencies

- Essentially compiled and controlled by IPCC (Intergovernment Panel on Climate Change – United Nations)
- Assume Carbon Dioxide is the main forcing agent
- Predict Climate Emergency
- Insist on immediate end to fossil fuels (currently 83% of world energy, 100-150 trillion US$ cost to replace)
- Immediate switch to wind and solar energy
- Backed by academics such as Professor Mann (hockey-stick fame)

Doubts about the Global Warming Modelling

- Taken as settled science
  - No science is ever settled, particularly that based on forward-modelling
- Controlled by tight cabal
  - Dissent and discussion immediately attacked/suppressed
- Climategate 2009 leak of UEA emails and documents
  - Suggested corruption and stifling of academic debate
- Appear to manipulate real-world data to fit models
  - Scientists extend and straighten iconic climate “hockey stick”
- Massive links to certain industries (‘renewables’)

Final Thoughts

- Model results generated by computers are taken at face value by the media and much of public
  - Assumptions and error bounds should be given prominence
  - Underlying real-world data should be quoted
- The forward-looking models are a new type of science
  - Not same rigour as traditional physical sciences in verification
  - Humility is required by the modellers
  - Treat with caution