

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.

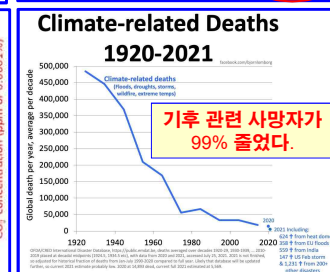
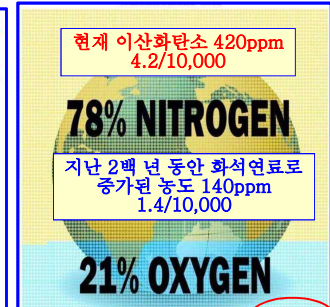
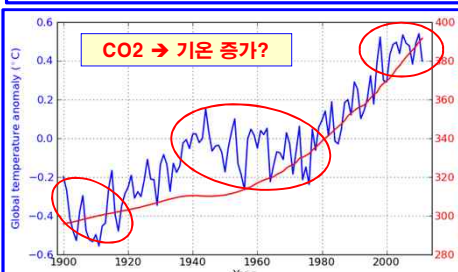
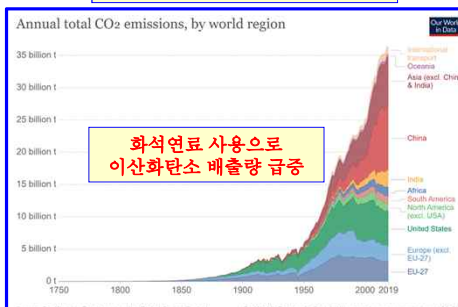
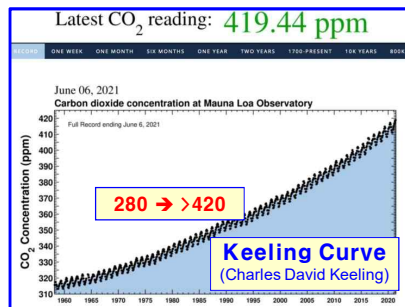


이화여대 환경공학과 교수 박석순
(전)국립환경과학원 원장

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

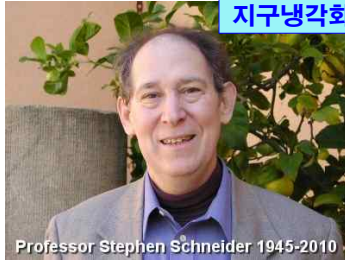
1. 기후변화 진실과 거짓

무엇이 진실인가?

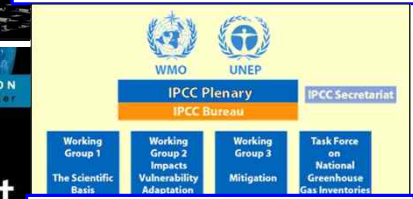


기후 소동의 시작

지구냉각화 소동(1970년대)



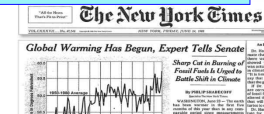
원인: 산업화



지구온난화 주장(1980년대)

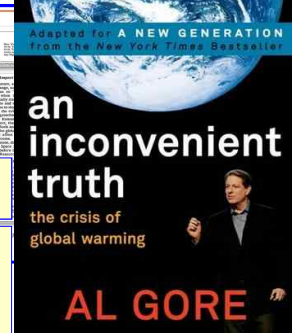


NASA scientist
James E. Hansen
testifying in June 1988.

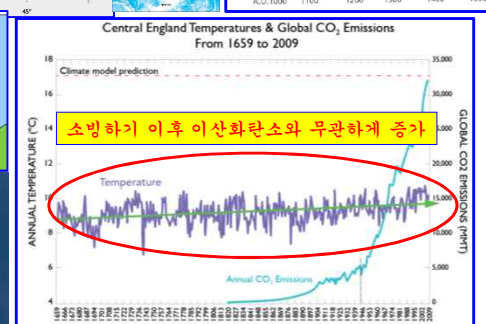
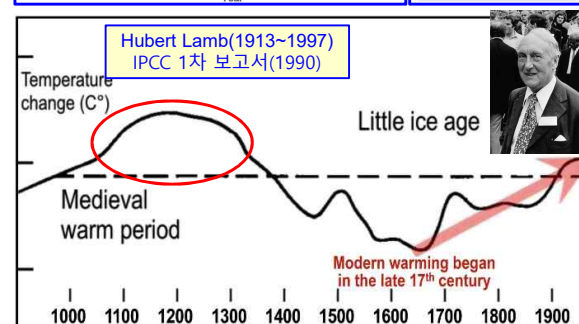
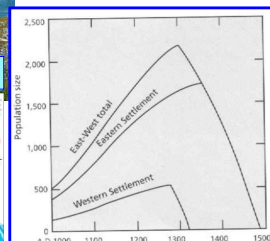
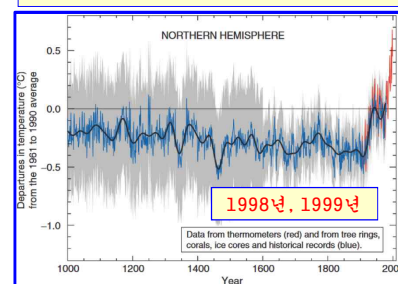


원인: 화석연료 사용으로
인한 이산화탄소 증가

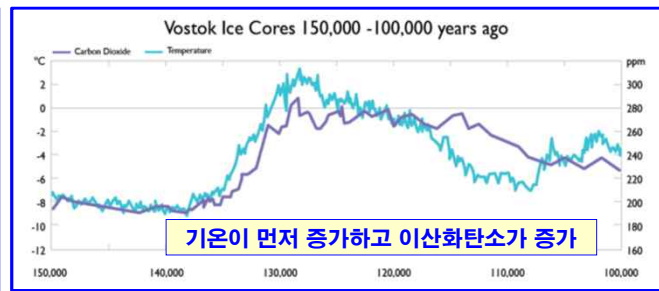
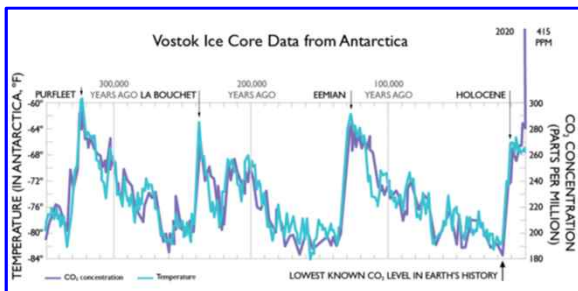
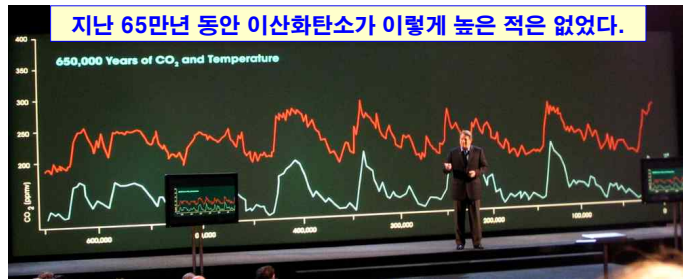
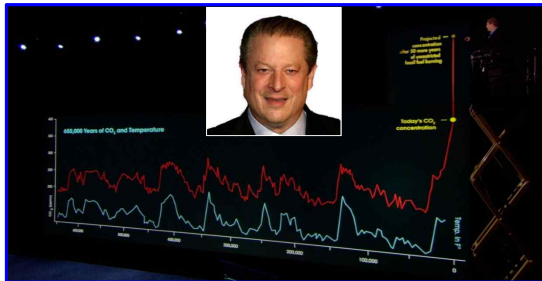
기온 측정
온도계 1659년부터(영국)
기상 기구 1950년대 중반
1979년부터 위성 측정



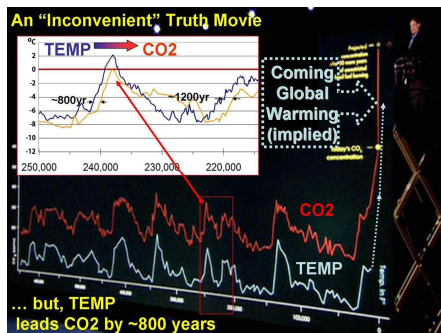
조작된 과학: 하키 스틱



앨 고어의 불편한 진실은 과학적 오류



800~1,200년 간격으로 기온 먼저 증가



밀란코비치 이론(1920년대)



• 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

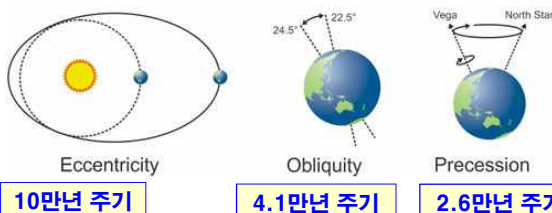
James Croll (1821-1890)

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



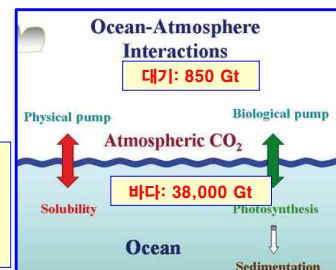
빙하기 70,000~125,000년, 간빙기 10,000~15,000년

10만년 주기 변화

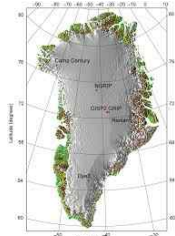
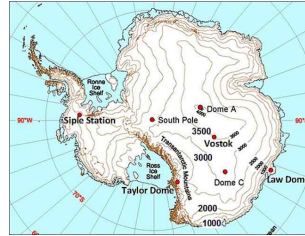
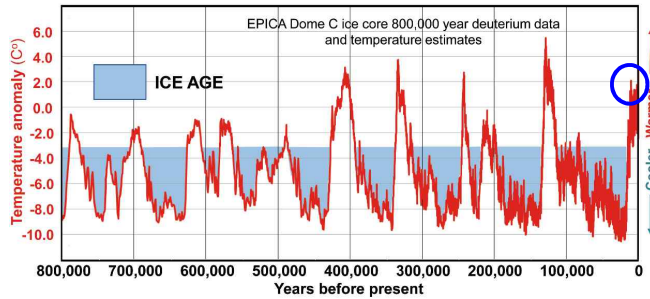
- 기온: 6~8°C
- CO₂: ~100ppm

원인

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

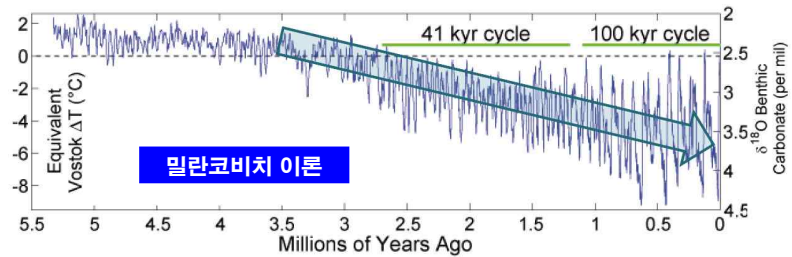
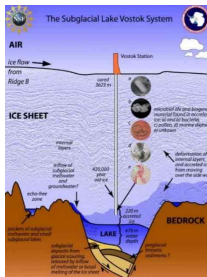


빙하기와 간빙기



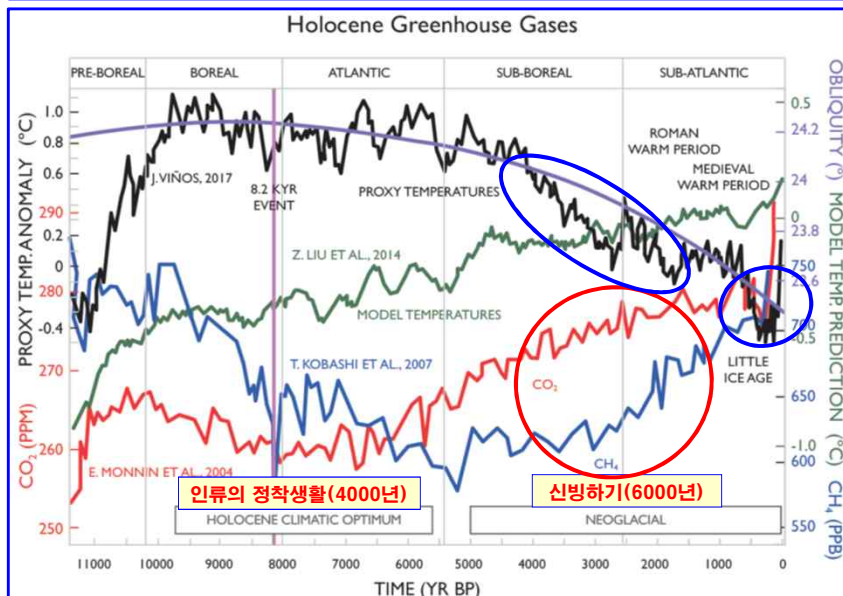
남극 빙핵(81만년 전까지)

그린란드(15만년 전까지)



빙하기와 간빙기가 반복(41,000년 → 100,000년 주기)

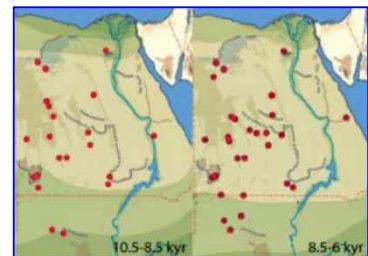
홀로세 간빙기(Interglacial Period, 11,600년, 인류문명)



1. 이산화탄소 260 → 280ppm

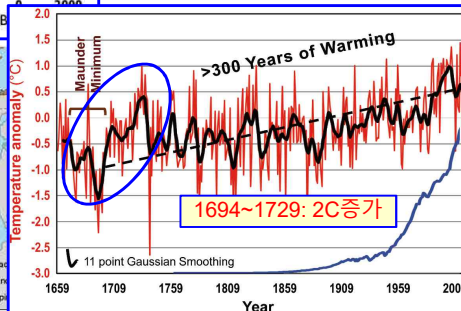
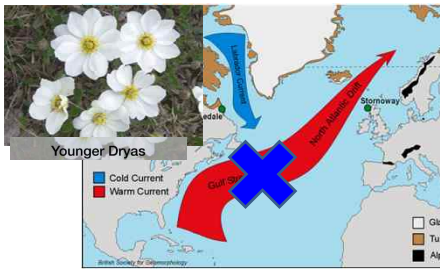
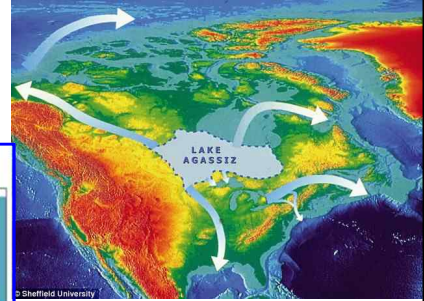
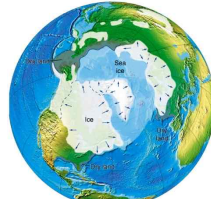
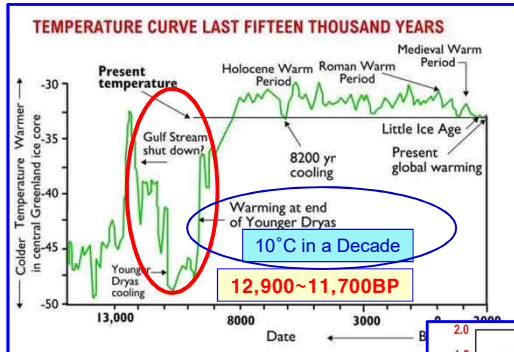
2. 메탄가스도 증가

3. 하지만 기온은 약 2°C 하락

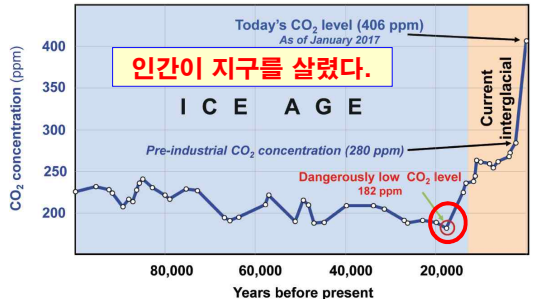
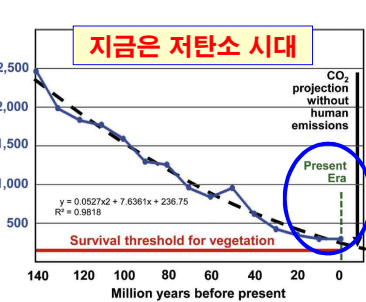
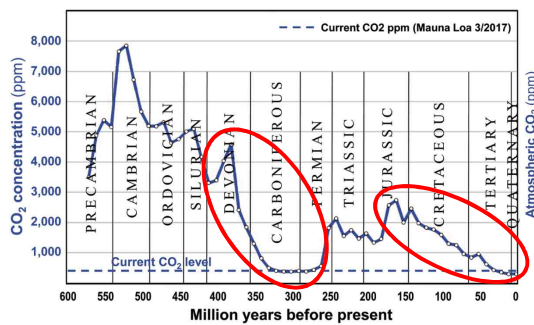
홀로세 기후 최적기
(Holocene Climatic Optimum)사하라 사막의 정착촌(목축)
African Humid Period

원인: 태양의 활동, 지축 기울기

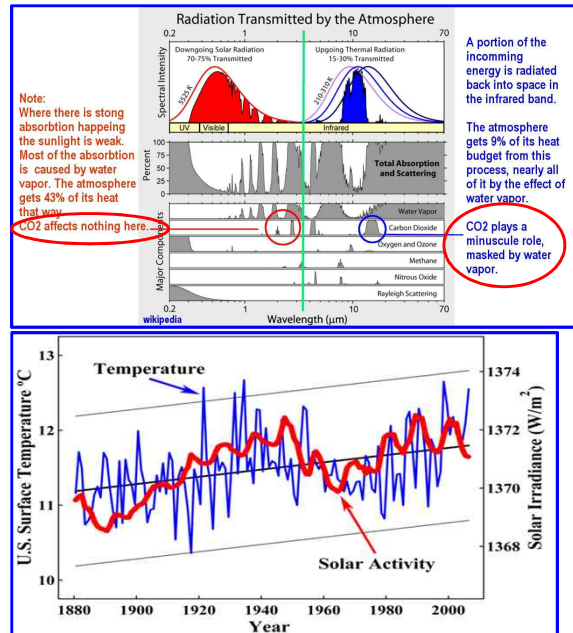
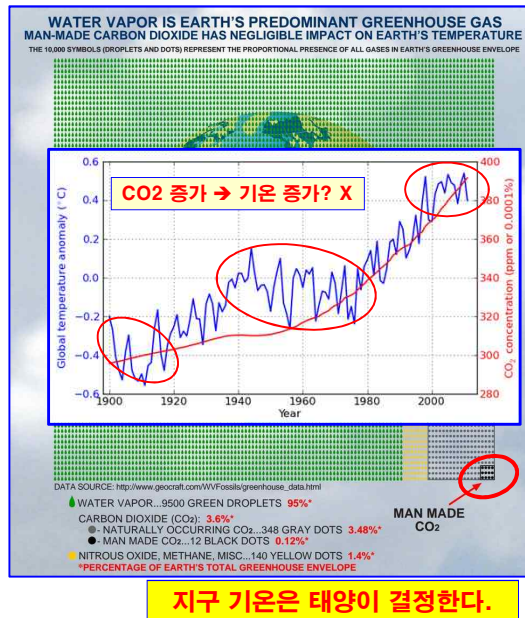
두 번의 급격한 기온 변화



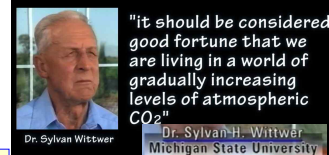
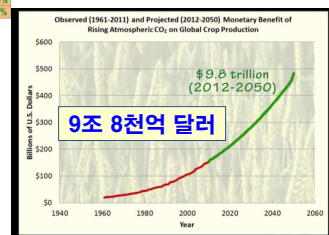
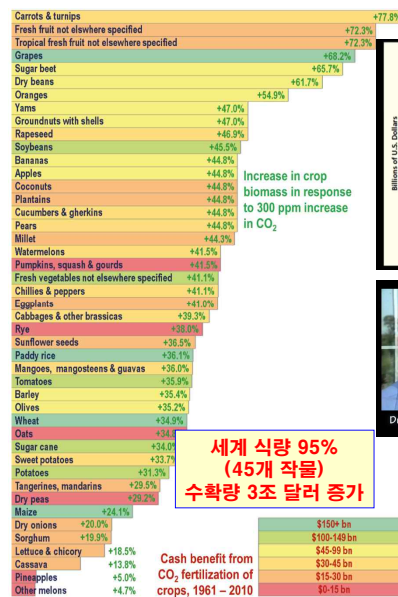
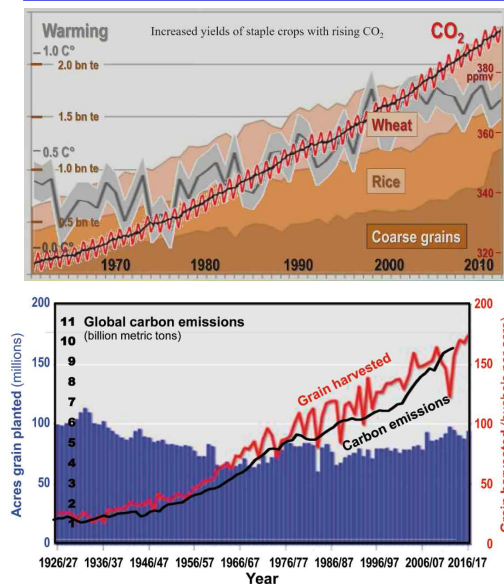
3. 이산화탄소의 과학적 이해



이산화탄소의 온실효과



식량 생산에 주는 긍정적 효과

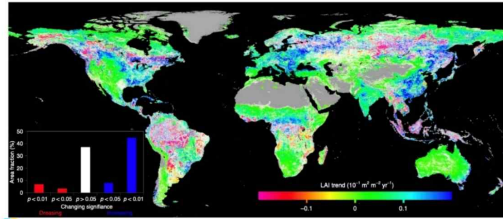


"It should be considered good fortune that we are living in a world of gradually increasing levels of atmospheric CO₂"

"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"

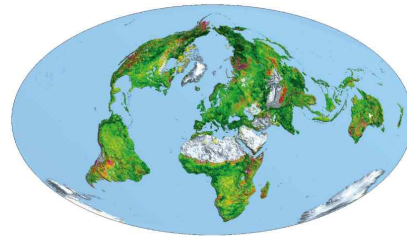
이산화탄소 증가로 지구는 더욱 푸르게

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



ENVIRONMENTAL
PROGRESS

Source: Jing M. Chen, Wenbin Ju, Philippe Ciais et al., "Vegetation Structural Change Since 1981 Significantly Enhanced the Terrestrial Carbon Sink," Nature Communications 10, no. 4259 (October 2019): 1-7. <https://www.nature.com/articles/s41467-019-12257-8.pdf>

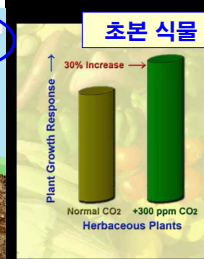
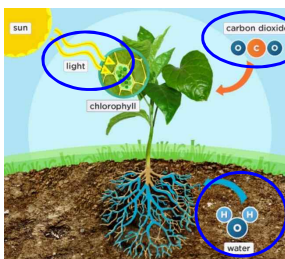
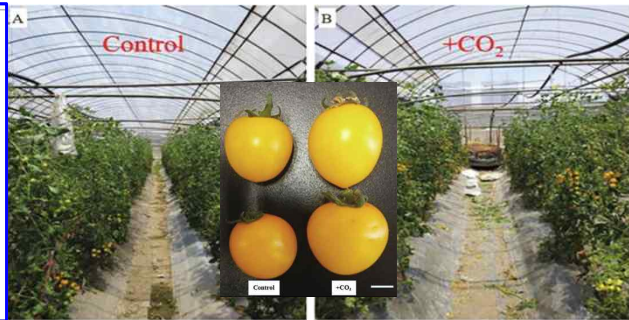
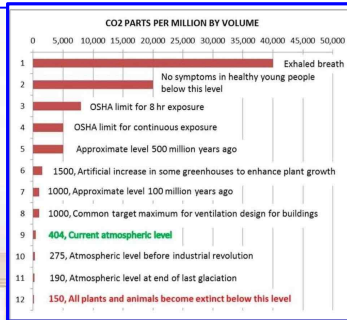


Change in leaf area, 1982 - 2015
-30% -15% -5% +5% +15% +25% +35% +50%



이산화탄소는 지구 생태계에 보약이지 독약이 아니다

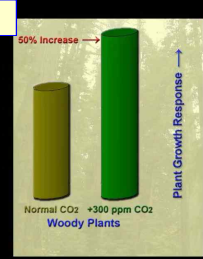
이산화탄소의 시비 효과(CO₂ Fertilization)



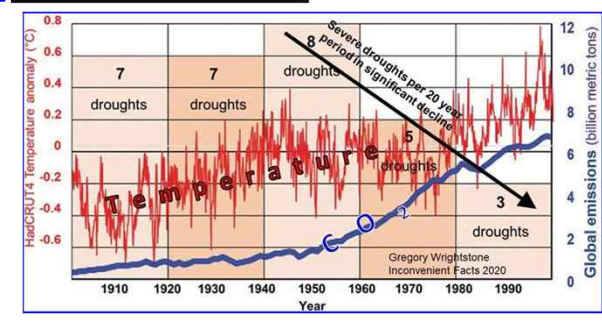
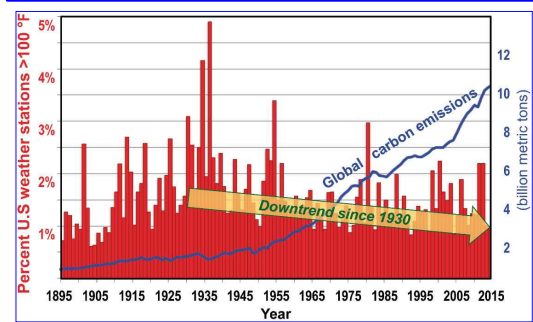
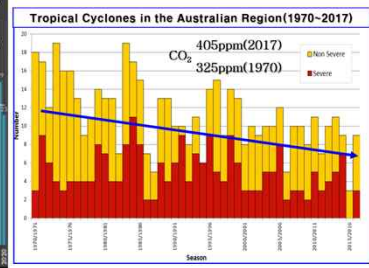
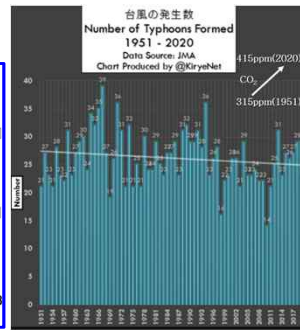
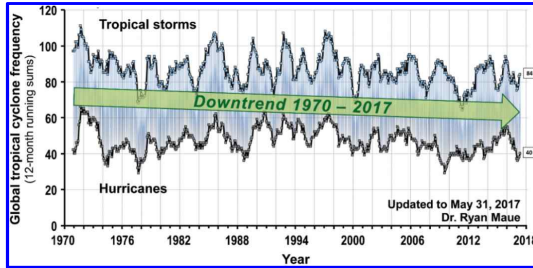
Elevated CO₂

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

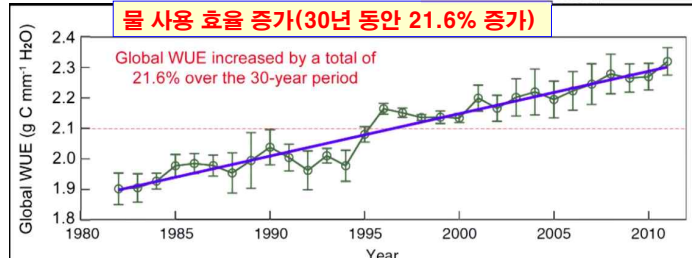
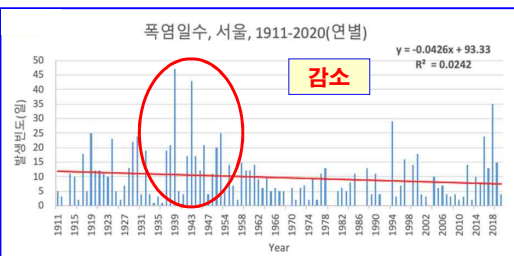
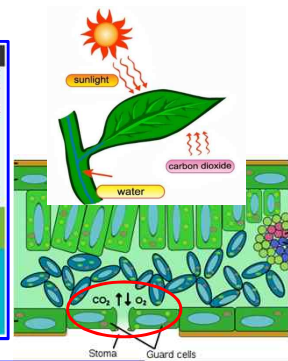
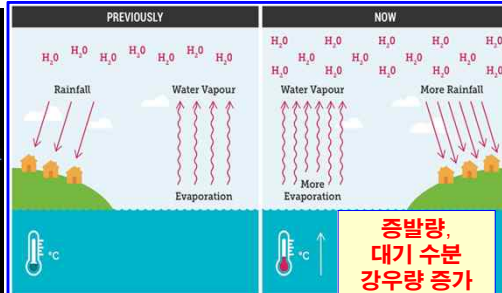
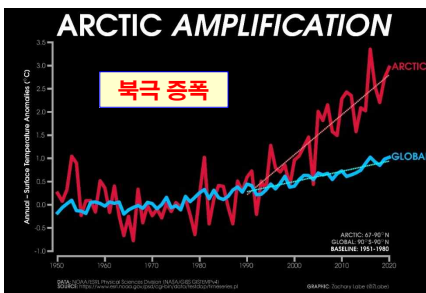
목본 식물 (Woody plant growth response to CO₂ enrichment is about 1.5 times that observed in herbaceous plant species)



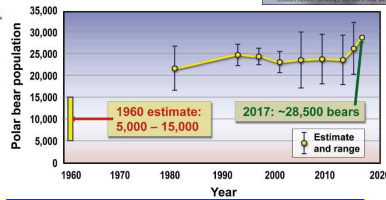
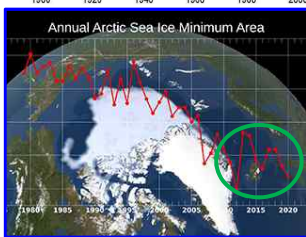
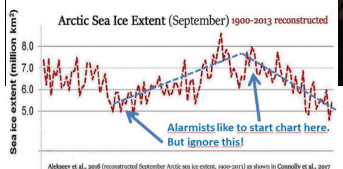
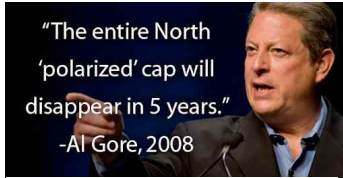
4. 잘못된 기후 위기설



과학적 이유(태풍, 폭염, 가뭄 등)



북극 해빙과 북극곰



Agreement on the Conservation of Polar Bears
Oslo, 15 November 1973
The Governments of Canada and the United States of America
1973년 미국, 캐나다, 러시아, 노르웨이, 덴마크가 북극곰 보전 국제 협약에 서명

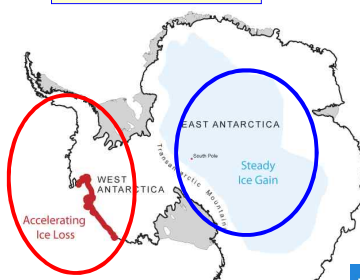


Polar bear numbers in Canadian Arctic pose threat to Inuit, controversial report says

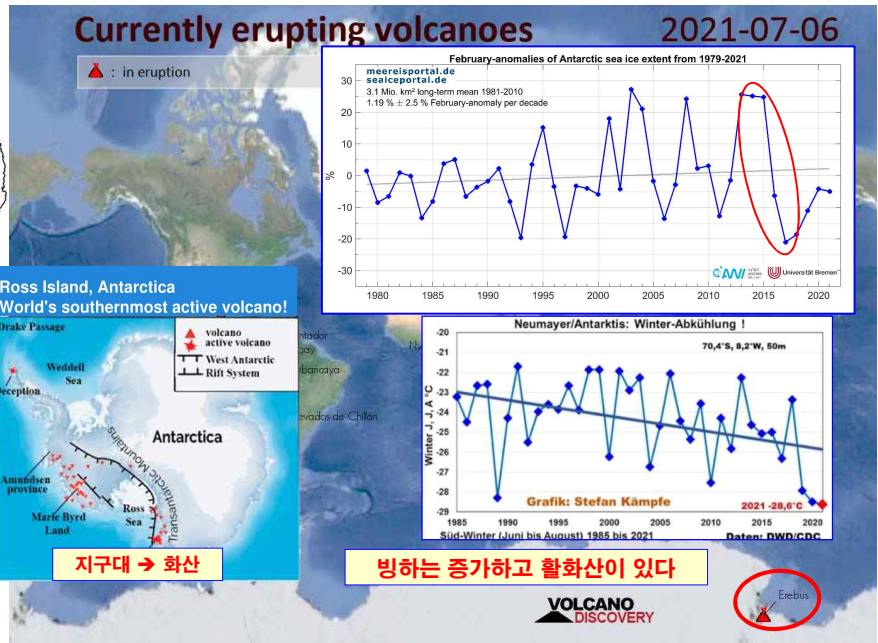
Report bitterly contested by scientists who say threat comes from climate change, which has pushed bears closer to humans - not because the population is growing



남극 빙하



91 volcanoes were discovered under Antarctica in 2017.
How many are active?
Sites of some of the 91 volcanoes discovered



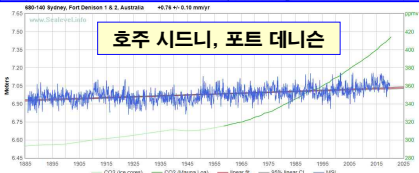
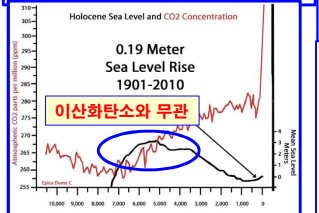
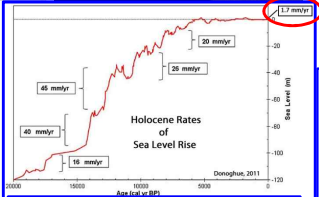
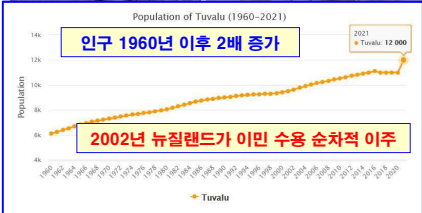
해수면 상승



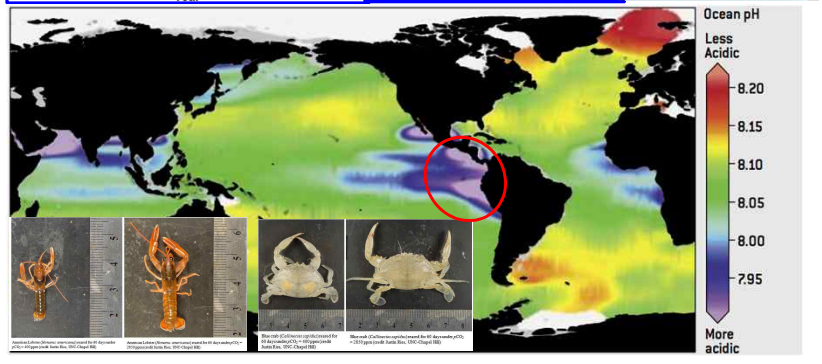
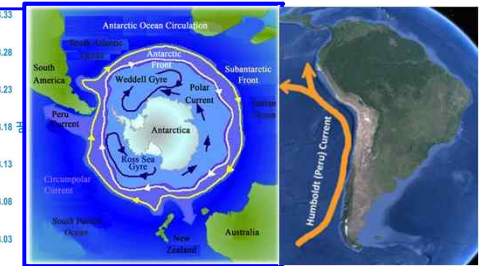
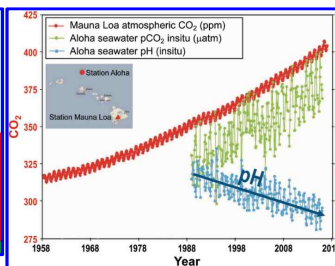
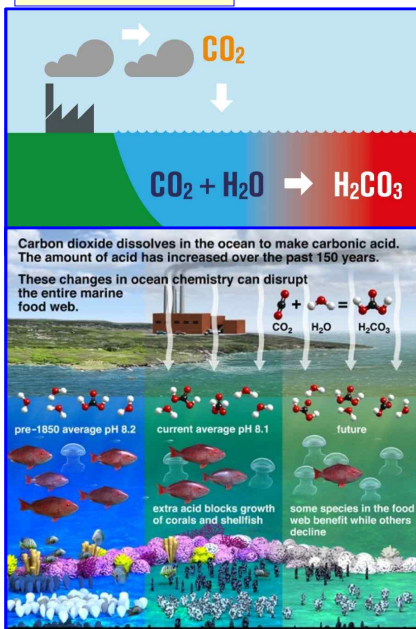
How dishonest can you be?

Cover Time Magazine:
UN Secretary General
in water off Tuvalu

Science:
Tuvalu land area
increased 2.9% past 40 years

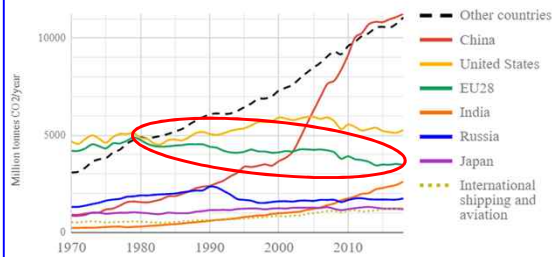


해양 산성화



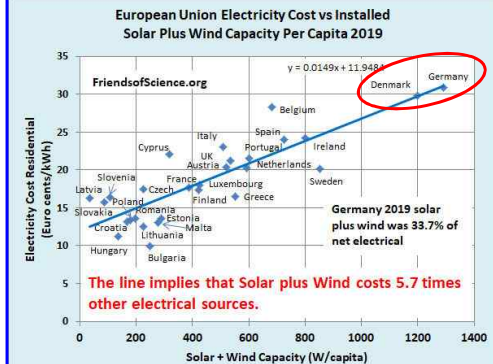
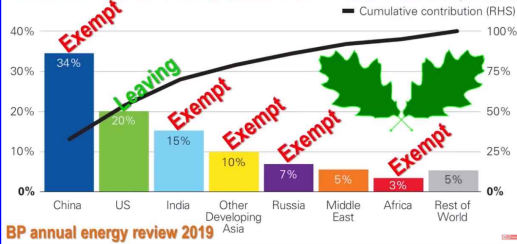
5. 탄소중립 전망과 미래 기후

World fossil carbon dioxide emission 1970-2018



Primary energy

Contribution to primary energy growth in 2018 70% in Paris-exempt nations



억울한 유럽의 탄소중립

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

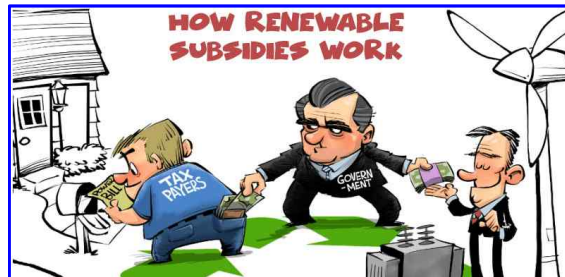
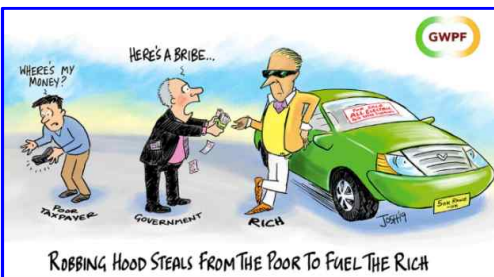
Ursula von der Leyen
President of the European Commission



탄소중립은 가난한 자를 더욱 가난하게

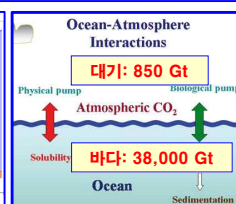
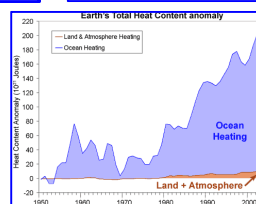
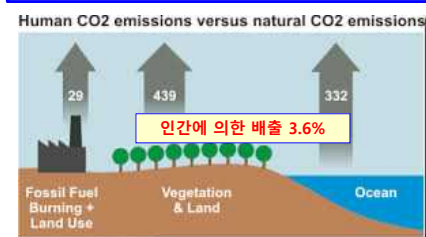
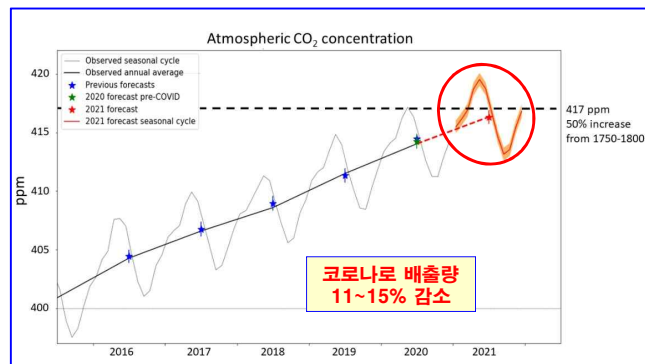
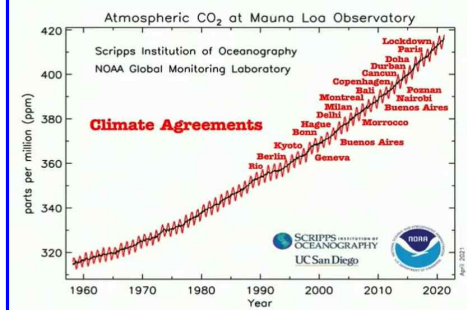
Top 20 Exporters to the EU-27 of CBAM Goods

Value, billion US\$, 2019



대기 이산화탄소 상승 억제는 인간 노력으로 불가능

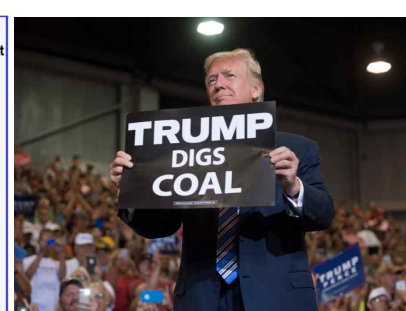
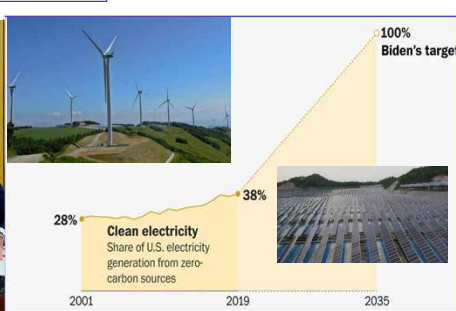
Climate Futility



인간에 의한 배출량보다 바다에 더욱 민감하게 변화

미국의 파리기후협약 재가입

BIDEN TO REJOIN
PARIS CLIMATE
AGREEMENT



Unsettled



WHAT CLIMATE SCIENCE
TELLS US, WHAT IT DOESN'T,
AND WHY IT MATTERS

Steven E. Koonin

FORMER UNDERSECRETARY FOR SCIENCE,
U.S. DEPARTMENT OF ENERGY
UNDER THE OBAMA ADMINISTRATION



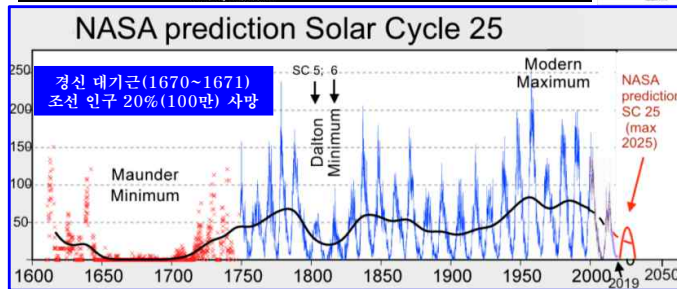
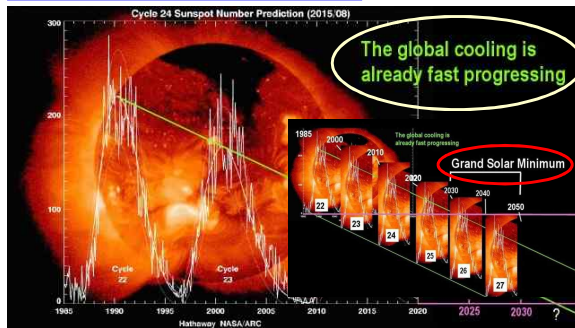
On behalf of environmentalists everywhere, I would like to formally apologize for the climate scare we created over the last 30 years.

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"



소빙하기가 오고 있다



There Is No Impending 'Mini Ice Age'

By NASA Global Climate Change

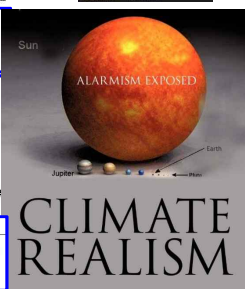
What Does A Super Grand Solar Minimum Look Like?

- 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-

