

Comunicación de la variabilidad y cambio climático a los usuarios

El Servicio de Cambio Climático de Copérnicus

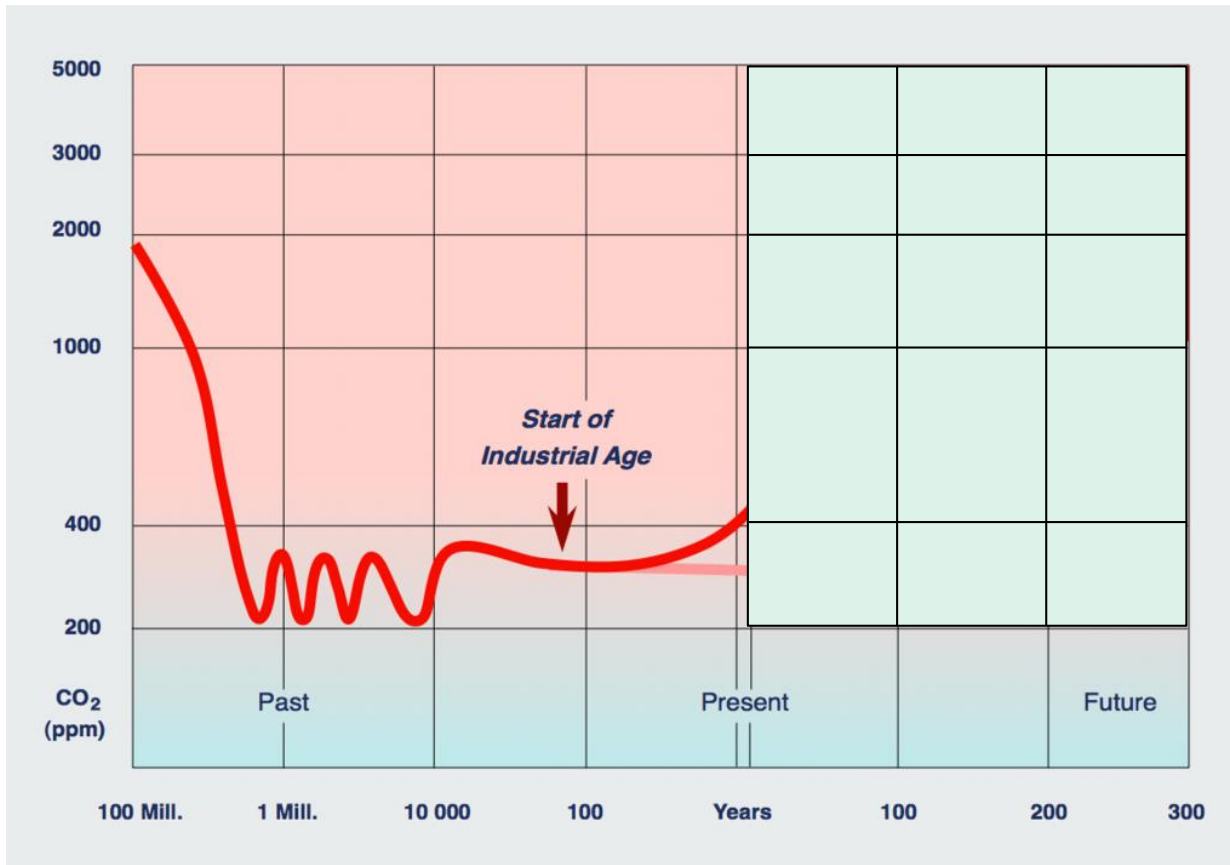
Joaquín Muñoz Sabater

- con inputs de Nuria López y David Armstrong -

European Centre for Medium-Range Weather Forecasts (ECMWF)
Copernicus Climate Change Service (C3S)

Introducción

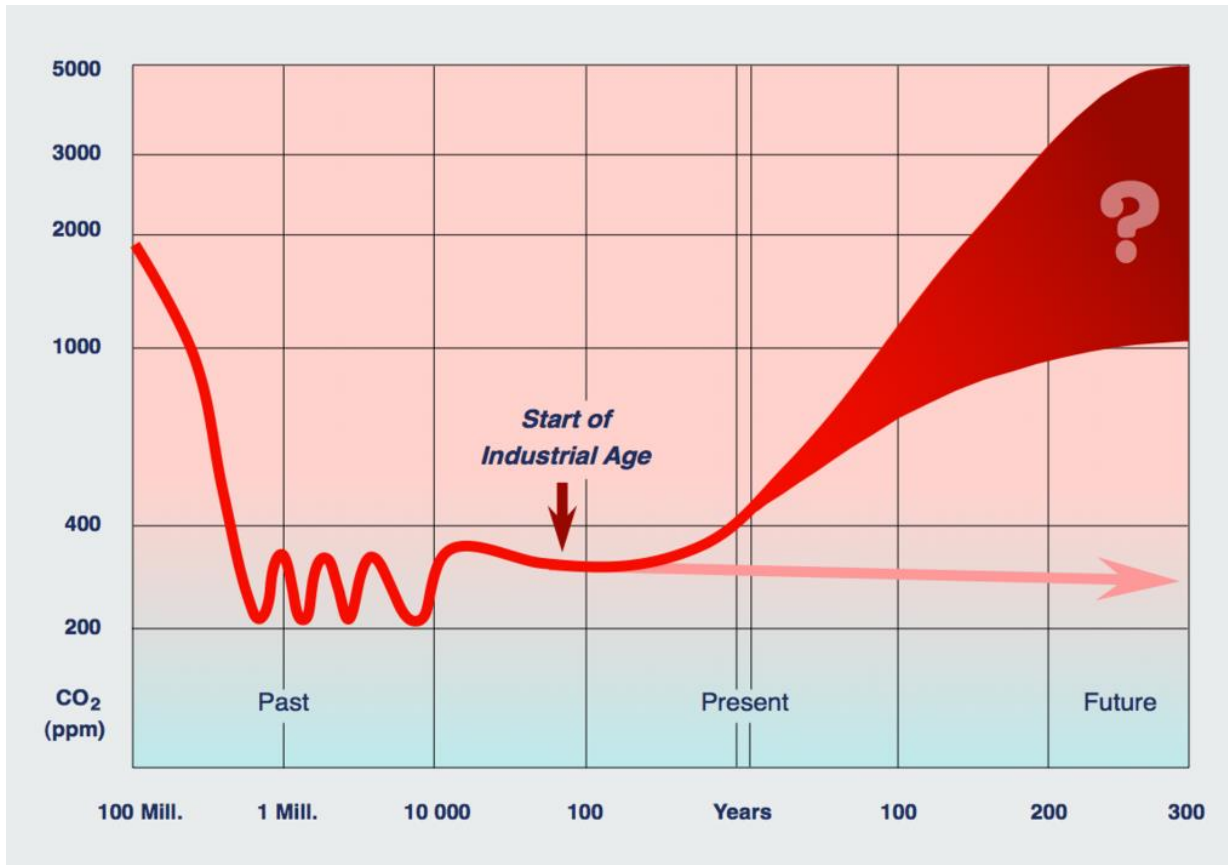
Por qué nos interesa y nos preocupamos por un *posible* cambio del clima?



Credits: Dr. Hannes Grobe

Introducción

Por qué nos interesa y nos preocupamos por un *posible* cambio del clima?



Credits: Dr. Hannes Grobe

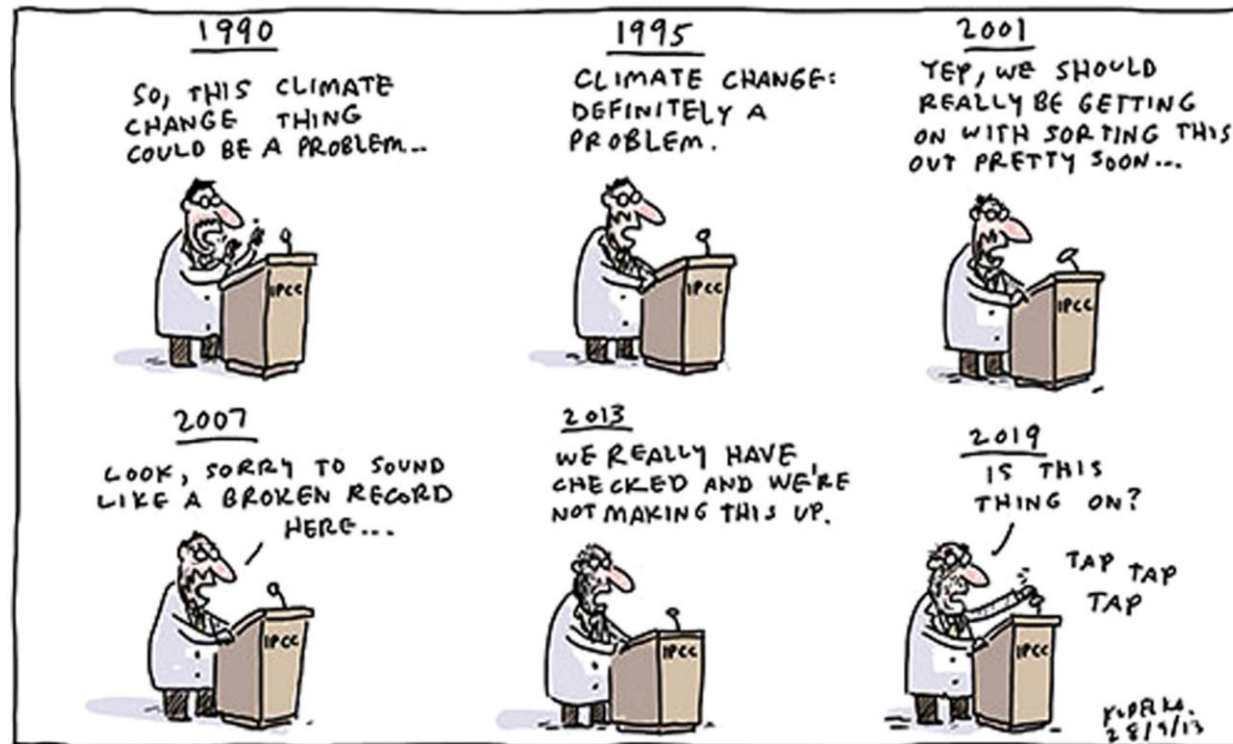
Contenido de esta clase

- Comunicación del cambio climático;
 - Para qué
 - Quién y a quién
 - Cómo
 - Retos
- Variabilidad climática vs. cambio climático
- El Servicio Europeo de Cambio Climático (**C3S**)
 - Breve introducción
 - La estrategia de comunicación de C3S
 - Acceso a los datos de información climática
 - Productos de información climática a los comunicadores

Para qué

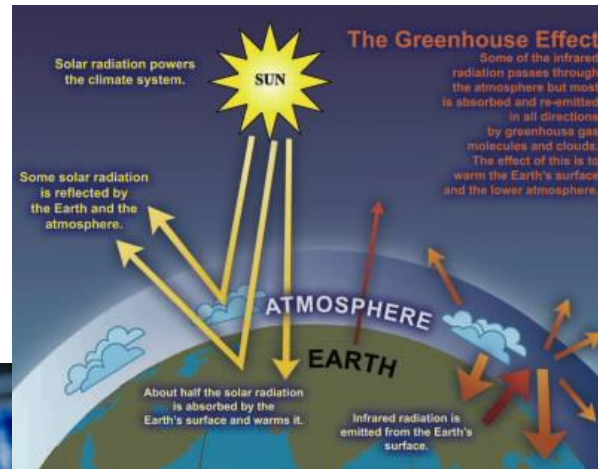
La lucha contra el cambio climático implica **cambios a todos los niveles**; económico, político, cultural y social.

Herramientas: tecnologías, innovación, big data, ..., **comunicación** ya que permite interactuar con actores o grupos de interés a todos esos niveles y facilitar las siguientes acciones:



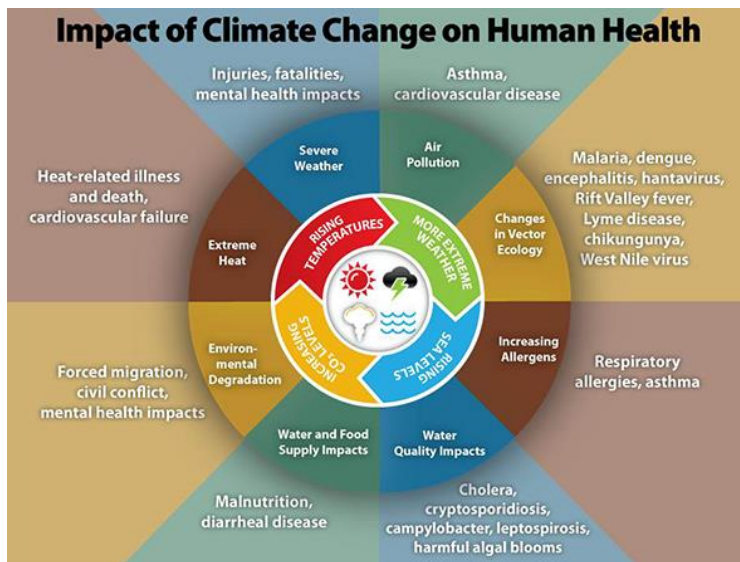
Para qué

- Educación: educar a la población sobre que es el cambio climático.
 - Demandar/exigir a las autoridades medidas de mitigación o adaptación,
 - Cambio de patrones de consumo,
 - Presión a la industria para desarrollar modelos de producción sostenibles
 - [...] Muchos otros [...]



Para qué

- Información: sobre los acontecimientos relacionados con el clima para que la población pueda hacer un seguimiento y valoración en cada momento.



YOU CAN MAKE A WORLD OF DIFFERENCE
TAKE CLIMATE ACTION 2020-2030 IS THE DECADE OF CLIMATE ACTION! CHOOSE YOUR COMMITMENTS FROM THIS LIST OF TOP CARBON SAVING ACTIONS.

TRAVEL	LIFESTYLE	ENERGY	WASTE	FOOD
Transport accounts for 34% of a household's carbon footprint.	Making a few changes can dramatically impact the environment.	Switching to an independent & renewable energy supplier can save a minimum of \$250 a year.	Schemes such as RecycleNow can help you recycle almost anything from your doorstep.	40% of food is wasted annually. Animal agriculture is responsible for 14.5% of global emissions.
LIVE CAR FREE (200 kg CO ₂)	WASH CLOTHES IN COLD WATER (260 kg CO ₂)	BUY GREEN ENERGY (160 kg CO ₂)	RECYCLE (200 kg CO ₂)	ADOPT VEGANISM (1000 kg CO ₂)
AVOID ONE-TRIP TRANSATLANTIC FLIGHTS (800 kg CO ₂)	HANG-DRY CLOTHES (210 kg CO ₂)	REPLACE BOILER IF MORE THAN 10 YEARS OLD (800 kg CO ₂)	COMPOST FOOD (300 kg CO ₂)	EAT A PLANT-BASED DIET (800 kg CO ₂)
BUY A MORE EFFICIENT CAR (100 kg CO ₂)	SHOWER, DON'T BATHE (100 kg CO ₂)	IMPROVE HOME INSULATION (100 kg CO ₂)	USE A REUSABLE COFFEE CUP (80 kg CO ₂)	WASTE NO FOOD (100 kg CO ₂)
REPLACE A TYPICAL CAR WITH HYBRID (300 kg CO ₂)	WORK FROM HOME, 2 DAYS A WEEK (100 kg CO ₂)	UPGRADE LIGHTBULBS (100 kg CO ₂)	SWITCH TO REUSABLE SHOPPING BAGS (100 kg CO ₂)	EAT LESS MEAT (300 kg CO ₂)

Commit to each action for a whole year to achieve the carbon saving shown.

1000 kg of carbon is equivalent to over 2,400 miles driven in a car.

You're never too small to make a difference.

EXAMPLE PERSONAL PLAN: LIVE CAR FREE

Para qué

- Sensibilización o concienciación:
 - de los problemas ambientales
 - de la necesidad de cuidar los recursos actuales para asegurar los recursos futuros,
 - de como nuestro modelo económico y cultural afecta a la conservación del planeta y a todo el ecosistema, y está acelerando el cambio climático



Para qué

- Incidencia política: : influir sobre las políticas públicas y las decisiones de asignación de recursos dentro de los sistemas políticos, económicos, sociales e institucionales.



Quién y a quién

Existen **multitud de agentes** involucrados en la comunicación y difusión del cambio climático, con **diferentes intereses, objetivos y necesidades**.

¿Qué deberíamos hacer para poner todos los datos y el conocimiento climático que poseemos en una forma utilizable y útil para toda la sociedad?

Es fundamental **identificar y entender las diferentes audiencias, conocer sus necesidades, objetivos y su potencial rol en la sociedad** para poder comunicar de forma efectiva.

Los datos climáticos y el conocimiento climático no es útil per-se. Afin de que esto ocurra, **los datos climáticos necesitan ser relevantes para los usuarios específicos a los cuales se está apuntando**. En cierto sentido, la información climática no existe sin usuarios y sin el conocimiento del contexto en el cual tales usuarios se mueven.

Quién y a quién

➤ ¿Qué le interesa a los agricultores en el Oeste de África?

- Precipitación?
- ✓ Fecha del inicio del Monzón



➤ ¿Qué les interesa a las compañías de seguros?

- Estimaciones fidedignas de probabilidad de ocurrencia de fenómenos extremos?
- ✓ Estimaciones a tiempo para la firma de contratos



➤ ¿Qué le interesa al sector vinícola?

- Estimaciones del clima en las parcelas?
- ✓ Cambios de temperature para comprar tierra



Quién y a quién

Igualmente, **no se debería reconocer a ningún grupo de población como un recipiente vacío** que llenar ya que las personas siempre llevan incorporados un bagaje de información y valores que nos permitirán llegar a ellos en mayor o menor medida. Conocer cuales son sus suposiciones y su posición respecto al cambio climático será fundamental para el éxito de la comunicación.

- **The ‘empty vessel’ approach**

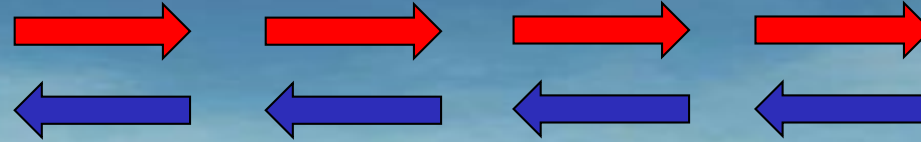
[Knowledge is specific content]



Learners are
empty vessels to
be filled with
knowledge

Quién y a quién

Climate Change Knowledge

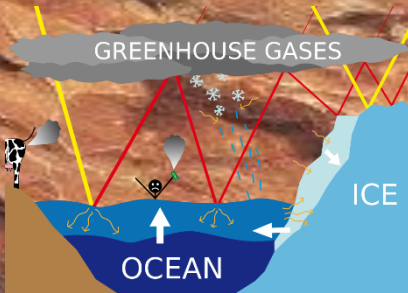


Usuario



Hay que reconocer que la opinión general no ha tenido en cuenta a la comunidad científica y eso ha dificultado poder comunicar con la suficiente efectividad.

Afortunadamente, la situación actual que vivimos ha logrado invertir esta tendencia y dicha comunidad debe aprovechar ahora mas que nunca que su discurso, sus conclusiones, estudios y recomendaciones sean escuchadas.



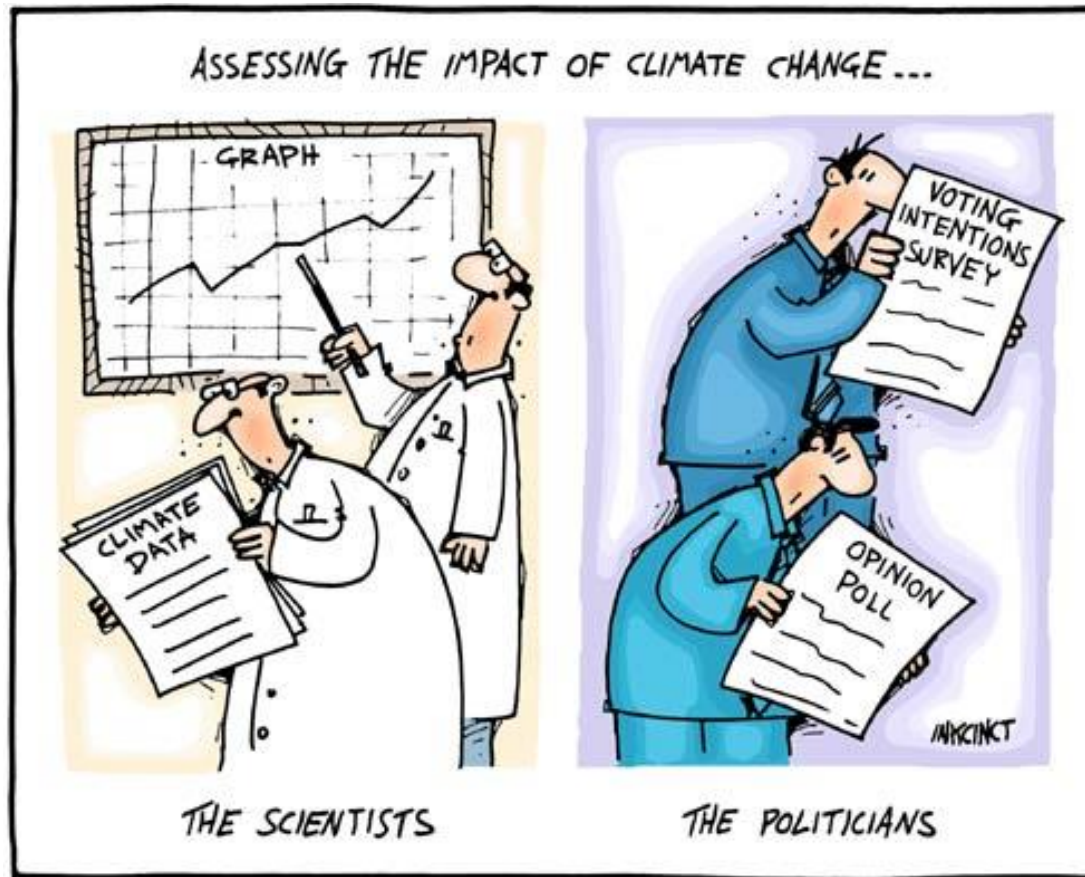
Quién y a quién

Terms that have different meanings for scientists and the public

Scientific term	Public meaning	Better choice
enhance	improve	intensify, increase
aerosol	spray can	tiny atmospheric particle
positive trend	good trend	upward trend
positive feedback	good response, praise	vicious cycle, self-reinforcing cycle
theory	hunch, speculation	scientific understanding
uncertainty	ignorance	range
error	mistake, wrong, incorrect	difference from exact true number
bias	distortion, political motive	offset from an observation
sign	indication, astrological sign	plus or minus sign
values	ethics, monetary value	numbers, quantity
manipulation	illicit tampering	scientific data processing
scheme	devious plot	systematic plan
anomaly	abnormal occurrence	change from long-term average

Quién y a quién

Obstáculos en el camino: La (des)comunicación del cambio climático



Quién y a quién

Grandes pensadores sobre el cambio climático...

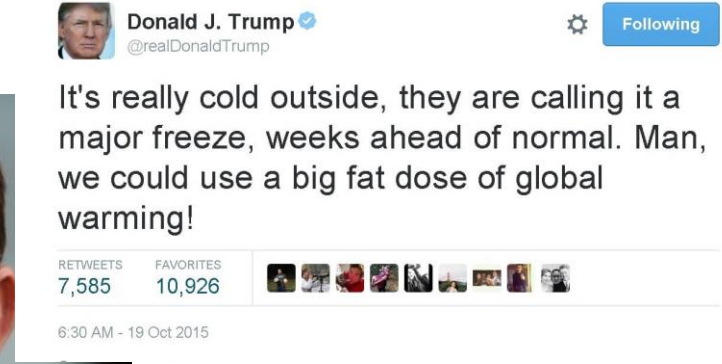


Donald J. Trump @realDonaldTrump

It's snowing & freezing in NYC. What the hell ever happened to global warming?

10:25 AM - 21 Mar 2013

618 retweets, 283 favorites

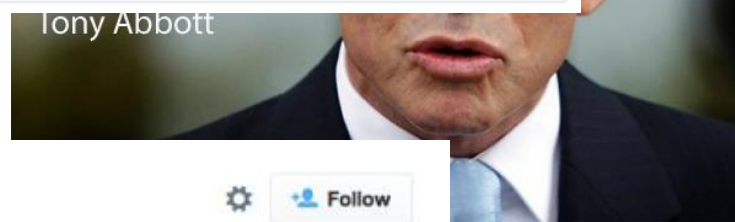


Donald J. Trump @realDonaldTrump

It's really cold outside, they are calling it a major freeze, weeks ahead of normal. Man, we could use a big fat dose of global warming!

7,585 retweets, 10,926 favorites

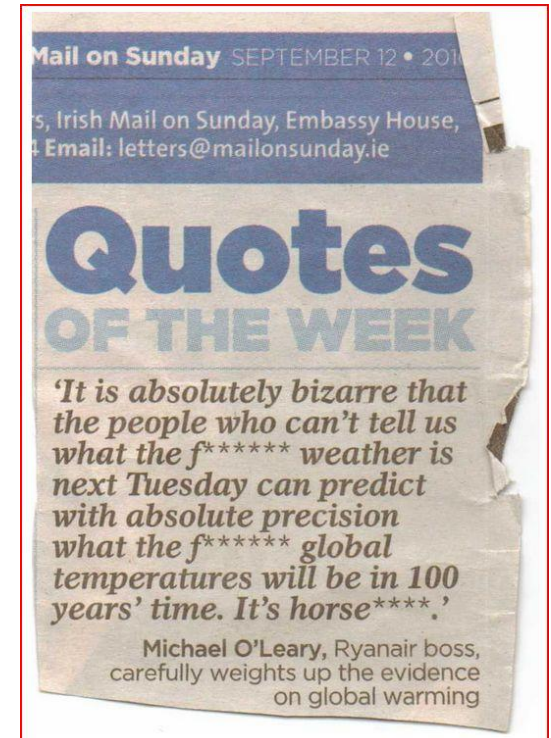
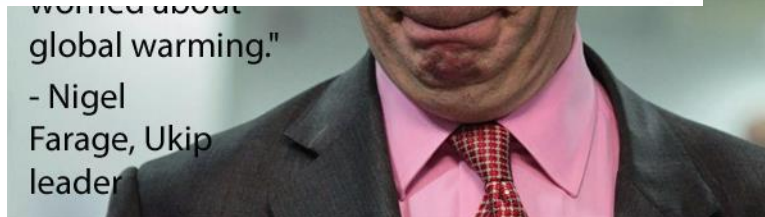
6:30 AM - 19 Oct 2015



Donald J. Trump @realDonaldTrump

This very expensive GLOBAL WARMING bullshit has got to stop. Our planet is freezing, record low temps, and our GW scientists are stuck in ice

2,461 retweets, 1,550 favorites



¿ Cómo ?

El hecho de que la población de más credibilidad a ciertos actores, ha promovido que se utilicen *influencers* o personalidades públicas para transmitir el mensaje de la necesidad de trabajar para mitigar y adaptarnos al cambio climático.

Ejemplo: “Fridays for Future”



¿ Cómo ?

Así, grandes campañas de difusión, con personalidades publicas que influyan en la población, y el uso de medios de masa que permitan penetrar el mensaje y llegar a todos los grupos a través de diferentes canales, también han resultado ser positivas para introducir el tema en la conversación pública. Por lo que **una mezcla de medios de masa y medios enfocados a grupos concretos sería la mejor estrategia.**



¿ Cómo ?

En comunicación, sobre todo en cambio climático, el uso de imágenes ha tenido un gran impacto



¿ Cómo ?



Algunos detractores prefieren enfoques de comunicación mas positivos sin mostrar imágenes de impacto:
<https://climatevisuals.org/>



¿ Cómo ?

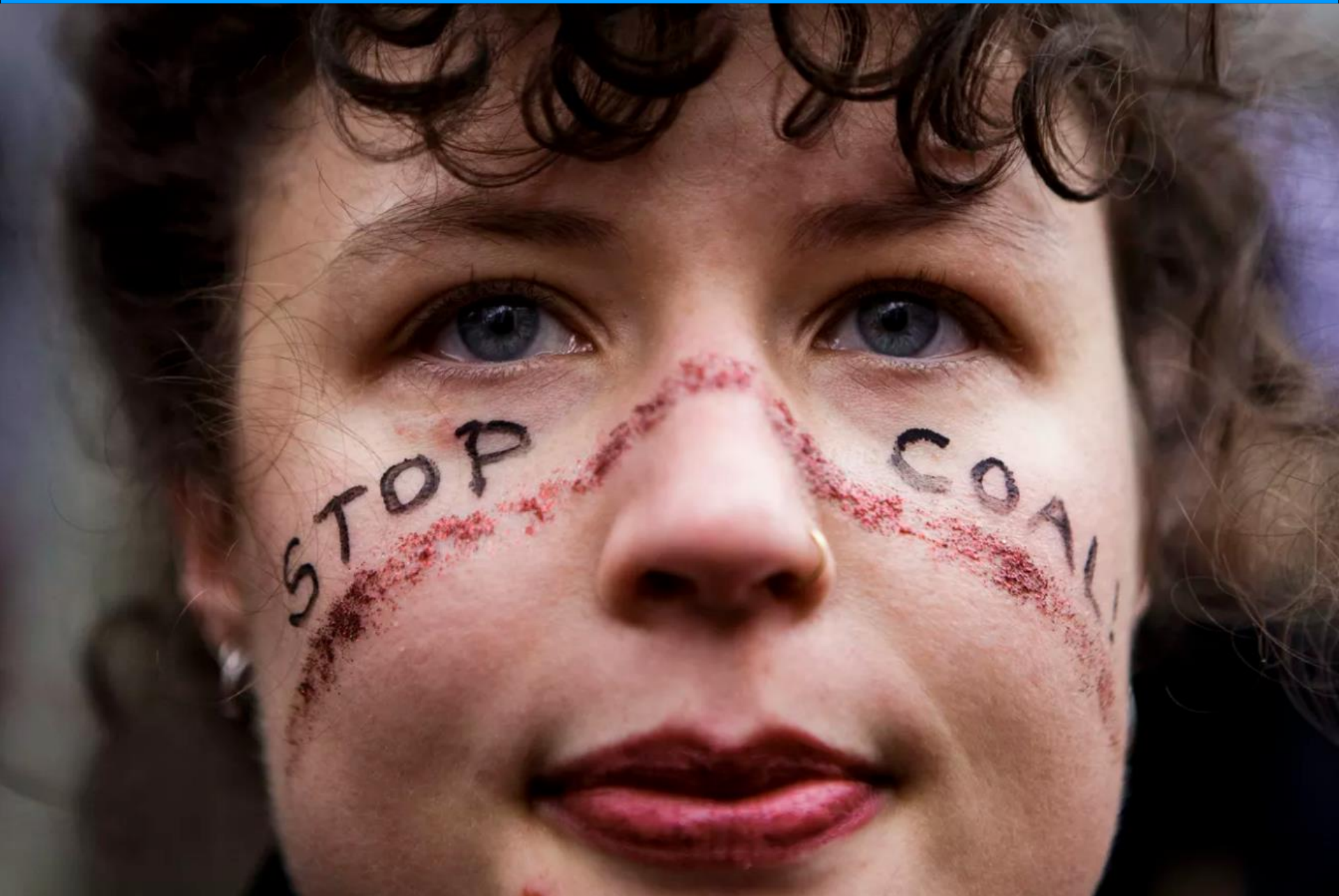
WHY SHOULD WE
GO TO SCHOOL IF
YOU WON'T LISTEN
TO THE EDUCATED



SCHEN-
MAT.
kschein
en
↓

HINGER SCHV

¿ Cómo ?



Retos

- Determinados conceptos que todavía hoy no se han asimilado correctamente:
 - variabilidad del clima vs cambio climático.
 - Eventos extremos y atribución
- Promover el uso de datos de calidad para la toma de decisiones relacionadas con el medio ambiente, la sostenibilidad y el cambio climático tanto en política como en negocios.
- Hay un sector de la población que están convencido de que no existe el cambio climático. Este grupo no es el objetivo de la comunicación en este caso pero si contrarrestar su discurso y minimizar su impacto.
- Es necesario poner en valor el rol de la comunicación y de los profesionales de la comunicación.

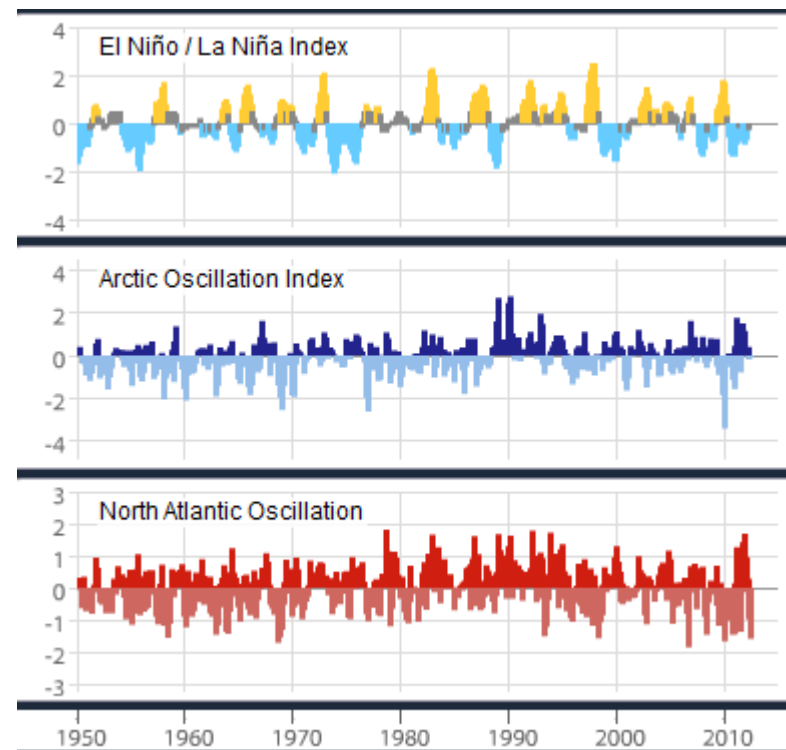
Contenido de esta clase

- Comunicación del cambio climático;
 - Para qué
 - Quién y a quién
 - Cómo
 - Retos
- Variabilidad climática vs. cambio climático
- El Servicio Europeo de Cambio Climático (**C3S**)
 - Breve introducción
 - La estrategia de comunicación de C3S
 - Acceso a los datos de información climática
 - Productos de información climática a los comunicadores

Variabilidad climática vs cambio climático

“La **variabilidad climática** denota las variaciones del estado medio y otras características estadísticas (desviación típica, sucesos extremos, etc.) del clima en todas las escalas espaciales y temporales más amplias que las de los fenómenos meteorológicos. La variabilidad puede deberse a procesos internos naturales del sistema climático (variabilidad interna) o a variaciones del forzamiento externo natural o antropógeno (variabilidad externa).

Glosario del IPCC

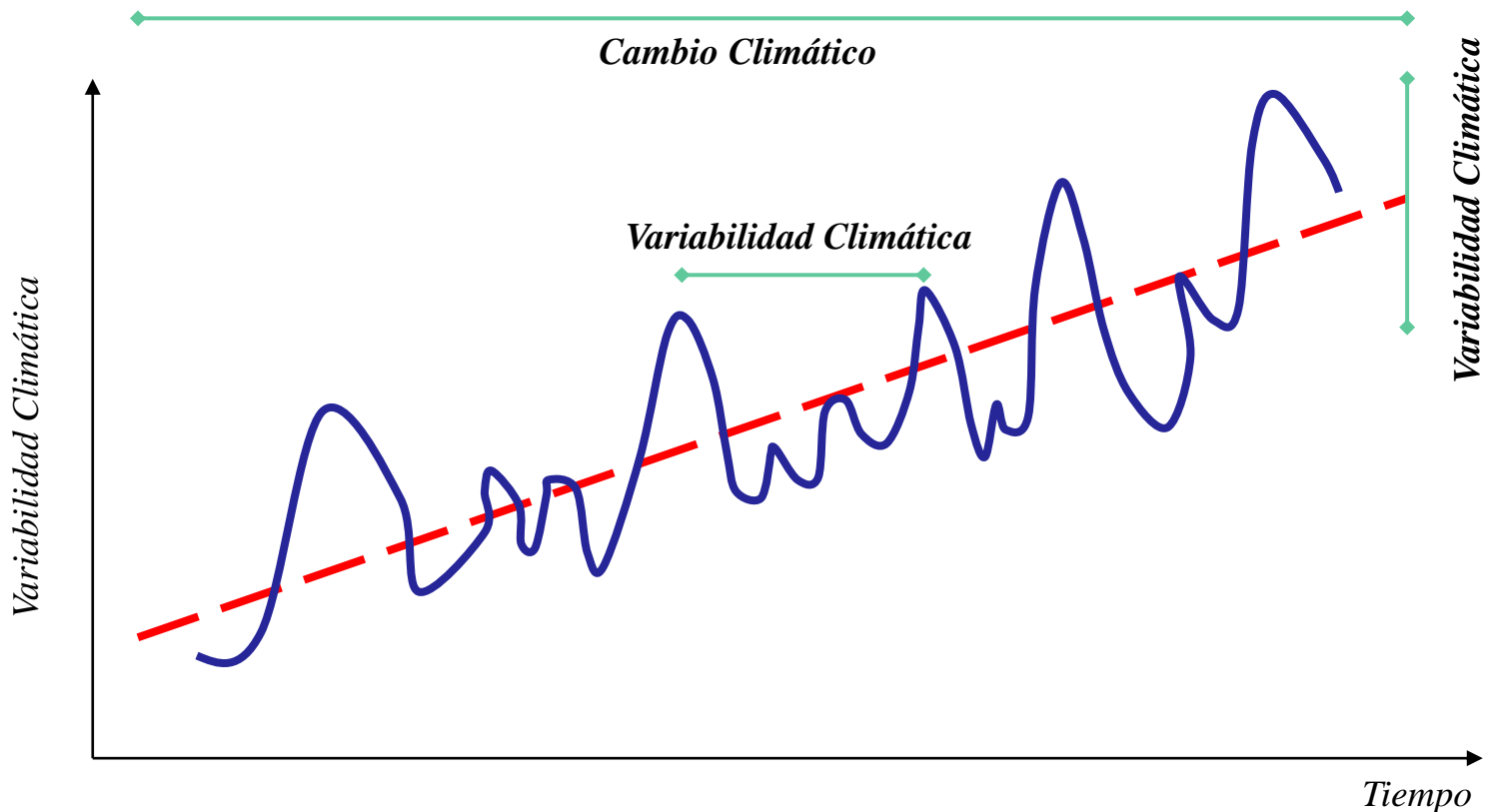


Credits NOAA

Variabilidad climática vs cambio climático

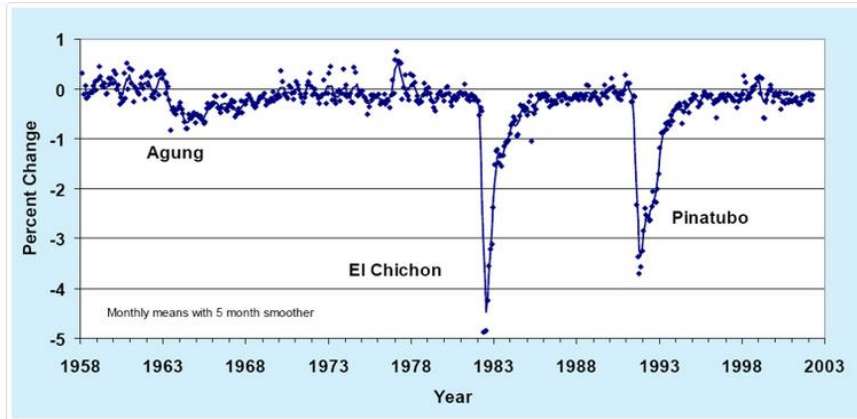
“Cambio climático es una variación del estado del clima identificable (por ejemplo, mediante pruebas estadísticas) en las variaciones del valor medio y/o en la variabilidad de sus propiedades, que persiste durante largos períodos de tiempo, generalmente decenios o períodos más largos.

Glosario del IPCC



Causas naturales de cambio climático

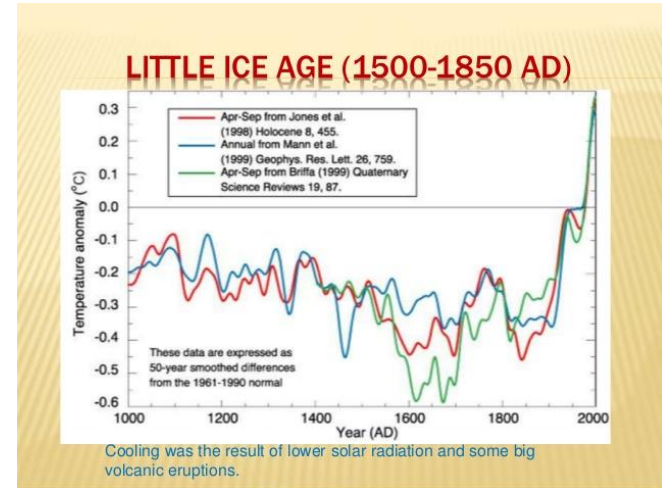
Actividad volcánica



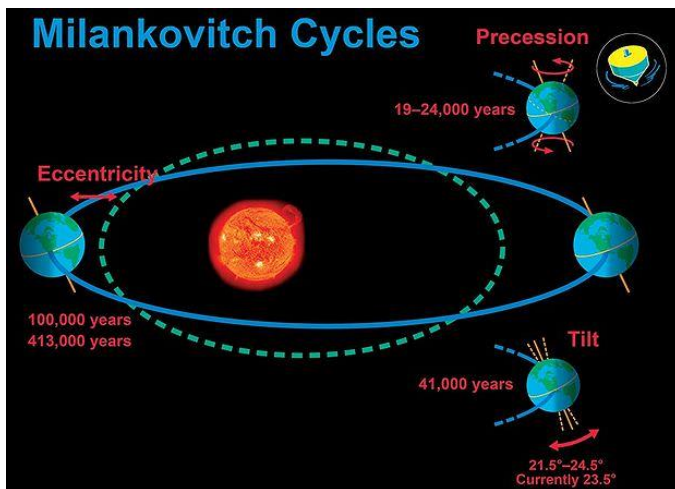
Net solar radiation at Mauna Loa Observatory, relative to 1958, showing the effects of major volcanic eruptions. Annual variations are due to transport of Asian dust and air pollution to Hawaii.

Credits ERSL-NOAA

Actividad solar



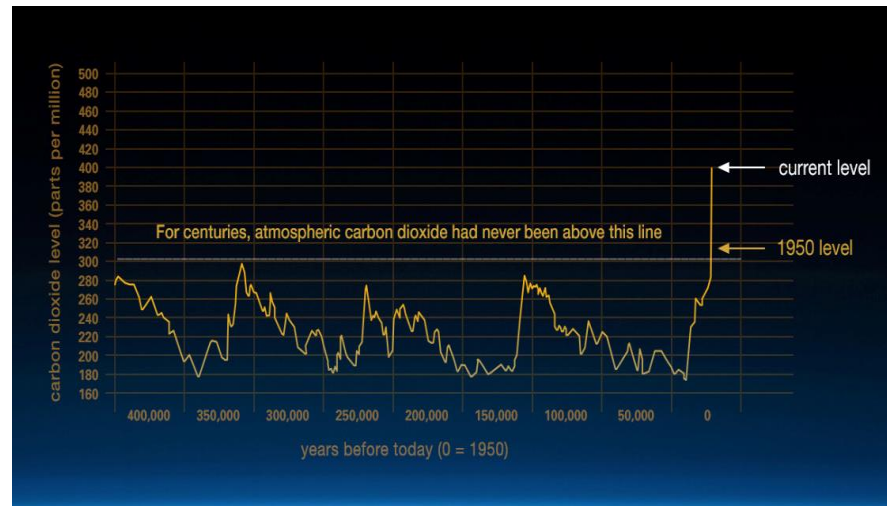
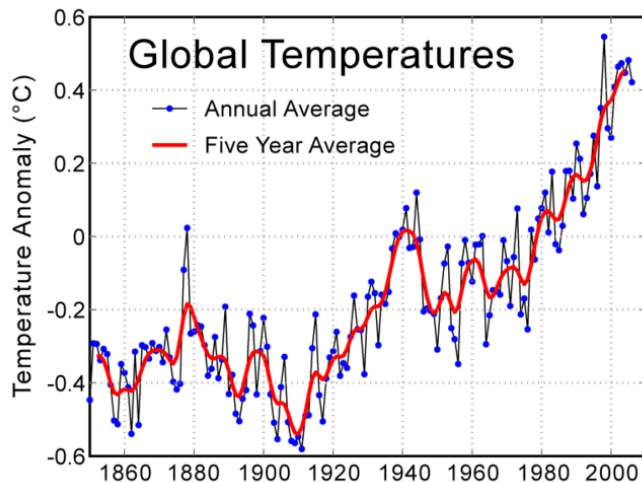
Geometría Tierra-Sol



- Movimientos de las placas tectónicas
- Cambio en las corrientes marinas
- **Concentración de gases de efecto invernadero,**
- Etc...

¿ Cambio climático ?

- Se dice que el clima está cambiando, pero **el clima ha cambiado, cambia y cambiará de forma natural!**
 - ¿En que nos basamos para afirmar que **hay un cambio climático y que es producido por la actividad humana?**
- Datos, hechos, evidencias, consenso científico



¿ Cambio climático ?

➤ Indicadores climáticos



**Agassiz Glacier,
Montana, in
1913...**

...and in 2005



**Pasterze Glacier,
Austria, in
1875...**

...and in 2004



¿ Cambio climático ?

➤ Y muchos otros:

Ocean acidification



Extreme events



Warming oceans



Decreased snow cover



Comunicación de datos climáticos

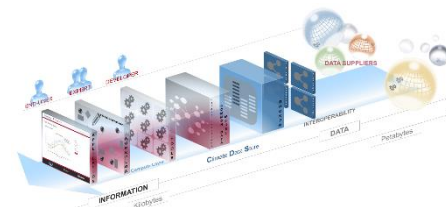
➤ Puntos a retener:

- 1) La comunicación es una herramienta muy útil para la lucha contra el cambio climático (educa, informa, conciencia, sensibiliza).
 - 2) Existen muchas formas de comunicar el cambio climático. La primera tarea de cualquier estrategia de comunicación y/o del desarrollo de cualquier servicio climático es la **identificación y el conocimiento del público al que se dirige**,
- Consecuencia: Es **prácticamente imposible** para cualquier organización **volverse proveedor de información climática genérica para todos los sectores**, ya que muy pocas organizaciones tienen el suficiente abanico de conocimiento especializado y de suficientes recursos humanos para comprender y abordar las necesidades de todos los usuarios.

Comunicación de datos climáticos

➤ La **estrategia de C3S** es centrarse en '**usuarios intermedios**' como audiencia objetivo, y proporcionarles los medios necesarios para que puedan desarrollar herramientas útiles y se impliquen/interaccionen adecuadamente con sus usuarios. Entre otras cosas, esto significa:

❑ **Acceso libre y actualizado** de la información climática



❑ Garantizar la **calidad de la información y del servicio**



❑ Proporcionar **herramientas gratuitas** que permita a los usuarios realizar procesamientos complejos de los datos con un esfuerzo y recursos limitados

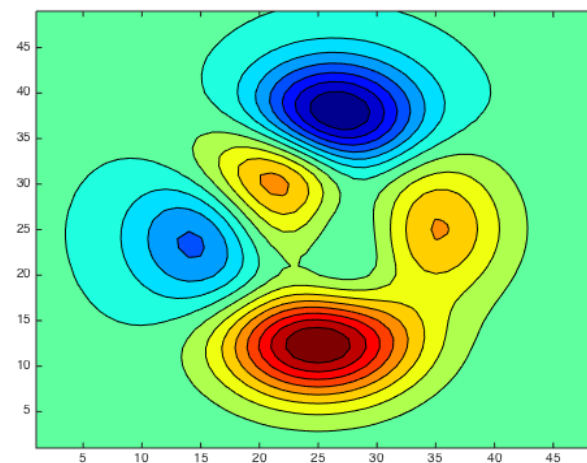
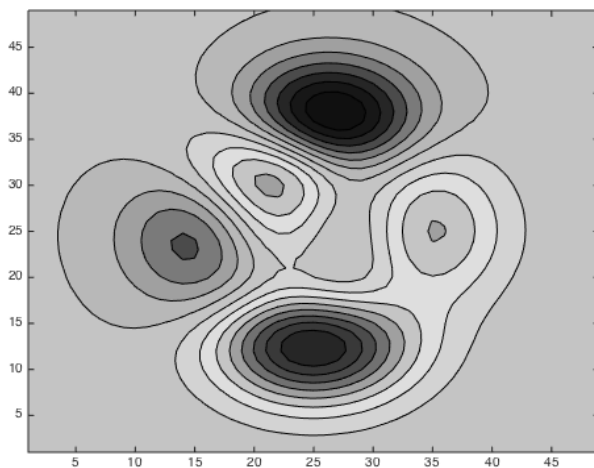


❑ Proporcionar ejemplos de **buenas prácticas**



Comunicación de datos climáticos

- Qué quiere decir buenas prácticas?
 - ❑ Documentación completa
 - ❑ Buena estructura de metadata del product
 - ❑ Complejidad limitada
 - ❑ Etc...
 - ❑ Exceso de preocupación por que los datos se utilizen de forma inadecuada?
- No hay un código de buenas practicas único, pero sí muchos ejemplos de malas prácticas



Contenido de esta clase

- Comunicación del cambio climático;
 - Para qué
 - Quién y a quién
 - Cómo
 - Retos
- Variabilidad climática vs. cambio climático
- El Servicio Europeo de Cambio Climático (**C3S**)
 - Breve introducción
 - La estrategia de comunicación de C3S
 - Acceso a los datos de información climática
 - Productos de información climática a los comunicadores



Climate
Change

Copernicus: Observaciones de la Tierra y servicios de información



→ Programa de observación de la Tierra de la Unión Europea;

- Gestionado y coordinado por la Comisión Europea
- Implementado en colaboración con los Estados Miembro de la UE, la Agencia Espacial Europea (ESA), EUMETSAT, Mercator Océan, ECMWF y agencias de la UE como la EEA.
- ~4300 M€ en el actual marco multianual de financiación (2014-2020)

→ Sistema basado en datos de satélites de observación de la Tierra y observaciones “in-situ” (no espaciales)

→ **Acceso completo, abierto y gratuito** a los datos y servicios para cualquier ciudadano u organización:

- Mejorar la vida de los ciudadanos
- Ofrecer (administraciones e industria) herramientas para la toma de decisiones



Climate
Change

Componentes de Copernicus

Sentinels



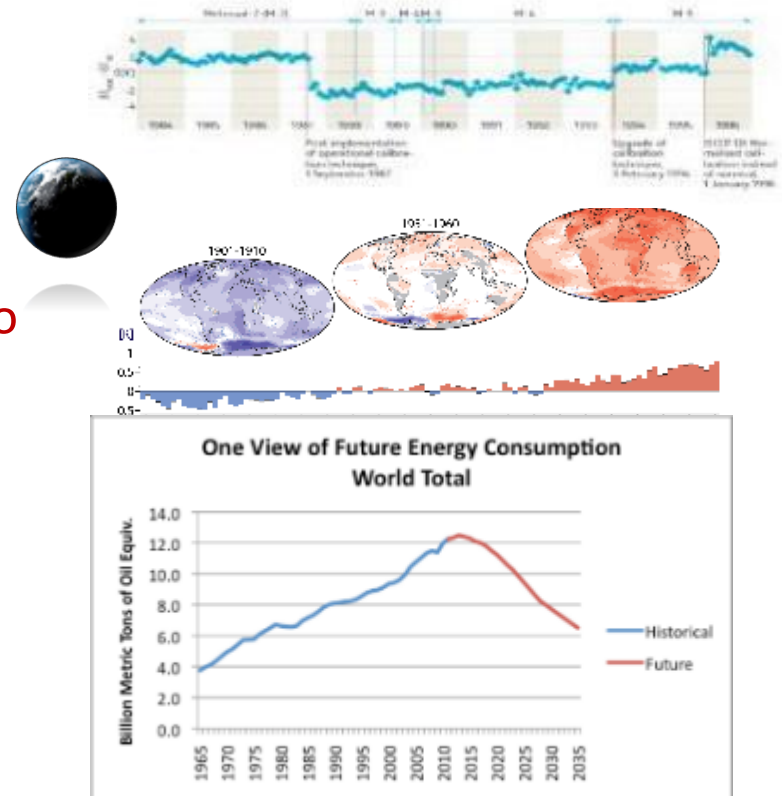
Servicios





Temas tratados en el servicio:

- **Cómo está cambiando el clima?**
 - Observaciones de la Tierra
 - Reanálisis
- **Continuará/se acelerará el cambio climático?**
 - Predicciones
 - Proyecciones
- **Cuáles son los impactos en la sociedad?**
 - Indicadores del clima
 - Información sectorial



Contenido de esta clase

- Comunicación del cambio climático;
 - Para qué
 - Quién y a quién
 - Cómo
 - Retos
- Variabilidad climática vs. cambio climático
- El Servicio Europeo de Cambio Climático (**C3S**)
 - Breve introducción
 - La estrategia de comunicación de C3S
 - Acceso a los datos de información climática
 - Productos de información climática a los comunicadores

The purpose of & approach to communication

- **WHAT**

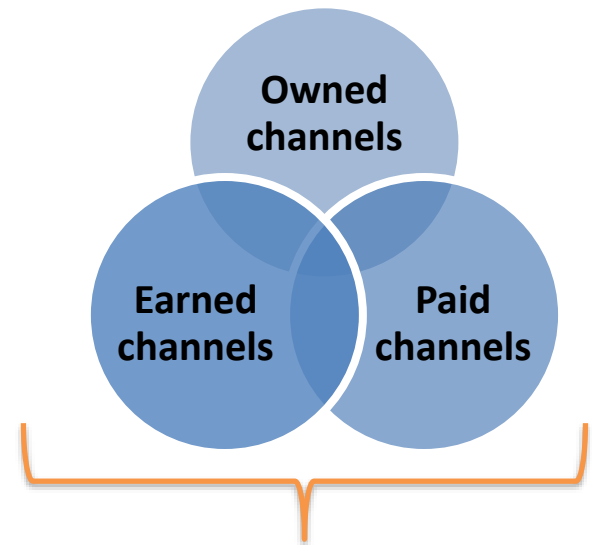
We build a positive audience association with the Copernicus programme, as a valuable and reliable source of information to enable decision-making, innovation and economic growth using environmental and earth observation data.

- **HOW**

Through a balanced and coordinated mix of Paid, Earned and Owned communication channels, partnerships, content and activity.

- **WHY**

To raise awareness, understanding and ultimately use of the Copernicus Climate Change and Atmosphere Monitoring Services on behalf of the European Commission and Member States

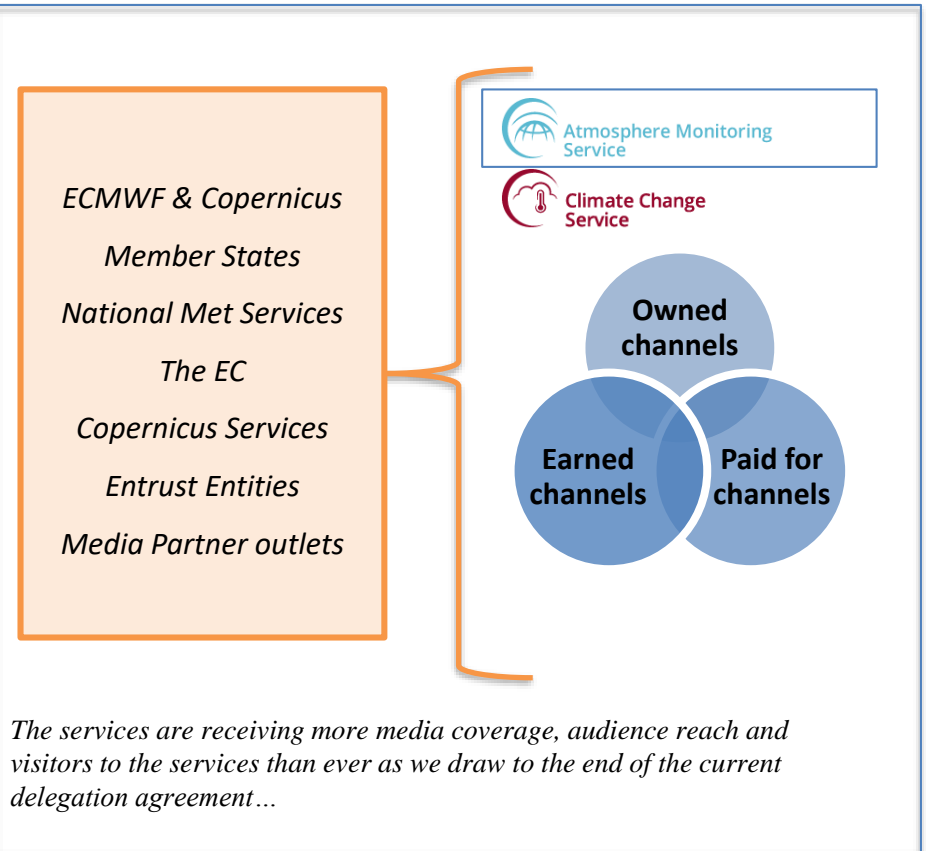




Asociaciones and colaboración

We benefit from - and feature - partners across this activity...

- Digital out of home *advertising*
- *Events* - General Assemblies, user days and press tours
- *Flagship products* such as The European State of the Climate report
- Media partnership articles
- Joint use cases, events and content
- Referral of *media requests*





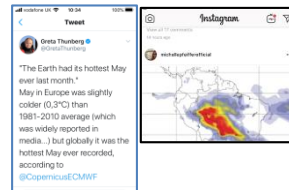
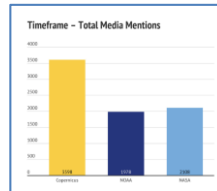
Impacto

A tipping point:

- **Media partnerships** – reaching opinion leaders and decision-makers across the globe and across sectors
- **Advertising** –reached decision-maker audiences on the way to key events via transport networks/hubs
- **Media outreach** – Increased top tier coverage & increased share of voice and preferred point of reference in Europe against US big players on key topics

Leading to:

- **Website and social media**– Continued traffic, follower and engagement growth bringing exposure to Service content
- **Events** – Visibility at high profile events and in-depth engagement and explanation opportunities, increasing audience understanding and take up.



- **115mi** reached -'opinion leader' - CNN
- **133k** reached last quarter Climate Now
- **234mi** times in first 4 months - TV air quality bulletin

- **13mi & 1.7mi** people – **Airport** screens
- **3mi & 750k** – **Metro** screens
- **396k** – **Tram** station screens

- **28k media mentions** over last year
- **TV, radio, online, print**
- **3589 mentions** in a 3-month period-SOV **Copx vs. NASA (2108) & NOAA 1978)**

- **8.7k to 28k** -Twitter 2019 - 2020
- **151% more webusers** (94,787 vs 37,785) **CAMS Q1 20 vs19**
- **220% more webusers** (119,562 vs 37,310) **C3S Q1 20 vs 19**

- **UNFCCC COP25 Earth Day Plenary** – **600** policymaker delegates
- **Press event** – Europe media attendance – **32** articles - **290mi** sum circulation

Contenido de esta clase

- Comunicación del cambio climático;
 - Para qué
 - Quién y a quién
 - Cómo
 - Retos
- Variabilidad climática vs. cambio climático
- El Servicio Europeo de Cambio Climático (**C3S**)
 - Breve introducción
 - La estrategia de comunicación de C3S
 - Acceso a los datos de información climática
 - Productos de información climática a los comunicadores

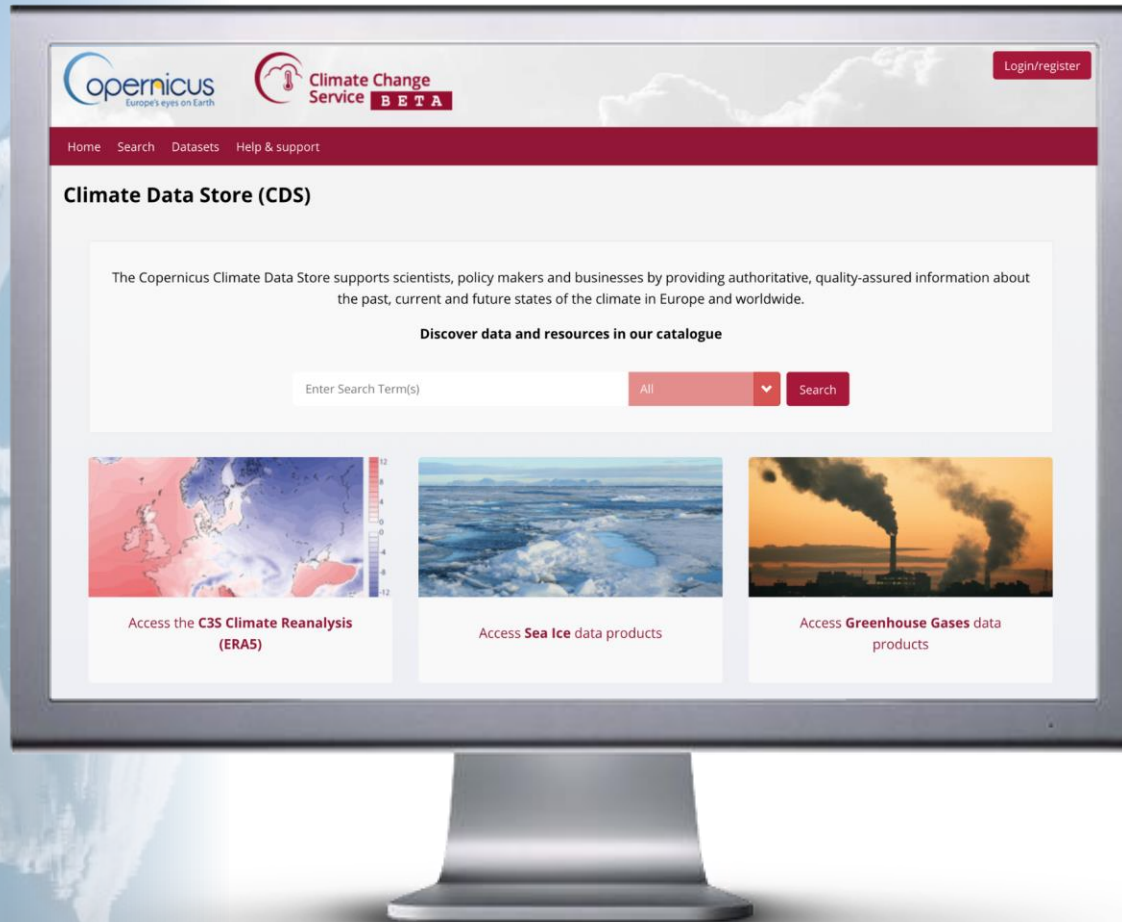


Climate
Change

Climate Data Store: ventanilla única climática

El CDS contiene **observaciones**, global and regional **reanálisis climáticos** globales y regionales, **proyecciones climáticas** y **predicciones estacionales**. También contiene **indicadores climáticos genéricos** y **sectoriales**.

El CDS está diseñado como un **sistema distribuido**, proporcionando el acceso a **datasets existentes** a través de un **web interfaz web unificado**.



IMPLEMENTED BY





Climate
Change

Climate Data Store

Funciones de búsqueda y navegación

The screenshot shows the Copernicus Climate Change Service BETA website. The header includes the Copernicus logo and navigation links: Home, Search, Datasets, Help & support. A search bar is visible with a magnifying glass icon. Below the search bar, a dropdown menu is open, showing options to sort by: Relevancy (selected), Title, Product type, Variable domain, Spatial coverage, and Temporal coverage. The main content area displays search results for 'Mediterranean delayed-time sea surface heights and derived variables'. Each result includes a database icon, the title, and a brief description of the dataset.

Search Results

Search dataset

Sort by

- Relevancy
- Title
- Product type
- Variable domain
- Spatial coverage
- Temporal coverage

Mediterranean delayed-time sea surface heights and derived variables

This Mediterranean sea dataset is a Level-4 Essential Climate Variable (ECV) product and Climate Data Record (CDR). It was brokered by ECMWF Copernicus Climate Change Service (C3S) and produced by t...

Global delayed-time sea surface heights and derived variables

This global sea dataset is a Level-4 Essential Climate Variable (ECV) product and Climate Data Record (CDR). It was brokered by ECMWF Copernicus Climate Change Service (C3S) and produced by the CLS/...

Black sea delayed-time sea level anomalies and derived variables

This Black sea dataset is a Level-4 Essential Climate Variable (ECV) product and Climate Data Record (CDR). It was brokered by ECMWF Copernicus Climate Change Service (C3S) and produced by the CLS/C...

Southern hemisphere sea ice concentration from satellites for the period 2015 onwards

This sea ice concentration dataset is a Level-3 Essential Climate Variable (ECV) product and Interim Climate Data Record (ICDR) produced by EUMETSAT OSI SAF using passive microwave data (PMW) from L...

Northern hemisphere sea ice thickness for the period 2002-2017

The sea ice thickness dataset is a Level-3 Essential Climate Variable (ECV) product and Climate Data Record (CDR) brokered by ECMWF Copernicus Climate Change Service (C3S). The sea ice thickness is ...

Northern hemisphere sea ice edge for the period 1979-2015

This sea ice edge dataset is a Level-3 Essential Climate Variable (ECV) product and Climate Data Record (CDR) brokered by ...



IMPLEMENTED BY





Climate Change

Climate Data Store

Funciones de Exploración y Recuperación

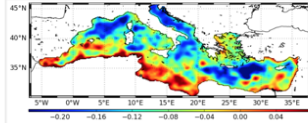
Gridded Satellite Observation Example

Home Search Datasets Help & support

Mediterranean delayed-time sea surface heights and derived variables

Overview Download data Validation and verification Documentation Sample application

This **Mediterranean sea** dataset is a Level-4 Essential Climate Variable (ECV) product and Climate Data Record (CDR). It was brokered by ECMWF Copernicus Climate Change Service (C3S) and produced by the CLS/CNES DUACS satellite altimeter production system. Within the production process, the long-term stability and large scale changes are built upon the records from the reference missions (TOPEX-Poseidon, Jason-1, Jason-2 and Jason-3). The additional missions (ERS-1, ERS-2, Envisat, CryoSat-2, SARAL/AltiKa and Sentinel-3A) are homogenized with respect to the reference mission and contribute to improve the sampling of mesoscale processes, provide the high-latitude coverage and increase the product accuracy. The steady number of satellites used in the constellation contributes to the long-term stability of the sea level record.



Sea level anomalies and derived variables are computed with respect to a twenty-year mean reference period (1993-2012) where up-to-date altimeter standards are used to estimate the sea level anomalies with mapping algorithms dedicated to this region. Contrary to near-real time and interim sea level products, the stability and accuracy of the **delayed-time** product make it adapted to climate applications. This product is delayed about 4-5 months due to the timeliness of the input data, the centred processing temporal window and the validation process. Any modification of past input data, or of the processing chain, will provoke the issuing of a new version of the whole dataset. These products were previously distributed by AVISO+. Details on the altimeter and processing algorithms, validation results and uncertainties are available in the Algorithm Theoretical Basis Document (ATBD), the Product User Guide and Specification (PUGS) and the Product Quality Assessment Report (PQAR) in the [Documentation](#) section.

Keywords: Altimetry, Sea Level, Climate, Currents, Ocean Topography

Metadata	
Horizontal coverage:	Mediterranean sea (cartesian projection)
Horizontal resolution:	1/8 degree
Temporal coverage:	From January 1993 until present with a few months delay
Temporal resolution:	Daily
Data format:	NetCDF
Data type:	GRID

Mediterranean delayed-time sea surface heights and derived variables

Overview Download data Validation and verification Documentation Sample application

Date interval

Start: 1993-01-01 End: 2017-01-06

Variables

Absolute dynamic topography and related variables

Terms of use

Use of each dataset is governed by the terms of use for each one.

Accept the licence to use Copernicus products [View terms](#)

You must accept the terms before submitting a request.

Show request (Debugging) Please check mandatory fields

Home Search Datasets Help & support

Search Results

Mediterranean delayed-time sea surface heights and derived variables

This Mediterranean sea dataset is a Level-4 Essential Climate Variable (ECV) product and Climate Data Record (CDR). It was brokered by ECMWF Copernicus Climate Change Service (C3S) and produced by the CLS/CNES DUACS satellite altimeter production system. Within the production process, the long-term stability and large scale changes are built upon the records from the reference missions (TOPEX-Poseidon, Jason-1, Jason-2 and Jason-3). The additional missions (ERS-1, ERS-2, Envisat, CryoSat-2, SARAL/AltiKa and Sentinel-3A) are homogenized with respect to the reference mission and contribute to improve the sampling of mesoscale processes, provide the high-latitude coverage and increase the product accuracy. The steady number of satellites used in the constellation contributes to the long-term stability of the sea level record.

Sea level anomalies and derived variables are computed with respect to a twenty-year mean reference period (1993-2012) where up-to-date altimeter standards are used to estimate the sea level anomalies with mapping algorithms dedicated to this region. Contrary to near-real time and interim sea level products, the stability and accuracy of the **delayed-time** product make it adapted to climate applications. This product is delayed about 4-5 months due to the timeliness of the input data, the centred processing temporal window and the validation process. Any modification of past input data, or of the processing chain, will provoke the issuing of a new version of the whole dataset. These products were previously distributed by AVISO+. Details on the altimeter and processing algorithms, validation results and uncertainties are available in the Algorithm Theoretical Basis Document (ATBD), the Product User Guide and Specification (PUGS) and the Product Quality Assessment Report (PQAR) in the [Documentation](#) section.

Keywords: Altimetry, Sea Level, Climate, Currents, Ocean Topography

+ APIs

IMPLEMENTED BY





Climate
Change

Climate Data Store

Funciones de bajado de datos y peticiones del usuario

Opernicus Europe's eyes on Earth | Climate Change Service BETA | CEDRIC BERGERON Logout

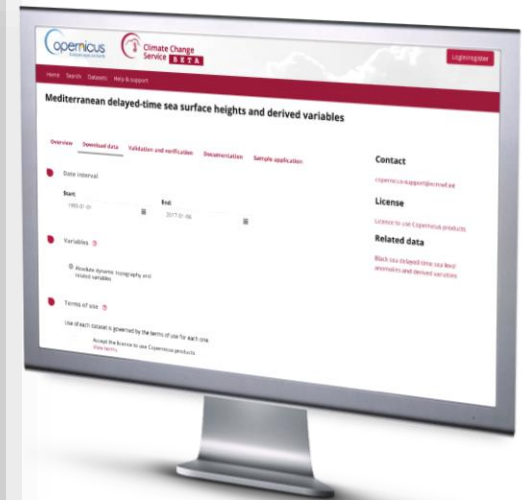
Home Search Datasets Applications Your requests Help & support

Your requests

All Queued In progress Failed Unavailable Complete Delete selected

Auto refreshed : 15:17:55

Product	Submission date	End date	Duration	Size	Status	
▶ Greenhouse gases: Methane	2017-11-30 11:34:42	2017-11-30 11:40:56	0:06:14	206.4 MB	Download	<input type="checkbox"/>
▶ Surface soil Moisture	2017-11-30 11:29:02	2017-11-30 11:29:03	0:00:00	968.7 KB	Download	<input type="checkbox"/>
▶ SIS: Gridded indicators of change in annual streamflow	2017-11-22 11:04:53	2017-11-22 11:05:01	0:00:07	61.7 MB	Download	<input type="checkbox"/>
▶ Global glaciers elevation changes and mass balance	2017-11-22 10:59:54	2017-11-22 10:59:54	0:00:00	145.8 KB	Download	<input type="checkbox"/>
▶ Global glaciers elevation changes and mass balance	2017-11-21 15:53:07	2017-11-21 15:53:09	0:00:02	145.8 KB	Download	<input type="checkbox"/>



IMPLEMENTED BY

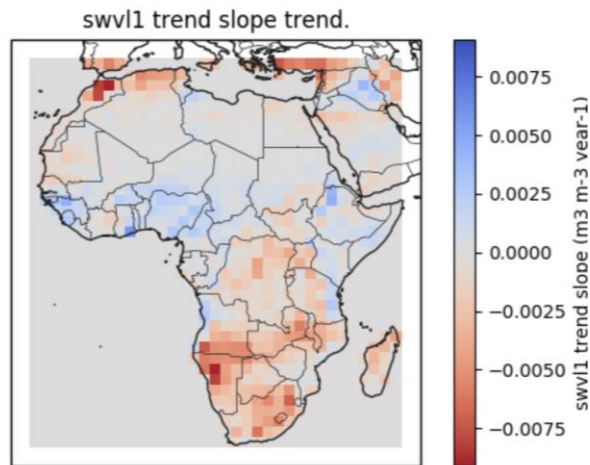




Climate
Change

Developing applications on the cloud

Trends



Copernicus
Europe's eyes on Earth

Climate Change
Service

31 Trends

Console

History

Save

Run

Layout

```
1 import cdstoolbox as ct
2
3
4 @ct.application(title='Trends')
5 @ct.input.dropdown('region', values=[ 'Sahel', 'Europe', 'Arctic',
6 'Mediterranean', 'Global'])
7 @ct.output.figure()
8 @ct.output.figure()
9 def trend_app(region):
10     """
11     Compute linear trends and show results on a map.
12     """
13     extent = {
14         'Europe': [-11, 35, 34, 60],
15         'Arctic': [-180, 180, 70, 90],
16         'Mediterranean': [-6, 34, 31, 45],
17         'Global': [-180, 180, -90, 90],
18         'Sahel': [-18, 50, -35, 38]
19     }
20
21     data = ct.catalogue.retrieve(
22         'reanalysis-era5-single-levels',
23         {
24             'variable': 'volumetric_soil_water_layer_1',
25             'product_type': 'reanalysis',
26             'year':
27 ['2009', '2010', '2011', '2012', '2013', '2014', '2015', '2016', '2017'],
28             'month': [
29                 '01', '02', '03',
30                 '04', '05', '06',
31                 '07', '08', '09',
32                 '10', '11', '12'
33             ],
34         }
35     )
```

Copernicus
Europe's eyes on Earth

European
Commission

ECMWF

Contenido de esta clase

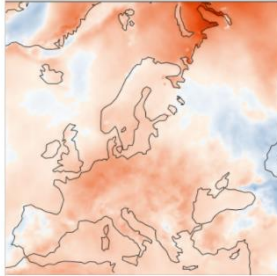
- Comunicación del cambio climático;
 - Para qué
 - Quién y a quién
 - Cómo
 - Retos
- Variabilidad climática vs. cambio climático
- El Servicio Europeo de Cambio Climático (**C3S**)
 - Breve introducción
 - La estrategia de comunicación de C3S
 - Acceso a los datos de información climática
 - Productos de información climática a los comunicadores



Climate
Change

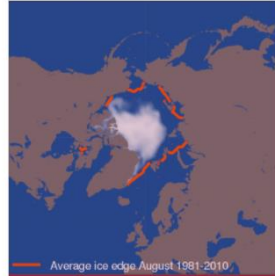
<https://climate.copernicus.eu/monthly-maps-and-charts>

Monthly summaries



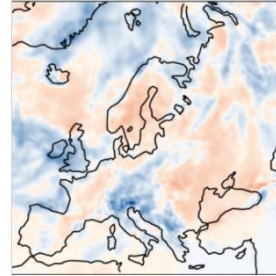
Surface air temperature

This series of monthly maps and charts, generated from ERA5 data, covers global and European surface air temperatures.



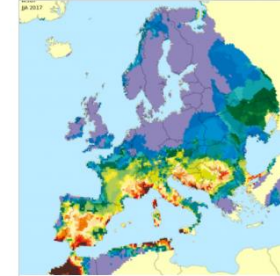
Sea ice

We produce sea ice maps every month. Based on ERA5 reanalysis data, these provide near real-time monitoring of the polar ice caps.



Hydrological variables

This series of monthly maps and charts, based on ERA5 data, covers several variables: precipitation, humidity, and soil moisture for Europe and the extra-tropical regions.



Surface in-situ monitoring for Europe

Monthly and yearly State-of-the-European-climate reports provided by C3S partners



- Publicado mensualmente en la web del C3S (4-6 de cada mes)
- Basado en ERA5 reanalysis
- Más ECVs en los próximos meses

IMPLEMENTED BY





Climate
Change

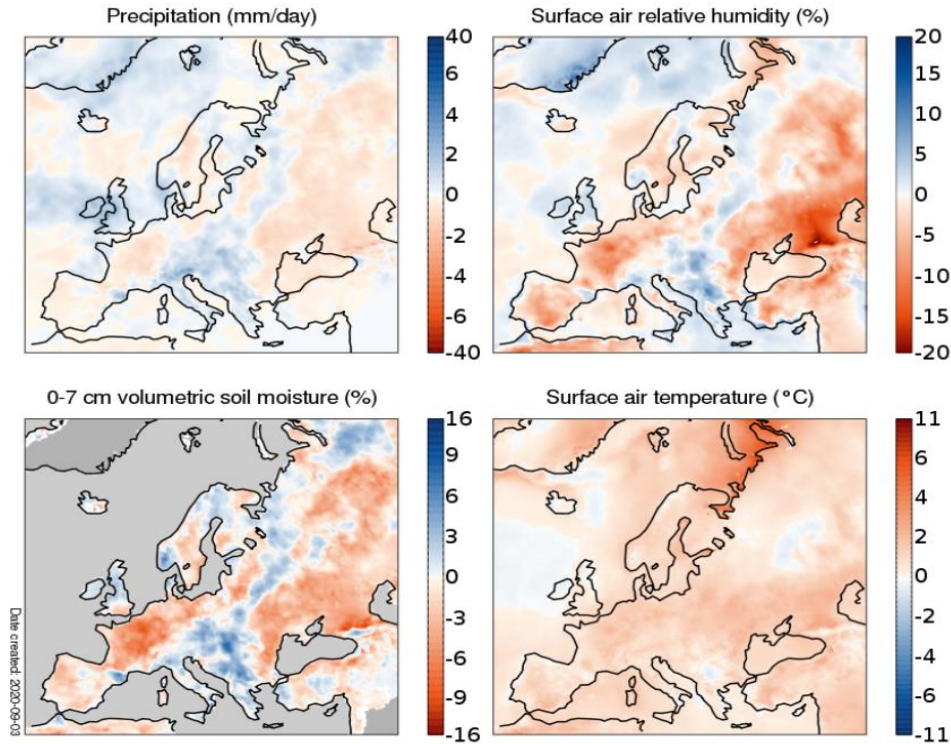
Precipitation, relative humidity and soil moisture for August 2020

During August 2020, many regions saw storm-related wetter-than-average-conditions. In Europe, summer storms caused flooding in a number of countries, including Greece, Ireland, Italy, Spain and the UK. Tropical storms affected many parts of the world, including hurricanes Isaias and Laura over the Caribbean and the USA, and typhoon Bavi over north-eastern China and the Korean Peninsula. August 2020 saw very dry conditions on the other hand in western USA.

EUROPE - AUGUST 2020 EUROPE SUMMER (JUNE 2020 TO AUGUST 2020) EUROPE - LAST 12 MONTHS GLOBE - AUGUST 2020 GLOBE - BOREAL SUMMER (JUNE 2020 TO AUGUST 2020) GLOBE - LAST 12 MONTHS LONGER TERM TRENDS



Anomalies for June to August 2020



(Data: ERA5. Reference period: 1981-2010. Credit: C3S/ECMWF)





Climate
Change

C3S – European State of the Climate



SUMMARY >

VIDEO OVERVIEW >

ABOUT THE EUROPEAN STATE
OF THE CLIMATE 2019 >

Climate in 2019

GENERAL

A review of annual and seasonal conditions in Europe and the European Arctic compared with the long-term average.



European temperature



European wet and dry conditions



European Arctic

EVENTS

We focus on two types of extreme events – heatwaves and heavy rainfall - which affected the continent during 2019.



Winter warm spell and summer heatwaves



Wet end to the year in western and southern Europe

SPOTLIGHT ON ...

High surface air temperatures and heavy precipitation during 2019 show a clear imprint on key climate variables.



Vegetation



Wildfires



Sunshine duration and clouds



Lake surface temperatures



River discharge



Heat and cold stress



Greenland ice sheet

<https://climate.copernicus.eu/ESOTC/>

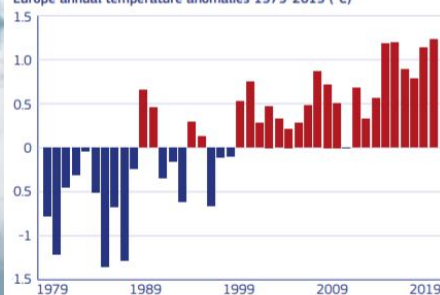


Climate Change

THE CLIMATE IN 2019 OVERVIEW

A review of annual and seasonal conditions in Europe and the European Arctic compared to the long-term average.

Europe annual temperature anomalies 1979-2019 (°C)



Surface air temperature anomaly for Europe, relative to 1981-2010. Data source: ERA5, Credit: C3S/ECMWF



11 of the 12 warmest years have occurred since 2000

European temperature

Over the last four decades, temperatures in Europe have shown a clear warming trend.

In 2019, the annual temperature for Europe was the highest on record, though closely followed by 2014, 2015 and 2018. It was warmer than average over almost the whole of Europe. Central and eastern areas saw the most above-average temperatures; it was cooler than average only over a very small part of northern Europe.

All seasons were warmer than average. Summer was the fourth warmest since at least 1979, with temperatures in some areas as much as 3°C to 4°C higher than normal. Two intense heatwaves in June and July brought record-breaking temperatures to some European countries.

The annual means of both minimum and maximum daily temperatures were above average almost everywhere in Europe, with maximum temperatures generally showing larger anomalies than minimum temperatures.



Soil moisture values in 2019 were the second lowest since at least 1979

European wet and dry conditions

There is no clear trend in annual precipitation for Europe, and 2019 values were close to average. The number of precipitation days was up to 30 days more than average in the north, west and south, whereas central and eastern Europe saw below-average values.

In winter, spring and summer, precipitation was below average in the southwest, however, this changed during autumn and December when for large parts of this region it became much above average.

Soil moisture shows a downward trend, with values for 2019 being the second lowest since at least 1979. Most of continental Europe saw below-average soil moisture throughout the year, especially in central Europe during summer and in the southeast during autumn. During autumn, parts of western, northern and southern Europe saw soil moisture anomalies becoming closer to or even above average, concurrent with the above-average precipitation in these regions.



Cooler and more sea ice than in recent years

European Arctic

The European sector of the Arctic has seen an upward trend in temperature and a downward trend in sea ice cover over the last 40 years. 2019 saw surface air temperatures over sea and land at 0.9°C above average. However, as the 14th warmest in the 41-year dataset, the year was relatively cold compared to recent years, with the lowest annual temperature since 2010.

At the end of July, all-time temperature records were broken in northern Scandinavia when a short heatwave travelled across Europe; it also led to record surface melting in Greenland. However, the summer season as a whole had temperatures relatively close to average.

Sea ice extent was lower than average, as it has been consistently for the past 15 years, but markedly above the values recorded in six of the preceding seven years.



IMPLEMENTED BY

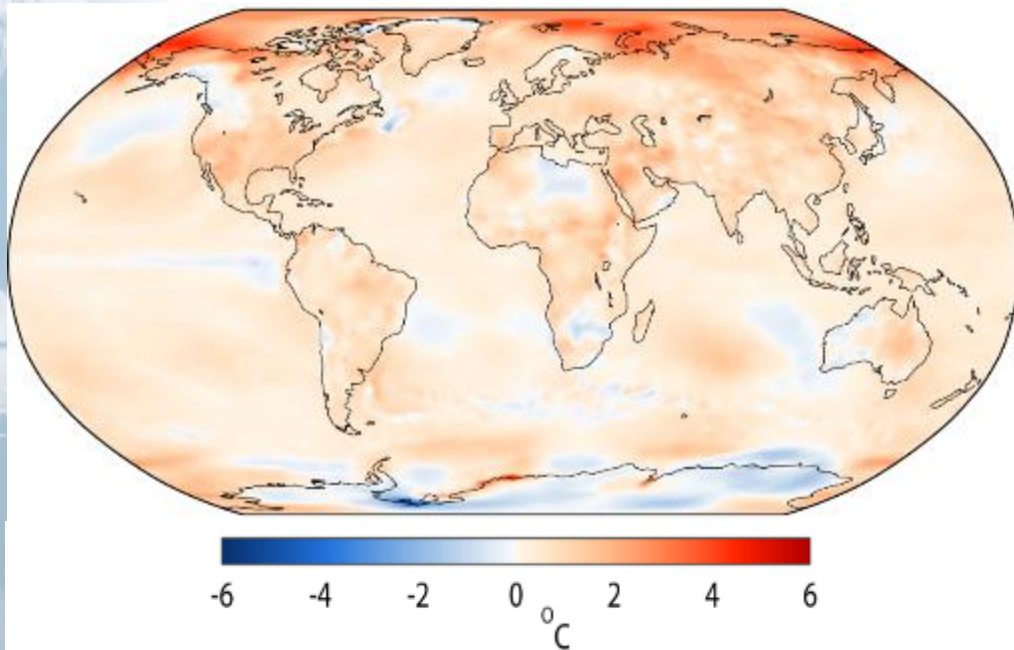




Climate
Change

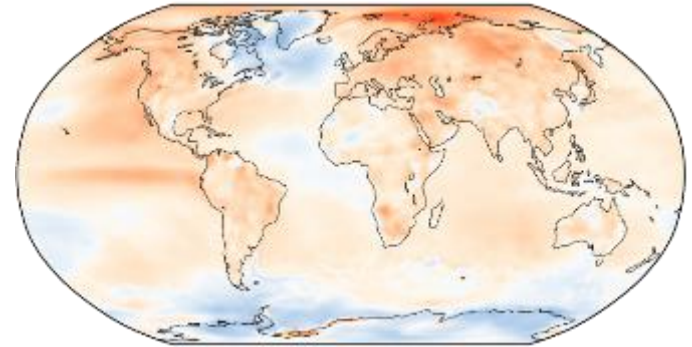
2017 – warmest non-El Niño year on record

2017

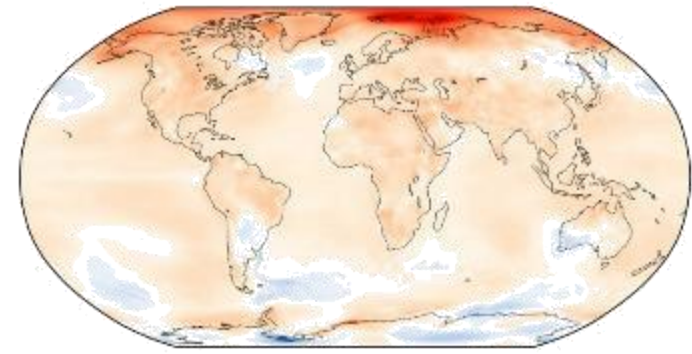


Average surface air temperature compared to 1981-2010

2015



2016



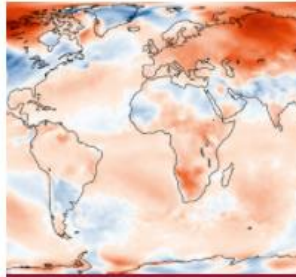


Climate
Change

•Indicadores del clima

Headline Climate Indicators

The headline climate indicators show the long-term evolution of several key climate variables. These can be used to assess the global and regional trends of a changing climate.



Surface temperature



Greenhouse gas concentrations



Greenhouse gas fluxes



Sea ice



Glaciers



Glaciers and sea level



Sea level



Ice sheets



Climate
Change

Indicadores – Gases de efecto invernadero

Greenhouse gases

Concentrations of atmospheric carbon dioxide (CO₂) and methane (CH₄) are increasing. We would have to look back millions of years in history to find concentrations as high as they were in 2019.

Greenhouse gas concentrations

The amount of a gas contained in a certain volume of air.



CO₂ increase by about

0.6% per year ▲

in atmospheric concentrations

CH₄ increase by about

0.4% per year ▲

in atmospheric concentrations



Concentrations (column-averaged mixing ratios) estimated from satellite data for CO₂ and CH₄ covering 2003–2019

The estimated net surface fluxes of the greenhouse gases CO₂, CH₄ and N₂O have also been increasing during recent decades.

Anthropogenic emissions of CO₂ have been partly compensated for by a natural uptake by oceans and vegetation. In some countries, the variation in these fluxes is mainly driven by fossil fuel burning, while for others the dominant process is the natural uptake by vegetation through photosynthesis. It is estimated that, across Europe as a whole, vegetation does not fully compensate for anthropogenic emissions. The scale of the European sink relative to the rest of the world varies over time.



Greenhouse gas net flux

The difference between the amount of a gas added to the atmosphere by emissions from various 'sources' and the amount taken up by various 'sinks', which remove that gas from the atmosphere.



CO₂ annual net emissions about

5 PgC per year ▲

at the Earth's surface

CH₄ annual net emissions about

420 TgC per year ▲

at the Earth's surface

N₂O annual net emissions about

18 TgN per year ▲

at the Earth's surface



Estimated net flux data for

CO₂: 1979–2018

N₂O: 1996–2017

CH₄: 1990–2018



IMPLEMENTED BY



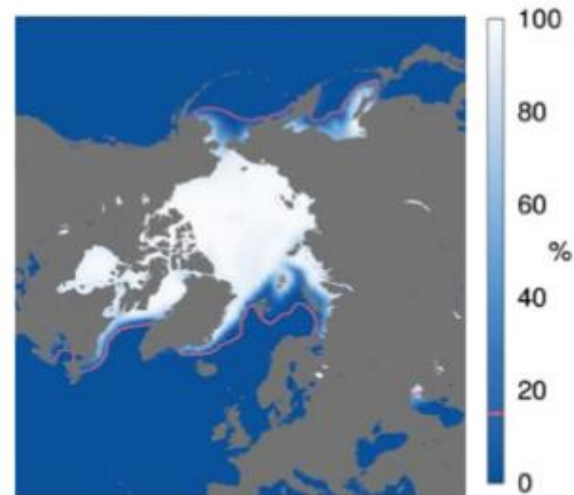


Climate
Change

Indicadores - Hielo marino



- Durante los últimos meses de 2017, algunas áreas del Ártico, del lado del Atlántico Norte, experimentaron temperaturas medias superiores a 6° C sobre la media de 1981-2010 average.
- 2017 fue el tercer año más cálido registrado con 1.7° C por encima de la media.



Sea ice cover for January 2017, the month with the year's largest anomaly in the European sector of the Arctic. The pink line denotes the 1981-2010 average sea ice edge for the month.



Climate

Indicadores - Glaciares

KEY MESSAGES

- Both globally and in Europe, glaciers are seeing a substantial and prolonged loss of ice mass.
- Globally, an average of about 30 m loss of ice thickness has been observed since 1957.
- Since 1997, the monitored glaciers in Europe have lost between 10 m (northern Scandinavia) and 29 m (Alps) of ice. However, over most of the 20th century, the rate of mass loss was lower, and intermittent periods of mass gain were observed at both regional and decadal scales.

The annual mass balance of a glacier is calculated as the difference between snow accumulation (mass gain) and melt of ice and snow (mass loss) over a year, and reflects the prevalent atmospheric conditions. When measured over a long period, trends in mass balance are an indicator of climate change. The graph below shows cumulative mass changes from 1957 to 2019, averaged over 41 reference glaciers around the world, relative to the year 1997. The figure reveals a strong net mass loss that is directly contributing to sea-level rise. Seasonal melting of ice and snow also contributes to runoff, but only the net change **impacts on global sea level.**



Globally around

30 m loss ▼

in ice thickness since 1957

In Europe observed

4–35 m loss ▼

in ice thickness in southwestern Scandinavia and the Alps respectively, since the 1960s

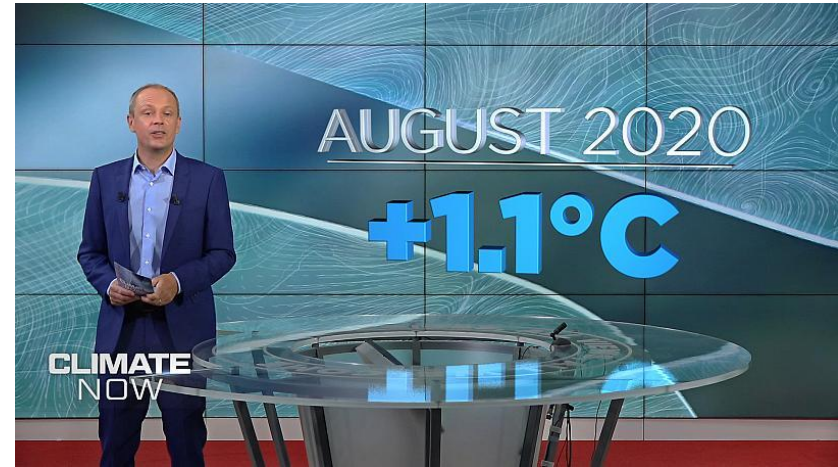
TYPES OF DATA USED:



Reference glacier network with more than 30 years of ongoing observations



C3S boletines climatológicos en televisión



Credit: ZDF, Özden Terli, C3S

- Productos mensuales standard
- Productos “adaptados”



Climate
Change

Resumen final – take home messages

- La comunicación es una herramienta muy ponderosa de lucha contra el cambio climático (pero también al contrario si es mal utilizada),
- En estrategia de comunicación es imprescindible conocer las necesidades y objetivos del público al que nos dirigimos,
- C3S ha desarrollado una estructura de acceso simple, libre y completa a un rango de datos e información climática de máxima calidad sin precedentes.
- C3S sirve un amplio espectro de usuarios y agencias europeas y en el mundo. La estrategia de C3S es el “intermediate user”.
- La estrategia de comunicación de C3S pasa por la difusión de información y datos climáticos a través de una mezcla de medios propios, medios ganados y otros de partnership.
- Los boletines ‘climáticos’ mensuales y el European State of Climate anual son dos ej de productos de información climática dirigidos a los comunicadores.



Climate
Change

Conclusions

● climate change

Search term

??

+ Add comparison

Spain ▾

Past 12 months ▾

All categories ▾

Web Search ▾

Interest over time ⓘ





Climate
Change

Conclusions

● **climate change**

Search term

● **ronaldo**

Search term

+ Add comparison

Spain ▾

Past 12 months ▾

All categories ▾

Web Search ▾

Interest over time ⓘ



Average

Gracias por vuestra atención !

joaquin.munoz@ecmwf.int



@j_munoz_sabater

Más información:

Programa Copernicus:

<http://www.copernicus.eu/>

Copernicus Climate Change Service:

<https://climate.copernicus.eu/>

Climate Data Store:

<https://cds.climate.copernicus.eu/>