

자유수호포럼 초청 강의

기후 위기와 탄소 중립의 문제점



1. 기후변화 진실과 거짓

2. 지구의 기후 역사

3. 이산화탄소의 과학적 이해

4. 잘못된 기후 위기설

5. 탄소 중립 전망과 미래 기후

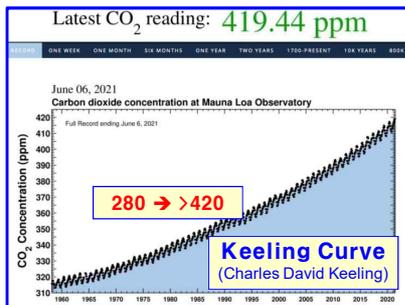
2021. 11. 18.



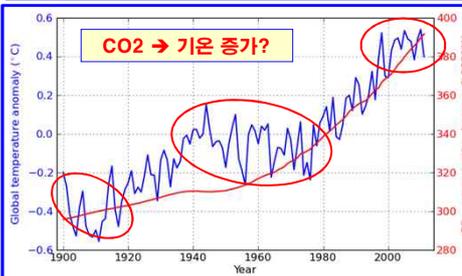
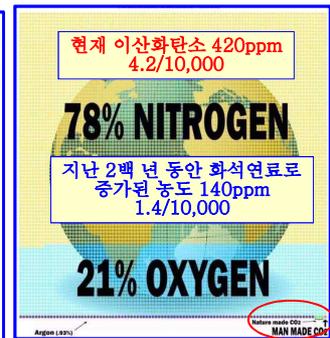
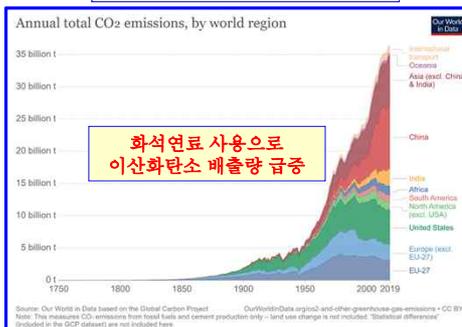
**이화여대 환경공학과 교수 박석순
(전)국립환경과학원 원장**

본 저작물은 저작권법 제25조 수업목적 저작물 이용 보상금제도에 의거 저작물의 재복제 및 수업 목적 외의 사용을 금지합니다.

1. 기후변화 진실과 거짓



무엇이 진실인가?

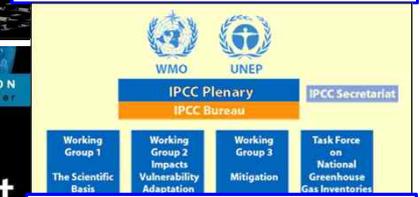


기후 소동의 시작

지구냉각화 소동(1970년대)



원인: 산업화



지구온난화 주장(1980년대)

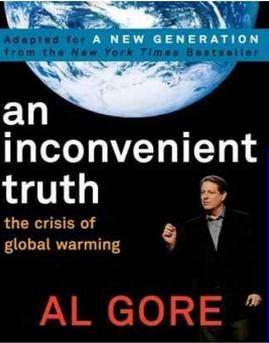


NASA scientist James E. Hansen testifying in June 1988.

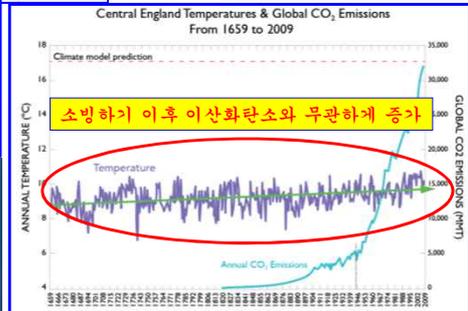
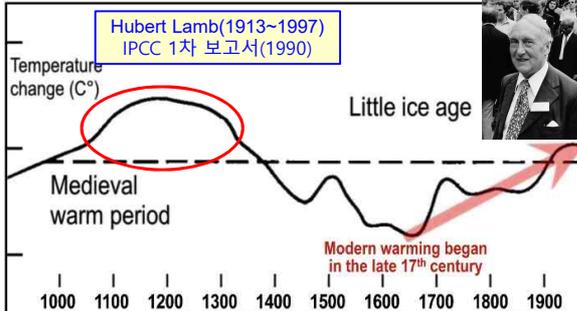
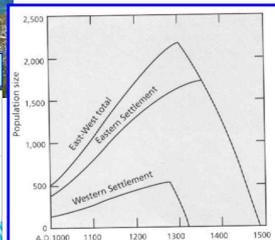
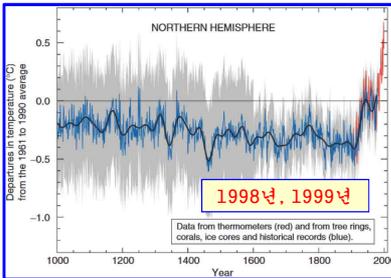


원인: 화석연료 사용으로 인한 이산화탄소 증가

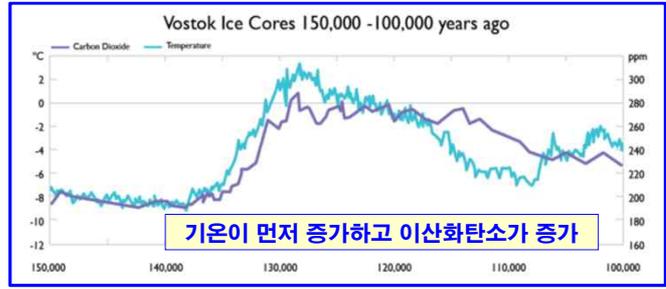
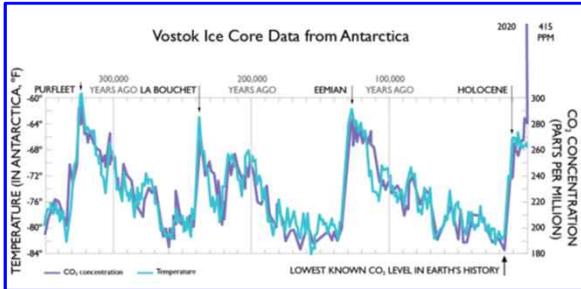
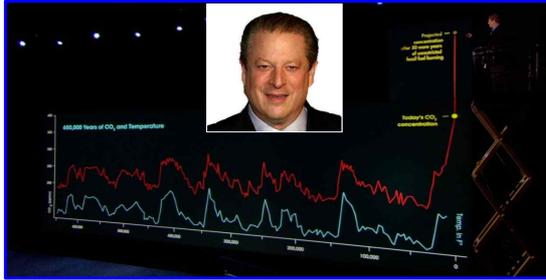
기온 측정 온도계 1659년부터(영국) 기상 기구 1950년대 중반 1979년부터 위성 측정



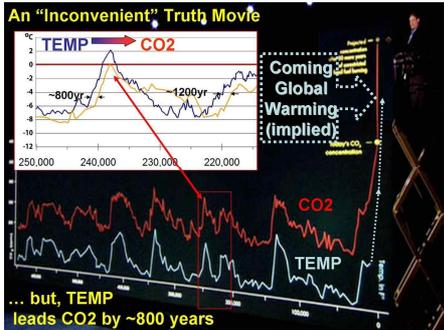
조작된 과학: 하키 스틱



엘 고어의 불편한 진실은 과학적 오류



800~1,200년 간격으로 기온 먼저 증가



밀란코비치 이론(1920년대)

Milutin Milankovitch
 Milutin Milankovitch (1879-1958)
 •Serbian astrophysicist is best known for developing one of the most significant theories relating Earth motions and long-term climate change

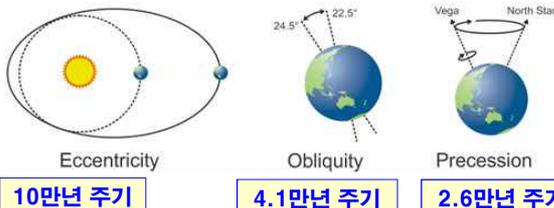
태양 공전 궤도, 지축의 각도, 지구 세차 운동 → 지구의 기온

Milankovitch's Big Chill

James Croll (1821-1890)
 was largely self-educated
 became an apprentice wheelwright, but gave that up due to ill-health.
 a tea merchant... manager of a temperance hotel... insurance agent
 He was appointed as a janitor in the museum at Glasgow, in 1859.

Andersonian(Strathclyde) 대학 수위

Milankovitch Cycles



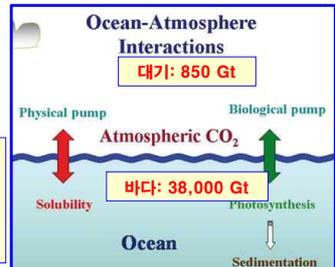
빙하기 70,000~125,000년, 간빙기 10,000~15,000년

10만년 주기 변화

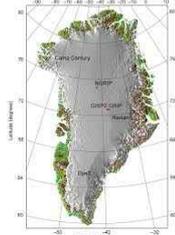
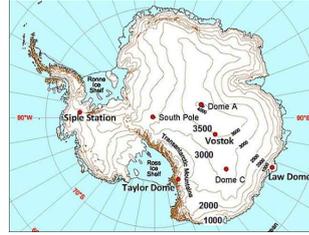
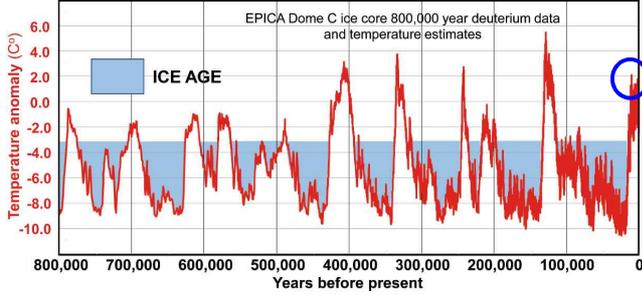
- 기온: 6~8°C
- CO₂: ~100ppm

원인

- 기온: 밀란코비치 이론
- 100ppm CO₂ 변화 어디서 왔나? ← 바다

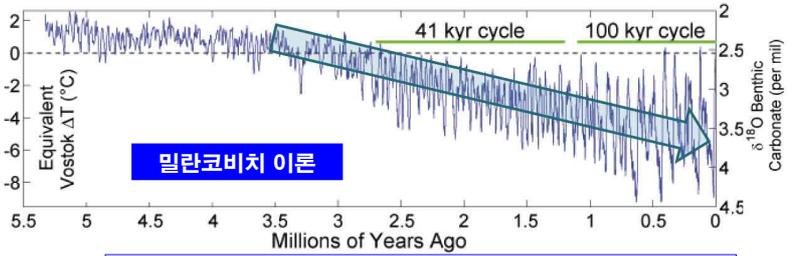
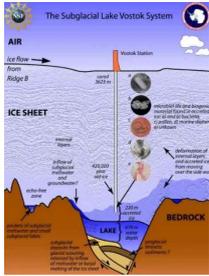


빙하기와 간빙기



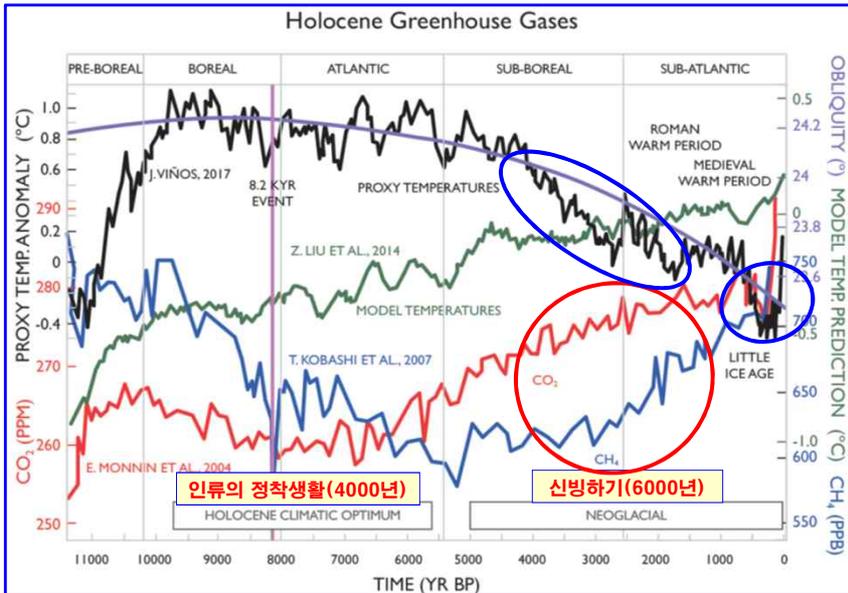
남극 빙핵(81만년 전까지)

그린란드(15만년 전까지)



빙하기와 간빙기가 반복(41,000년 → 100,000년 주기)

홀로세 간빙기(Interglacial Period, 11,600년, 인류문명)

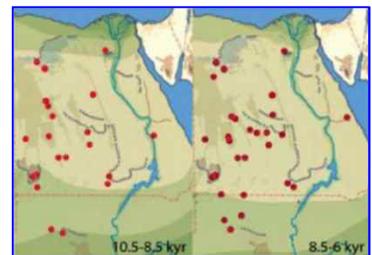


1. 이산화탄소 260 → 280ppm

2. 메탄가스도 증가

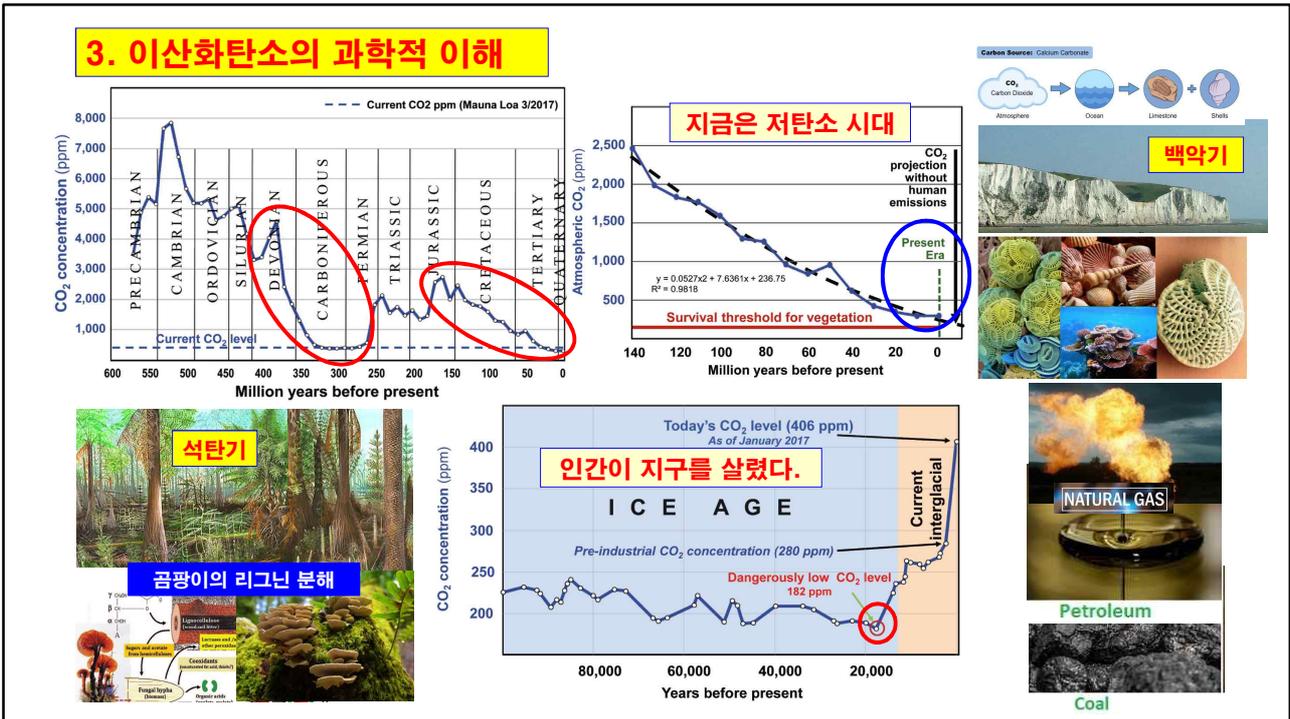
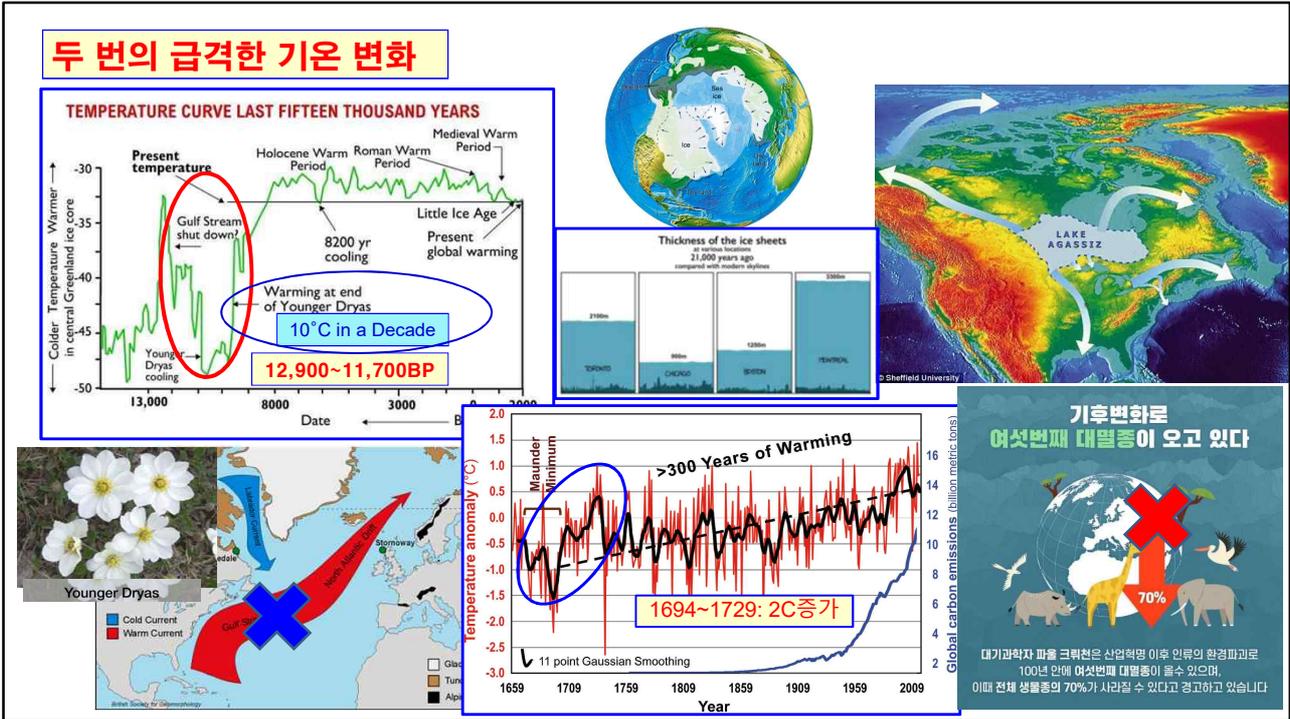
3. 하지만 기온은 약 2C 하락

홀로세 기후 최적기 (Holocene Climatic Optimum)

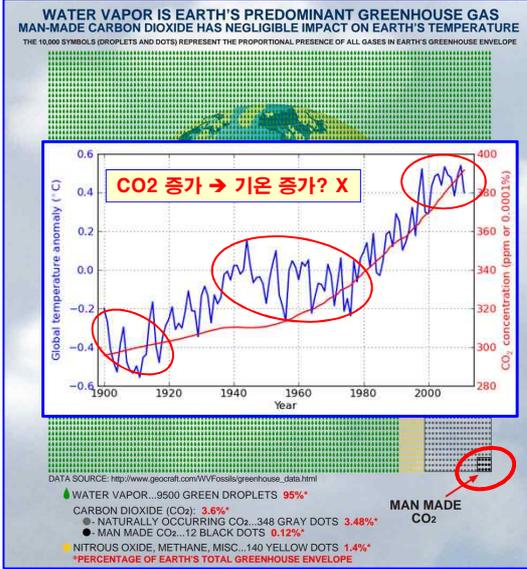


사하라 사막의 정착촌(목축) African Humid Period

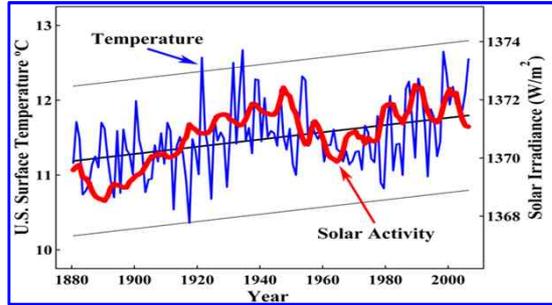
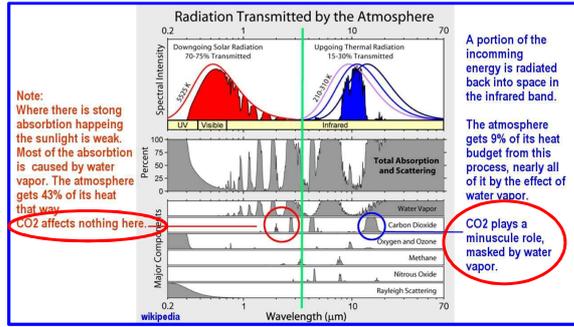
원인: 태양의 활동, 지축 기울기



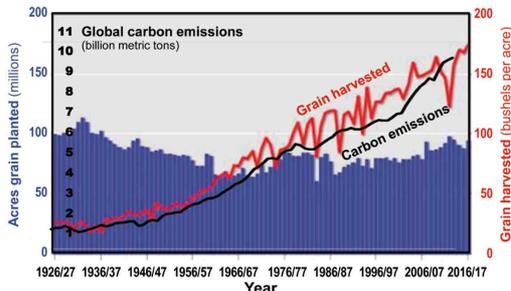
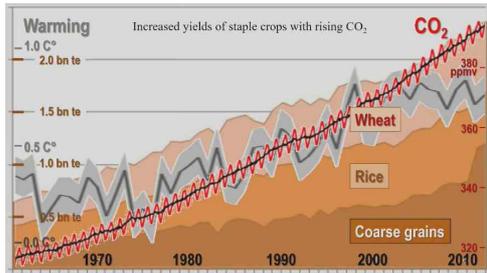
이산화탄소의 온실효과



지구 기온은 태양이 결정한다.



식량 생산에 주는 긍정적 효과



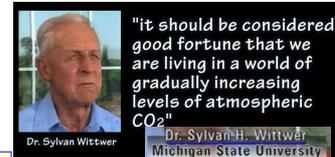
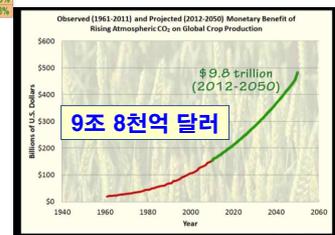
Increase in crop biomass in response to 300 ppm increase in CO₂

Carrots & turnips	+77.8%
Fresh fruit not elsewhere specified	+72.3%
Tropical fresh fruit not elsewhere specified	+72.3%
Grapes	+68.2%
Sugar beet	+65.7%
Dry beans	+61.7%
Oranges	+54.9%
Yams	+47.0%
Groundnuts with shells	+47.0%
Rapeseed	+46.9%
Soybeans	+45.5%
Bananas	+44.8%
Apples	+44.8%
Coconuts	+44.8%
Plantains	+44.8%
Cucumbers & gherkins	+44.8%
Pears	+44.8%
Millet	+44.3%
Watermelons	+41.5%
Pumpkins, squash & gourds	+41.3%
Fresh vegetables not elsewhere specified	+41.1%
Chillies & peppers	+41.0%
Eggplants	+41.0%
Cabbages & other brassicas	+39.3%
Rye	+38.9%
Sunflower seeds	+36.5%
Paddy rice	+36.1%
Mangoes, mangosteens & guavas	+36.0%
Tomatoes	+35.3%
Barley	+35.4%
Olives	+35.2%
Wheat	+34.9%
Oats	+31.1%
Sugar cane	+34.0%
Sorghum	+33.7%
Potatoes	+31.3%
Tangerines, mandarins	+25.5%
Dry peas	+20.2%
Maize	+24.1%
Dry onions	+20.0%
Sorghum	+19.9%
Lettuce & chictory	+18.5%
Cassava	+13.8%
Pineapples	+5.0%
Other melons	+4.7%

세계 식량 95% (45개 작물) 수확량 3조 달러 증가

Cash benefit from CO₂ fertilization of crops, 1961 - 2010

\$1509 bn
\$100-149 bn
\$45-99 bn
\$30-45 bn
\$15-30 bn
\$0-15 bn

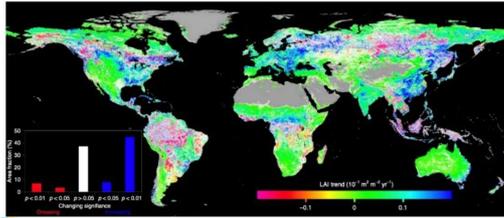


"It should be considered good fortune that we are living in a world of gradually increasing levels of atmospheric CO₂"

"the rising level of atmospheric CO₂ is a universally free premium, gaining in magnitude with time, on which we can all recon for the future"

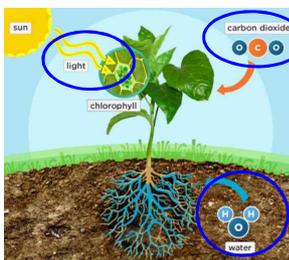
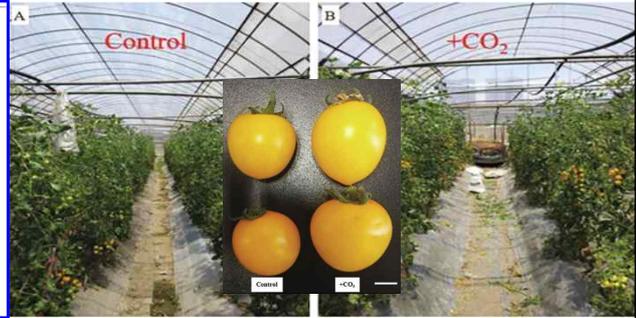
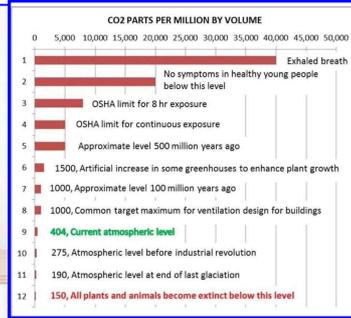
이산화탄소 증가로 지구는 더욱 푸르게

Roughly 40 percent of the planet has seen "greening" between 1981 and 2016



이산화탄소는 지구 생태계에 보약이지 독약이 아니다

이산화탄소의 시비 효과(CO₂ Fertilization)

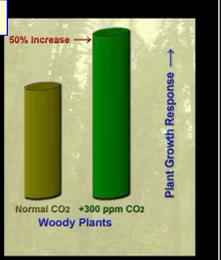


Elevated CO₂

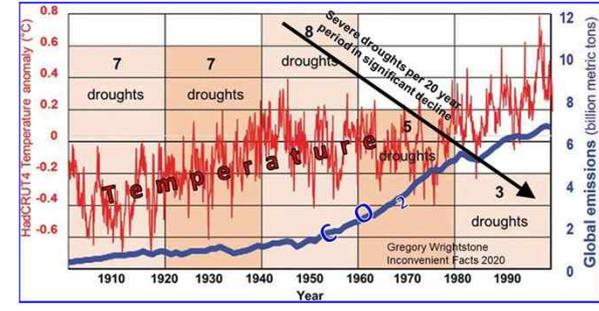
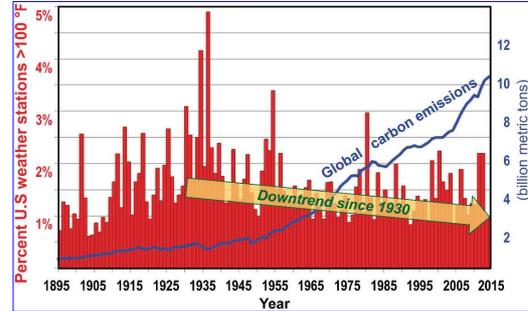
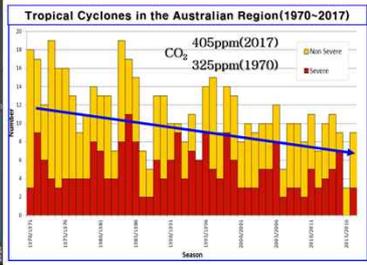
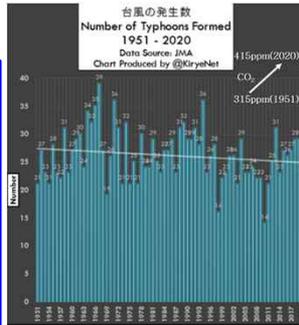
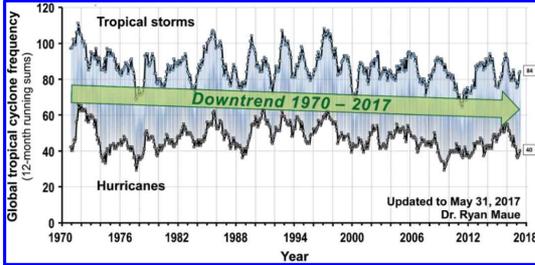
- Increases the number of branches & tillers
- Produces more and thicker leaves
- Enhances roots
- Yields more flowers & fruit

목본 식물 (Woody plant growth response)

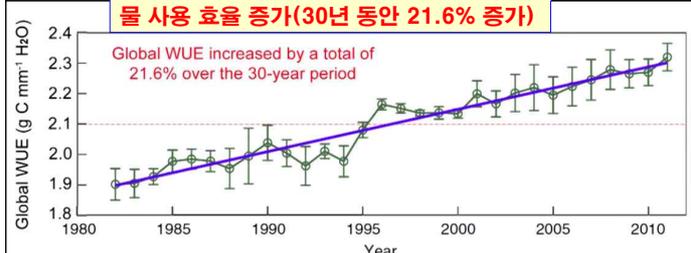
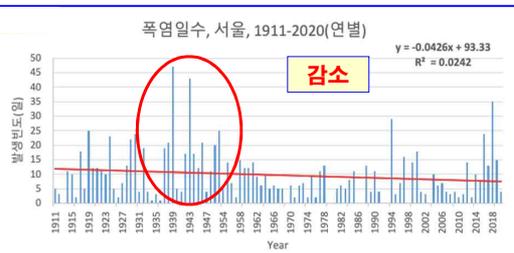
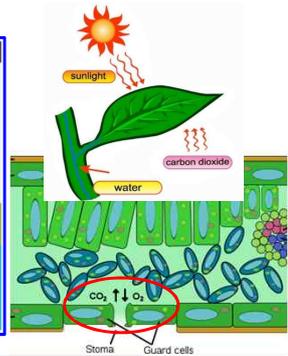
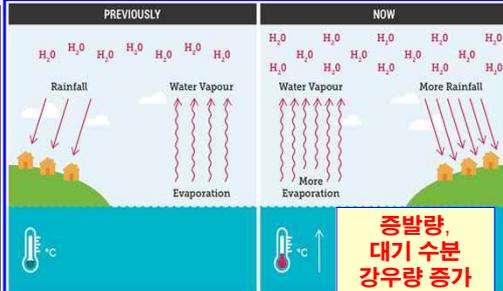
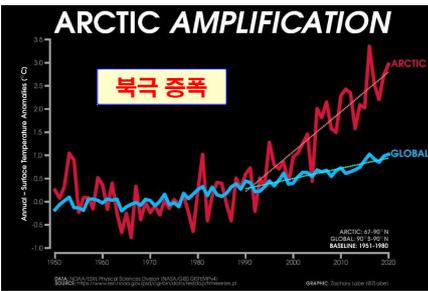
Woody plant growth response to CO₂ enrichment is about 1.5 times that observed in herbaceous plant species



4. 잘못된 기후 위기설



과학적 이유(태풍, 폭염, 가뭄 등)



해수면 상승

6m 상승

How dishonest can you be?

Cover Time Magazine: UN Secretary General in water off Tuvalu

Science: Tuvalu land area **increased 2.9% past 40 years**

Comparison Bar Chart Of Gross domestic product (real GDP) growth rate (annualized) (World Average vs World Median vs Tuvalu) (graphsstockart.com)

1991 to 2019

World Average World Median Tuvalu

Holocene Rates of Sea Level Rise

1.16 mm/yr, 2.6 mm/yr, 2.0 mm/yr, 1.7 mm/yr

Mean Sea Level at Stockholm, Sweden (NOAA [50-141], PSMSL Z8)

스웨덴 스톡홀름

Linear sea-level trend... unaffected by accelerating CO₂ level increase

1880-141 Stockholm, Sweden -3.77 ± 0.29 mm/yr
1900-2020 Stockholm, Sweden -0.01305 ± 0.01735 mm/yr

Population of Tuvalu (1960-2021)

인구 1960년 이후 2배 증가

2021 Tuvalu: 12,000

2002년 뉴질랜드가 이민 수용 순차적 이주

Holocene Sea Level and CO₂ Concentration

0.19 Meter Sea Level Rise 1901-2010

이산화탄소와 무관

Mean Sea Level at Sydney, Fort Denison 1 & 2, Australia -4.79 ± 0.16 mm/yr

호주 시드니, 포트 데니슨

해양 산성화

$CO_2 + H_2O \rightarrow H_2CO_3$

Carbon dioxide dissolves in the ocean to make carbonic acid. The amount of acid has increased over the past 150 years.

These changes in ocean chemistry can disrupt the entire marine food web.

pre-1850 average pH 8.2

current average pH 8.1

future

extra acid blocks growth of corals and shellfish

some species in the food web benefit while others decline

Mauna Loa atmospheric CO₂ (ppm)

Aloha seawater pCO₂ (µatm)

Aloha seawater pH (µatm)

Station Mauna Loa

Station Aloha

Antarctic Ocean Circulation

South Atlantic Ocean, Indian Ocean, Pacific Ocean, Southern Ocean, Weddell Gyre, Ross Sea Gyre, Antarctic Circumpolar Current, Polar Current, Subantarctic Front, Humboldt (Peru) Current

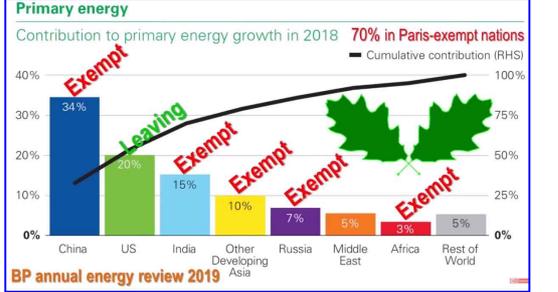
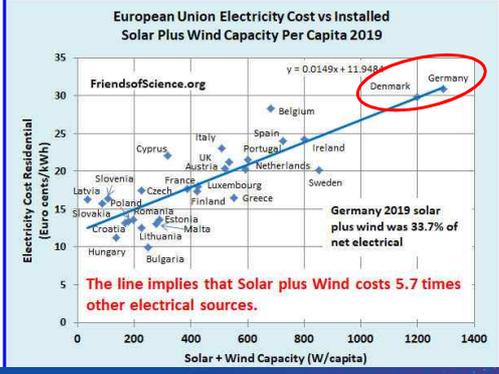
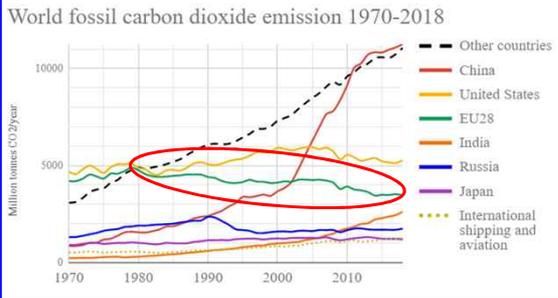
Ocean pH

Less Acidic

8.20, 8.15, 8.10, 8.05, 8.00, 7.95

More acidic

5. 탄소중립 전망과 미래 기후

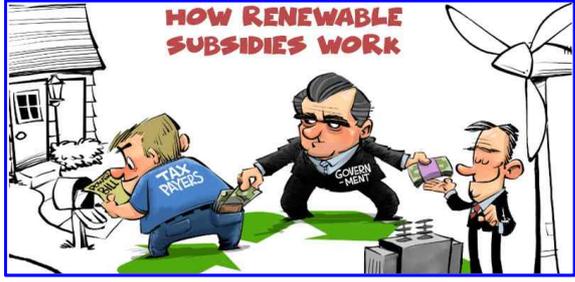
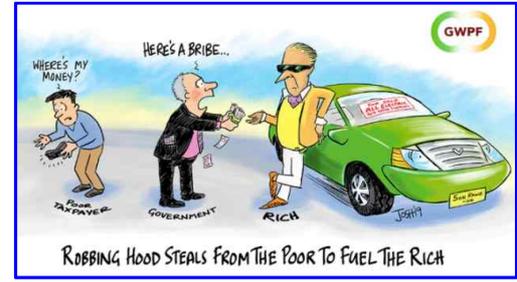


억울한 유럽의 탄소중립

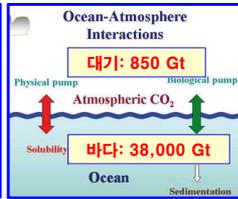
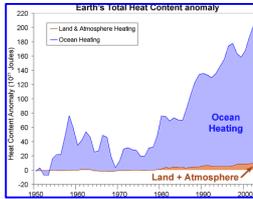
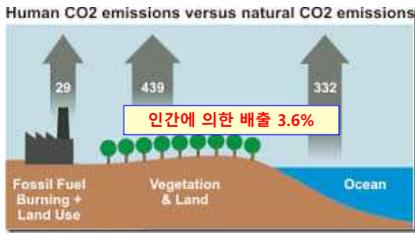
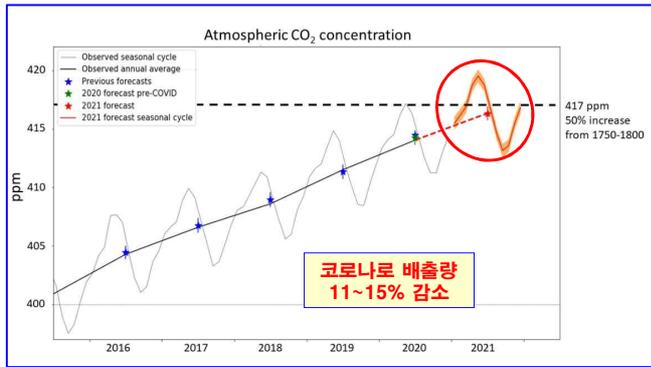
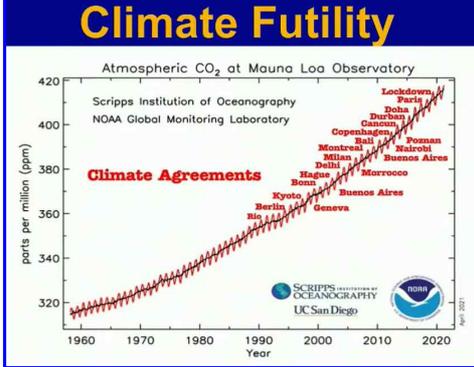
Carbon must have its price – because nature cannot pay the price anymore. We are working on a Carbon Border Adjustment Mechanism.

Ursula von der Leyen
President of the European Commission

탄소중립은 가난한 자를 더욱 가난하게

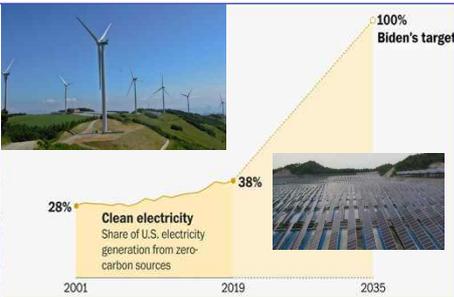


대기 이산화탄소 상승 억제는 인간 노력으로 불가능



인간에 의한 배출량보다 바다에 더욱 민감하게 변화

미국의 파리기후협약 재가입



On behalf of environmentalists everywhere, I would like to formally apologize for the climate scare we created over the last 30 years.

Climate change is happening. It's just not the end of the world. It's not even our most serious environmental problem.

MICHAEL SHELLENBERGER
Former Climate Alarmist
Author of "Apocalypse Never"



탄소중립의 경제성과 효과 분석

THE WALL STREET JOURNAL.

THURSDAY, OCTOBER 14, 2021 - VOL. CCLXXXVIII NO. 89

Biden's Climate Ambitions Are Too Costly for Voters

By Bjorn Lomborg

Nature: US climate policy costs

Net-zero in 2050 costs more than \$11,000 per person per year

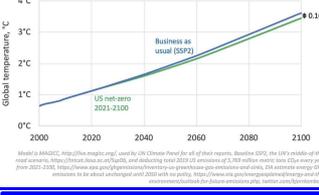


Whatever the UK(Glasgow COP26) decides to do will have no impact on your climate, but will have a profound impact on your economy.

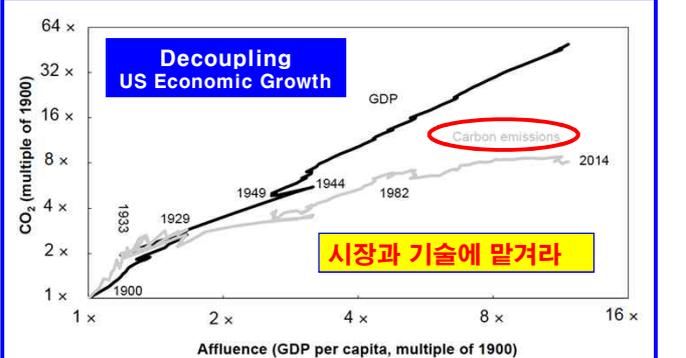
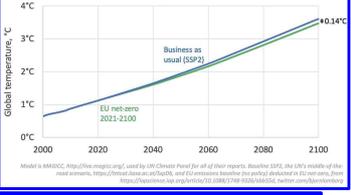
고비용 무효과

Dr. Richard Linzen, CO2 Coalition Board of Directors
 Professor Emeritus of Atmospheric Science at MIT
 Alfred P. Sloan Professor of Meteorology at MIT(1983-2013)
 Previous Professorships at Harvard and the University of Chicago

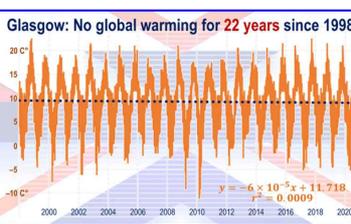
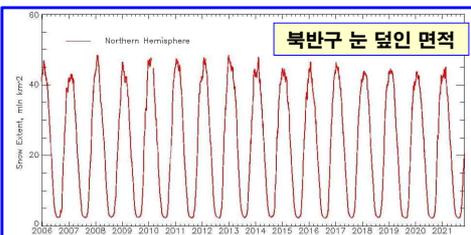
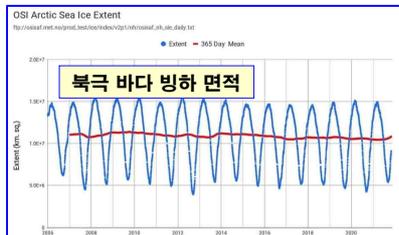
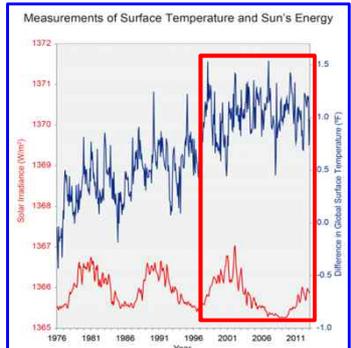
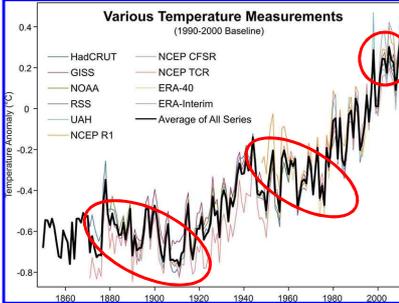
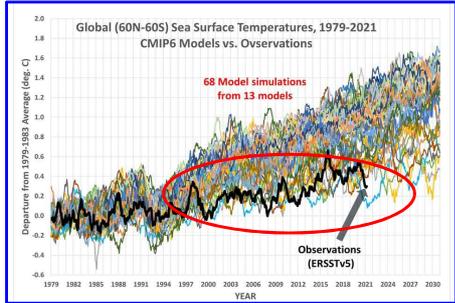
If US goes net-zero today and stays net-zero for the rest of the century



If EU goes net-zero today and stays net-zero for the rest of the century

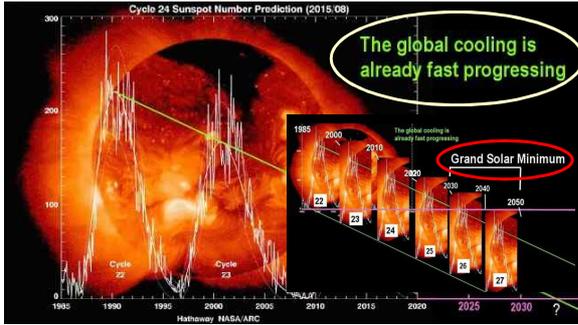


IPCC에 속지 마라.

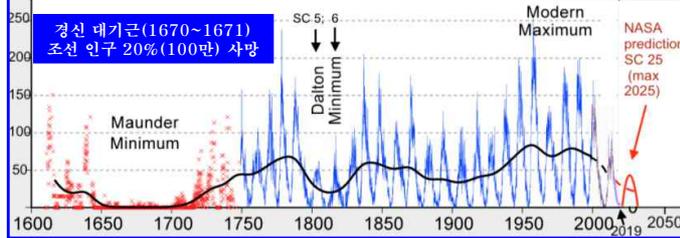


이산화탄소 농도 2006년부터 2021년까지: 380→420ppm(10% 변화)

소빙하기가 오고 있다



NASA prediction Solar Cycle 25



There Is No Impending 'Mini Ice Age'

By NASA Global Climate Change

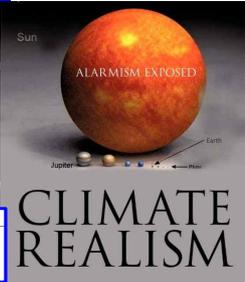
What Does A Super Grand Solar Minimum Look Like?

- Bitter Cold
- Extremely Hot
- Loss of life
- Social upheaval

FEW (Food, Energy, Water) 탄소 중립만 빼고

Climate "Realism" Is the New Climate Denial

Climate change deniers like Naomi Seltz claim to be fighting Greta Thunberg's "alarmism," but their real target is climate action itself.



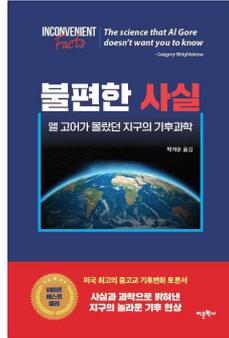
기후 과학자와 보수 정치인의 강력한 저항



인간이 지구 기온에 미치는 영향은 극히 미미하다

지구온난화와 이산화탄소 증가는 인간과 지구 생물에겐 축복이다

-참고 자료-



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