

Cambiamenti Climatici: dinamiche e impatti a livello globale

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Seminari «Mitigazione e adattamento nella gestione delle foreste mediterranee»
4 Ottobre 2021 (online)

- Il clima e i cambiamenti climatici:
nozioni chiave
- Scenari dei cambiamenti climatici
(e come possiamo agire)
- I dati per lo studio del clima e degli
impatti

TEMPO ATMOSFERICO

Il **tempo meteorologico** indica le **condizioni atmosferiche** di una zona in un **periodo di tempo molto breve**, al massimo **pochi giorni**.

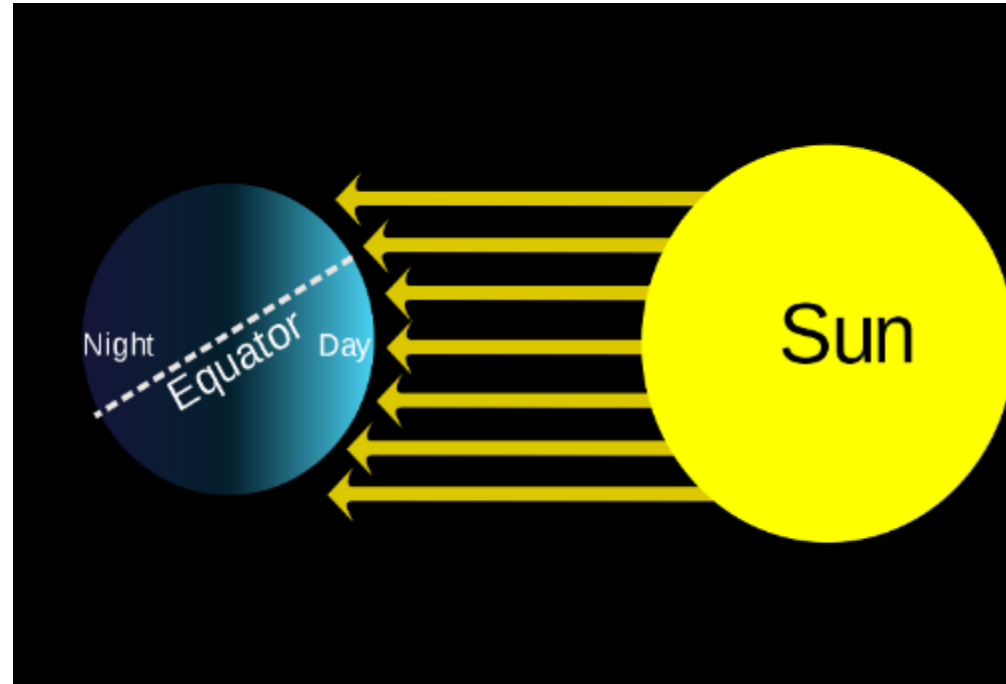


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CLIMA

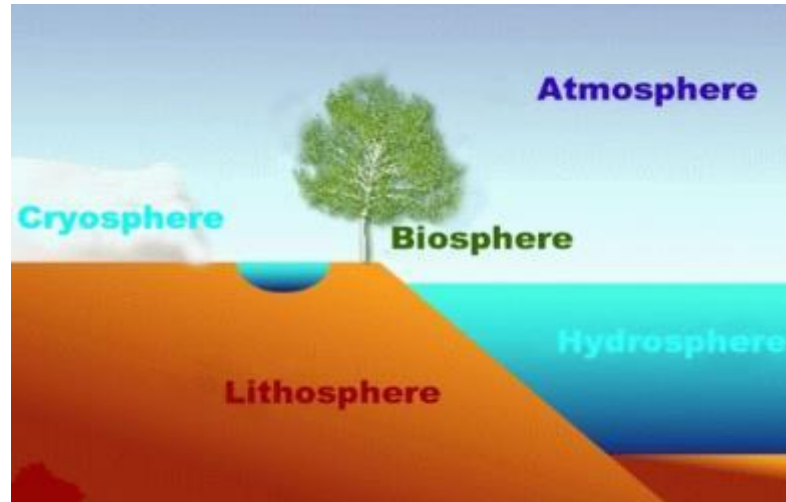
La parola *clima* viene dal greco *klima* che vuol dire «inclinazione» o «latitudine».

E' l'insieme delle **condizioni atmosferiche** (*temperatura, precipitazioni, umidità, venti etc.*) che caratterizzano **una certa regione** in un **periodo di tempo abbastanza lungo**, in genere alcuni **decenni** (per lo più 30 - 40 anni) e permettono la vita degli esseri viventi.



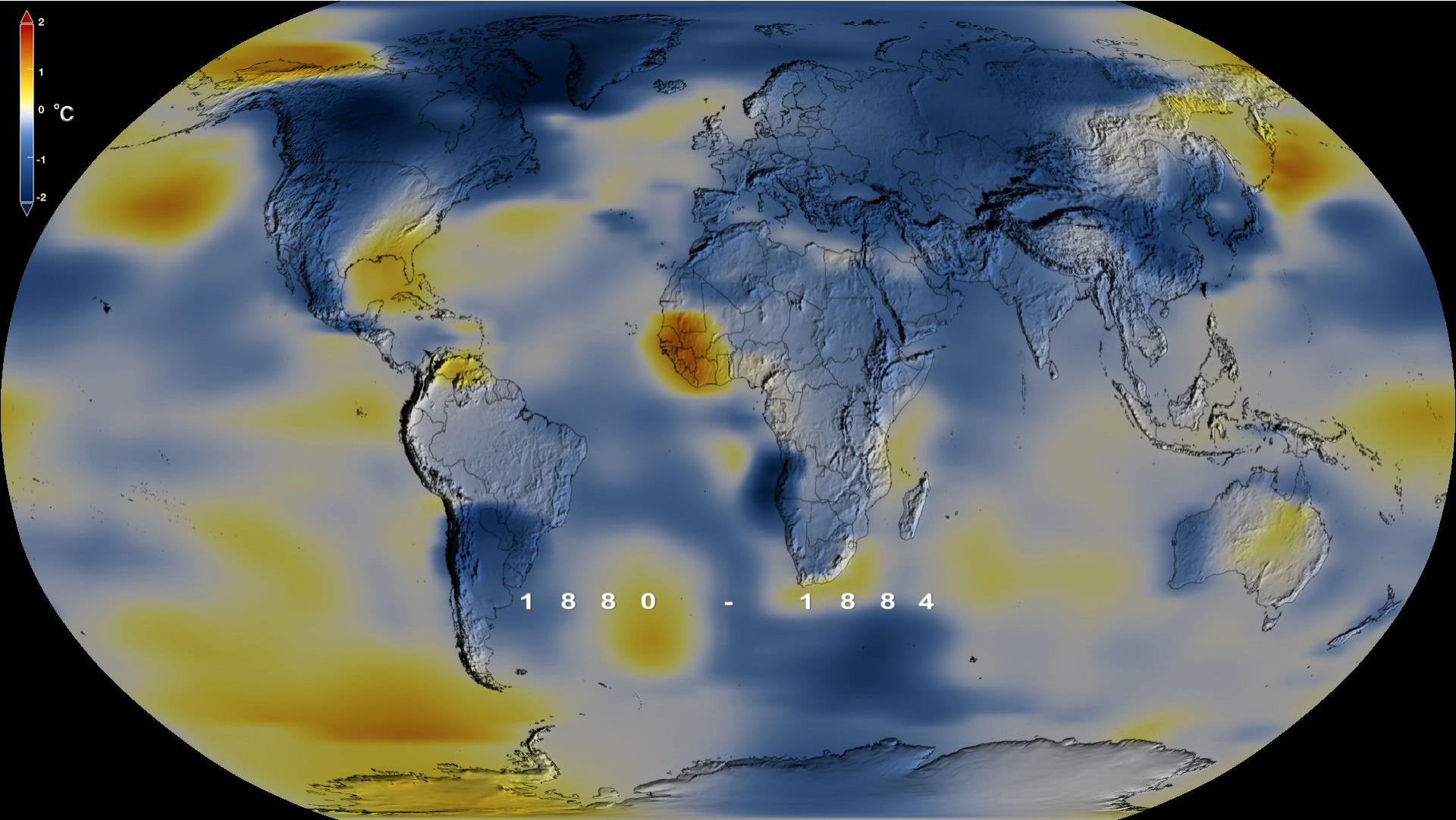
SISTEMA CLIMATICO

È un insieme di componenti, totalmente aperte tra loro (per scambio di energia e materia), concatenate da complessi *feedback* (o cicli) positivi e negativi



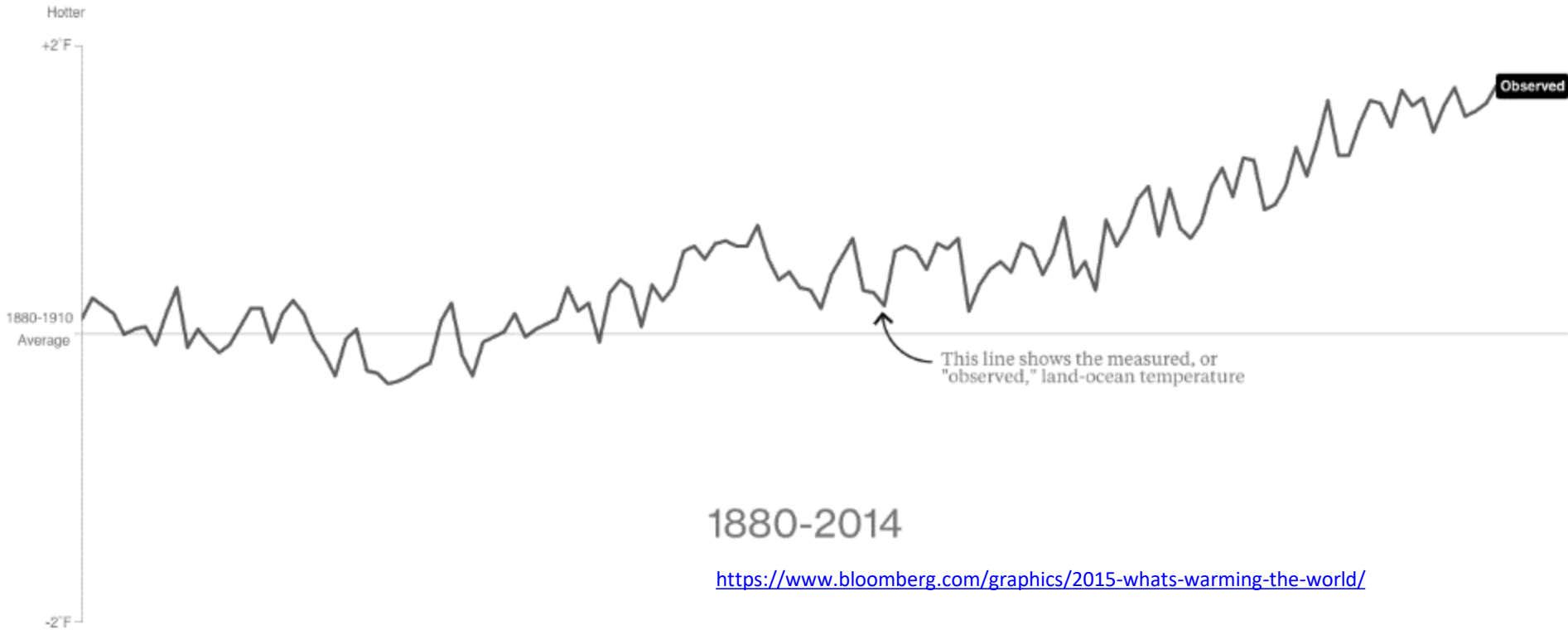
Componenti	Scale temporali di variazione
ATMOSFERA	Da giorno a giorno
LITOSFERA	Decine a centinaia di milioni di anni
CRIOSFERA	Centinaia a migliaia di anni
IDROSFERA	Decenni a centinaia di anni
BIOSFERA	Varie

Anomalie delle temperature



Riferimento 1951-1980

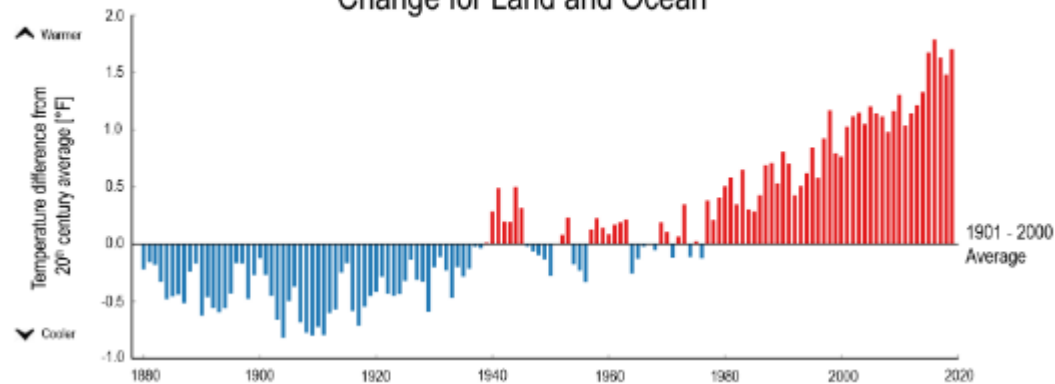
Medie globali delle anomalie



1880-2014

<https://www.bloomberg.com/graphics/2015-whats-warming-the-world/>

Annual Global Surface Temperature Change for Land and Ocean



1°F=0.56°C

Quali fattori (forzanti) possono spiegare il riscaldamento globale?

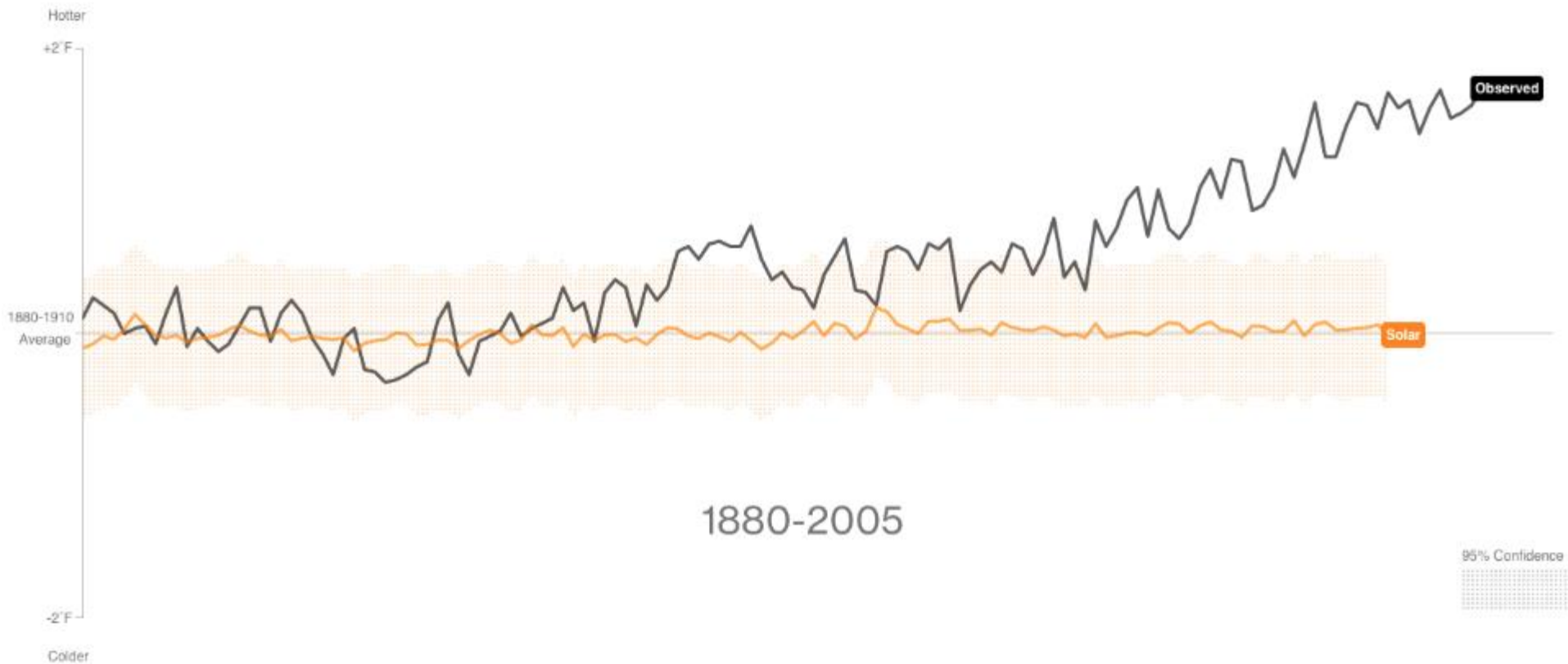
Fattori naturali



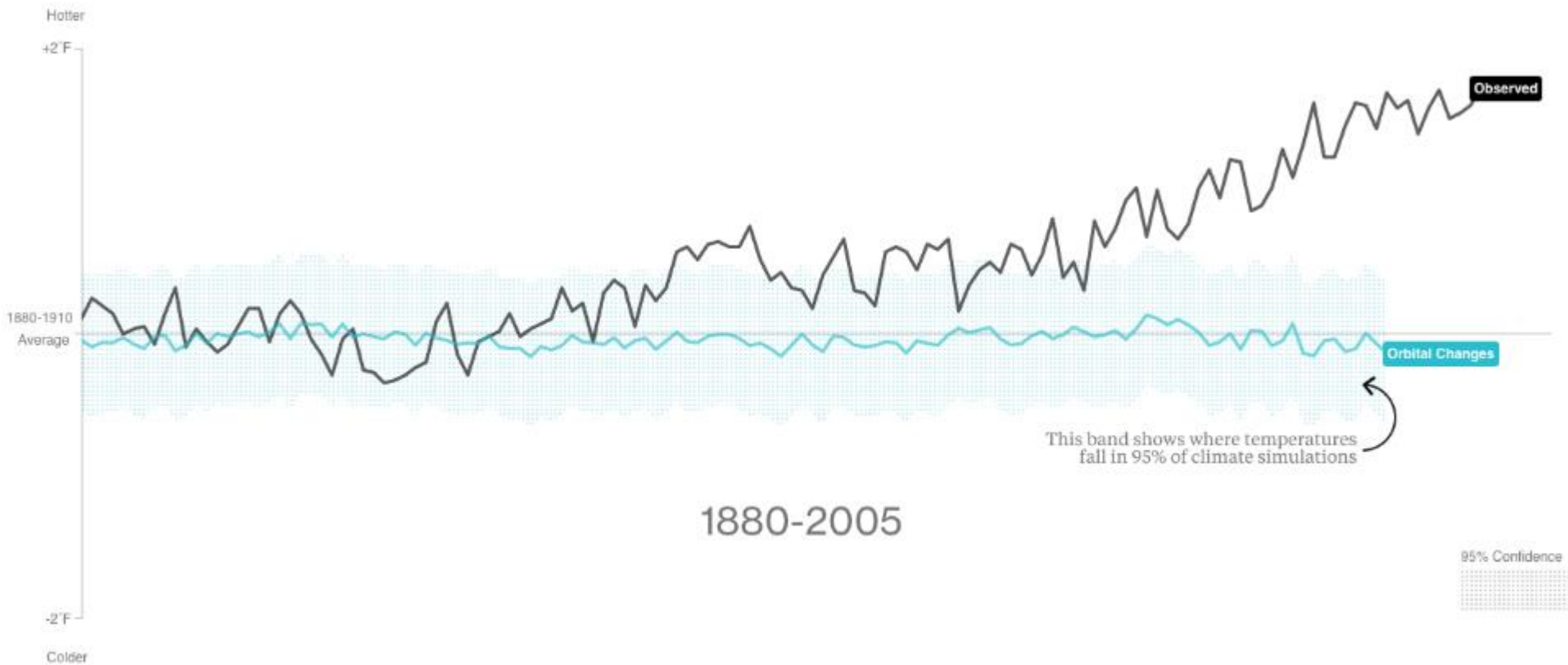
- Flusso di energia solare
- Modifiche nell'orbita terrestre
- Attività vulcanica



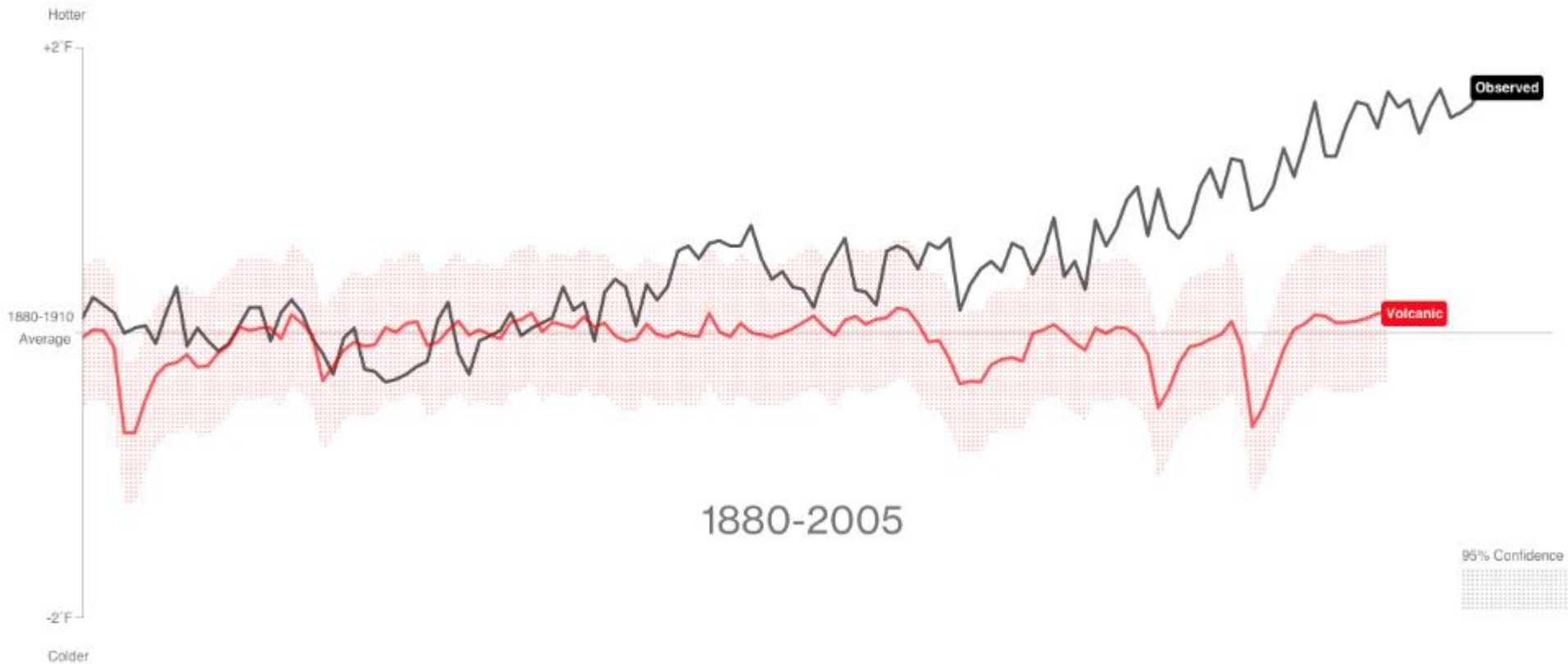
Energia Solare



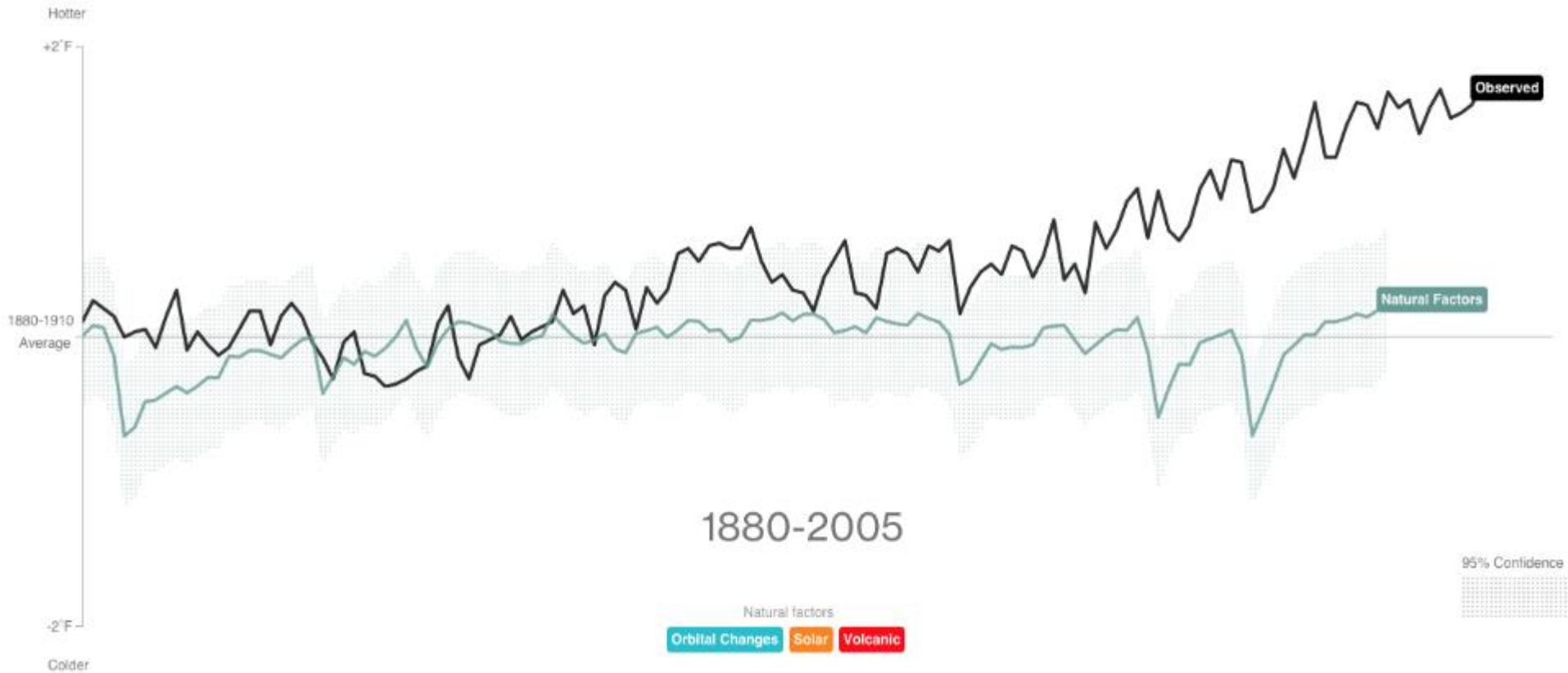
Orbita Terrestre



Attività Vulcanica

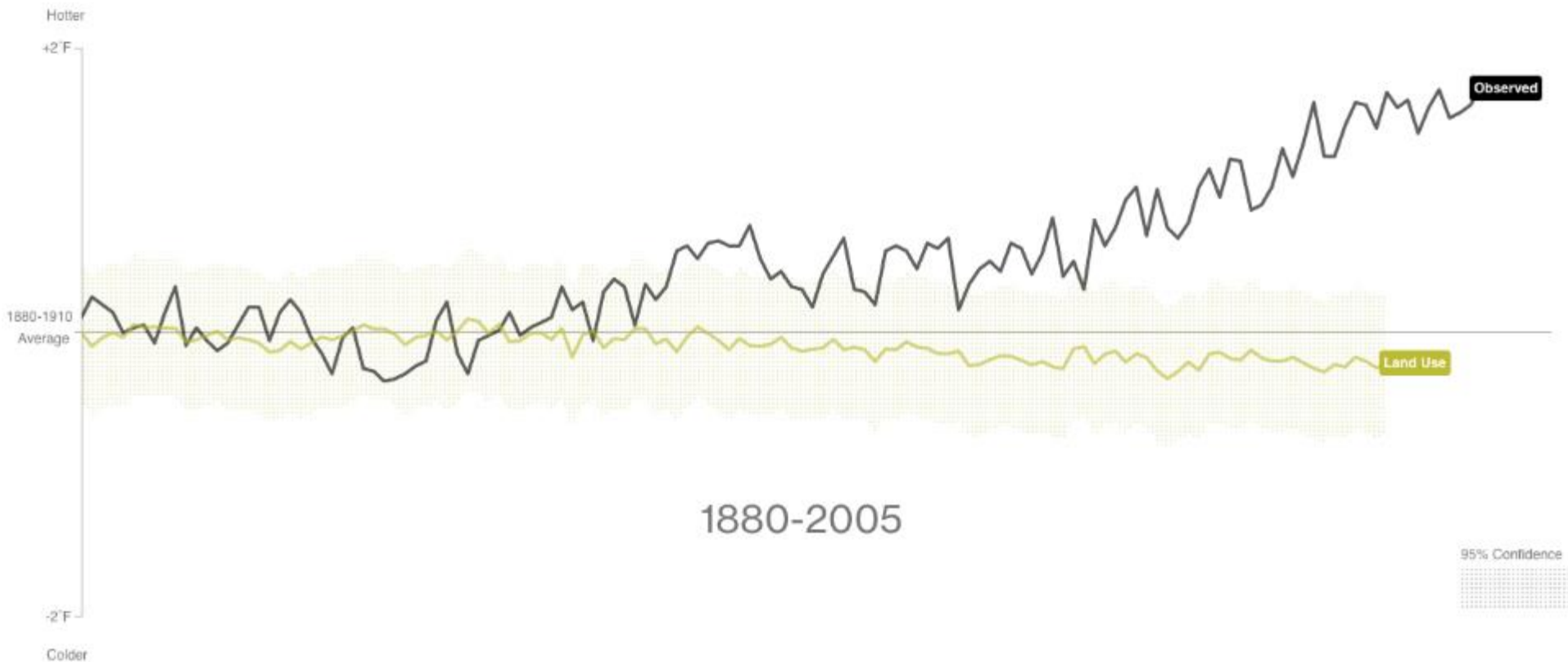


Somma dei fattori naturali

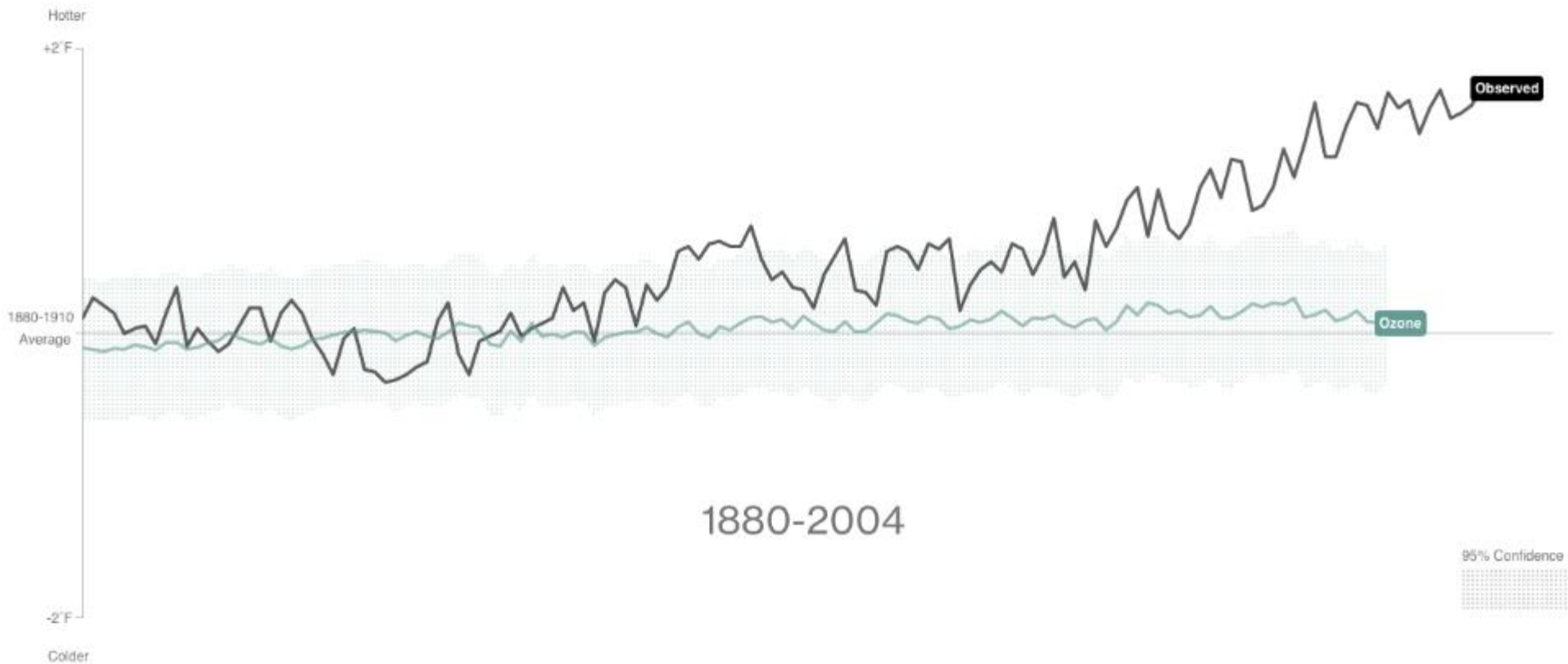


Fattori antropici

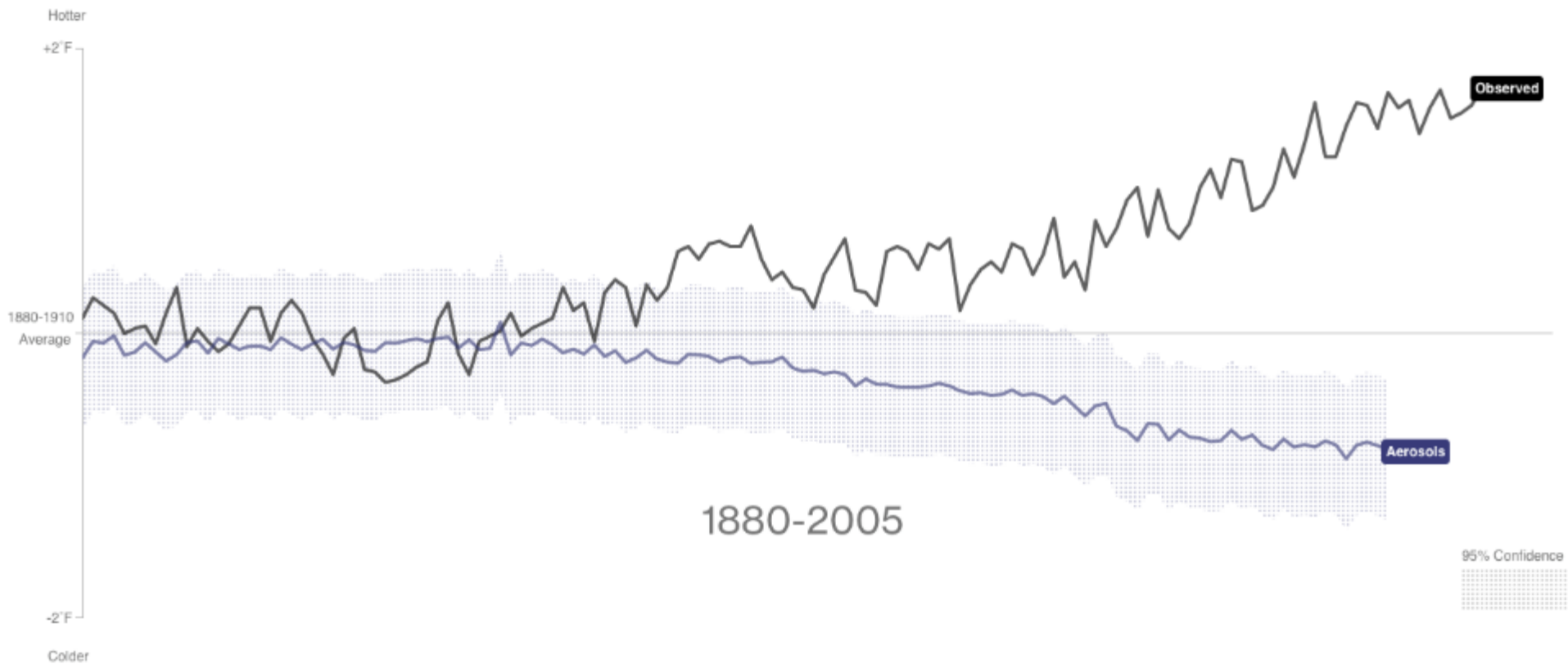
Uso del suolo: deforestazione



Inquinamento da Ozono



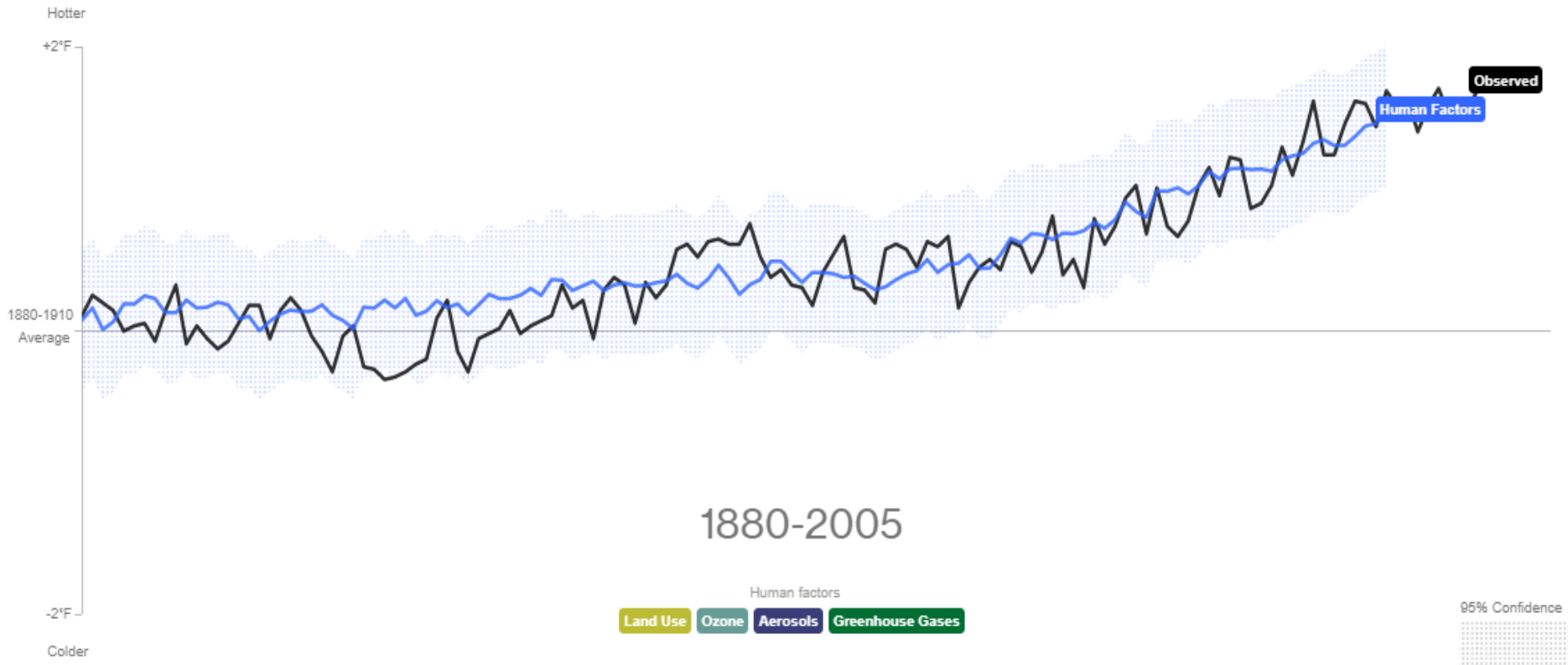
Inquinamento da Aerosol



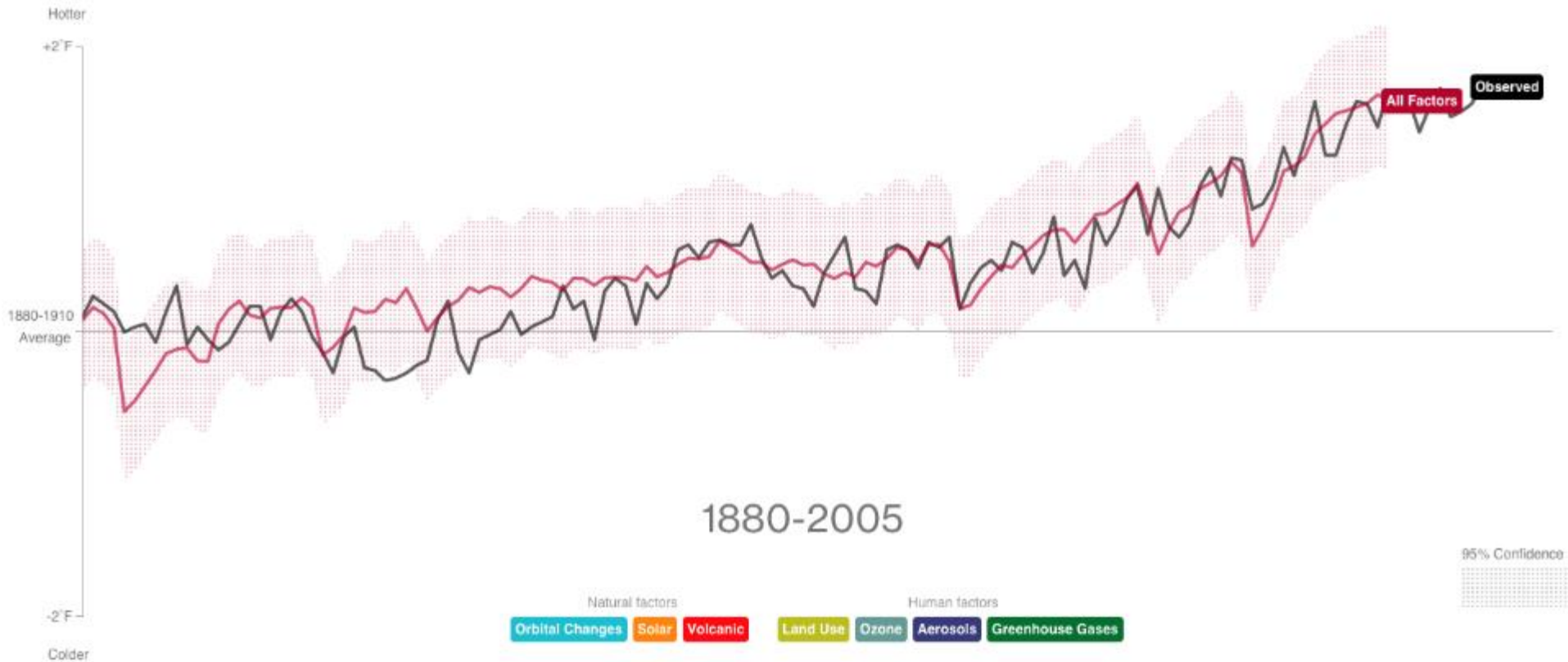
Gas a Effetto Serra



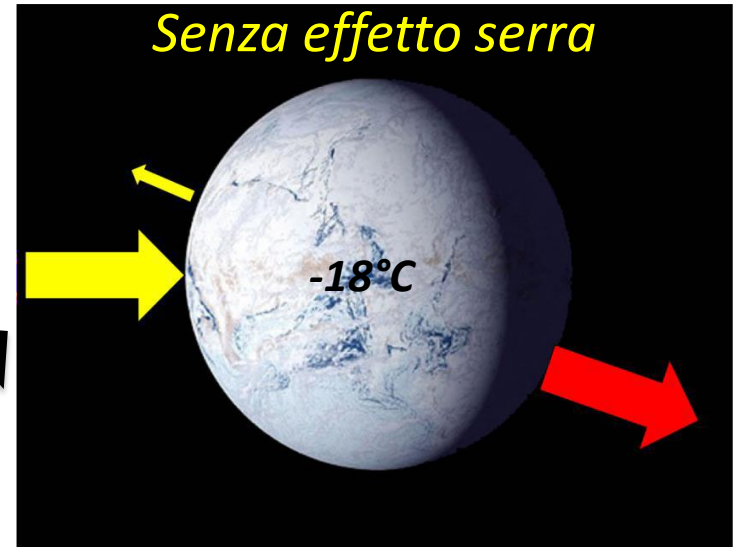
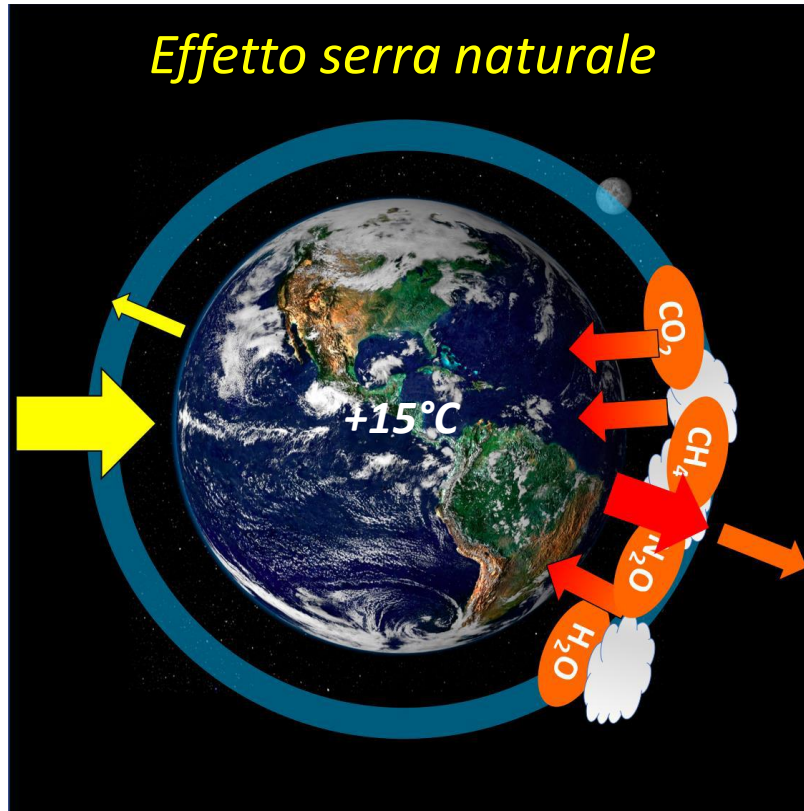
Somma dei fattori antropici



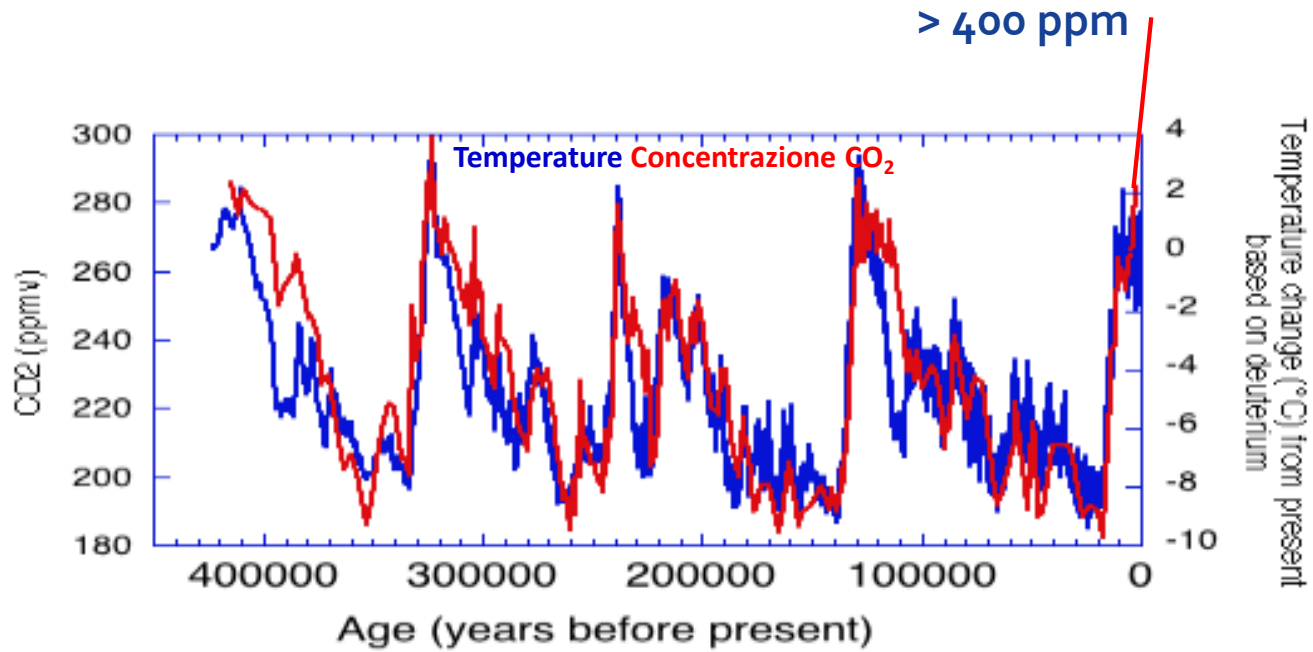
Somma dei fattori naturali e antropici



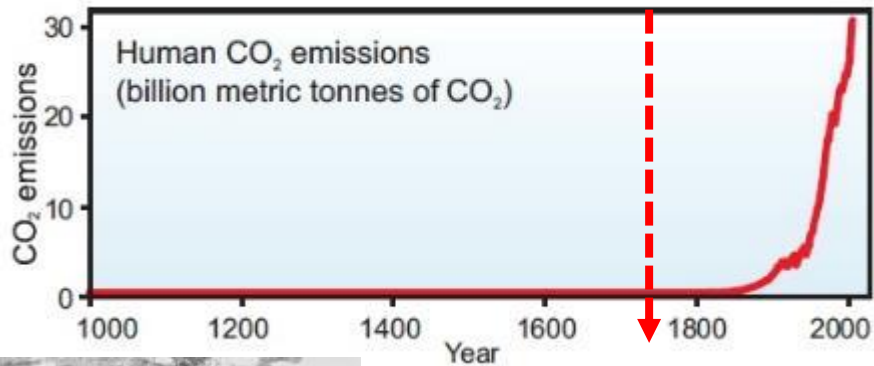
Effetto serra



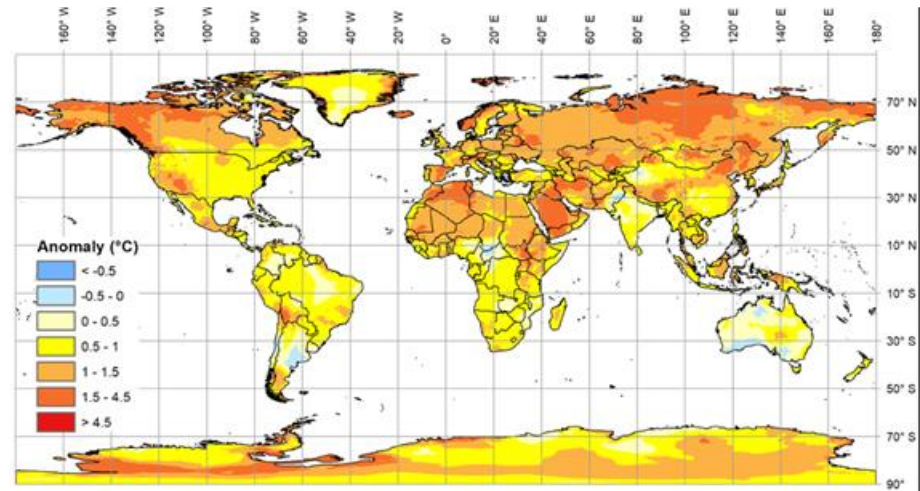
Variazioni CO₂ vs. Temperatura



<http://ossfoundation.us/projects/environment/global-warming/natural-cycle>



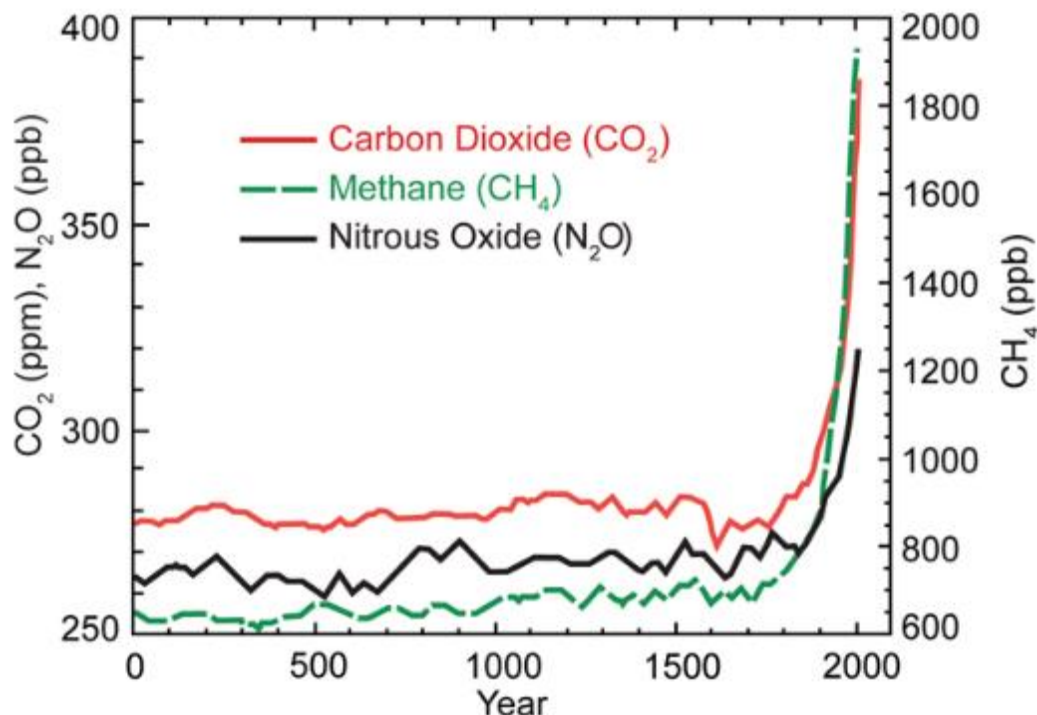
Industrial revolution
England, ~1750 on...



Elaborazioni CMCC (Passamonti et al., 2021)



Aumento delle emissioni antropogeniche

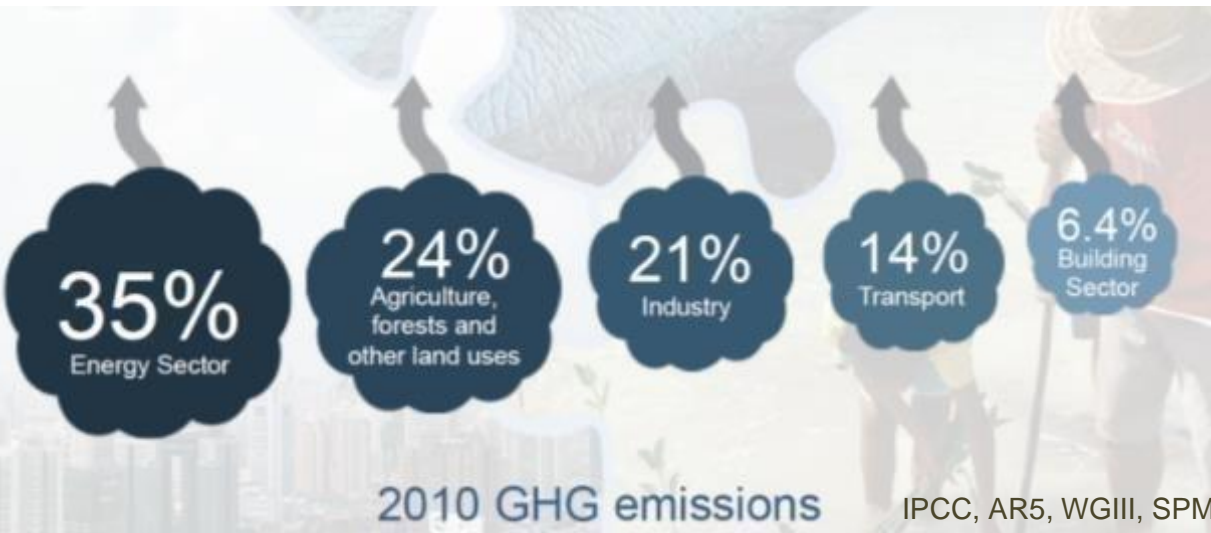


C'è consenso nella comunità scientifica sulle cause?

IPCC: "È estremamente probabile (confidenza al 95%) che la maggior parte dell'aumento osservato della temperatura globale dal 1951 al 2010 sia stata causata dalle emissioni di gas serra antropogeniche"

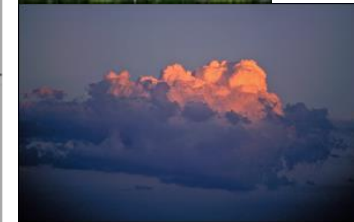
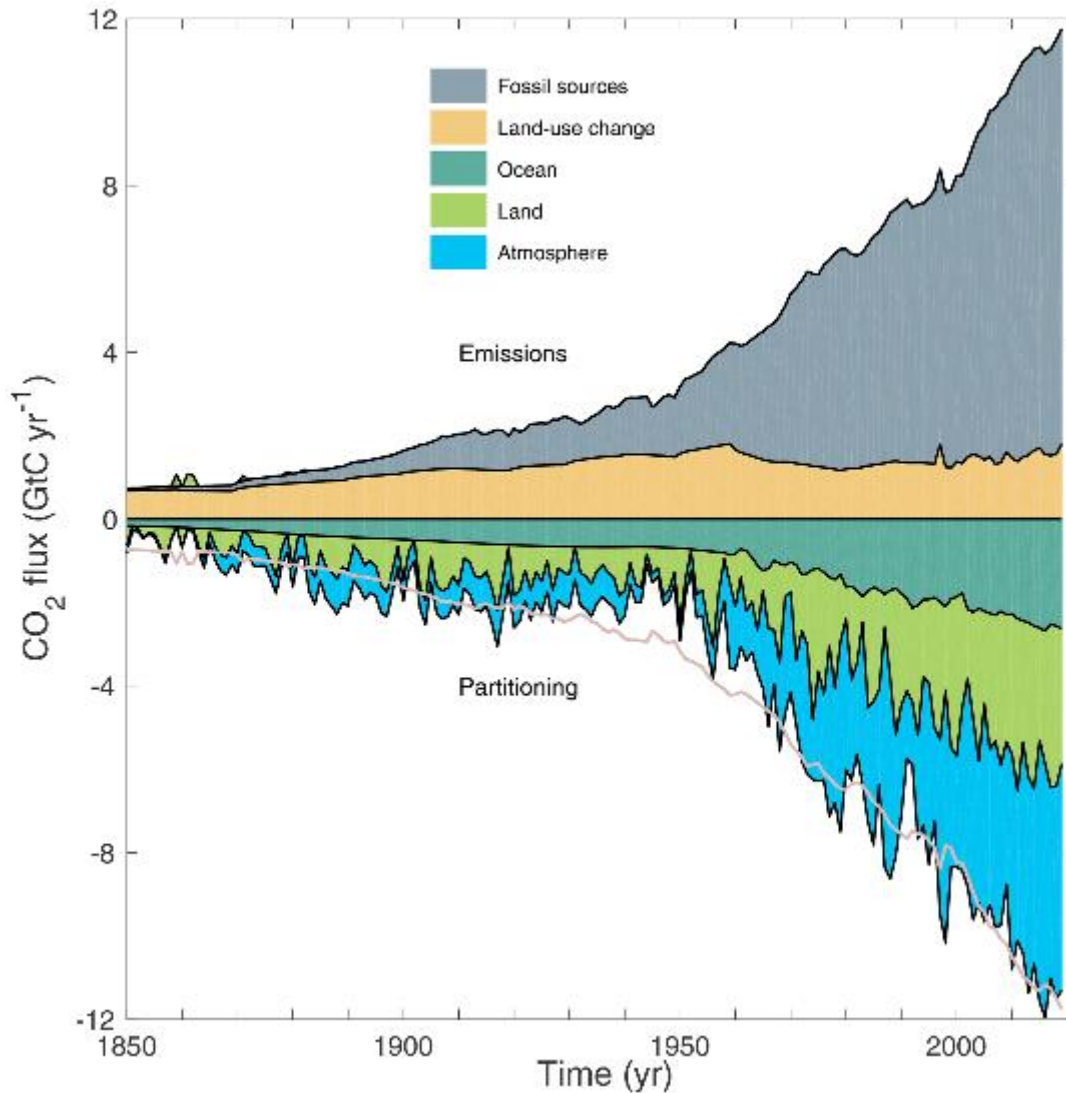


<https://nca2009.globalchange.gov/2000-years-greenhouse-gas-concentrations/index.html>



Dove vanno a finire i gas ad effetto serra?

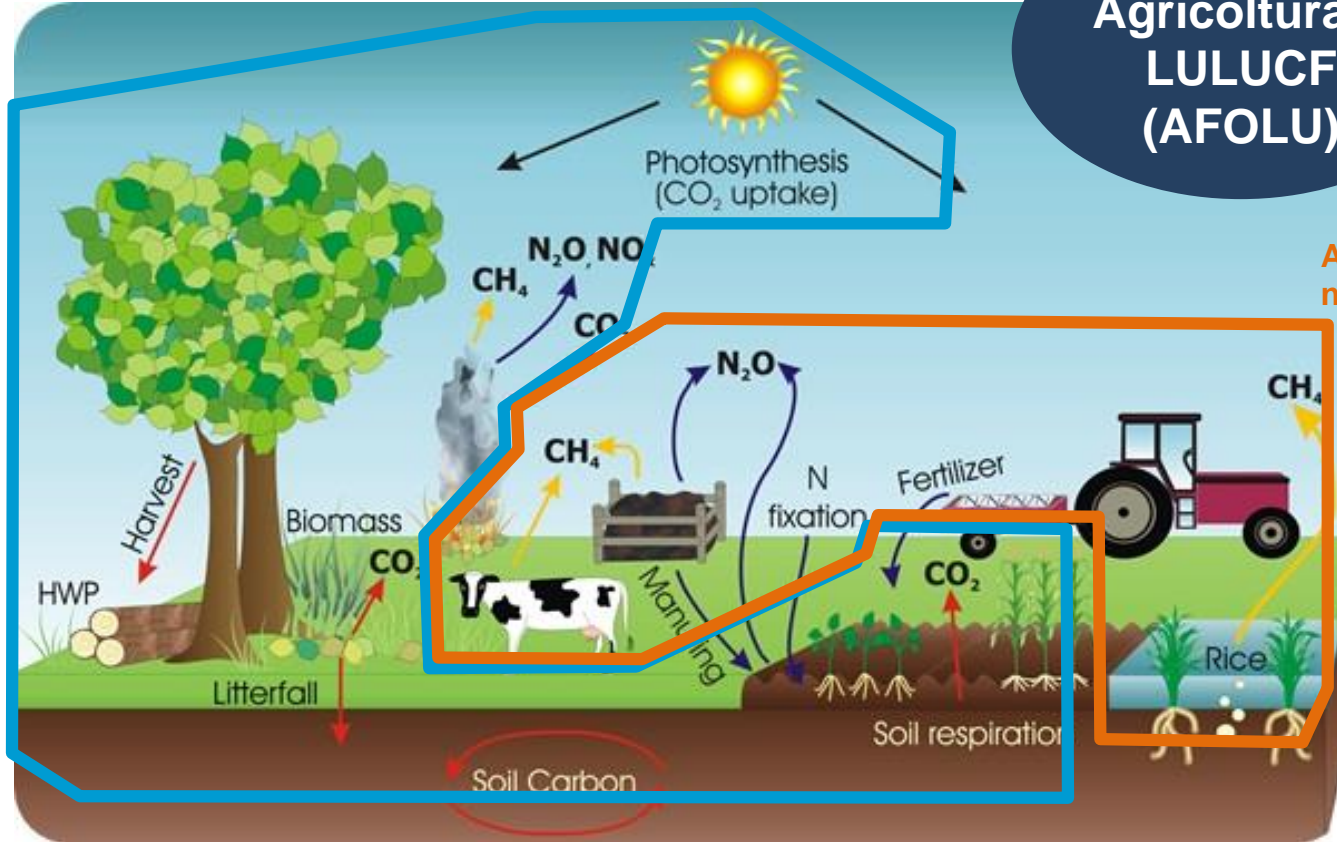
Il bilancio globale del carbonio (Fonte: Global Carbon Budget 2020)



Ecosistemi ed emissioni di GHG

Land Use, Land Use Change and Forestry (LULUCF): CO₂

~11%

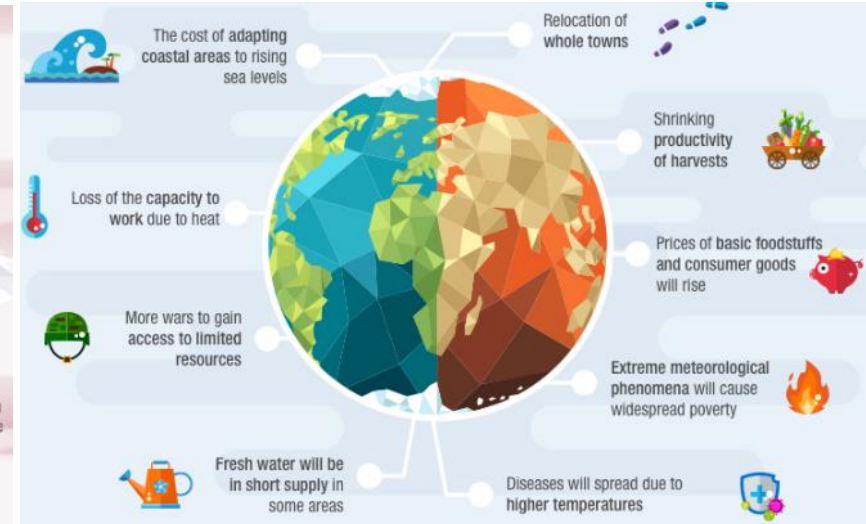
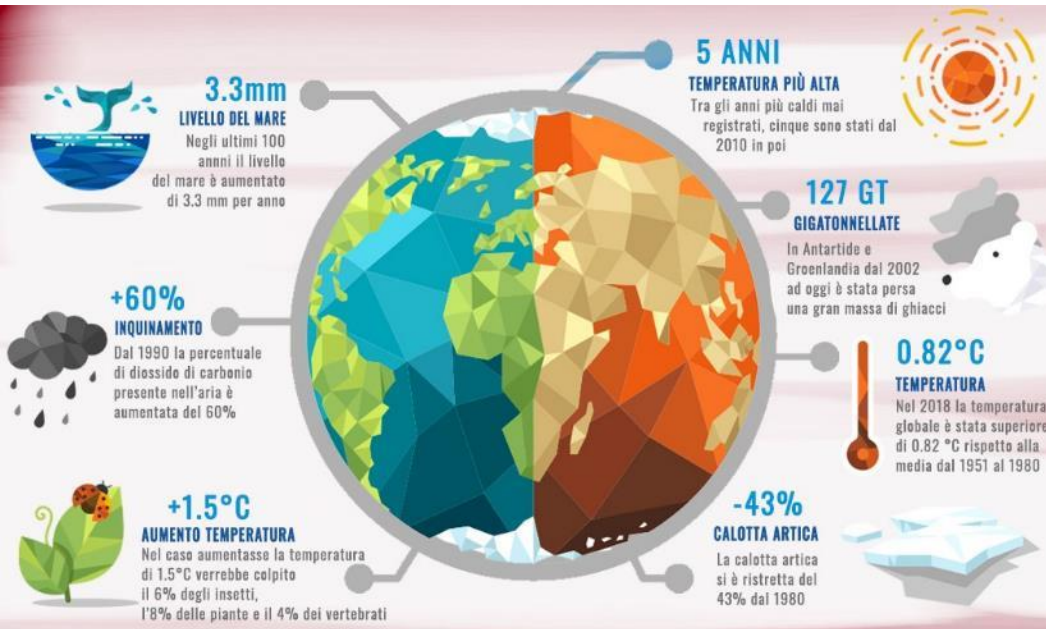


~ 24%
Agricoltura +
LULUCF
(AFOLU)

AGRICOLTURA:
non-CO₂ (CH₄, N₂O)

~13%

Effetti dei Cambiamenti Climatici

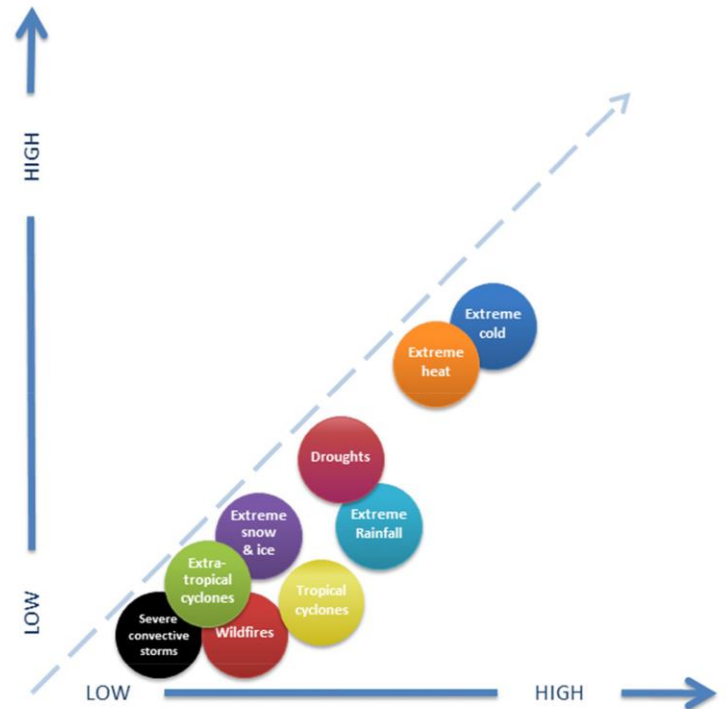


<https://www.iberdrola.com/environment/impacts-of-climate-change>

<https://ilbolive.unipd.it/it/news/dati-cambiamento-climatico-aumentata>



Confidence in capabilities for attribution of specific events to anthropogenic climate change

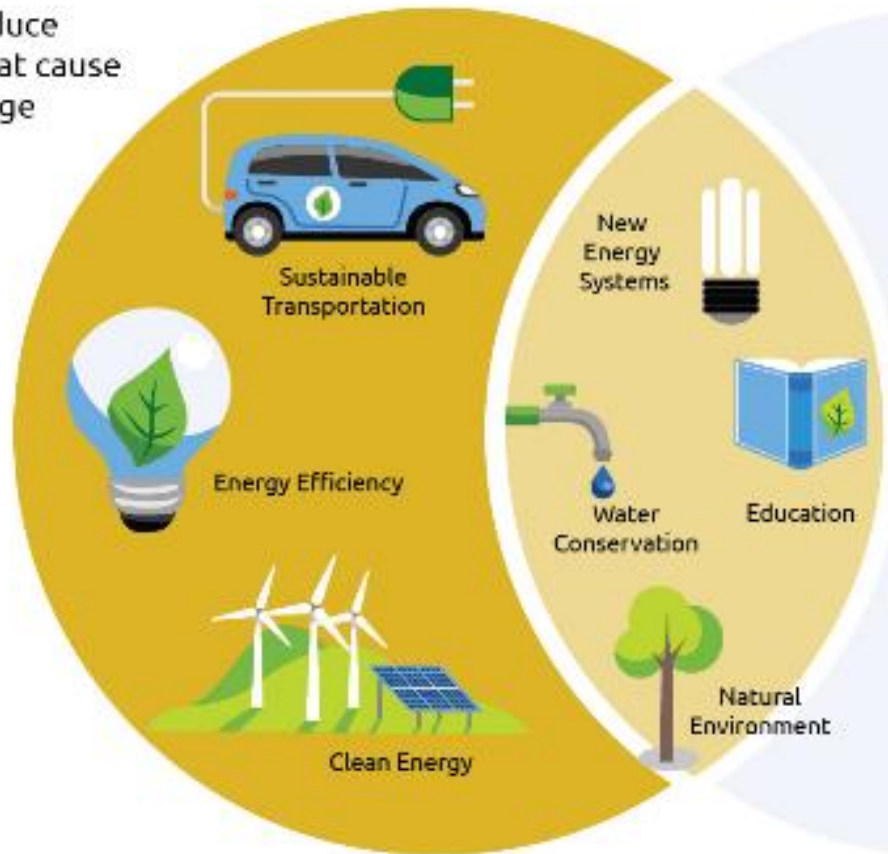


Understanding of effect of climate change on event type

Cosa possiamo fare?

Mitigation

Action to reduce emissions that cause climate change



Adaptation

Action to manage the risks of climate change impacts



Dalla scienza al sistema decisionale: l'UNFCCC e l'IPCC

Le politiche sul clima

UNFCCC: stabilizzare le concentrazioni dei gas serra in atmosfera a un livello tale da prevenire interferenze antropogeniche dannose per il sistema climatico



MILESTONE	YEAR	IMPORTANCE
First World Climate Conference	1979	Lays the foundation for some international climate programmes including the Intergovernmental Panel on Climate Change (IPCC)
IPCC's First assessment report	1990	Provides the first estimates of confidence about the extent of global climate change and the human influences behind it
UN Framework Convention on Climate Change (UNFCCC) signed	1992	A major international climate change treaty representing worldwide agreement that action is needed against climate change
UNFCCC enters into force	1994	Countries signing the UNFCCC are now bound by its rules.
First Conference of the Parties (COP) of the UNFCCC	1995	The first of the (generally annual) international negotiations on climate change stipulated by the UNFCCC, leading to the Kyoto Protocol
Kyoto Protocol signed	1997	Thirty-seven developed nations and economies in transition commit to reducing their emissions by at least five per cent below 1990 levels from 2008-2012
Kyoto Protocol enters into force	2005	Countries with greenhouse gas reduction targets are now committed to them
IPCC's Fifth assessment report	2013-2014	Follows reports in 1995, 2001 and 2007. Makes strong statements about the high likelihood of human influence on the global climate and the consequent impacts
Twenty-first UNFCCC COP in Paris	2015	The meeting is aiming for an agreement to succeed the Kyoto Protocol

COP21, Parigi 2015



- 195 Paesi
- Circa 50 mila partecipanti
- Più di 150 capi di stato



Mitigazione - Obiettivo di lungo termine: contenere l'aumento della temperatura $< 2^{\circ}\text{C}$, meglio se $< 1.5^{\circ}\text{C}$, rispetto ai livelli pre-industriali.

Adattamento - Aumentare la capacità di adattarsi agli impatti del cambiamento climatico

Finanza - Flussi finanziari in linea con il percorso verso uno sviluppo resiliente ai cambiamenti climatici e a basse emissioni.



Rapporti IPCC

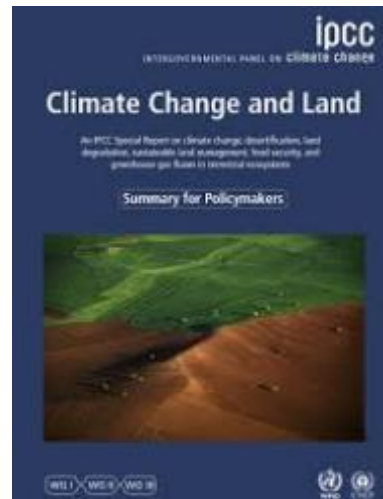
IPCC
INTERGOVERNMENTAL
PANEL ON
CLIMATE CHANGE



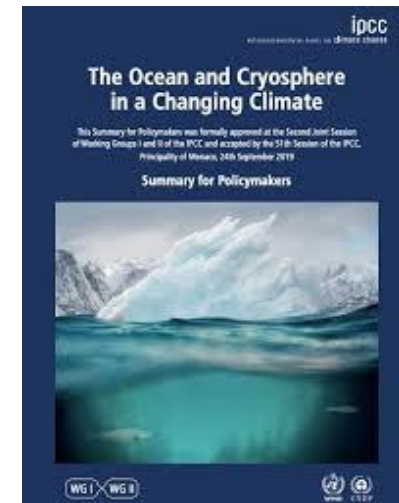
IPCC-AR5



2018

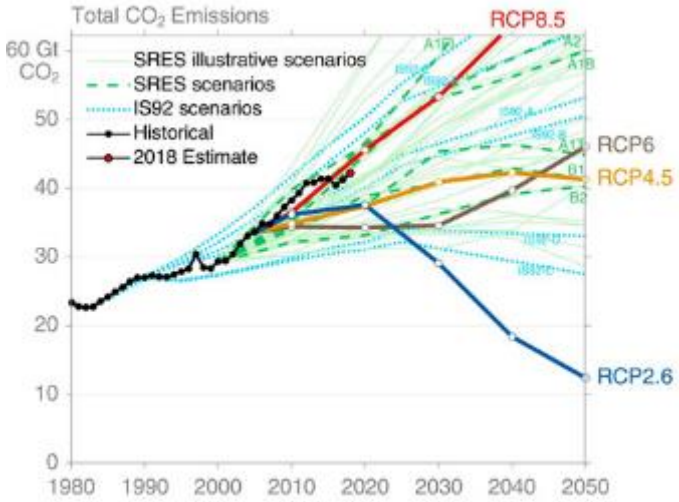


AGOSTO 2019

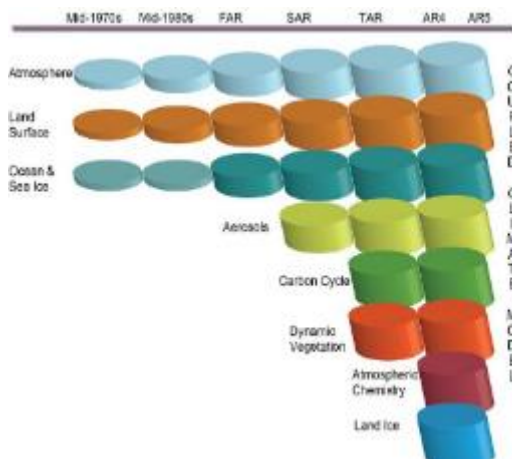


SETTEMBRE 2019

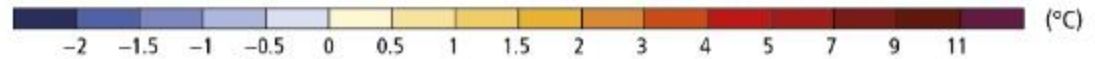
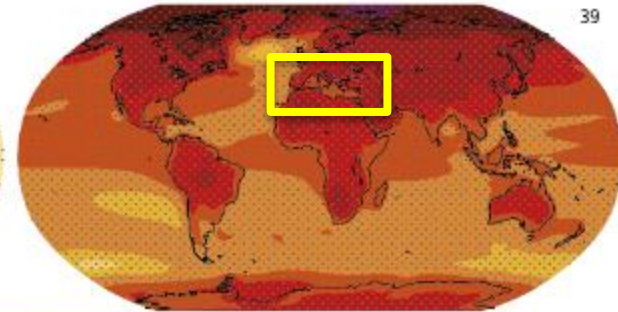
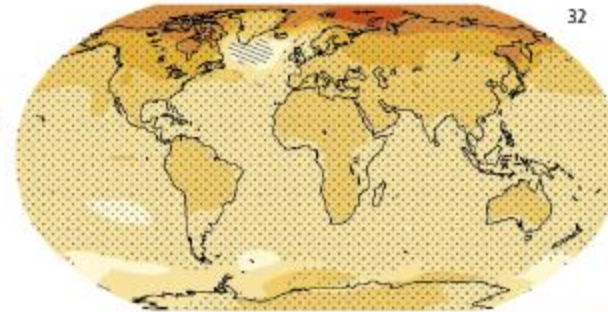
Le anomalie annuali



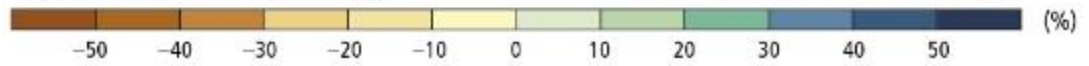
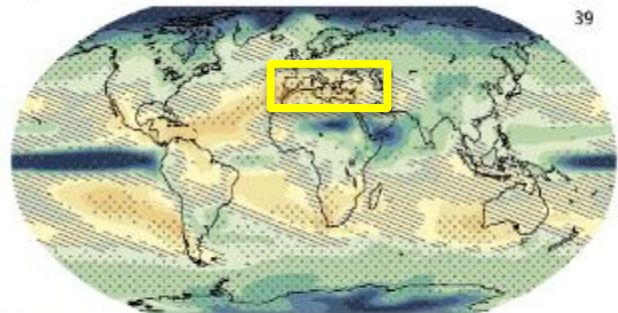
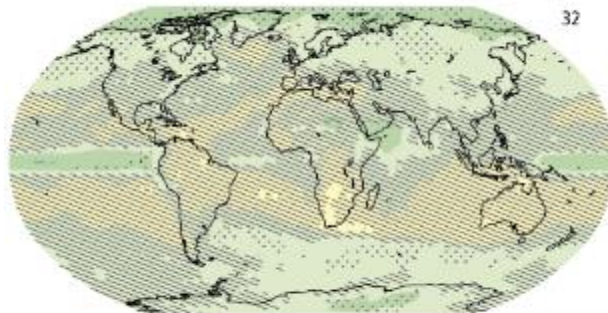
Scenarios	Description	CO ² Concentration (ppm)	Global Warming until 2100 (Mean and Likely Range)
RCP 2.6	Peak in radiative forcing at -3 W/m^2 before 2100 year and then decline	490	1.0 (0.3-1.7) °C
RCP 4.5	Stabilization without overshoot pathway to -4.5 W/m^2 at stabilization after 2100 year	650	1.8 (1.1-2.6) °C
RCP 6.0	Stabilization without overshoot pathway to -6 W/m^2 at stabilization after 2100 year	850	2.2 (1.4-3.1) °C
RCP 8.5	Rising radiative forcing pathway leading to 8.5 W/m^2 by 2100 year	1370	3.7 (2.6-4.8) °C










RCP2.6 RCP8.5
Change in average surface temperature (1986–2005 to 2081–2100)



Change in average precipitation (1986–2005 to 2081–2100)



La regione Mediterranea e il CC: eventi estremi

Region/ region code	Trends in daytime temperature extremes (frequency of hot and cool days)		Trends in heavy precipitation (rain, snow)		Trends in dryness and drought	
	Observed	Projected	Observed	Projected	Observed	Projected
Southern Europe and Mediterranean MED, 13	 Likely increase in hot days (decrease in cool days) in most of the region. Some regional and temporal variations in the significance of the trends. <i>Likely</i> strongest and most significant trends in Iberian peninsula and southern France ^a  Smaller or less significant trends in southeastern Europe and Italy due to change point in trends, strongest increase in hot days since 1976 ^a	 Very likely increase in hot days (decrease in cool days) ^b	 Inconsistent trends across the region and across studies ^a	 Inconsistent changes and/or regional variations ^b	 Overall increase in dryness, <i>likely</i> increase in the Mediterranean ^{a, c}	 Increase in dryness. Consistent increase in area of drought ^{b, d}

Symbols

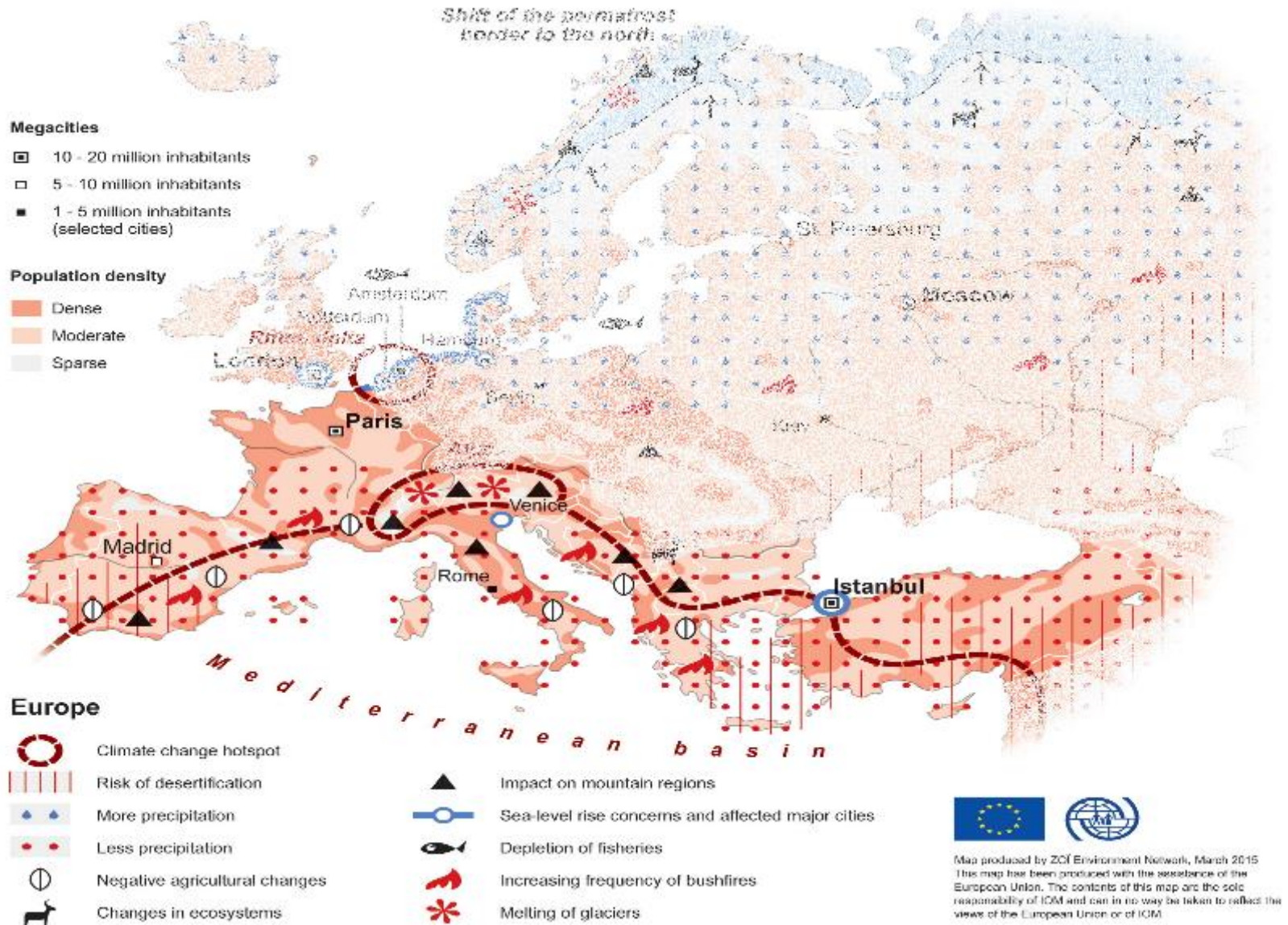
				
Increasing trend or signal	Decreasing trend or signal	Both increasing and decreasing trend or signal	Inconsistent trend or signal or insufficient evidence	No change or only slight change

Level of confidence in findings

		
Low confidence	Medium confidence	High confidence



La regione Mediterranea e le sue fragilità





Rapporti IPCC

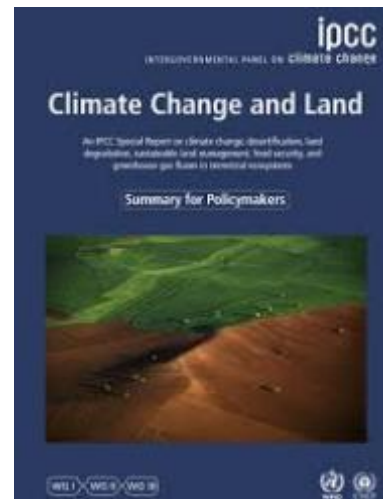
IPCC
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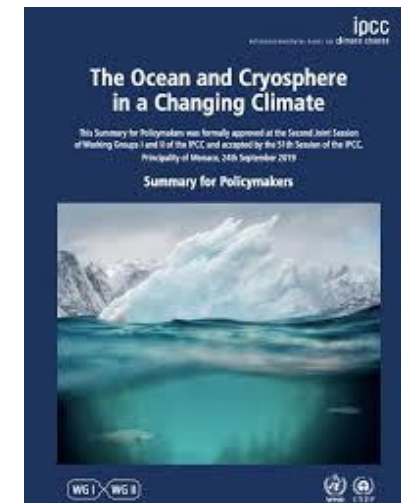
IPCC-AR5



2018



AGOSTO 2019



SETTEMBRE 2019

Global Warming of 1.5°C

An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global pathways for limiting warming to 1.5°C in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.



OGGI

Il riscaldamento globale ha toccato oggi quota +1°C

Gli effetti del **cambiamento climatico si vedono già**, in particolare modo tra le **popolazioni più vulnerabili**

Riduzione della barriera corallina

Innalzamento del livello del mare

Perdita di ghiaccio in Artico

Perdita di biodiversità

Calo della resa dei raccolti agricoli

Ondate di calore

precipitazioni estreme

RISCALDAMENTO GLOBALE DI 1,5°C

Il futuro del pianeta, dell'ambiente, delle economie e delle società è strettamente legato ai cambiamenti climatici.

La **temperatura del pianeta** avrà un ruolo cruciale su questi impatti.

I prossimi **dieci** anni saranno determinanti

Le attività umane sono fondamentali per contenere l'innalzamento della temperatura

Se continuiamo ad **emettere gas serra** gli attuali raggiungeremo **+1,5°C nel 2040**

10

2040

COSA ACCADRÀ

Cosa cambia se la temperatura aumenterà di **1,5°C** o di **2°C**
Molti impatti associati ai cambiamenti climatici comporteranno **rischi minori con un riscaldamento globale minore.**

Mezzo grado in meno fa molta differenza

Salute

migliore qualità dell'aria, del cibo, delle condizioni ambientali

Piante e specie animali

conservazione di biodiversità e protezione habitat di foreste e zone umide

Barriere coralline tropicali

sopravvivenza di barriere che scomparirebbero con maggiore aumento di temperatura

Oceani

contenuto incremento della temperatura dei mari e della loro acidità, riduzione dei rischi per ecosistemi marini, pesca ed economia del mare

Adattamento

minore necessità di adattamento, anche se ci sarà comunque bisogno di farsi trovare pronti di fronte agli impatti dei cambiamenti climatici

1,5 : NON È UNA MISSIONE IMPOSSIBILE, MA MOLTO IMPEGNATIVA

Intraprendere azioni immediate a livello globale e locale

Affrontare trasformazioni complesse e connesse in tutti gli aspetti della società

Zero emissioni di gas serra entro il 2050

1,5°C

Rimozione della CO₂ in eccesso già presente in atmosfera

Riduzione della quantità di energia prodotta

Uso più efficiente di energia



Rapporti IPCC

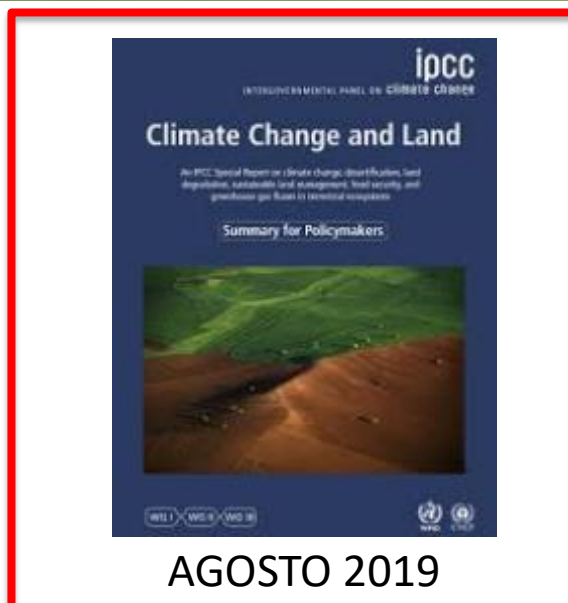
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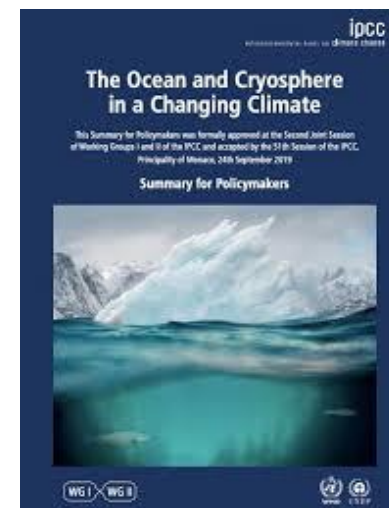
IPCC-AR5



2018



AGOSTO 2019



SETTEMBRE 2019

Rapporto speciale IPCC su cambiamenti climatici e territorio SRCCL (2019)

107 AUTORI

Divisi tra Coordinating Lead Authors,
Lead Authors and Review

52 PAESI

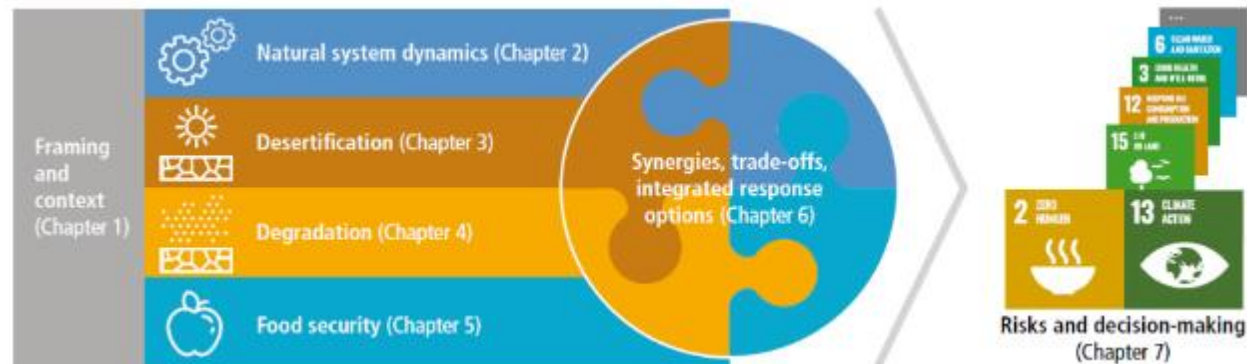
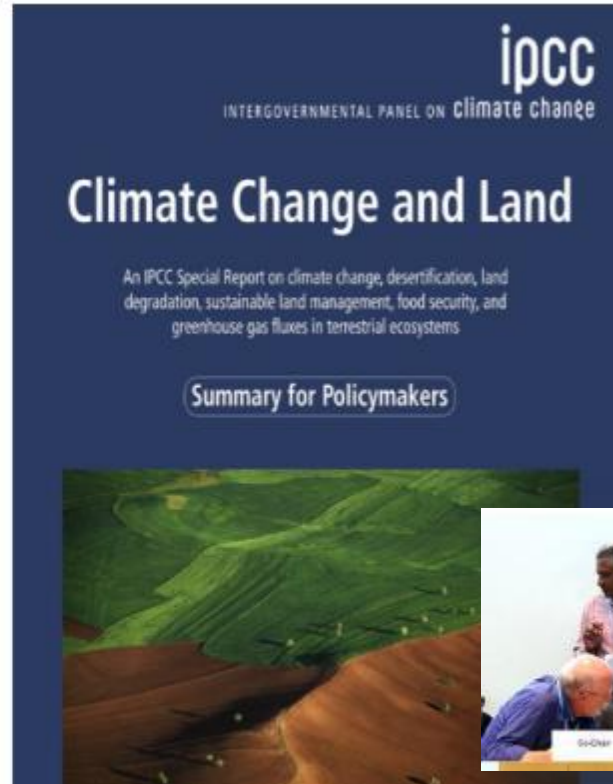
È il primo report dell'IPCC in cui la maggior parte degli autori (53%)
proviene da paesi in via di sviluppo.

7.000 PUBBLICAZIONI

È il numero di ricerche, articoli, papers preso in considerazione dagli
autori del report.

28.275 COMMENTI

Esperti revisori e governi hanno inviato commentimncosi divisi tra
First Order Draft; Second Order Draft e Final Government Draft.



Contesto SRCCL

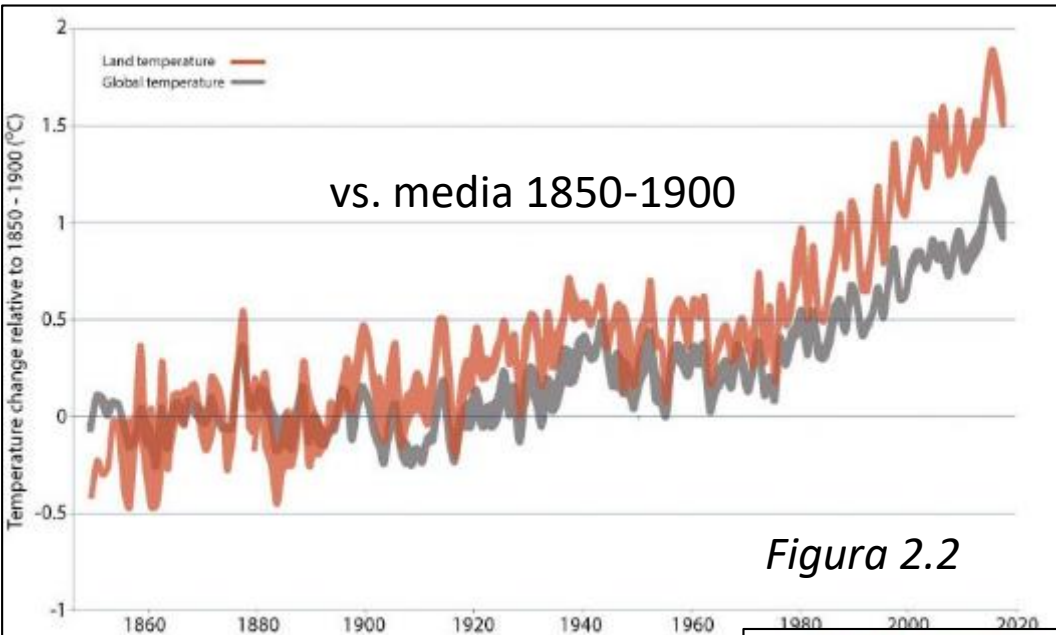
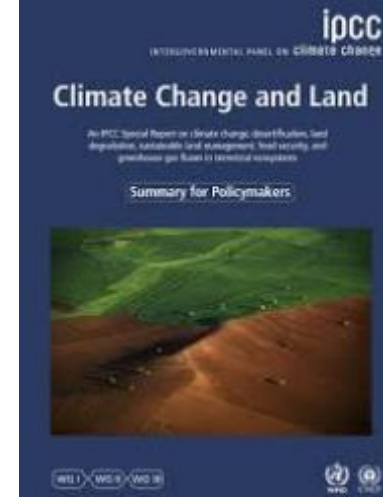


Figura 2.2

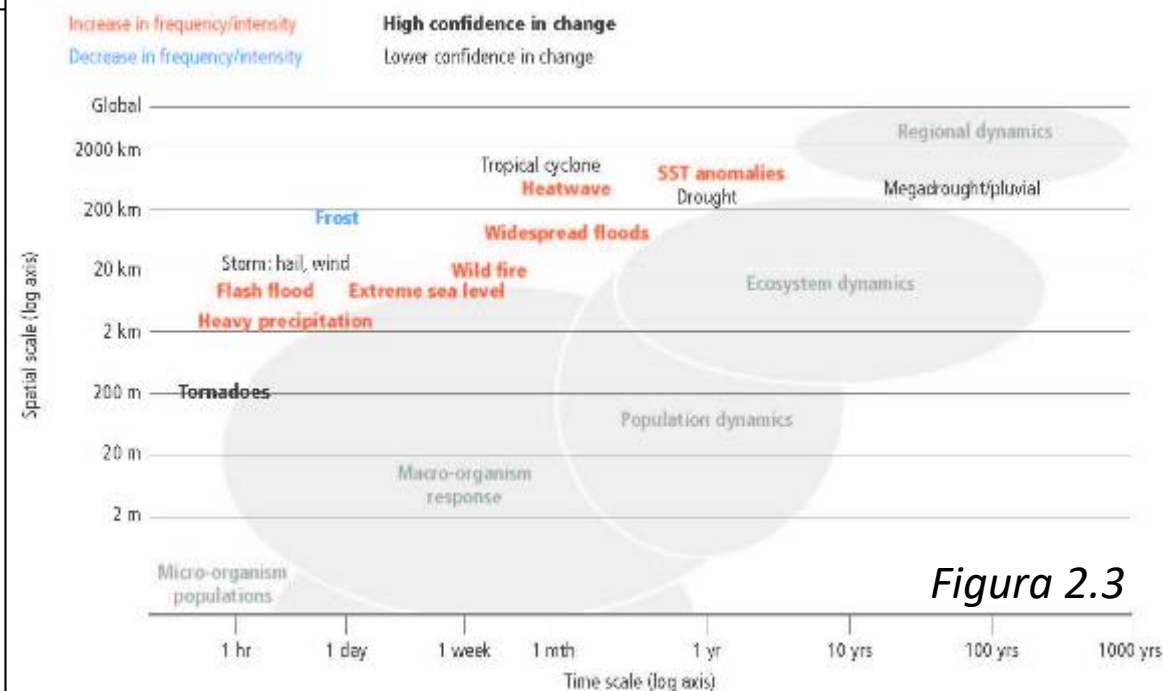


Figura 2.3

SFIDE globali

- Il 70% delle terre emerse sono sfruttate dall'uomo
- L'appropriazione dei servizi ecosistemici e la perdita di biodiversità non ha avuto precedenti nella storia dell'uomo



OPZIONI DI RISPOSTA INTEGRATE



Gestione del territorio

Agricoltura

- Aumento della produttività agricola
- Miglioramento gestione agricola
- Miglioramento dei pascoli
- Miglioramento gestione zootecnica
- Agroforestry
- Diversificazione agricola
- Riduzione della conversione dei pascoli in agricolo
- Gestione idrica integrata

Foreste

- Gestione forestale
- Riduzione della deforestazione e del degrado forestale
- Rimboschimenti e restauro
- Imboschimenti

Suoli

- Aumento del carbonio organico dei suoli
- Riduzione di:
 - dell'erosione
 - Salinizzazione e dei suoli
 - Compattazione del suolo
- Aumento di Biochar

Altri ecosistemi

- Gestione degli incendi
- Riduzione della instabilità dei pendii
- Riduzione dell'inquinamento (inclusa acidificazione)
- Gestione delle specie invasive
- Restauro e riduzione di conversione delle aree umide costiere
- Restauro e riduzione della conversione delle torbiere
- Conservazione biodiversità

CDR

- Aumento del dilavamento dei minerali
- Bioenergia e BECCS

Gestione filiera

Lato domanda

- Cambio alimentazione
- Riduzione delle perdite post-raccolta
- Riduzione degli sprechi alimentari (distributori e consumatori)
- Sostituzione materiali

Lato produzione

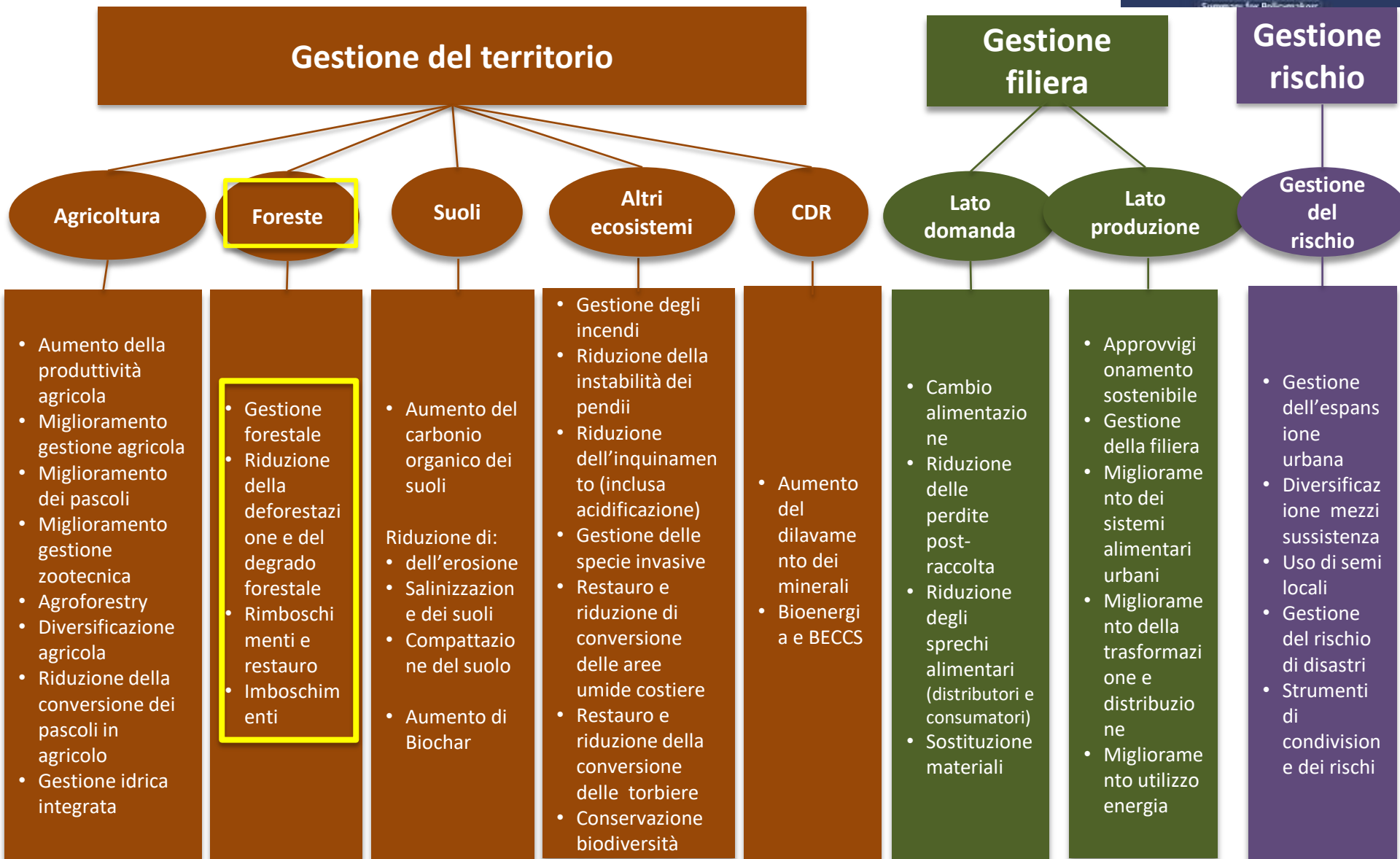
- Approvvigionamento sostenibile
- Gestione della filiera
- Miglioramento dei sistemi alimentari urbani
- Miglioramento della trasformazione e distribuzione
- Miglioramento utilizzo energia

Gestione rischio

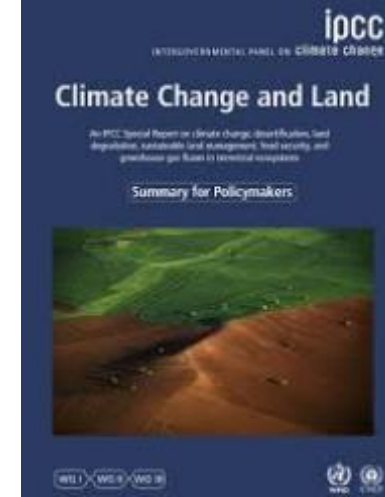
Gestione del rischio

- Gestione dell'espansione urbana
- Diversificazione mezzi sussistenza
- Uso di semi locali
- Gestione del rischio di disastri
- Strumenti di condivisione e dei rischi

OPZIONI DI RISPOSTA INTEGRATE



Opzioni di risposta: FORESTE



Impatti

Integrated response option	Mitigation	Adaptation	Desertification	Land degradation	Food security
Forest management	(M)	(L)	(L)	(L)	(L)
Reduced deforestation and forest degradation	(H)	(L)	(L)	(L)	(L)
Reforestation and forest restoration	(M)	(M)	(M)	(M)	(M)
Afforestation	(M)	(M)	(M)	(L)	(M)



Potenziale di mitigazione

0.4-2.1 GtCO₂e/anno

0.4-5.8 GtCO₂e/anno

1.5-10.1 GtCO₂e/anno

0.5-8.9 GtCO₂e/anno

Fattibilità

Response option	Saturation	Reversibility	Cost	Technological	Institutional	Socio-cultural	Environmental and geophysical
Forest management	Orange	Orange	Light orange	White	Orange	Orange	White
Reduced deforestation and forest degradation	Dark blue	Dark blue	Orange	White	Orange	Orange	Orange
Reforestation and forest restoration	Orange	Orange	Light orange	White	Orange	Orange	White
Afforestation	Orange	Orange	Light orange	White	Orange	Orange	Orange

Saturation and reversibility

- Dark blue: Not important
- Orange: A concern

Cost

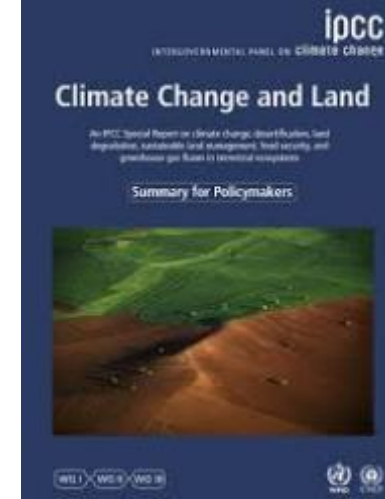
- Dark blue: Low cost (<10 USD tCO₂e⁻¹ or <20 USD ha⁻¹)
- Light orange: Medium cost (10-100 USD tCO₂e⁻¹ or <20-200 USD ha⁻¹)
- Orange: High cost (>100 USD tCO₂e⁻¹ or >200 USD ha⁻¹)

Technological, institutional, socio-cultural and environmental and geophysical barriers

- Dark blue: High current feasibility (no barriers)
- Light orange: Medium current feasibility (moderate barriers)
- Orange: Low current feasibility (large barriers)
- Grey: Variable barriers

L,M,H=Low, Medium, High confidence

Opzioni di risposta: FORESTE



Integrated response options based on land management	Habitat creation and maintenance	Pollination and dispersal of seeds and other propagules	Regulation of air quality	Regulation of climate	Regulation of ocean acidification	Regulation of freshwater quantity, flow and timing	Regulation of freshwater and coastal water quality	Formation, protection and decontamination of soils and sediments	Regulation of hazards and extreme events	Regulation of organisms detrimental to humans	Energy	Food and feed	Materials and assistance	Medicinal, biochemical and genetic resources	Learning and inspiration	Physical and psychological experiences	Supporting identities	Maintenance of options	
Forest management and forest restoration	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	+ or -	Small positive impacts or low evidence	Medium positive impacts, some evidence		+ or -	Small positive impacts or low evidence					
Reduced deforestation and forest degradation	Medium positive impacts, some evidence	Medium positive impacts, some evidence		Medium positive impacts, some evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence		Small positive impacts or low evidence		Medium negative impacts, medium evidence	Small positive impacts or low evidence	Small positive impacts or low evidence					
Reforestation	Medium positive impacts, some evidence	Small positive impacts or low evidence		Medium positive impacts, some evidence	Small positive impacts or low evidence	Small positive impacts or low evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence	+ or -	Small positive impacts or low evidence	Medium positive impacts, some evidence		Small positive impacts or low evidence						
Afforestation	Small positive impacts or low evidence			Medium positive impacts, some evidence				+ or -	+ or -	Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium negative impacts, medium evidence	Small positive impacts or low evidence	Small positive impacts or low evidence					

- Large positive impacts, strong evidence
- Medium positive impacts, some evidence
- Small positive impacts or low evidence
- Low negative impacts or low evidence
- Medium negative impacts, medium evidence
- Large negative impacts, high evidence

Opzioni e Servizi Ecosistemici

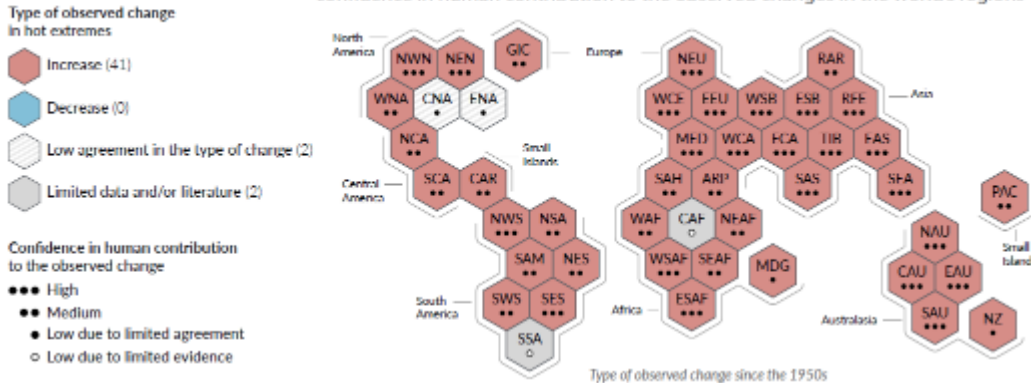
Opzioni e SDGs

Integrated response options based on land management	GOAL 1: No poverty	GOAL 2: Zero hunger	GOAL 3: Good health and well-being	GOAL 4: Quality education	GOAL 5: Gender equality	GOAL 6: Clean water and sanitation	GOAL 7: Affordable and clean energy	GOAL 8: Decent work and economic growth	GOAL 9: Industry, innovation and infrastructure	GOAL 10: Reduced inequality	GOAL 11: Sustainable cities and communities	GOAL 12: Responsible consumption and production	GOAL 13: Climate action	GOAL 14: Life below water	GOAL 15: Life on land	GOAL 16: Peace, justice and strong institutions	GOAL 17: Partnerships to achieve the goals
Forest management and forest restoration	Small positive impacts or low evidence	Medium positive impacts, some evidence	Large positive impacts, strong evidence		Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence		Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Large positive impacts, strong evidence		
Reduced deforestation and forest degradation	+ or -	Small positive impacts or low evidence	Medium positive impacts, some evidence		Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium negative impacts, medium evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence		
Reforestation	+ or -	Low negative impacts or low evidence			Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence		Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence		
Afforestation	Low negative impacts or low evidence				Small positive impacts or low evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Small positive impacts or low evidence	Medium positive impacts, some evidence		Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Medium positive impacts, some evidence	Large positive impacts, strong evidence		

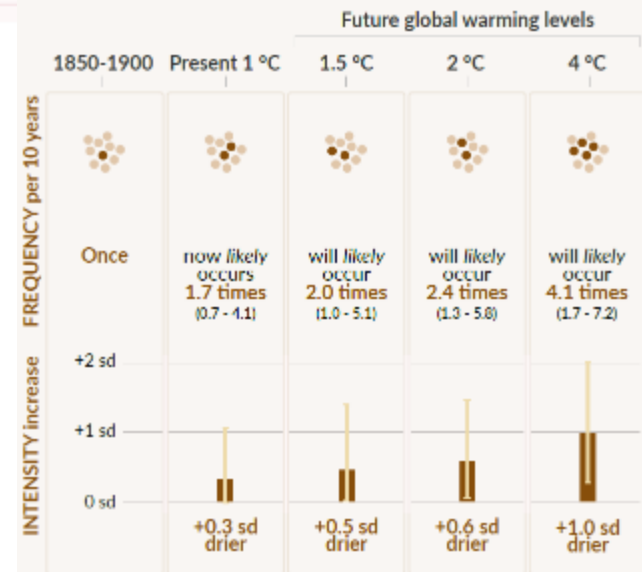
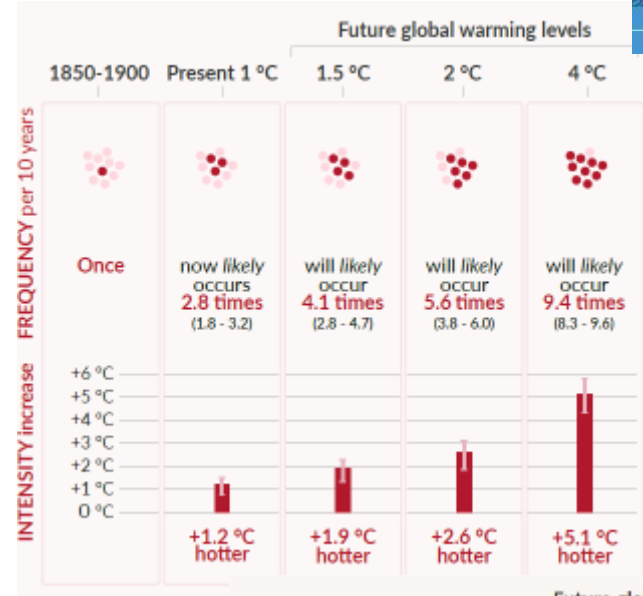
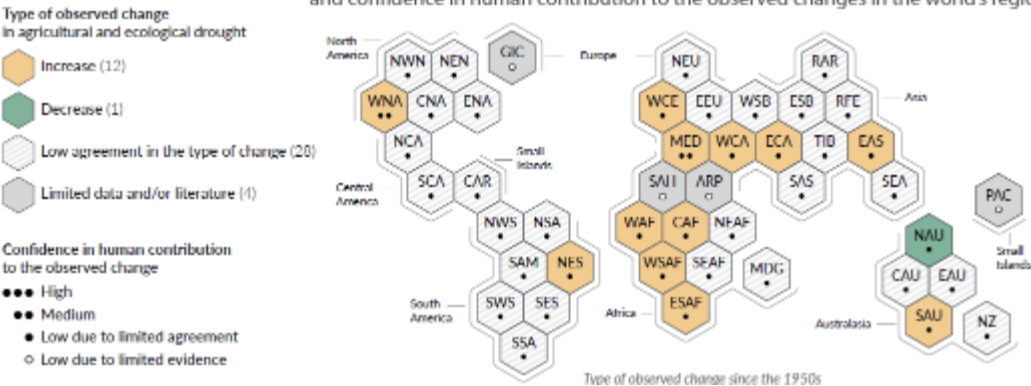
IPCC AR6

Scenario	Near term, 2021–2040		Mid-term, 2041–2060		Long term, 2081–2100	
	Best estimate (°C)	Very likely range (°C)	Best estimate (°C)	Very likely range (°C)	Best estimate (°C)	Very likely range (°C)
SSP1-1.9	1.5	1.2 to 1.7	1.6	1.2 to 2.0	1.4	1.0 to 1.8
SSP1-2.6	1.5	1.2 to 1.8	1.7	1.3 to 2.2	1.8	1.3 to 2.4
SSP2-4.5	1.5	1.2 to 1.8	2.0	1.6 to 2.5	2.7	2.1 to 3.5
SSP3-7.0	1.5	1.2 to 1.8	2.1	1.7 to 2.6	3.6	2.8 to 4.6
SSP5-8.5	1.6	1.3 to 1.9	2.4	1.9 to 3.0	4.4	3.3 to 5.7

a) Synthesis of assessment of observed change in **hot extremes** and confidence in human contribution to the observed changes in the world's regions



c) Synthesis of assessment of observed change in **agricultural and ecological drought** and confidence in human contribution to the observed changes in the world's region



I dati:
dove e quali?

Dati climatici osservati

Dati puntuali / stazioni

ARPA

Agrometeo

Autorità di bacino/servizio idrografico

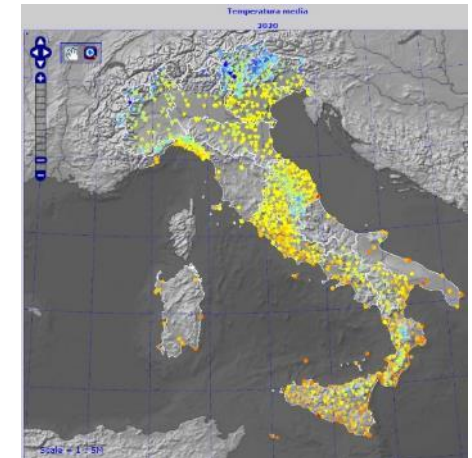
Ecc.



Database nazionale

(include grid → GIS)

SCIA (ISPRA)

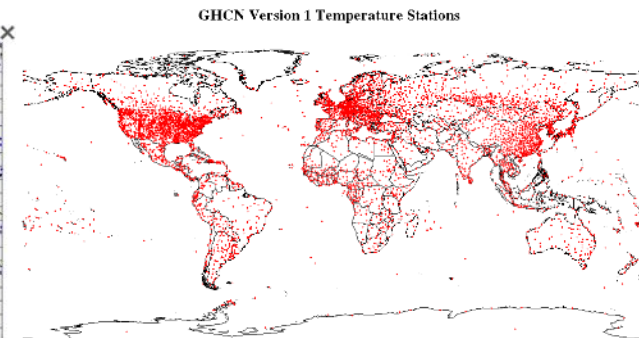
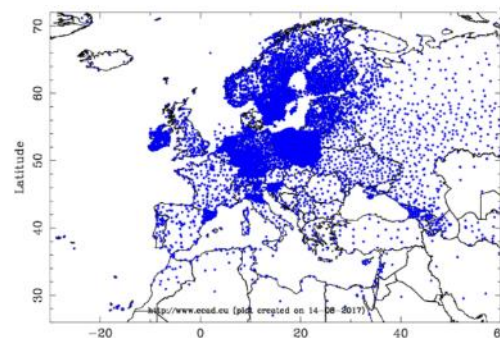


Database internazionali

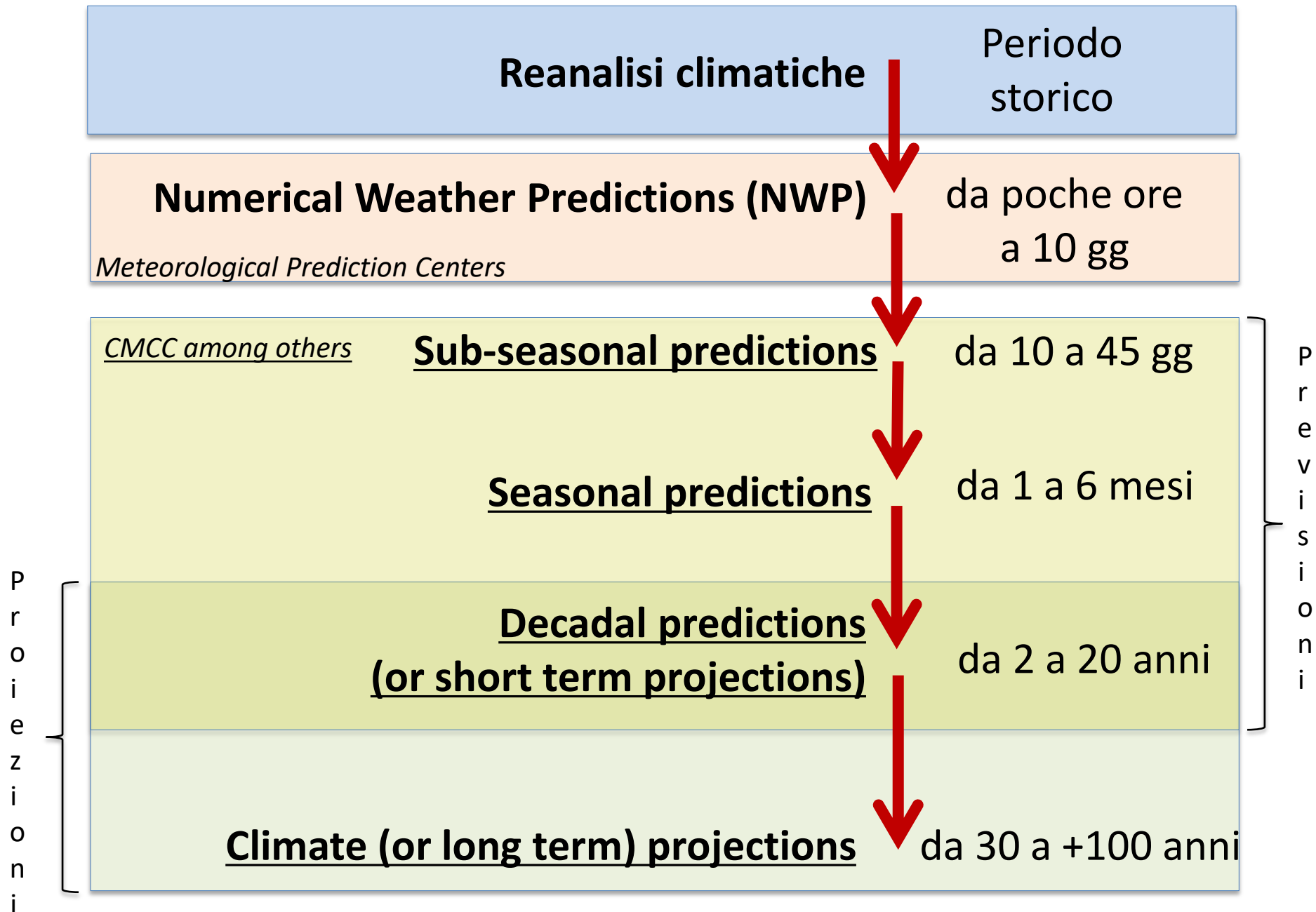
(include grid → GIS)

ECAD + E-OBS (Europe)

GHCN (U.S.), CRU (UK)



Simulazioni numeriche



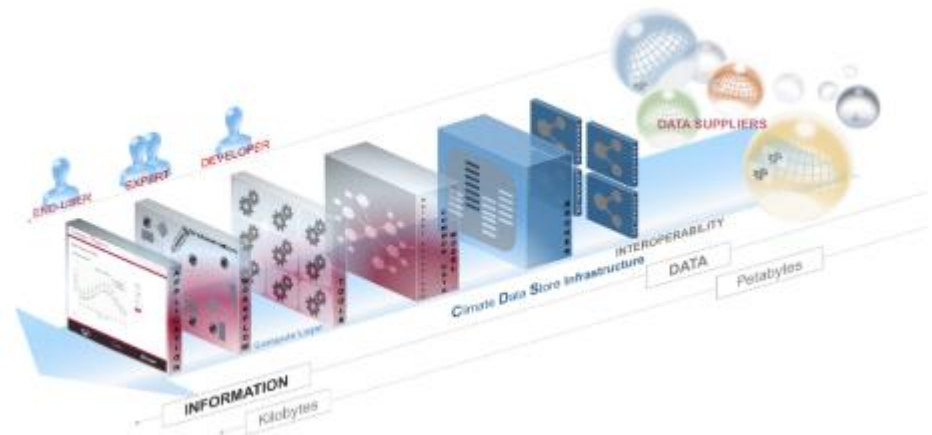
Programma Copernicus & C3S

Copernicus

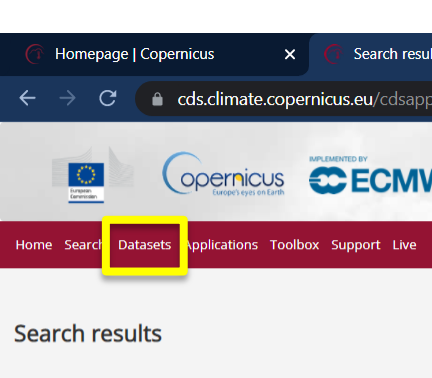


Copernicus Climate Change Service (C3S)

Climate Data Store (CDS)



CDS Dataset: Reanalisi climatiche ERA5

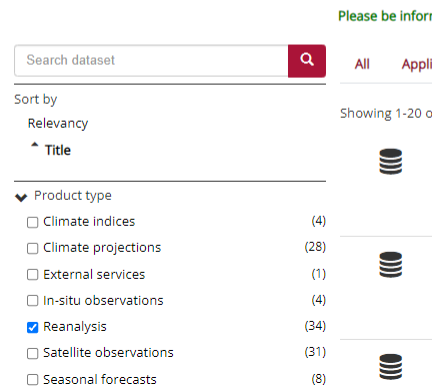


Homepage | Copernicus Search results

cds.climate.copernicus.eu/cdsapp

Home Search **Datasets** Applications Toolbox Support Live

Search results



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Search dataset All Appli

Sort by

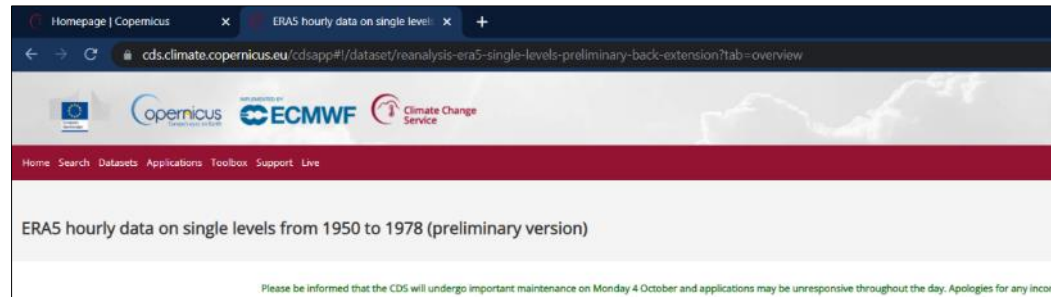
Relevancy

^ Title

Showing 1-20 of 20 results

Product type

- Climate indices (4)
- Climate projections (28)
- External services (1)
- In-situ observations (4)
- Reanalysis (34)
- Satellite observations (31)
- Seasonal forecasts (8)



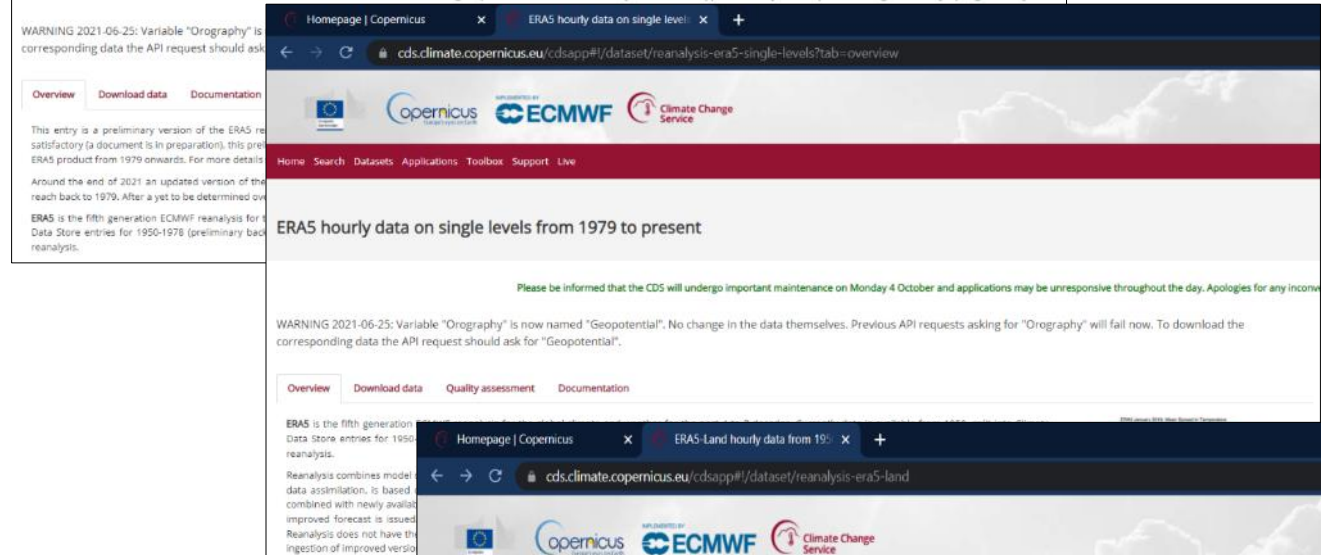
Homepage | Copernicus ERAS hourly data on single level

cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-era5-single-levels-preliminary-back-extension?tab=overview

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ERAS hourly data on single levels from 1950 to 1978 (preliminary version)

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Homepage | Copernicus ERAS hourly data on single level

cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-era5-single-levels?tab=overview

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ERAS hourly data on single levels from 1979 to present

Please be informed that the CDS will undergo important maintenance on Monday 4 October and applications may be unresponsive throughout the day. Apologies for any inconvenience.

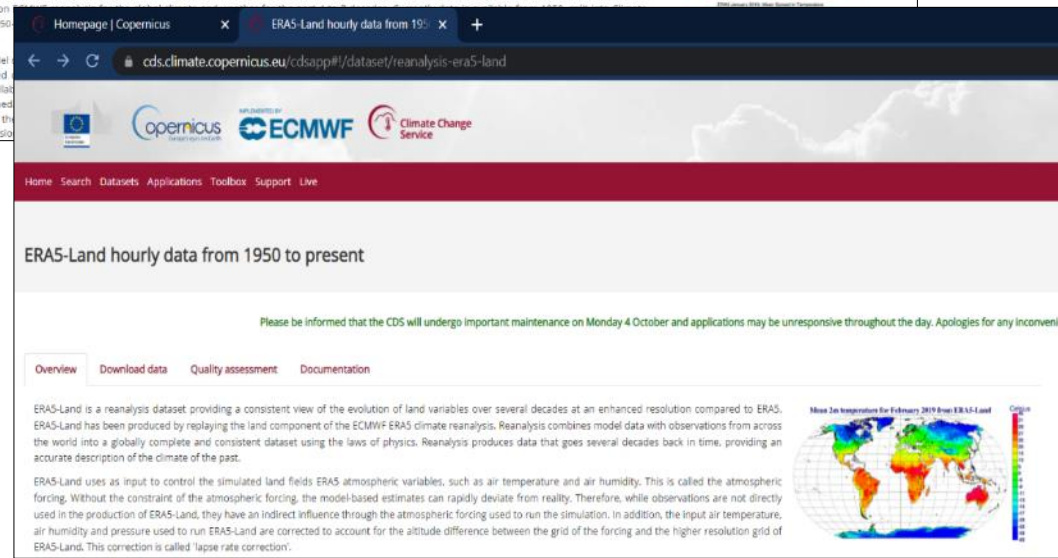
WARNING 2021-06-25: Variable "Orography" is now named "Geopotential". No change in the data themselves. Previous API requests asking for "Orography" will fail now. To download the corresponding data the API request should ask for "Geopotential".

Overview Download data Quality assessment Documentation

ERAS is the fifth generation ECMWF reanalysis for the Data Store entries for 1950-1978 (preliminary back reanalysis).

Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. Reanalysis produces data that goes several decades back in time, providing an accurate description of the climate of the past.

ERAS-Land uses as input to control the simulated land fields ERAS atmospheric variables, such as air temperature and air humidity. This is called the atmospheric forcing. Without the constraint of the atmospheric forcing, the model-based estimates can rapidly deviate from reality. Therefore, while observations are not directly used in the production of ERAS-Land, they have an indirect influence through the atmospheric forcing used to run the simulation. In addition, the input air temperature, air humidity and pressure used to run ERAS-Land are corrected to account for the altitude difference between the grid of the forcing and the higher resolution grid of ERAS-Land. This correction is called 'lapse rate correction'.



Homepage | Copernicus ERAS-Land hourly data from 1950 to present

cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-era5-land

Home Search Datasets Applications Toolbox Support Live

ERAS-Land hourly data from 1950 to present

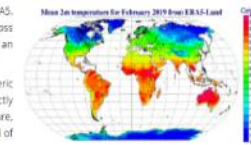
Please be informed that the CDS will undergo important maintenance on Monday 4 October and applications may be unresponsive throughout the day. Apologies for any inconvenience.

Overview Download data Quality assessment Documentation

ERAS-Land is a reanalysis dataset providing a consistent view of the evolution of land variables over several decades at an enhanced resolution compared to ERAS. ERAS-Land has been produced by replaying the land component of the ECMWF ERA5 climate reanalysis. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. Reanalysis produces data that goes several decades back in time, providing an accurate description of the climate of the past.

ERAS-Land uses as input to control the simulated land fields ERAS atmospheric variables, such as air temperature and air humidity. This is called the atmospheric forcing. Without the constraint of the atmospheric forcing, the model-based estimates can rapidly deviate from reality. Therefore, while observations are not directly used in the production of ERAS-Land, they have an indirect influence through the atmospheric forcing used to run the simulation. In addition, the input air temperature, air humidity and pressure used to run ERAS-Land are corrected to account for the altitude difference between the grid of the forcing and the higher resolution grid of ERAS-Land. This correction is called 'lapse rate correction'.

More 3m temperature for February 2019 from ERA5-Land



Anche serie mensili!

CDS Dataset: Previsioni stagionali

Seasonal forecasts | Copernicus

climate.copernicus.eu/seasonal-forecasts

implemented by ECMWF as part of The Copernicus Programme

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European Commission Copernicus Climate Change Service

IMPLEMENTED BY ECMWF

Seasonal forecasts

The C3S regularly publishes seasonal forecast products. These products are based on data from several state-of-the-art seasonal prediction systems.

Home / What we do / Climate datasets / Seasonal forecasts

The seasonal forecasts include data as well as graphical products, and are updated every month – currently on the **13th day at 12 UTC**. They cover a time period of six months.

The graphical products consist of maps or time series for a number of forecast variables (air and sea-surface temperature, atmospheric circulation and precipitation); the interface offers the facility to navigate the full set of graphics. Multi-system combinations, as well as predictions from the individual component systems, are available.

[Graphical forecast products >](#)

Data for a larger set of variables are available from each of the contributors to the multi-system, in the original time resolution and as monthly means (including monthly-mean anomalies); these data can be accessed through the C3S Climate Data Store (CDS).

[Digital forecast data and products >](#)

RELATED NEWS

[C3S provides early warning to the energy industry >](#)

[Enhanced seasonal forecast system now available >](#)

[C3S multi-model seasonal forecasting system takes over from EUROSIP >](#)



+ NCEP (US), JMA (JP), ECCO (CA)

CDS Previsioni stagionali: bollettini

C3S | Charts |

← → ↻ climate.copernicus.eu/charts/c3s_seasonal/?facets=Centres,C3S%20multi-system 🔍 ☆ M

69 matching items
No filters applied

Filters

Filter

Parameters

- MSLP (9)
- SST (18)
- T2m (9)
- T850 (9)
- geopotential height 500hPa (9)
- precipitation (9)
- zonal wind 10hPa (6)

Plot type

- Maps (34)
- Time series (15)

Centres

- C3S multi-system (7)
- CMCC (8)
- DWD (8)
- ECCC (7)
- ECMWF (8)
- JMA (8)
- Met Office (8)
- Meteo-France (8)
- NCEP (7)

C3S multi-system MSLP	C3S multi-system SST	C3S multi-system SST Indices	C3S multi-system T2m	C3S multi-system T850	C3S multi-system geopotential height	C3S multi-system precipitation	CMCC MSLP
CMCC SST	CMCC SST Indices	CMCC T2m	CMCC T850	CMCC U10hPa	CMCC geopotential height 500hPa	CMCC precipitation	DWD MSLP
DWD SST	DWD SST Indices	DWD T2m	DWD T850	DWD U10hPa	DWD geopotential height 500hPa	DWD precipitation	ECCC MSLP
ECCC SST	ECCC SST Indices	ECCC T2m	ECCC T850	ECCC geopotential height 500hPa	ECCC precipitation	ECMWF MSLP	ECMWF SST
ECMWF SST Indices	ECMWF T2m	ECMWF T850	ECMWF U10hPa	ECMWF geopotential height 500hPa	ECMWF precipitation	JMA MSLP	JMA SST
JMA SST Indices	JMA T2m	JMA T850	JMA U10hPa	JMA geopotential height 500hPa	JMA precipitation	Met Office MSLP	Met Office SST
Met Office SST Indices	Met Office T2m	Met Office T850	Met Office U10hPa	Met Office geopotential height 500hPa	Met Office precipitation	Meteo-France MSLP	Meteo-France SST

CDS Previsioni stagionali: ultimo bollettino



[Home](#) / [Charts](#)

C3S multi-system T2m

C3S seasonal charts

Base time: Sep 2021 | Map type (forecast...) | Area: Europe

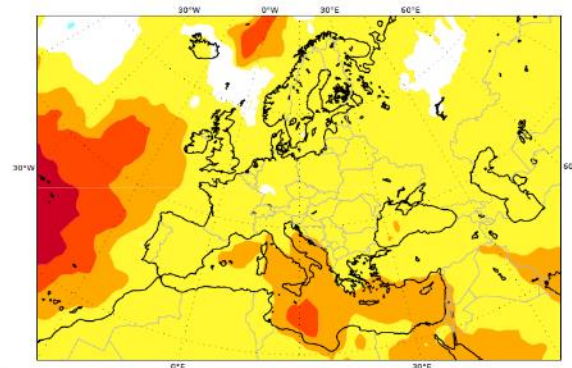
Results

1 matching items

- Centres: C3S multi-system / Parameters: T2m
- C3S multi-system T2m
Multi-system combination sp...

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECFC
Prob(most likely category of 2m temperature) DJF 2021/22
Nominal forecast start: 01/09/21
Unweighted mean

← below lower tercile above upper tercile →
70..100% 60..70% 50..60% 40..50% other 40..50% 50..60% 60..70% 70..100%



Dataset: proiezioni climatiche

Search results

cds.climate.copernicus.eu/cdsapp#!/search?type=dataset&keywords=((%20"Product%20type:%20Climate%20projections"%20)%20AND%20(%20"Spatial%20coverage:%20Global"%20))

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Product type

- Climate projections (9)
- External services (1)
- In-situ observations (2)
- Reanalysis (20)
- Satellite observations (25)
- Seasonal forecasts (7)

Variable domain

- Atmosphere (surface) (7)
- Atmosphere (upper air) (5)
- Land (biosphere) (1)


Spatial coverage


- Europe (17)
- Global (9)


Temporal coverage


- Future (9)


Showing 1-9 of 9 results for **Climate projections** **Global**

-  **CMIP5 monthly data on single levels**


This catalogue entry provides monthly climate projections on single levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Coupled Model Intercomparison Project (CMIP5). The term "single levels" is used to express that the variables are computed at one vertical level which can be surface (or a level close to the surface) or a ded...
-  **CMIP6 climate projections**

This catalogue entry provides daily and monthly global climate projections data from a large number of experiments, models and time periods computed in the framework of the sixth phase of the Coupled Model Intercomparison Project (CMIP6). CMIP6 data underpins the Intergovernmental Panel on Climate Change 6th Assessment Report. The use of these data is mostly aimed at: addressing outstanding scienc...
-  **CMIP5 daily data on single levels**

This catalogue entry provides daily climate projections on single levels from a large number of experiments, models, members and time periods computed in the framework of the fifth phase of the Coupled Model Intercomparison Project (CMIP5). The term "single levels" is used to express that the variables are computed at one vertical level which can be surface (or a level close to the surface) or a d...
-  **CMIP5 monthly data on pressure levels**

This catalogue entry provides monthly climate projections on pressure levels from a large number of experiments, models, members and time periods computed in the framework of the fifth phase of the Coupled Model Intercomparison Project (CMIP5). The term "pressure levels" is used to express that the variables were computed at multiple vertical levels, which may differ in number and location among t...
-  **CMIP5 daily data on pressure levels**

This catalogue entry provides daily climate projections on pressure levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Coupled Model Intercomp...



Dataset derivati...

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Search results

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Search dataset

All

Showing 1-1 of 1 results for [Climate projections](#) [Land \(biosphere\)](#) [Global](#) [Future](#)

- Sort by
- Relevancy
- Title
- Product type
- Climate projections (1)
- Variable domain
- Atmosphere (surface) (7)
 - Atmosphere (upper air) (5)
 - Land (biosphere) (1)
- Spatial coverage
- Europe (2)
 - Global (1)
- Temporal coverage
- Future (1)
 - Past (1)
 - Present (1)



Agroclimatic indicators from 1951 to 2009 derived from climate projections

This dataset provides agroclimatic indicators used to characterise plant-climate interactions for global agriculture. Agroclimatic indicators are useful in conveying climate variability and change in the terms that are meaningful to the agricultural sector. The objective of this dataset is to provide these indicators at a global scale in an easily accessible and usable format for further downstream...

MAIN VARIABLES		
Variable	Description	Units
CDD	Maximum number of consecutive dry days (Drought spell)	day
CFD	Maximum number of consecutive frost days (Cold spell)	day
CSDI	Cold-spell duration index	day
WSDI	Warm-spell duration index	day
CSU	Maximum number of consecutive summer days (Hot spell)	day
CWD	Maximum number of consecutive wet days (Wet spell)	day
WW	Warm and wet days	day
DTR	Mean of diurnal temperature range	°C
BEDD	Biologically Effective Degree Days	°C
GSL	Growing Season Length	day
FD	Frost Days	day
ID	Ice Days	day
R10mm	Heavy precipitation days	day
R20mm	Very heavy precipitation days	day
RR	Precipitation sum	mm
RR1	Wet Days	day
SDII	Simple daily intensity index	mm
SU	Summer days	day
TG	Mean of daily mean temperature	K
TN	Mean of daily minimum temperature	K
TNn	Minimum value of the daily minimum Temperature	K
TNx	Maximum value of the daily minimum temperature	K
TR	Tropical nights	day
TX	Mean of daily maximum temperature	K
TXn	Minimum value of daily maximum temperature	K
TXx	Maximum value of daily maximum temperature	K



Applicazioni

ERA5 explorer

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Overview Application Documentation Source code

Full screen

Click anywhere on the map or search for a city to discover a range of local climate statistics for the period 1979-2020.
This application is driven by ERA5, the fifth generation ECMWF atmospheric reanalysis of the global climate. Inspired by [Lobelia's Past Climate Explorer](#).

Search...

- Average wind speed (ms⁻¹)
- Average annual precipitation tot...
- Average temperature (°C)
- States and provinces*
- Country boundaries*

Contact

ECMWF Support Portal

Licence

Licence to use Copernicus Products

Publication date

2019-10-01

Related applications

CDS monthly climate bulletin explorer

CDS monthly climate bulletin explorer

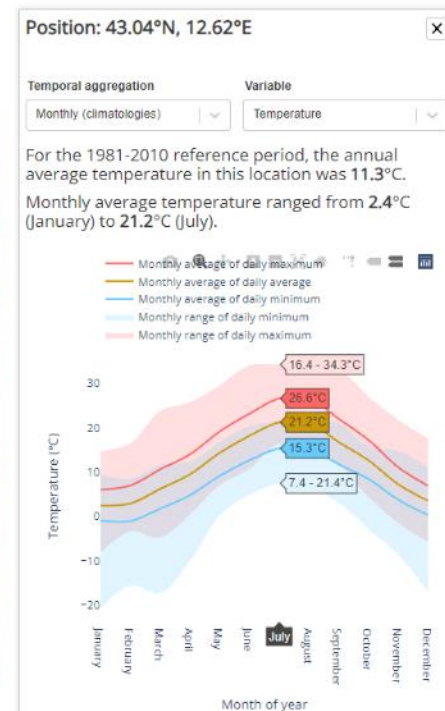
Click anywhere on the map or search for a city to discover a range of local climate statistics for the period 1979-2020.
This application is driven by ERA5, the fifth generation ECMWF atmospheric reanalysis of the global climate. Inspired by [Lobelia's Past Climate Explorer](#).

Search...

- Average wind speed (ms⁻¹)
- Average annual precipitation tot...
- Average temperature (°C)
- States and provinces*
- Country boundaries*

Average temperature (°C)

*The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.



CMCC Data Delivery System

The screenshot shows the CMCC DDS website interface. At the top, there is a navigation bar with the text "CMCC DDS Data Delivery System" and a "Login" button. Below this is a "DATASETS" section containing nine dataset cards, each with a title, a small map or visualization, and a brief description.

- BIOLIMIND**: BioClim is a dataset of 35 bioclimatic indicators calculated from historical and future climate simulations. These indicators include...
- BLACKSEA-ANALYSIS**: The Black Sea physics analysis and Forecasting System (BSFS) is one of the Production Units of the Black Sea Monitoring and Forecasting...
- COOLING-HEATING-DEGREEDAYS**: A high resolution (0.25 degree) historical global gridded dataset of monthly and annual cooling and heating degree-days (1970-2019) bas...
- CGLORSV7**: The CMCC Global Ocean Physical Reanalysis System (C-GLORS) is used at CMCC to simulate the state of the ocean in the last decades. It c...
- ITALY-SOIL-EROSION**: This dataset provides rainfall erosivity (R factor), associated indicators, and the potential for soil loss induced by water erosion fo...
- MEDSEA-CMIP5-PROJECTIONS**: The dataset provides a set of physical ocean parameters over the Mediterranean Sea region which describe the evolution of the system un...
- ERA5-DOWNSCALED-OVER-ITALY**: The dataset contains dynamically downscaled ERA5 reanalysis, originally available at ~31 km x 31 km horizontal resolution, to 2.2 km x ...
- ERA5-SINGLE-LEVELS**: This dataset is related to ERA5 that is the fifth generation ECMWF atmospheric reanalysis of the global climate. Reanalysis combines mo...
- E-OBS**: E-OBS is a daily gridded land-only observational dataset over Europe. The blended time series from the station network of the European ...

<https://dds.cmcc.it/>

Grazie per l'attenzione

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