



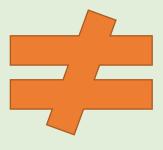
Origine antropica del cambiamento climatico in atto

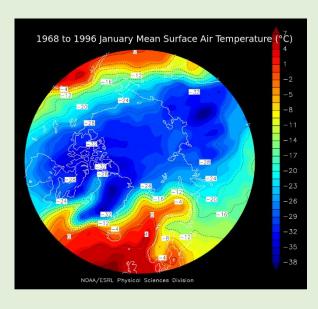
Poliedro Co-Working

Torino, 21 ottobre 2021

METEO







CLIMA

Gli ultimi anni in Piemonte...

2020

Il 6° più caldo degli ultimi 63 anni, con un'anomalia termica media di circa +1.1°C rispetto al periodo 1971-2000. Il 2 ottobre è risultato il giorno più piovoso dal 1958 a oggi.

2019

Il 5° più caldo degli ultimi 63 anni, con un'anomalia termica di circa +1.5°C rispetto al periodo 1971-2000. A giugno l'eccezionale ondata di calore ha fatto registrare la più alta temperatura media misurata in Piemonte dal 1958 a oggi. Da metà ottobre a fine novembre l'anomalia di precipitazione è passata da -25% a +20%, grazie ad eventi pluviometrici intensi.

2018

Il 2° più caldo degli ultimi 63 anni, con un'anomalia termica media di circa +1.6°C rispetto al periodo 1971-2000.

2017

Il 3° più caldo degli ultimi 63 anni, con un'anomalia termica di circa +1.5°C rispetto al periodo 1971-2000. E' stato inoltre il 4° anno più secco degli ultimi 63 anni.

2015

Il più caldo dell'intera serie storica di misure dal 1958 ad oggi, con un'anomalia di circa +1.9°C rispetto al periodo 1971-2000. Spicca il mese di luglio, risultato quello con le temperature più elevate di tale serie storica, con un'anomalia termica di circa +3.9°C.

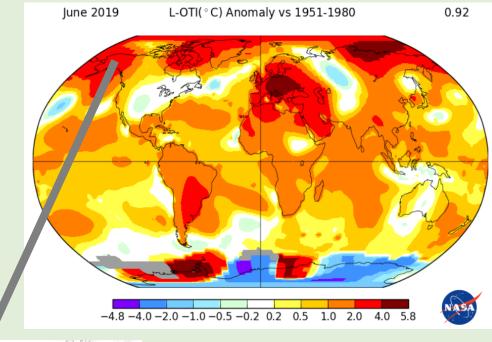
fonte **ARPA Piemonte** (arpa.piemonte.it)

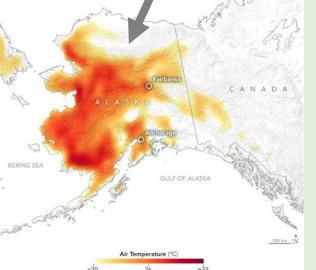
... in Europa

Giugno 2019 è risultato in Europa <u>il più caldo in</u>
<u>assoluto mai registrato</u>
(con anomalie fino a +10°C).

fonte **NOAA** (www.noaa.gov)

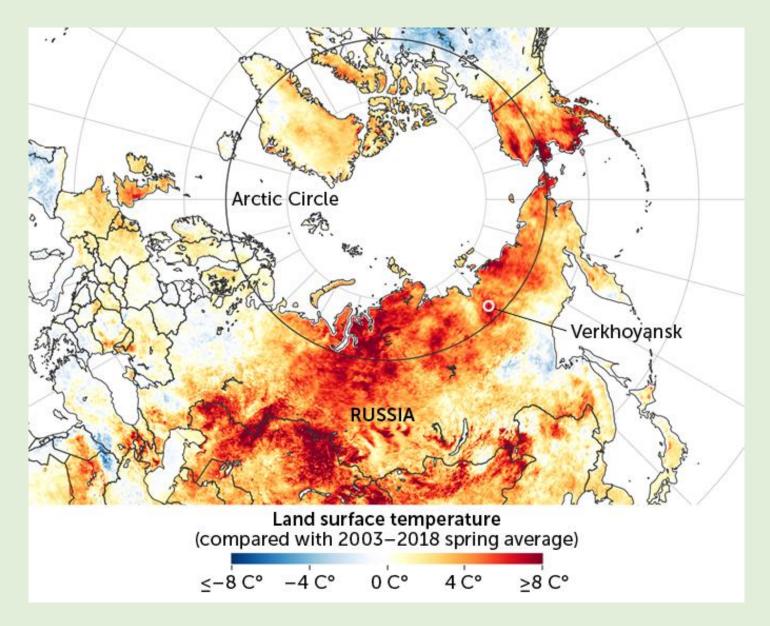
... e nel mondo





4 Luglio 2019: record +32°C in Alaska

... ancora nel mondo!



Data collected by NASA's Aqua satellite show that temperatures on land in Siberia from March 19 through June 20, 2020, were much higher than the average March–June temperatures from 2003 to 2018.

Deep red values indicate regions more than 8°C higher than average (blue values are colder than average).

The town of Verkhoyansk (dot) logged a record high temperature of 38° C on June 20.

fonte **NOAA** (www.noaa.gov)

GLOBAL AVERAGE TEMPERATURE

The January–December 2020 average global land and ocean surface temperature was the second highest since global records began in 1880.

ALASKA

Alaska's 2020 statewide temperature departure of 1.5°F above average was the smallest since 2012.

NORTH AMERICA

North America had its 10thwarmest year on record.

EUROPE

During its growth season, the Arctic had its 11th-smallest annual

maximum extent on record. During its melt season, the Arctic had its

The year 2020 was Europe's warmest year on record. This was the first year where Europe's annual temperature departure was over +2.0°C (+3.6°F). The years 2014–2020 all rank among Europe's seven warmest years on record.

ASIA

Asia's 2020 temperature was also the highest in the 111-year record. The year 2020 also marked the first time Asia had an annual temperautre departure greater than 2.0°C (3.6°F). Asia's 10 warmest years have occurred since 2002.

CONTIGUOUS UNITED STATES

The contiguous U.S. had its fifth-warmest year since national records began in 1895. A maximum temperature of 130°F was observed in Death Valley, California on August 16, 2020. If verified, this would be the warmest August temperature on record and the third-warmest temperature for any month across the U.S.

ATLANTIC HURRICANE SEASON

Above-average activity:
30 storms, 13 hurricanes
The year 2020 had the highest number of tropical cyclones in a single year, surpassing the previous record of 28 set in 2005.
Official records date back to 1851.

AFRICA
Africa had its fourth-warmest

ARCTIC SEA ICE EXTENT

second-smallest minimum extent on record.

(May 16–21, 2020)

Maximum winds — 270 km/hr Amphan brought strong winds and dangerous storm surge to coastal areas of West Bangal in India and Bangladesh.

WESTERN NORTH PACIFIC OCEAN TYPHOON SEASON

Below-average activity: 23 storms, 12 typhoons

EASTERN NORTH PACIFIC HURRICANE SEASON

Below-average activity: 16 storms, 4 hurricanes

HURRICANE ETA & IOTA (November 1–18, 2020)

Maximum winds — 260 km/hr Both storms made landfall as category 4 hurricanes within 25 km of each other in Nicaragua less than two weeks apart. Both storms brought heavy rain and flooding to isolated regions in Central America.

year on record.

ATI

CYCLONE GATI (November 21–24, 2020)

Maximum winds — 185 km/hr Gati was the strongest cyclone to make landfall in Somalia.

TYPHOON GONI

(October 26–November 6, 2020) Maximum winds — 315 km/hr Goni was one of the most powerful landfalling typhoons on record.

SOUTH AMERICA

South America's 2020 temperature departure from average ranked as the second-highest in the 111-year record. Only the year of 2015 was warmer.

GLOBAL TROPICAL CYCLONE

103 storms, 45 hurricanes The total number of named storms in 2020 tied the record set in 2018.

SOUTH INDIAN OCEAN CYCLONE SEASON

Near-average activity: 17 storms, 9 cyclones



SOUTHWEST PACIFIC OCEAN CYCLONE SEASON

Above-average activity: 10 storms, 5 cyclones

ARGENTINA

Argentina had the second-warmest year on record. Argentina's five warmest years have all occurred since 2012.

AUSTRALIA

NORTH INDIAN OCEAN

CYCLONE SEASON

5 storms, 4 cyclones

Above-average activity:

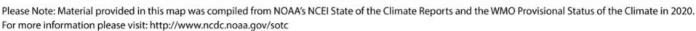
Australia had its fourth-warmest year since national records began in 1910.



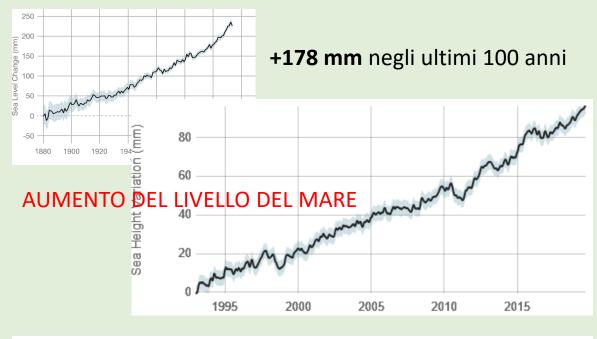
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ANTARCTIC SEA ICE EXTENT

During its growth season, the Antarctic had its 11thhighest annual maximum extent. During its melt season, the Antarctic had a near-average annual minimum extent.



Evidenze scientifiche del riscaldamento globale



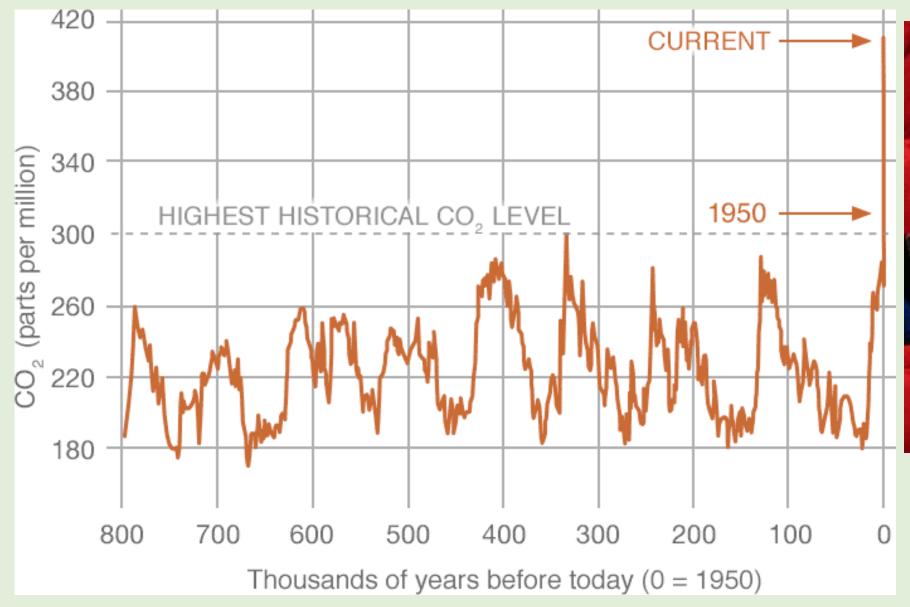


fonte **NASA** (climate.nasa.gov)





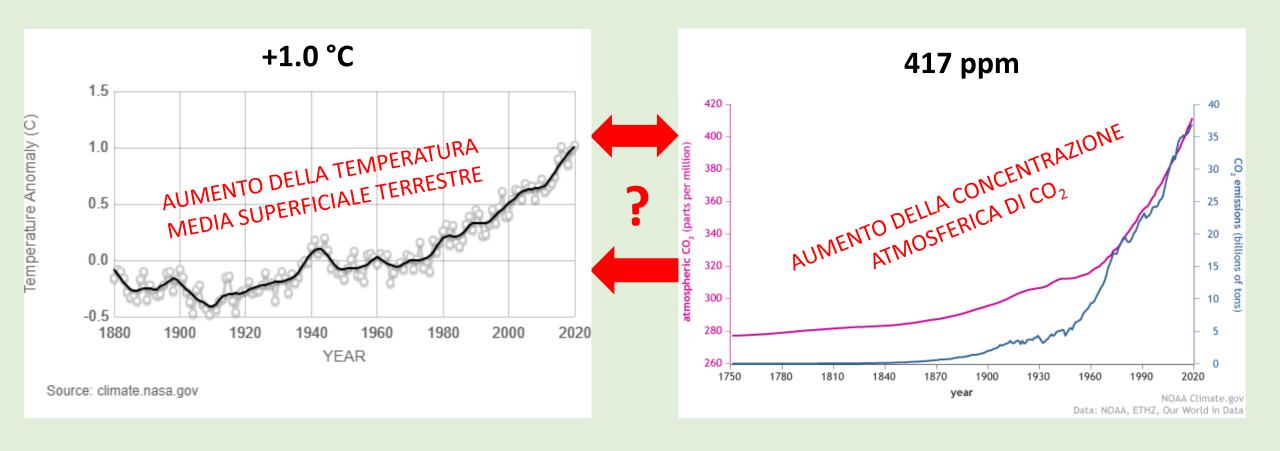
Andamento della concentrazione di CO2



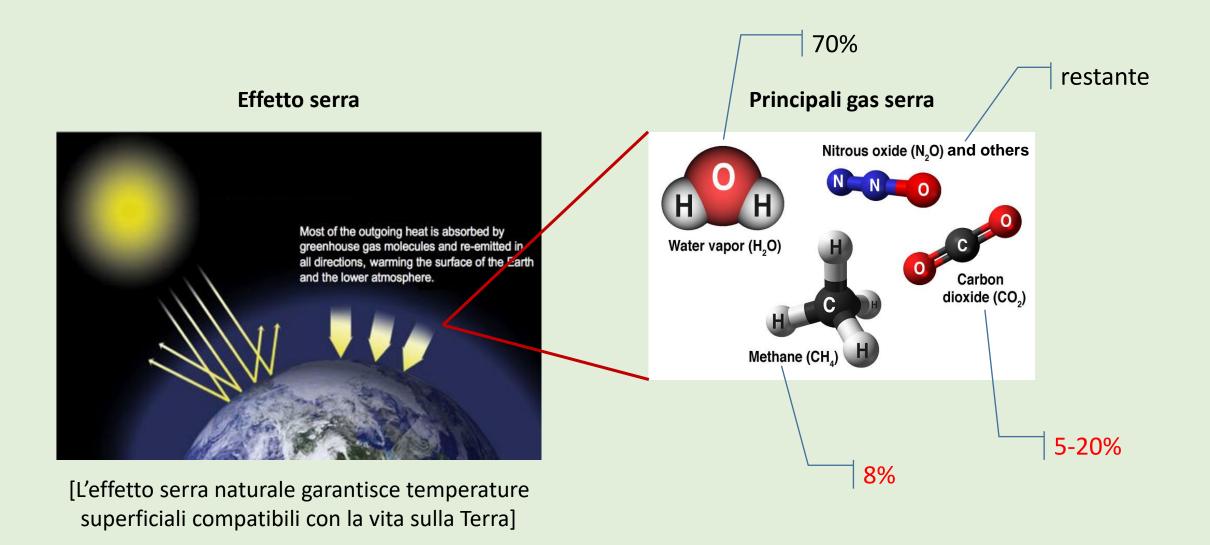


fonte NASA (climate.nasa.gov)

Causalità o «semplice» correlazione?

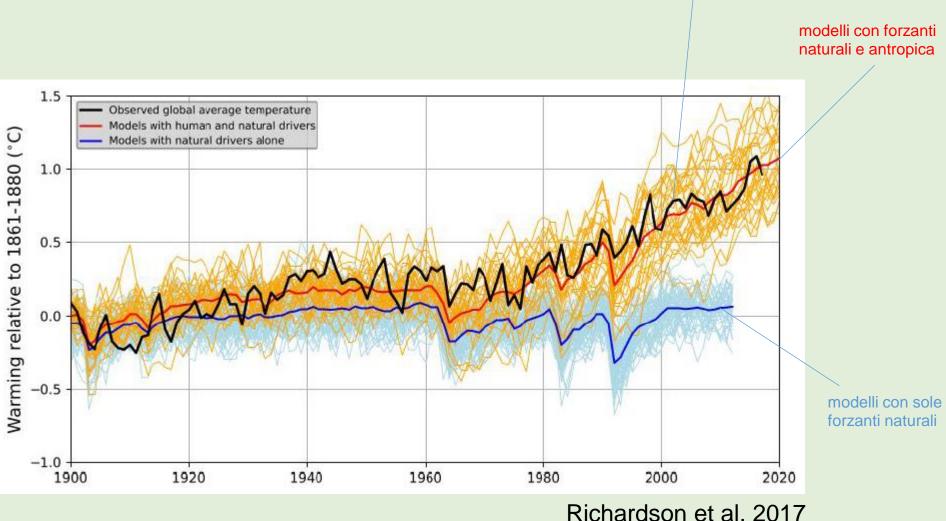


Come funziona l'atmosfera terrestre?



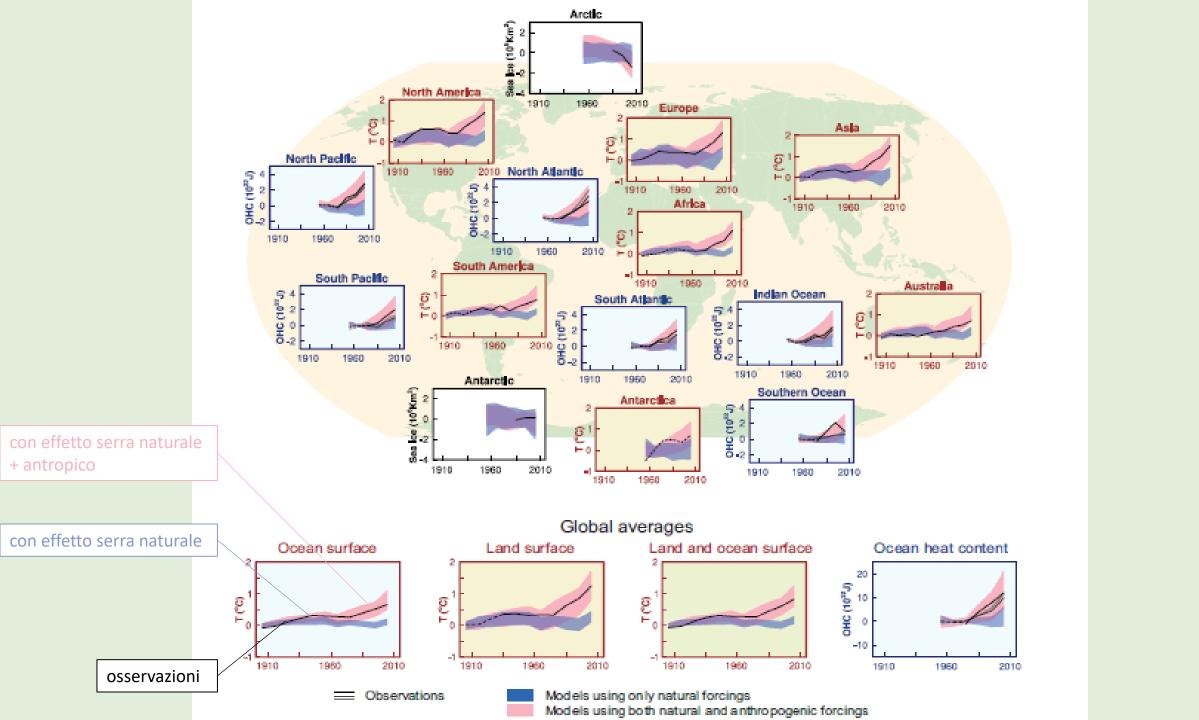
Modelli climatici





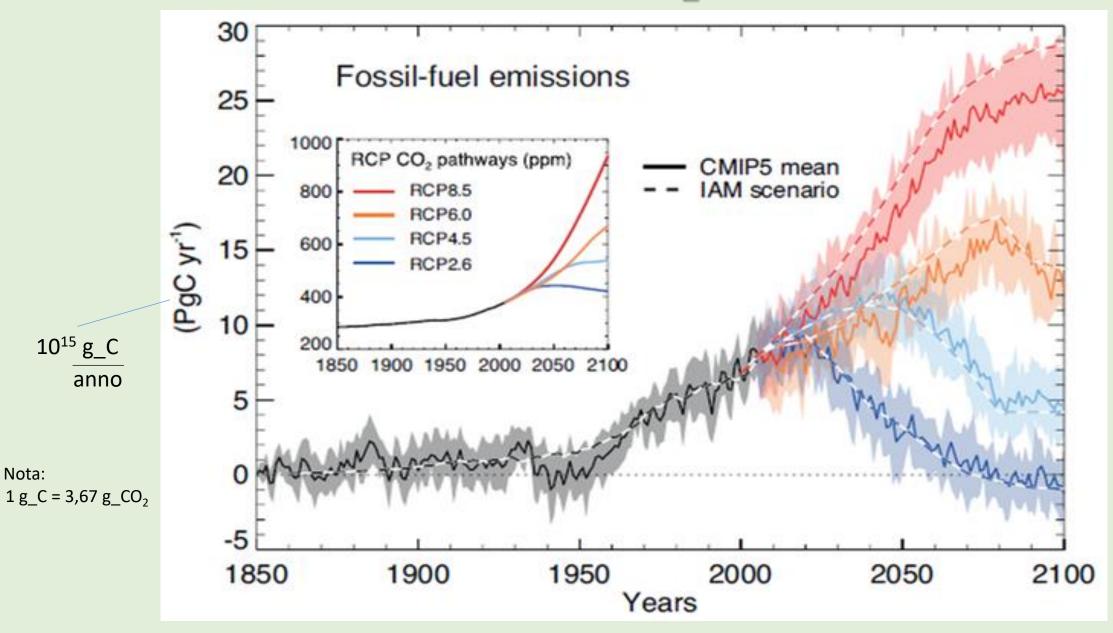
Richardson et al, 2017

I modelli climatici riproducono il riscaldamento osservato se e solo se si tiene conto della forzante antropica

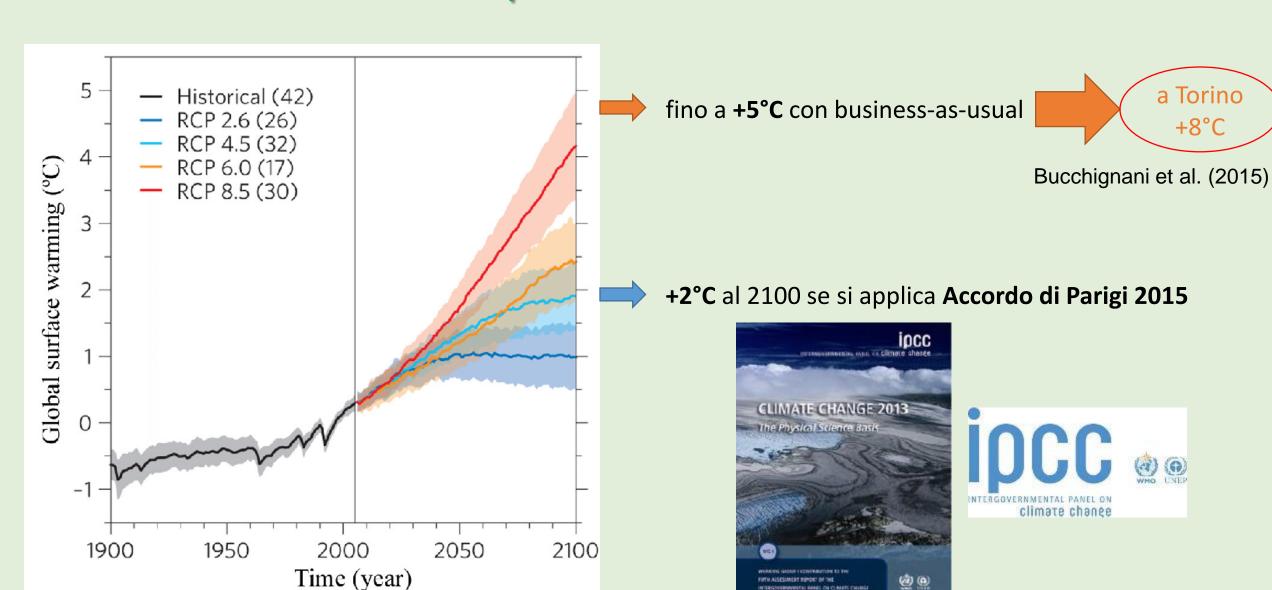


Scenari di emissione di CO₂

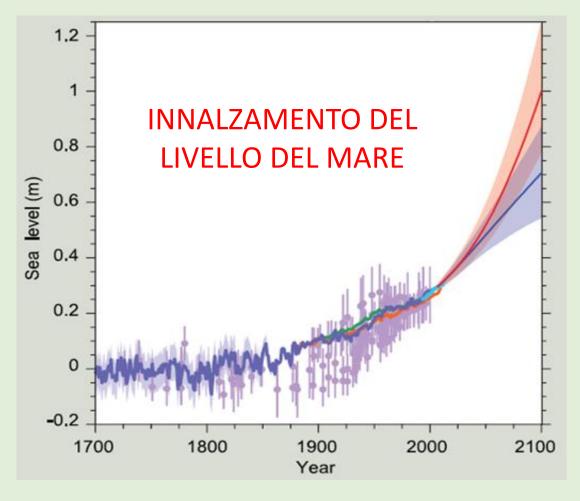
Nota:



Aumento delle temperature medie



Innalzamento del livello del mare





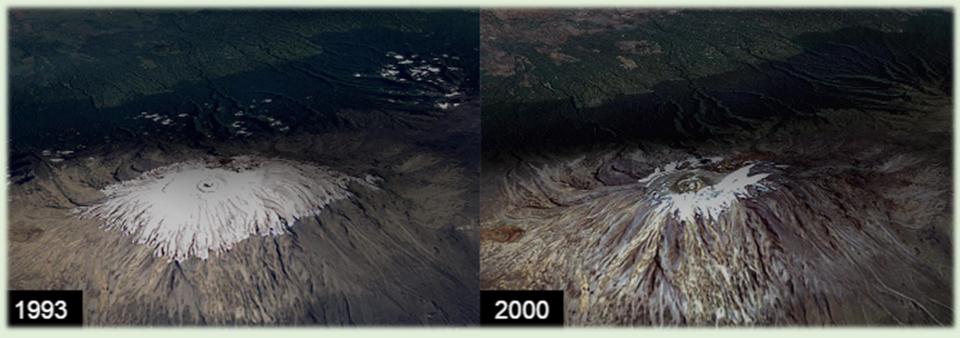




fonte **NASA** (http://climate.nasa.gov/)

mt. Matterhorn





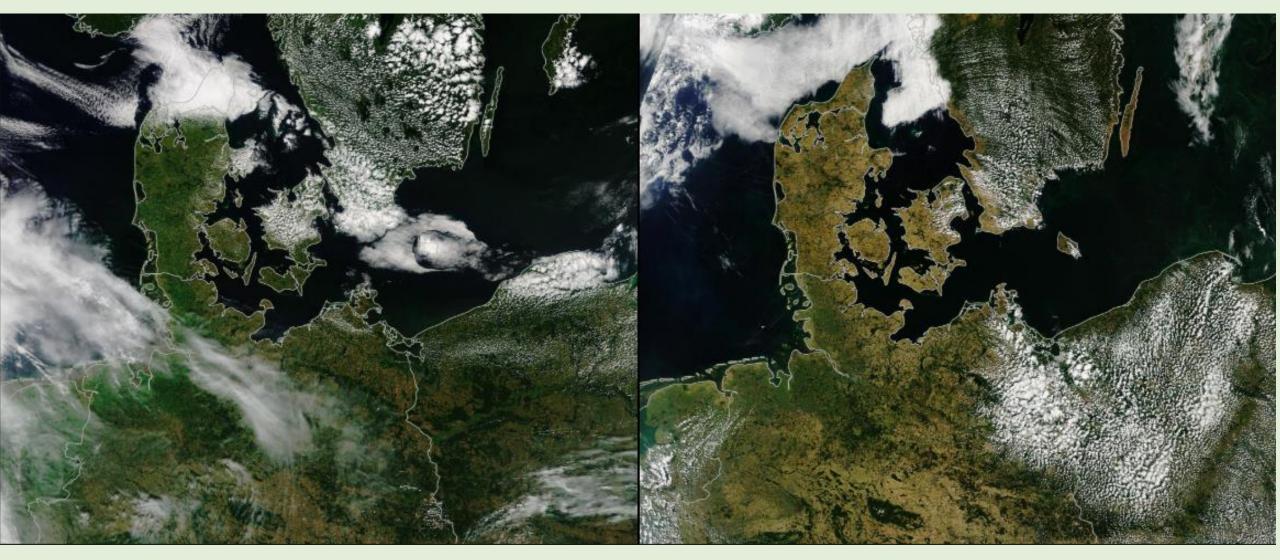




ghiacciaio Galambra



Un'onda di calore investe l'Europa



19 luglio 2017 24 luglio 2018

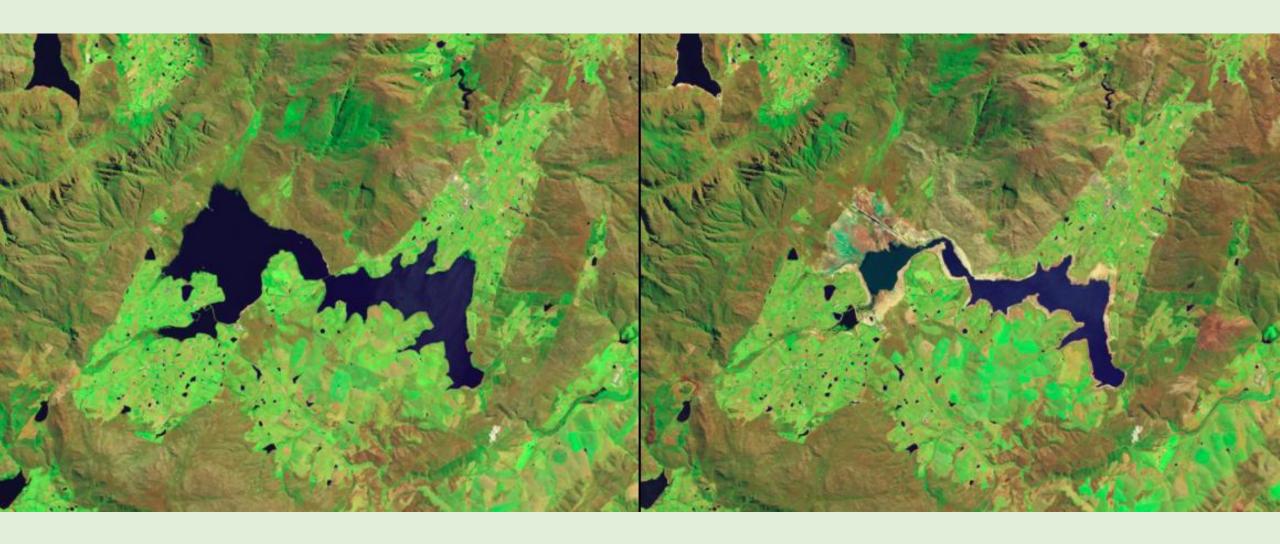
Incendio "Thomas", California del Sud



23 novembre 2017

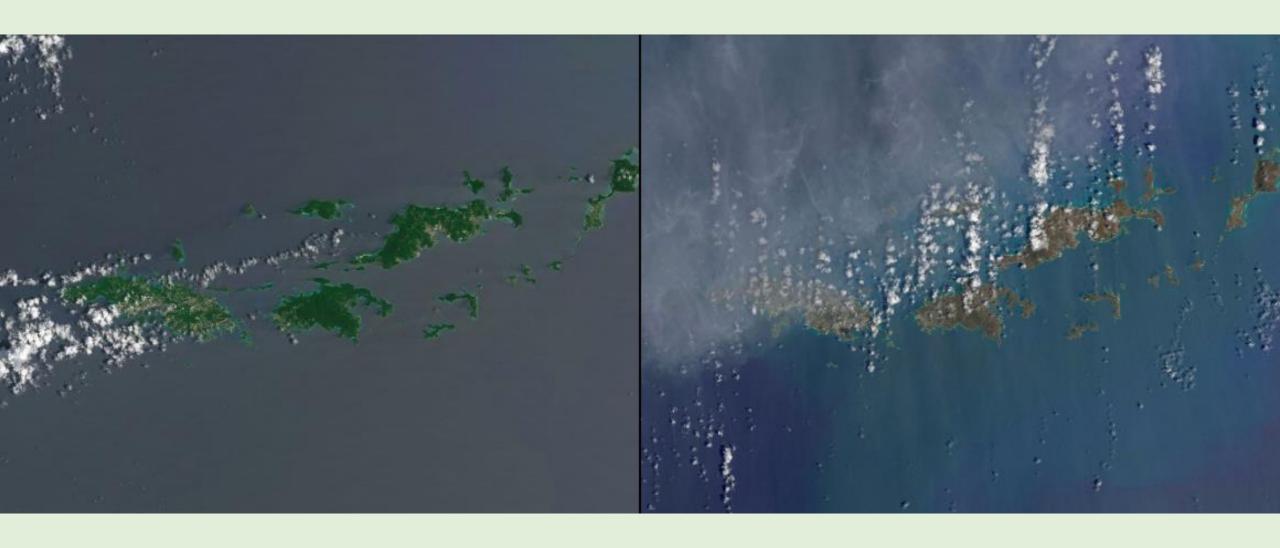
25 dicembre 2017

Siccità, Sud Africa



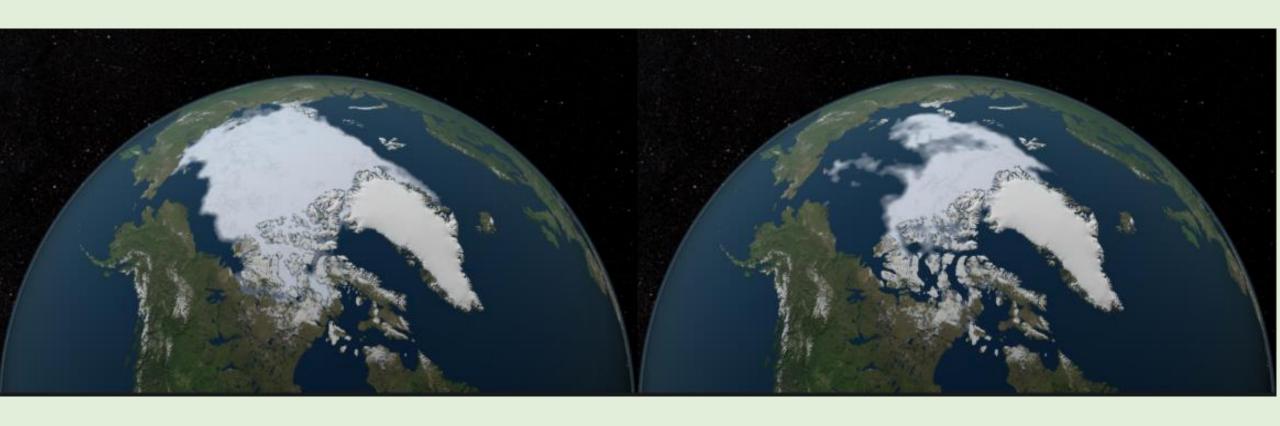
18 ottobre 2014 10 ottobre 2017

Il passaggio dell'uragano Irma sulle Isole Vergini



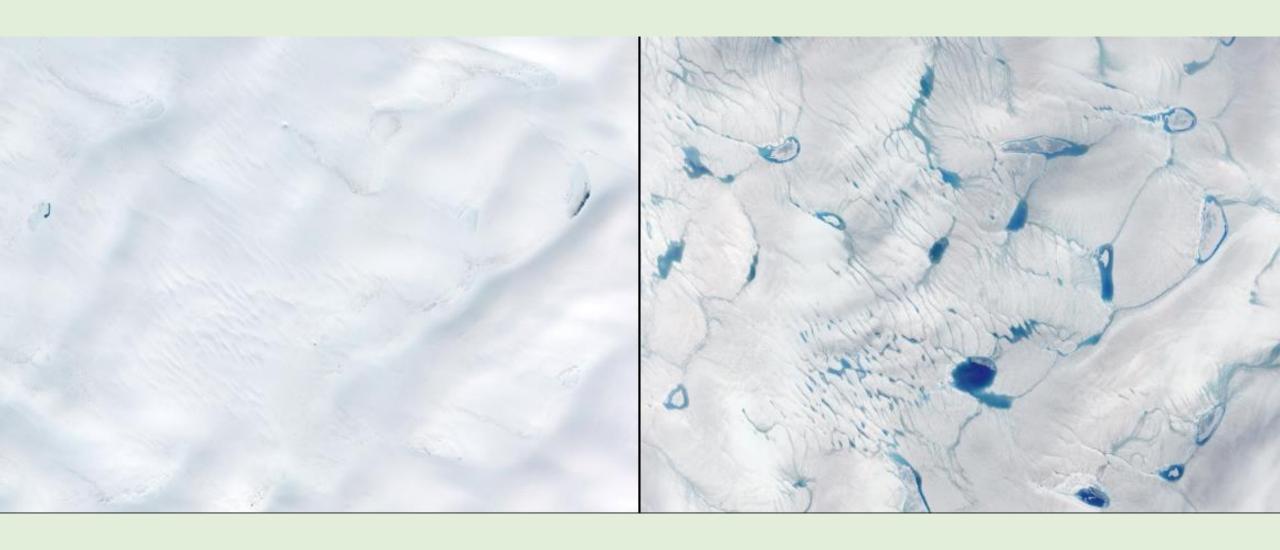
25 agosto 2017 10 settembre 2017

Record negativo di copertura dell'Artico



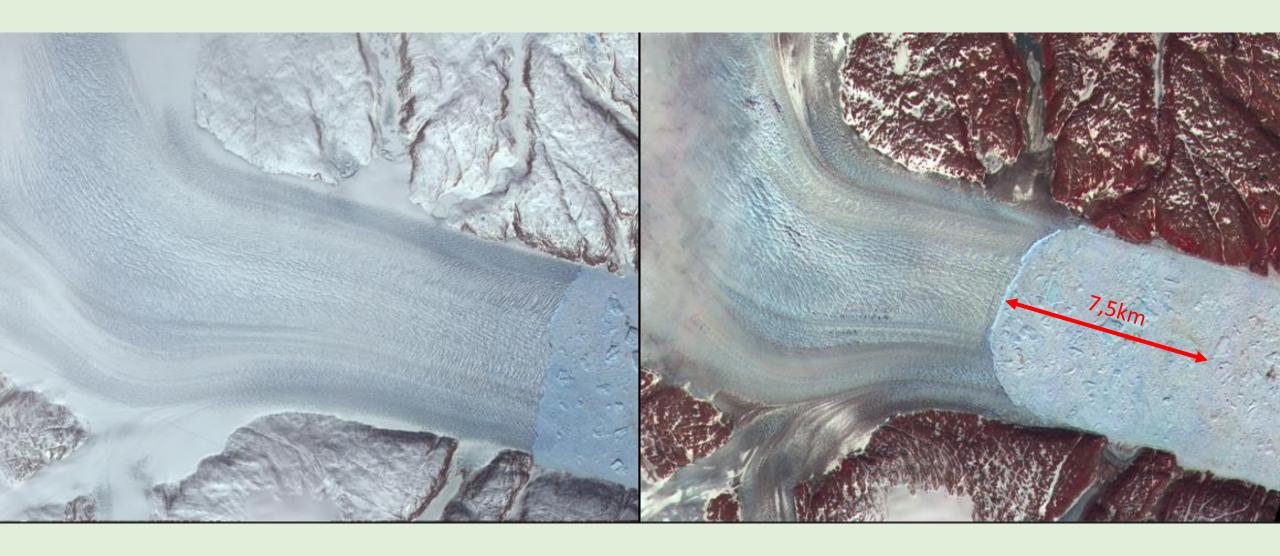
1984 2012

Scioglimento anticipato del ghiaccio in Groenlandia



10 giugno 2014 15 giugno 2016

Ritiro di 7,5km del fronte di un ghiacciaio in Groenlandia



12 maggio 2001 19 giugno 2005

Ritiro del ghiacciaio Qori Kalis, Perù



Luglio 1978 Luglio 2011

Ritiro del ghiacciaio Mýrdalsjökull, Islanda



16 settembre 1986

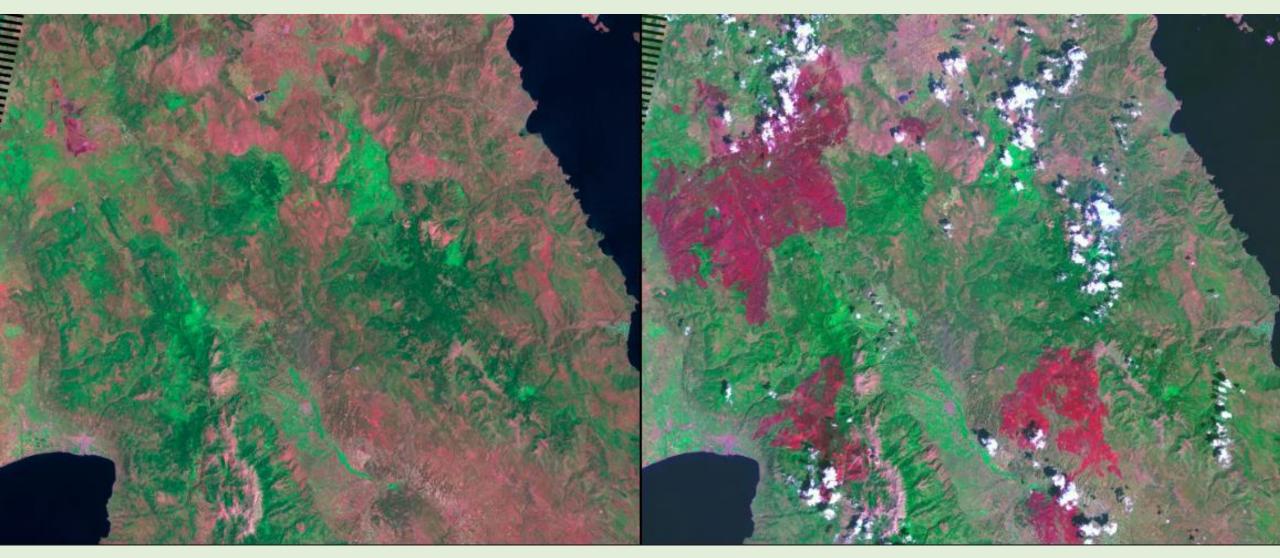
20 settembre 2014

Scioglimento del ghiacciaio Muir, Alaska



13 agosto 1941 31 agosto 2004

Incendio del Peloponneso, Grecia



25 giugno 2007 28 agosto 2007

Deforestazione e costruzione di una diga "Samuel" in Rondonia, Brasile



24 giugno 1984 6 agosto 2011