# Recent Developments in Climate Policies and Science

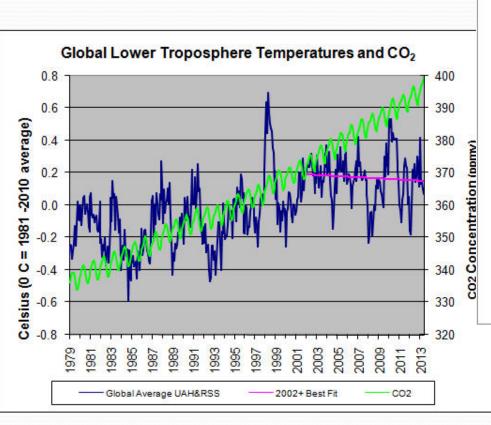
Friends of Science AGM

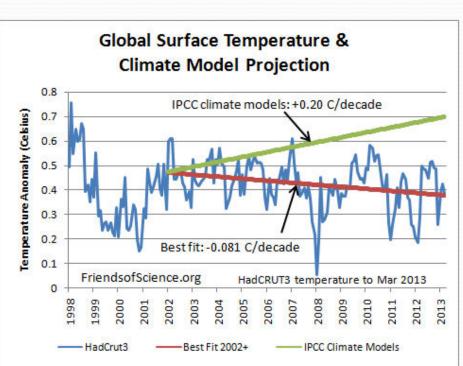
June 18, 2013

Ken Gregory, P.Eng.



# Recent Global Temperatures

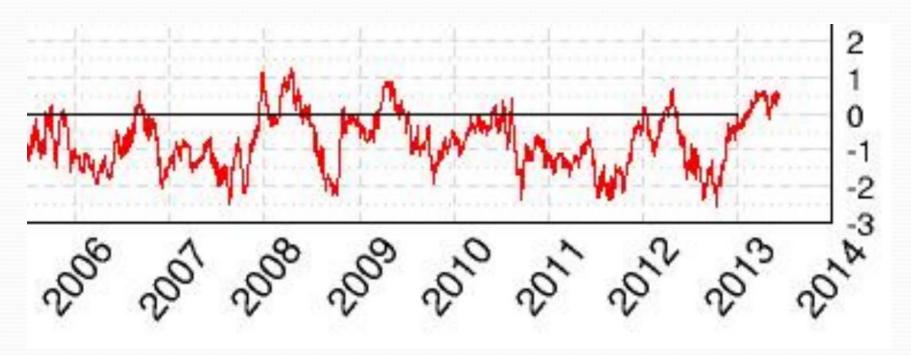




Satellite and surface temperatures are declining since 2001.



### Global Sea Ice Area



Global sea ice area has been above the 1979 – 2008 average for most of 2013. Now 0.5 million sq. km above normal.

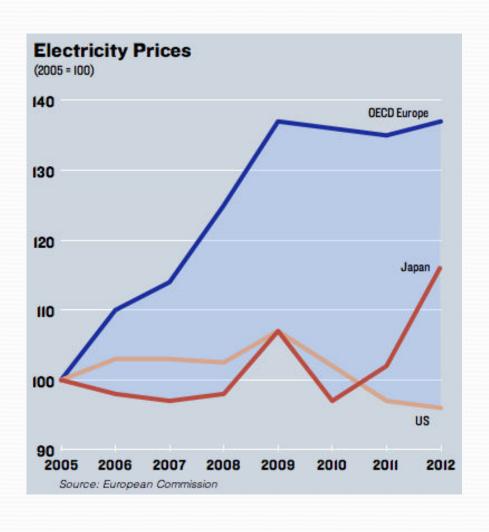


# Climate Policy in Europe

- Dr. Benny Peiser presentation on FoS website.
- Europe pays >1 Billion Euros/day on energy imports
- Germany plans to start-up 14 coal-fired power plants by 2020: 2 in 2012, 6 in 2013, 6 by 2020.
- May 22 Energy Summit in Europe promotes shale gas.
- The EU will draft rules for shale gas production by the end of 2013.
- IPCC Bonn climate talks collapse June 12, 2013 May delay payout of the \$100 Billion Mitigation and Adaptation Fund.
- Britain Drops Climate Change From G8 Agenda, June 17-18.

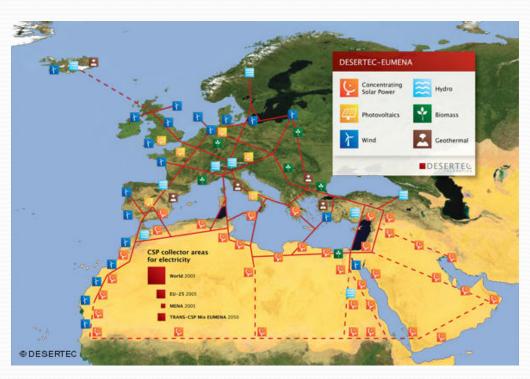


# **Europe Electricity Prices**



- •UK energy targets for 2020 will require wind turbines, transmission lines and gas-fired back-up at a cost of £120 billion.
- •The same demand could be met from gas-fired plants alone at a cost of £13 billion. Report: June 3, 2013.

## Desertec Abandons Solar Power Exports



Desertec planned to export solar power to Europe from Northern Africa using HVDC transmission lines at a cost of €400 Billion. The project was abandoned as too costly. (May 31, 2013)



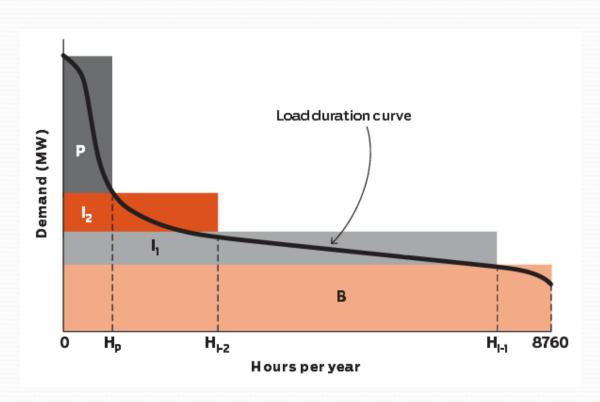
# Alberta School Boards Buy Wind



- •25 year wind power purchase deal with BluEarth Renewables, Inc.
- •BluEarth says "wind is free!" and "has long-term cost predictability".
- •UK on-shore windfarms produce 11% of rated power at age 15 years.
- •Most operate 12 15 years.
- •Wind power is least available when demand is greatest.

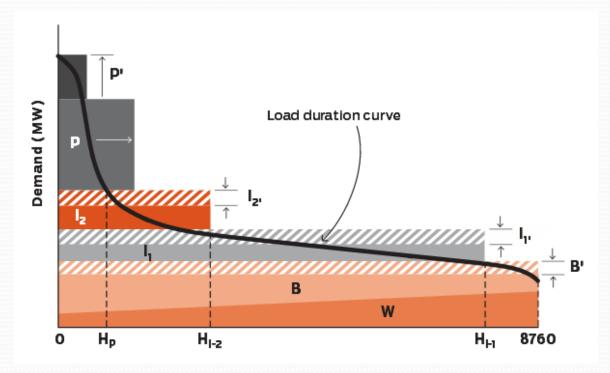


## **How Does Wind Affect Power Costs?**



- •Peaking plants have high operating costs.
- •Value of power depends on ability to supply when needed.
- •Wind farms reduce market prices when wind blows.
- •Wind power is very diffuse, unreliable.

# Wind: More High-cost Peak Generations.



- •Low prices when wind blows reduces base plant returns.
- •More high-cost peaking plants required.
- •Overall prices increase.

Wind power results in less low-cost, more high-cost conventional power.



# North America Policy Notes

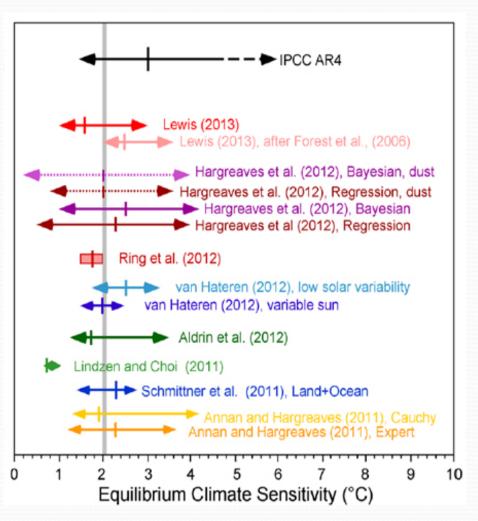
- Eleven scientists submit legal brief to the US Supreme Court to overturn the EPA CO2 endangerment finding.
- US approves two Liquefied Natural Gas terminals.
- Alberta gives \$745 million, Canada gives \$120 million to Quest Shell Oil Carbon Capture & Storage.
- US Government raises SCC to \$38/tonne in 2015 from \$23.80 (June 12).

# Keystone Approval Impact on Climate

- The Keystone XL Pipeline is a proposed 1,897 km, 36-inchdiameter crude oil pipeline
- Canadian tar sands produce 17% more CO2/bbl than average US oil.
- US State Department estimates 2.7 MTCO2/yr incremental emissions from pipeline approval.
- Assuming CS of o.7 °C/double CO2
- o.oooooo43 °C/year
- o.oooo2 °C in 50 years
- Hansen says Keystone XL approval is "game over for the climate."



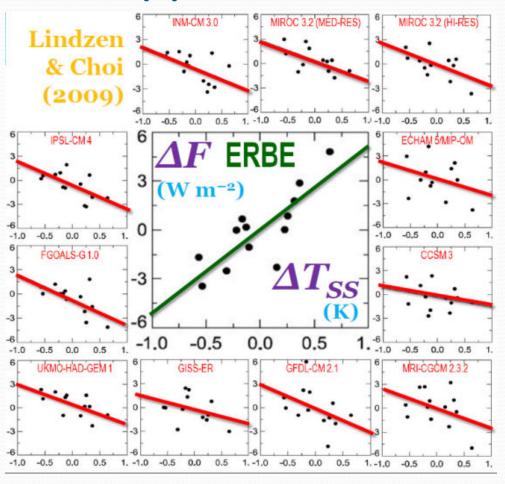
# New Estimates of Climate Sensitivity



- •New estimates of ECS are 2/3 of the IPCC AR4.
- •Transient CS is about 77% of equilibrium CS.
- •Most estimates assume no natural climate change other than from solar heat (TSI).
- •The ONLY estimate that used the changes in the GHE is the lowest (Lindzen and Choi).



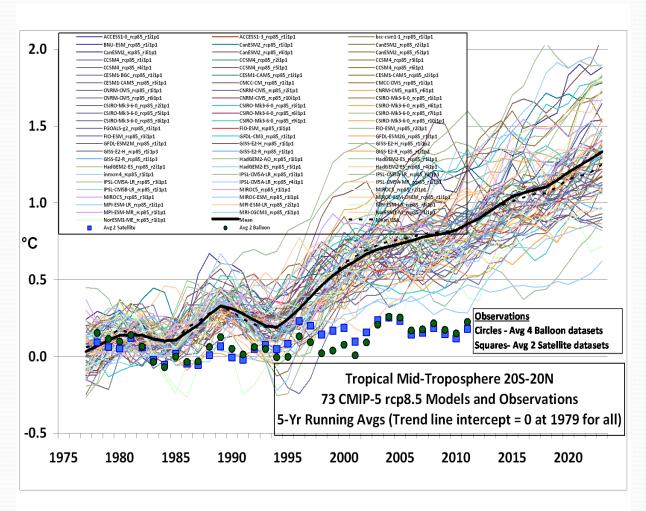
# Climate Models Wrong: Heat Escapes, not Trapped



- •11 climate models predict decreasing OLR as sea surface temperatures rise (red lines).
- •Satellite measurements show the opposite.



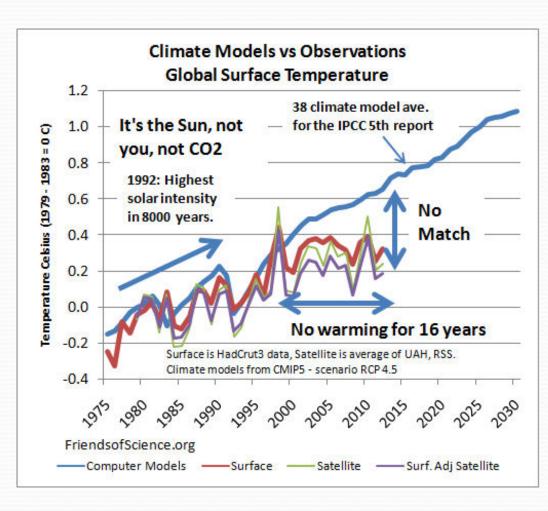
# Epic Fail: Climate Models vs Observations



- •New climate models fail to match last four decades.
- •Tropical midtroposphere



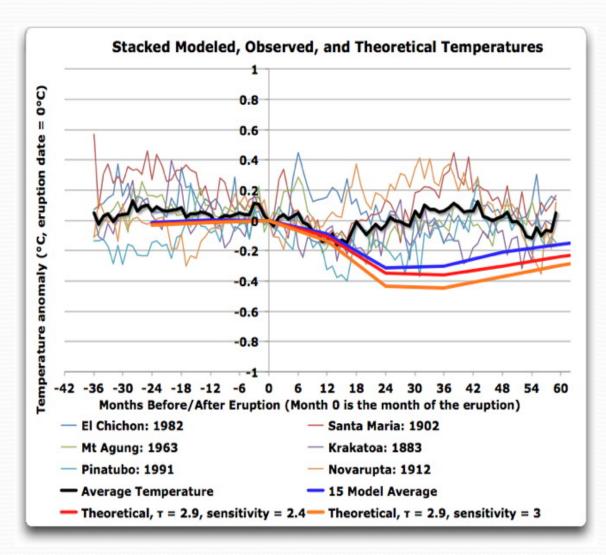
## Global Surface Temperatures & Models



- •The new climate models ignored the lack of warming since 1998.
- •A model MUST have a good history match to be useful.
- •Even models with a history match may be wrong.

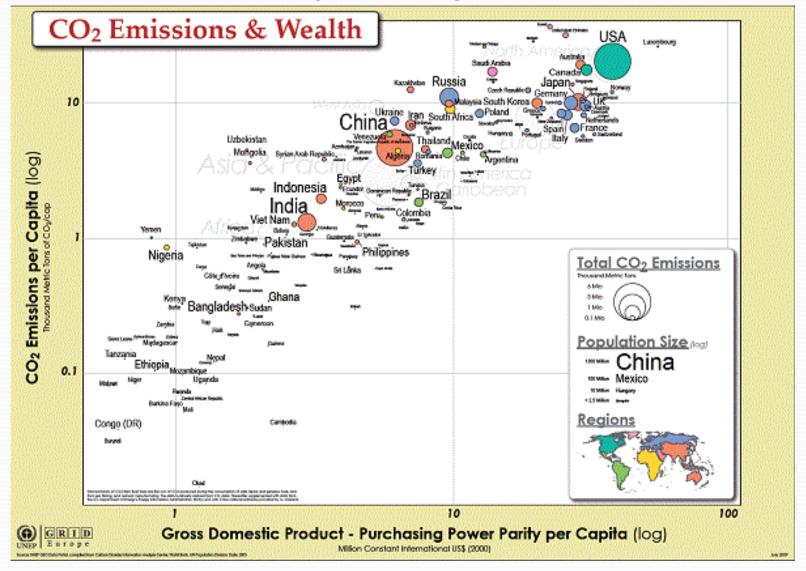


#### Volcanoes: Models vs Observations



- •The average climate response to six volcanic eruptions is much less than climate models predict.
- •The response returns to the pre-eruption temperatures in 1 ½ years.
- •Climate models overestimate the cooling and take too long to recover.

# CO2 Emissions per Capita Vs. Wealth



# Climate Policy: Cost/Benefit Problem

- Public assumes the benefit is greater than the cost.
- Cost: World has spent \$1.6 Trillion to end 2012 in renewable investments (excluding research & development).
- Cost of Environment Canada's regulation:
  - \$92 Trillion/°C at IPCC CS 3 °C /2X CO2
  - \$394 Trillion/°C at Lindzen CS 0.7 °C /2X CO2
- Social Cost of Carbon: \$25/tonne CO2
- Reduce emissions by 175 Mt, for \$4.4 Billion.
- Avoided Costs are:
  - Sea Level Rise
  - Extreme Weather
  - Food Shortages

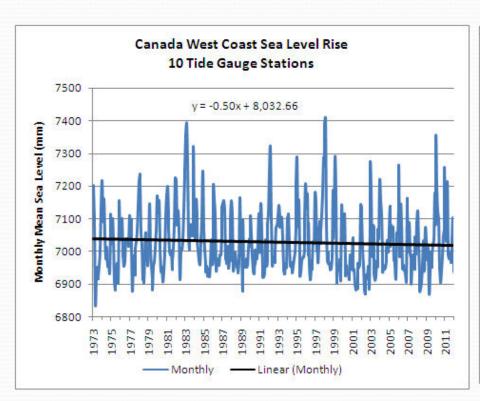


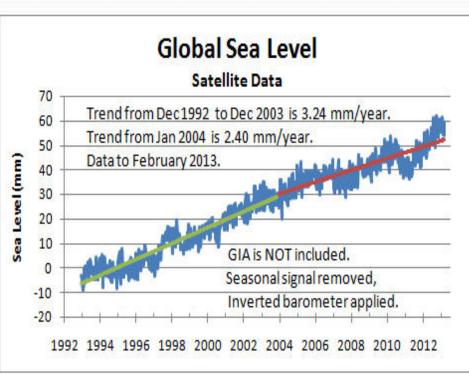
# Alarmists Want Poverty and Deaths

- Obama: "Electricity Rates Would Necessarily Skyrocket"
- Sam Keen closing State of the World Forum: "Cut the [world's] population by 90 percent and there aren't enough people left to do a great deal of ecological damage."



## Sea Level Rise: Little Impact

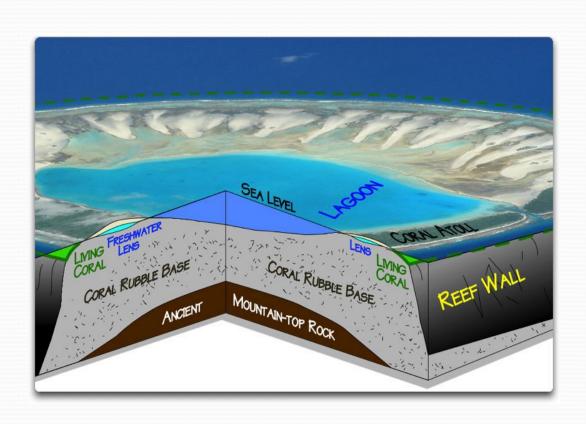




- •No sea level rise on Canada's west coast in 40 years.
- •Global sea level rise by satellite data is 2.9 mm/yr before GIA.



## Tropical Coral Islands Not at Risk from SLR

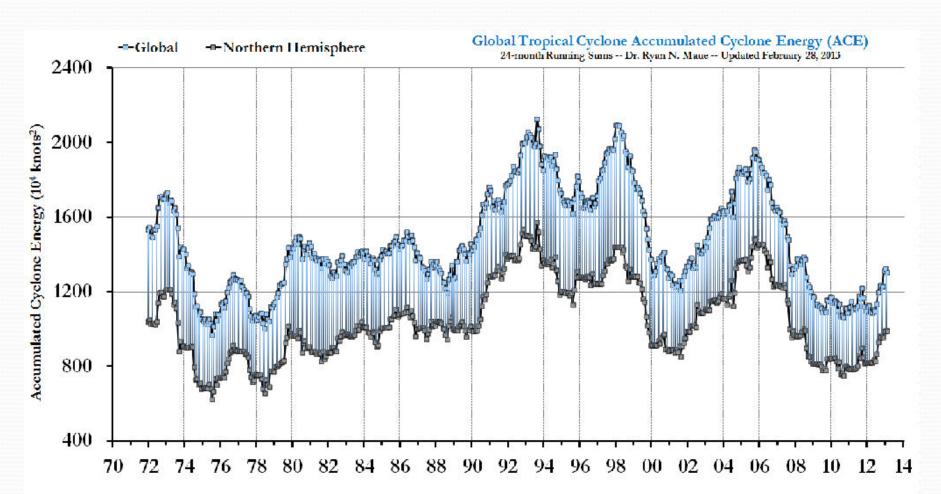


- Tropical coral islands grow as fast as SLR.
- Arial photos show that 23 of 27 islands grew or stayed the same area since 1950.
- Island atolls rise with sea levels.

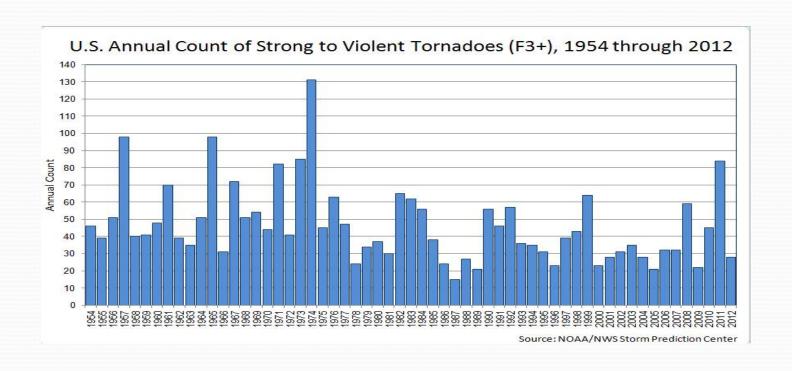


#### **Extreme Weather Cost**

World Bank: Storms, floods, droughts, heat waves to cause 0.015% of GDP damages. Stern: >1% GDP damages.



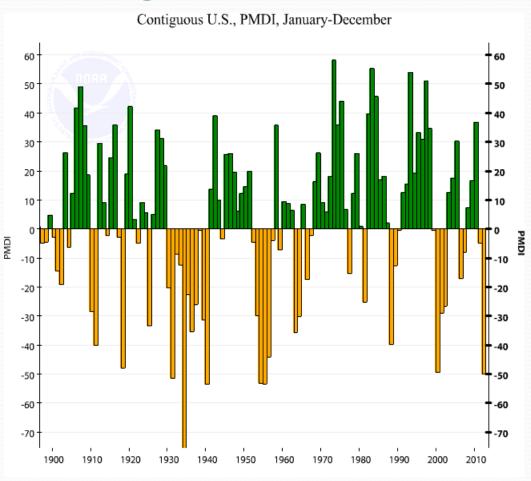
# Tornado Trend Declines with Warming



Tornadoes require a cold front colliding with warm air. Warming makes tornadoes less likely.



# U.S. Drought



- •No correlation of temperature to drought.
- •The most severe droughts in U.S. were in the 1930s and 1950s.



#### IPCC AR5 Second Order Draft on Extremes

- complete reversal from AR4 on trends in drought, hurricanes, floods.
- "high confidence that natural variability dominates any AGW influence in observed/historical TC records."
- "no significant observed trends in global tropical cyclone frequency."
- "low confidence regarding the sign of trend in the magnitude and/or frequency of floods."
- "does not support the AR4 conclusions regarding global increasing trends in droughts."

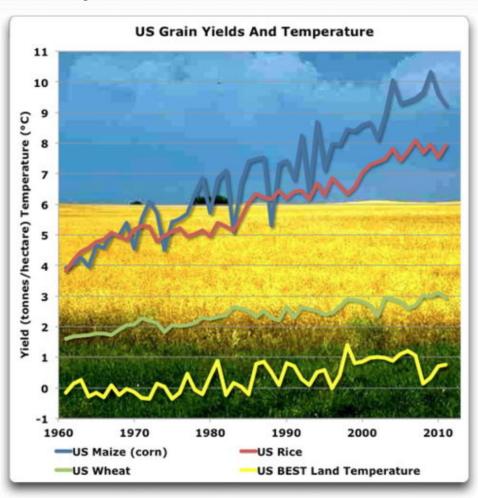
# 1970 Global Cooling: Crop Failures

 1974 NCAR: "There is mounting evidence that the bad [cold] climate" will lead to "less favorable crop years" and "widespread food shortages".





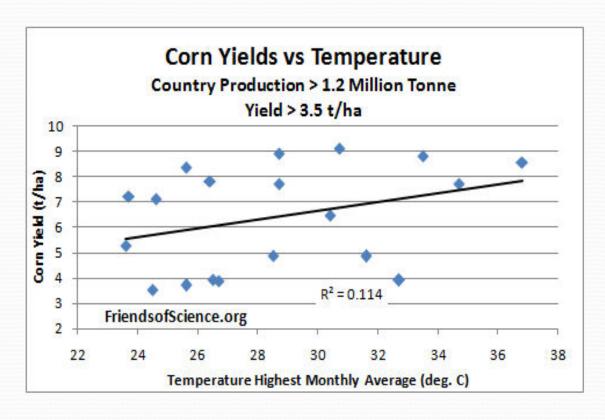
# Crop Yields Rise with Temperature and CO2



- •US Corn, wheat and rice yields have increased with temperatures.
- •Temperature increase of 1 deg. C caused no harm.
- •Corn yields up 130% since 1960.
- •Warming increases arable area.



# Corn Yields by Country vs Temperature

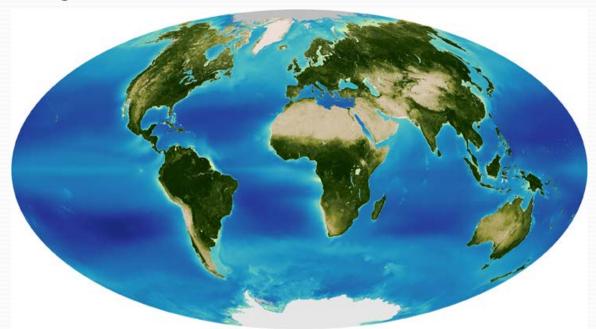


- •Corn yields of 19 major corn producing countries tend to increase with temperature.
- •Corn yields correlate poorly with temperature.
- •Technology and precipitation are more important.



# CO2 Makes Arid Regions Greener

- Satellite images show an 11% increase in foliage of arid regions from CO2 fertilization from 1982 to 2010 when CO2 increased by 14%. (May 31, 2013)
- After adjusting for temperature, etc.
- "Trees are re-invading grass lands" due to CO2 fertilization.
- Sea-viewing Wide Field-of-view-Sensor, or SeaWiFS

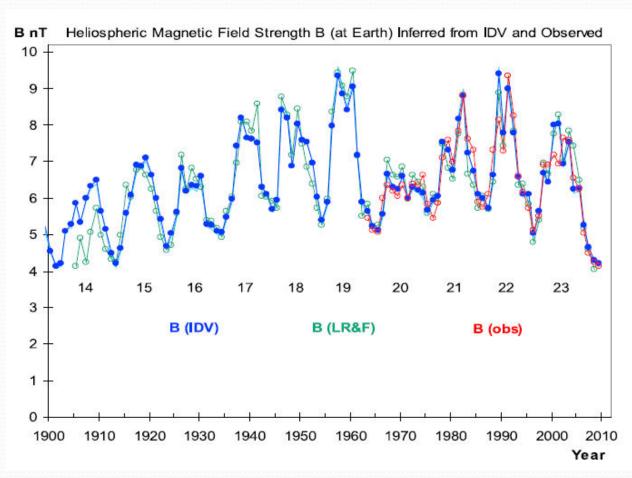


# CO2 Warming is Small and Beneficial

- Sea Level Rise: Small, not accelerating, hasn't caused any problems.
- Extreme Weather: Warming reduces costs.
- Food Shortages: CO2 fertilization and warming increases crop yields.
- There is no net social cost, but a benefit.
- Carbon dioxide is a wonderful by-product of fossil fuel use.



## Sun and Climate

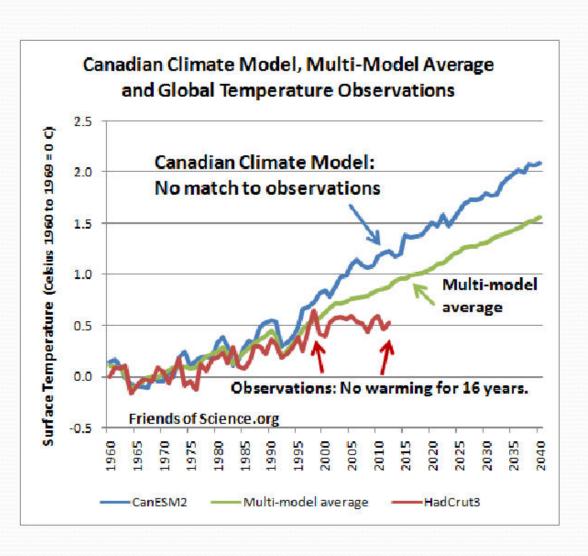


**IPCC:** "The forcing from changes in total solar irradiance alone does not seem to account for these observations, implying the existence of an amplifying mechanism"

The rest of the IPCC report ignores this revelation!



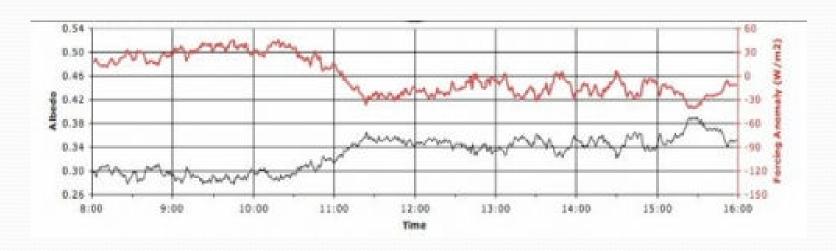
### The World's Worst Climate Model



- •Canadian climate model is one of the world's worst.
- •Managed by Andrew Weaver, IPCC lead author.
- •Pat Michaels: Hindcast errors are 2 times greater than random numbers.
- •Tim Ball is being sued by Andrew Weaver.



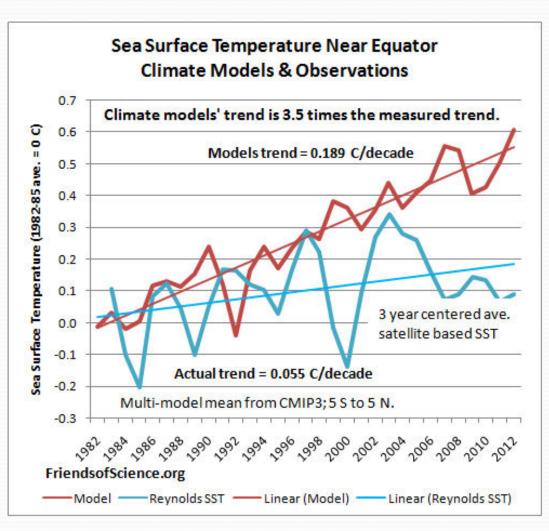
# Tropical Clouds Regulate the Climate



- •There are few clouds in the morning.
- •Insolation declines 60 W/m2 between 10:00 AM and noon due to clouds and thunderstorms.
- •If it is warmer, clouds form earlier, reflecting more solar energy.



# Climate Model Fail in the Tropics

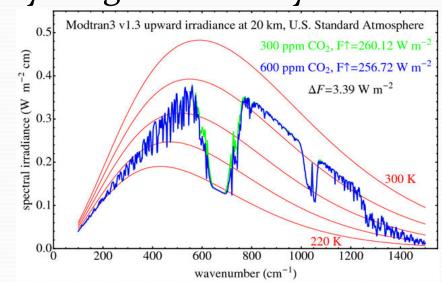


- •There is a 3.5 fold discrepancy between temperature trends near the equator.
- •Models fail to replicate clouds and thunderstorms behavior.



# Simple Physics of the Greenhouse Effect

- We are adding greenhouse gases to the atmosphere.
- More greenhouse gases must cause warming
- Doubling CO<sub>2</sub> causes 1 C temperature rise if nothing else changes.
- Complex physics get in the way.



# Will Adding Gravel Flood Your Cottage?



- •Pouring gravel into a lake analogous to adding CO<sub>2</sub> to the atmosphere.
- •Will the gravel raise the lake level?
- •Does adding CO<sub>2</sub> increase the total GHG in the atmosphere?

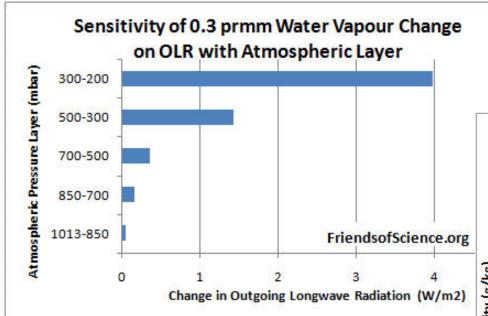
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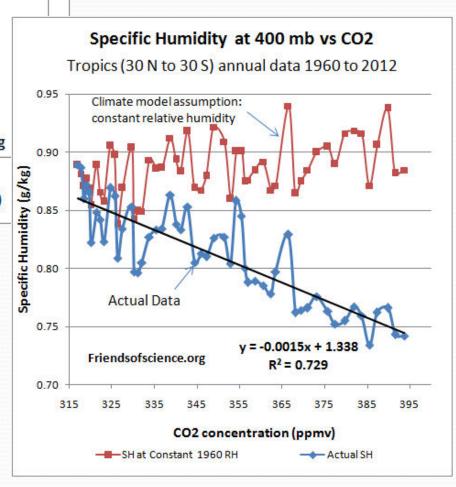
- •Pouring gravel into a lake analogous to adding CO<sub>2</sub> to the atmosphere.
- •Will the gravel raise the lake level?
- •Does adding CO<sub>2</sub> increase the total GHG in the atmosphere?
- •Lake: No! Controlled by the river spill point.
- •Atmosphere: Not much!



# Water Vapor Offsets CO2 Effect

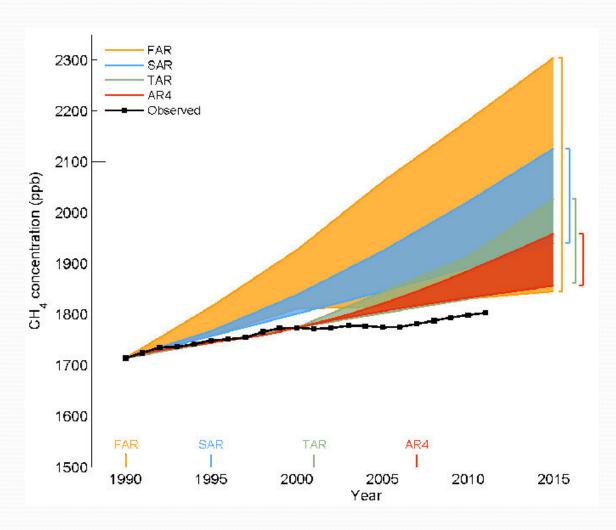


The greenhouse effect is mainly determined in the upper atmosphere, where water vapor declines.





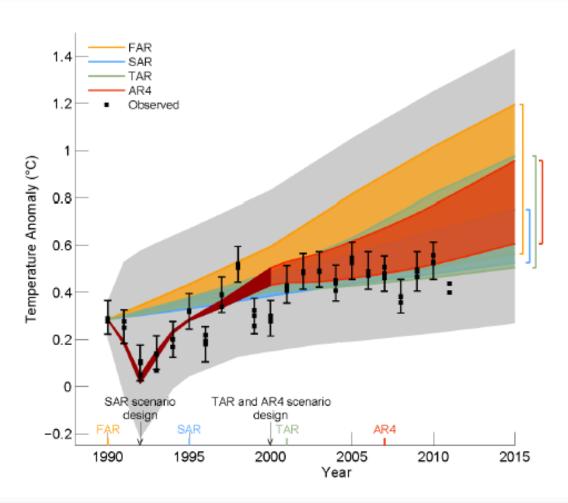
### **Bad Predictions - Methane**



- •CO2 is so weak, modelers have to add a huge methane increase to make scary forecasts.
- Actual trend is below the bottom of all ranges.



# Bad Predictions – Global Temperatures



- •IPCC temperature projections ranges are above the observations.
- •IPCC SOD 1-9:

"temperatures are well within the uncertainty range of all previous IPCC projections, and generally are in the middle of the scenario ranges."