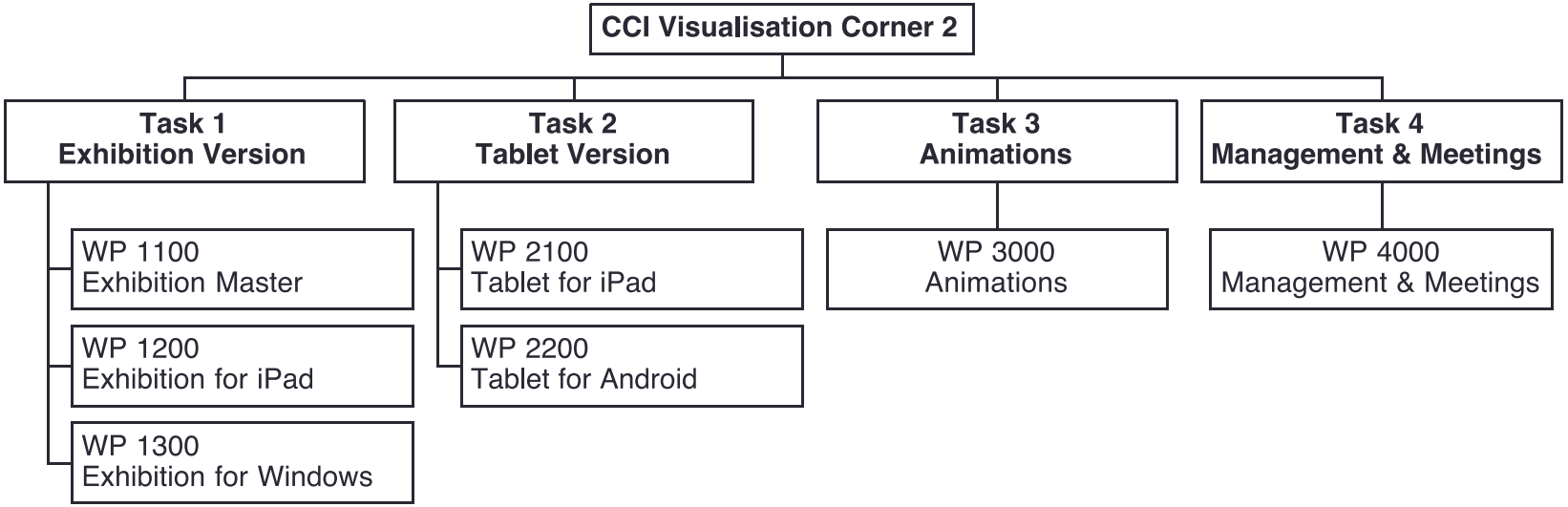
CCI Visualisation Corner
Phase 2

Philip Eales, Kevin Tildsley, Andrew Wayne,
Tim Day, Mona Craven, Fulvio Marelli
Planetary Visions Limited

Cat Downy, Pascal Lecomte
European Space Agency ESA-ECSAT

CCI Visualisation Corner 2

Tasks and Work Packages



CCI Visualisation Corner 2

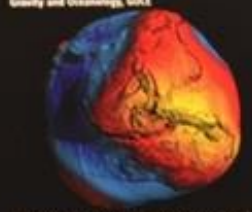
TASK 1 Exhibition Version

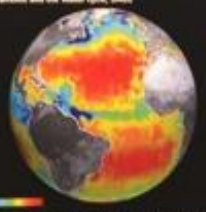

IMATE

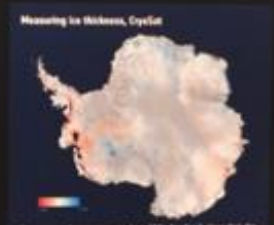

esa
sea ice
sea level
sea surface temperature
ocean colour
ice sheets
glaciers
climate modelling user group
land cover
soil moisture
fire
greenhouse gases
ozone
cloud
aerosol
CLIMATE CHANGE INITIATIVE

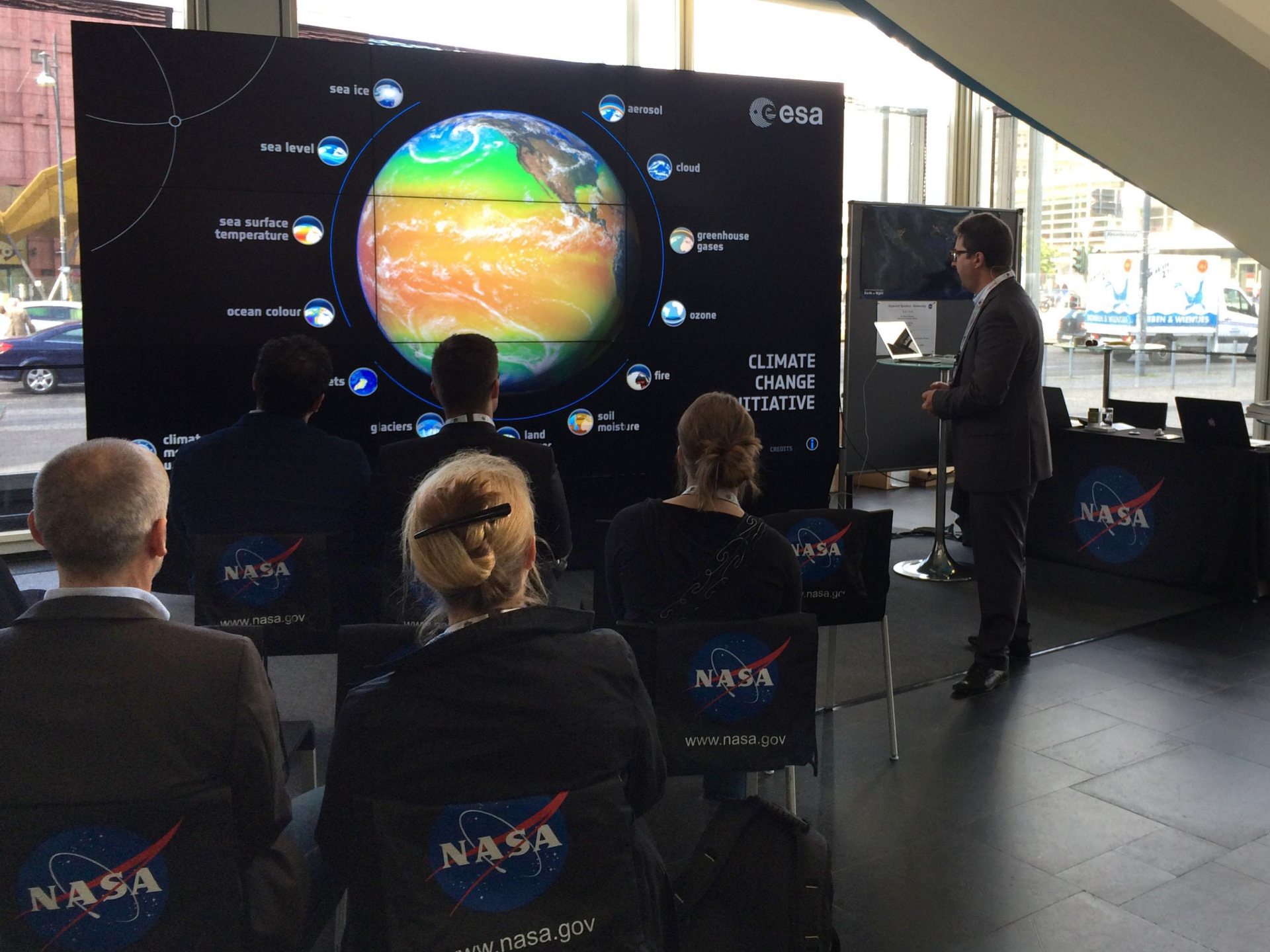
UNDERSTANDING THE EARTH

Breakthrough technologies to understand how the Earth works








sea ice
sea level
sea surface temperature
ocean colour
glaciers
land
soil moisture
fire
ozone
greenhouse gases
cloud
aerosol
esa
CLIMATE
CHANGE
NASA
www.nasa.gov

CCI Visualisation Corner 2

TASK 1 Exhibition Version

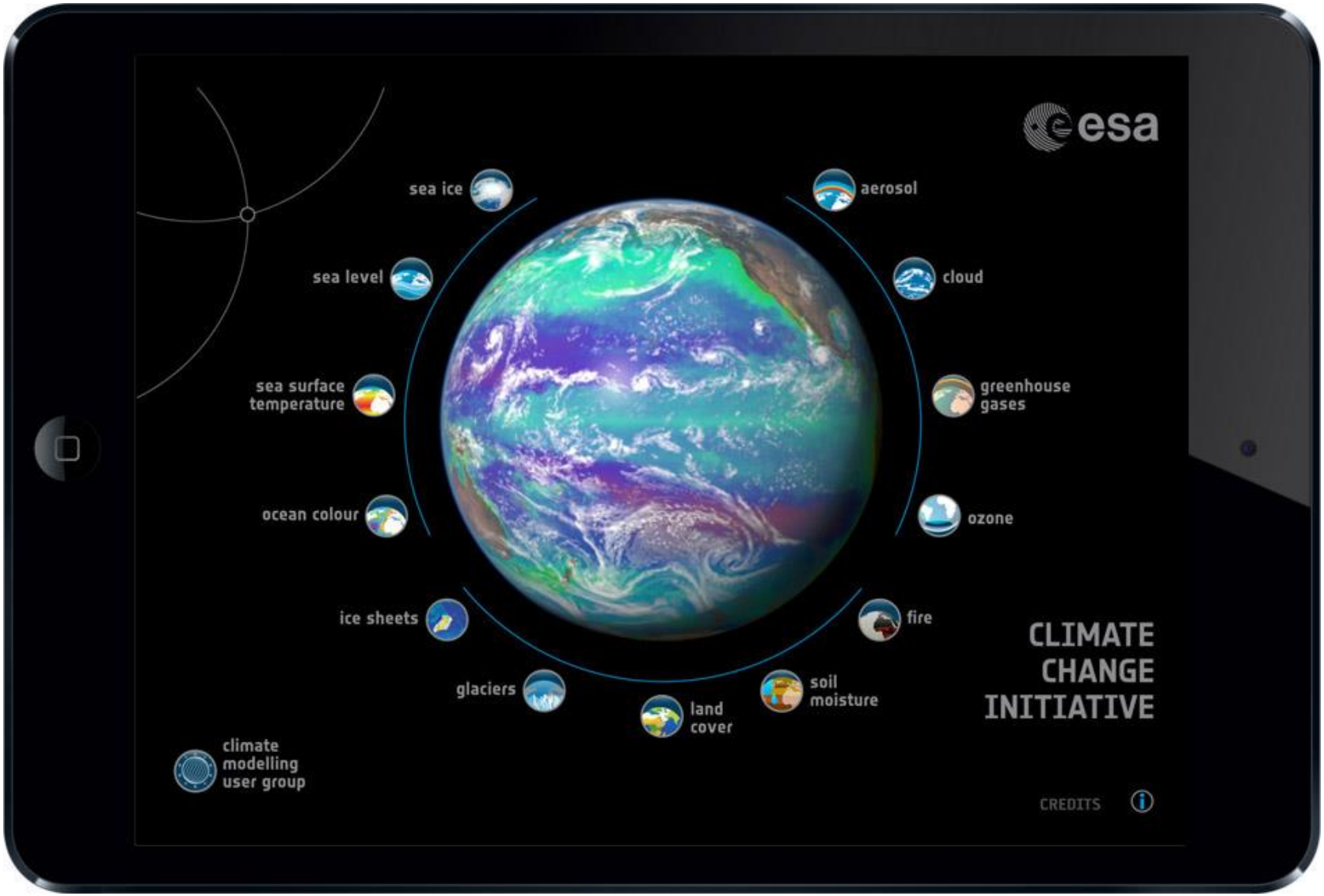
WP1000 Exhibition Master Version (MacOS)

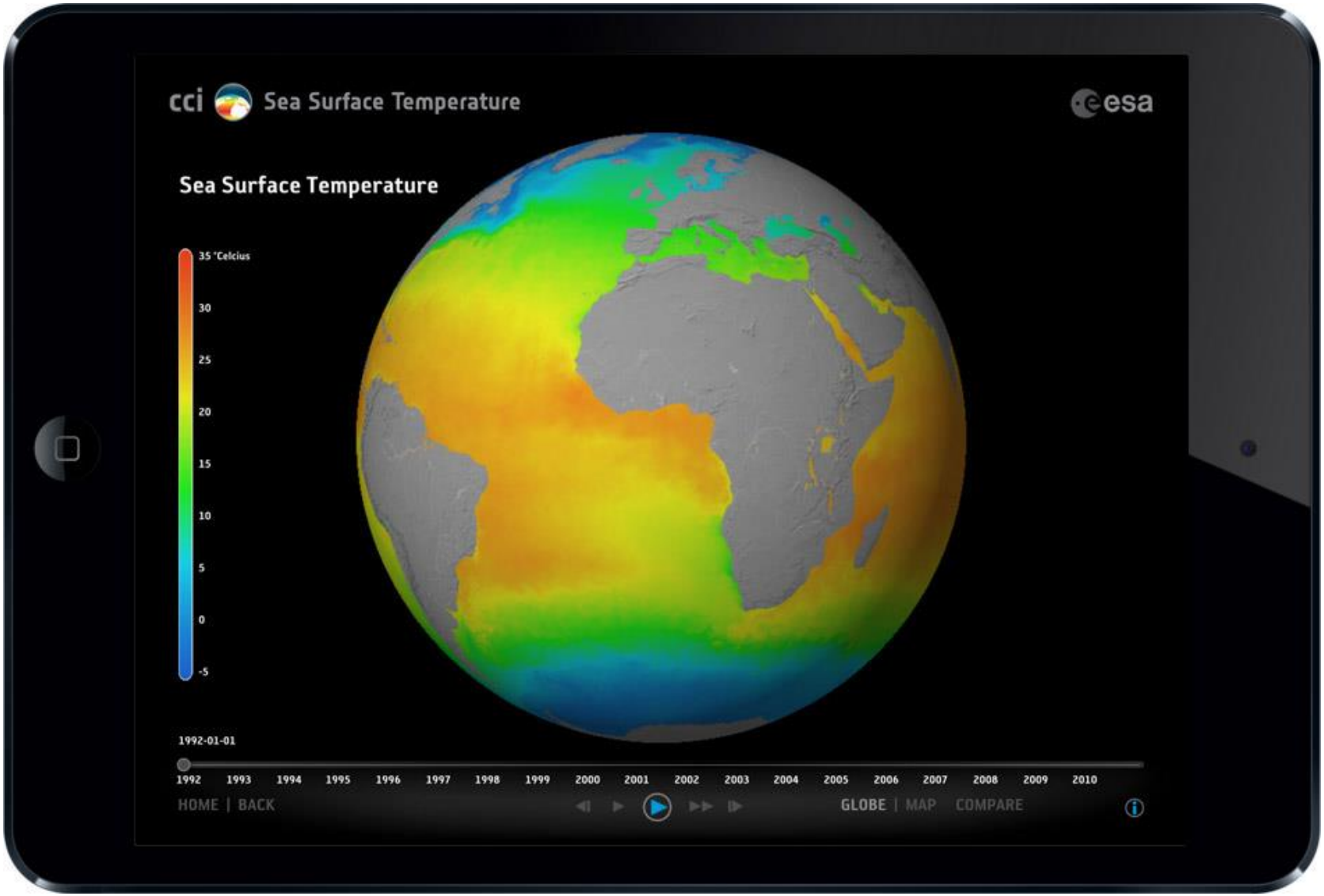
- definitive version 1 (v5.3.7)
- user guide
- includes data from CMUG (Met Office)
- updated data
- distributed by ESA in March 2015

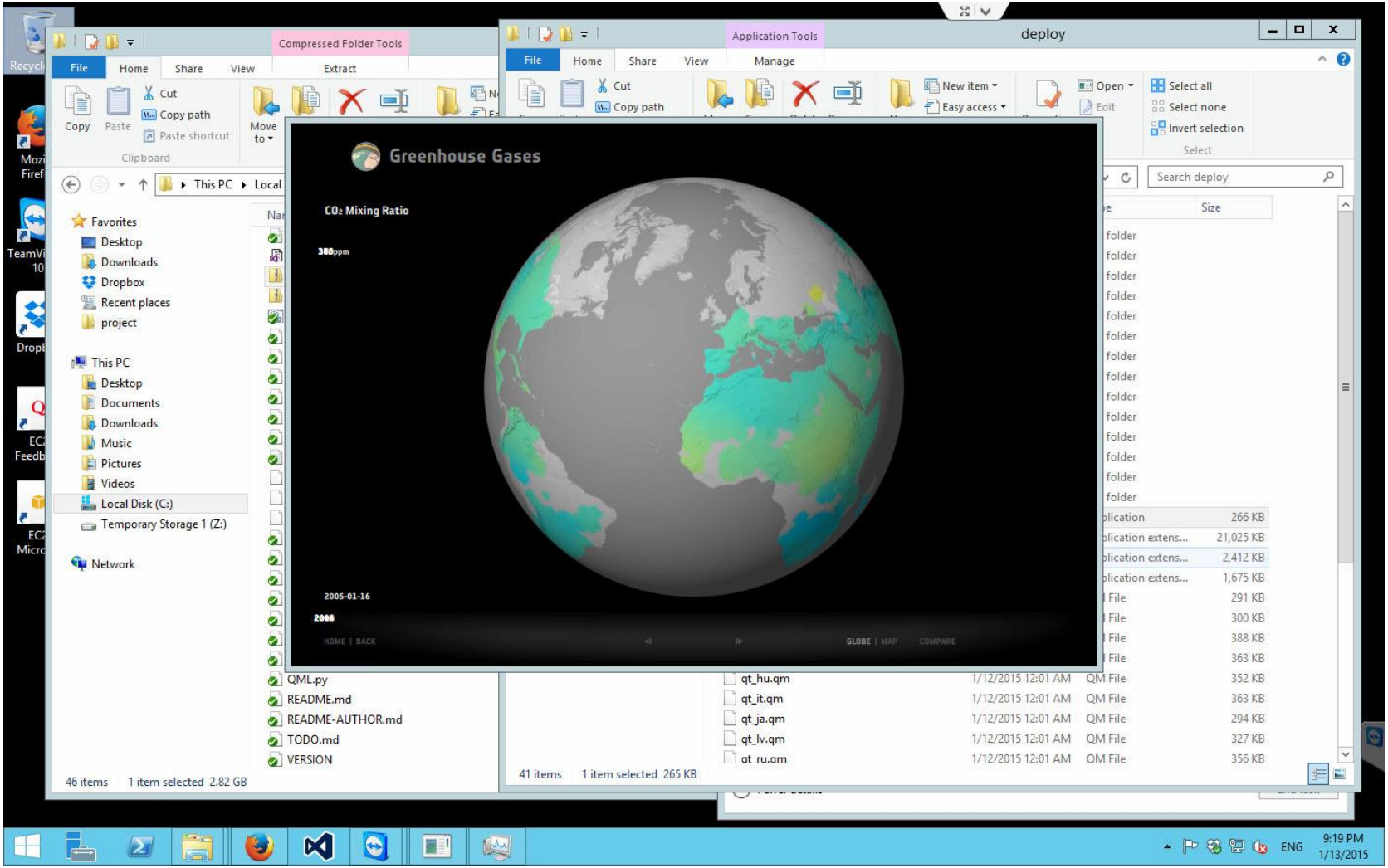
WP1100 Exhibition Version for iPad

WP1200 Exhibition Version for Windows


esa
aerosol
cloud
greenhouse gases
ozone
fire
soil moisture
land cover
glaciers
ice sheets
ocean colour
sea surface temperature
sea level
sea ice
climate modelling user group
CLIMATE CHANGE INITIATIVE
MacBook Pro


esa
sea ice
aerosol
sea level
cloud
sea surface temperature
greenhouse gases
ocean colour
ozone
ice sheets
fire
glaciers
soil moisture
land cover
climate modelling user group
CLIMATE CHANGE INITIATIVE
CREDITS


cci
Sea Surface Temperature
esa
Sea Surface Temperature
35 °Celcius
30
25
20
15
10
5
0
-5
1992-01-01
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
HOME | BACK
GLOBE | MAP COMPARE


Greenhouse Gases
CO2 Mixing Ratio
386ppm
2005-01-16
2008
HOME | BACK
GLOBE | MAP
COMPARE
Compressed Folder Tools
Application Tools
deploy
File
Home
Share
View
Extract
Manage
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
New item
Easy access
Open
Edit
Select all
Select none
Invert selection
Select
This PC
Local
Search deploy
Favorites
Desktop
Downloads
Dropbox
Recent places
project
This PC
Documents
Music
Pictures
Videos
Local Disk (C:)
Temporary Storage 1 (Z:)
Network
Size
folder
QML.py
README.md
README-AUTHOR.md
TODO.md
VERSION
qt_hu.qm
qt_it.qm
qt_ja.qm
qt_lv.qm
qt_ru.qm
1/12/2015 12:01 AM
QM File
46 items
1 item selected 2.82 GB
41 items
1 item selected 265 KB
ENG
9:19 PM
1/13/2015

CCI Visualisation Corner 2

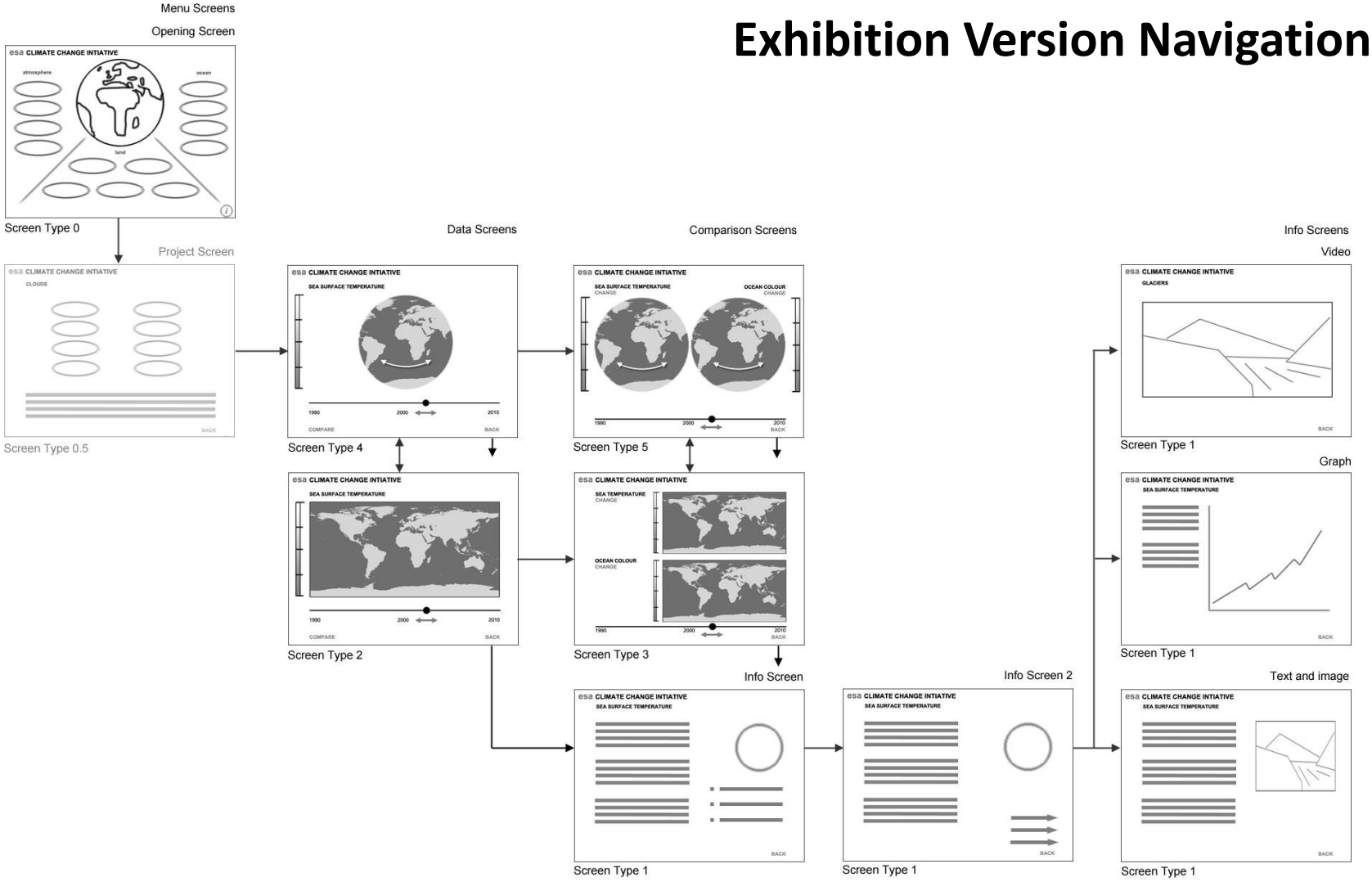
TASK 1 Exhibition Version

WP1000 Exhibition Master Version 2

- to cover all ECV parameters - 35 data sets (not 13)
- implement new project index screen (type 0.5)
- text for additional parameters
- more hotspot close-ups for Glaciers, Land Cover?
- more non-text content - graphs, pictures, video
- updated data

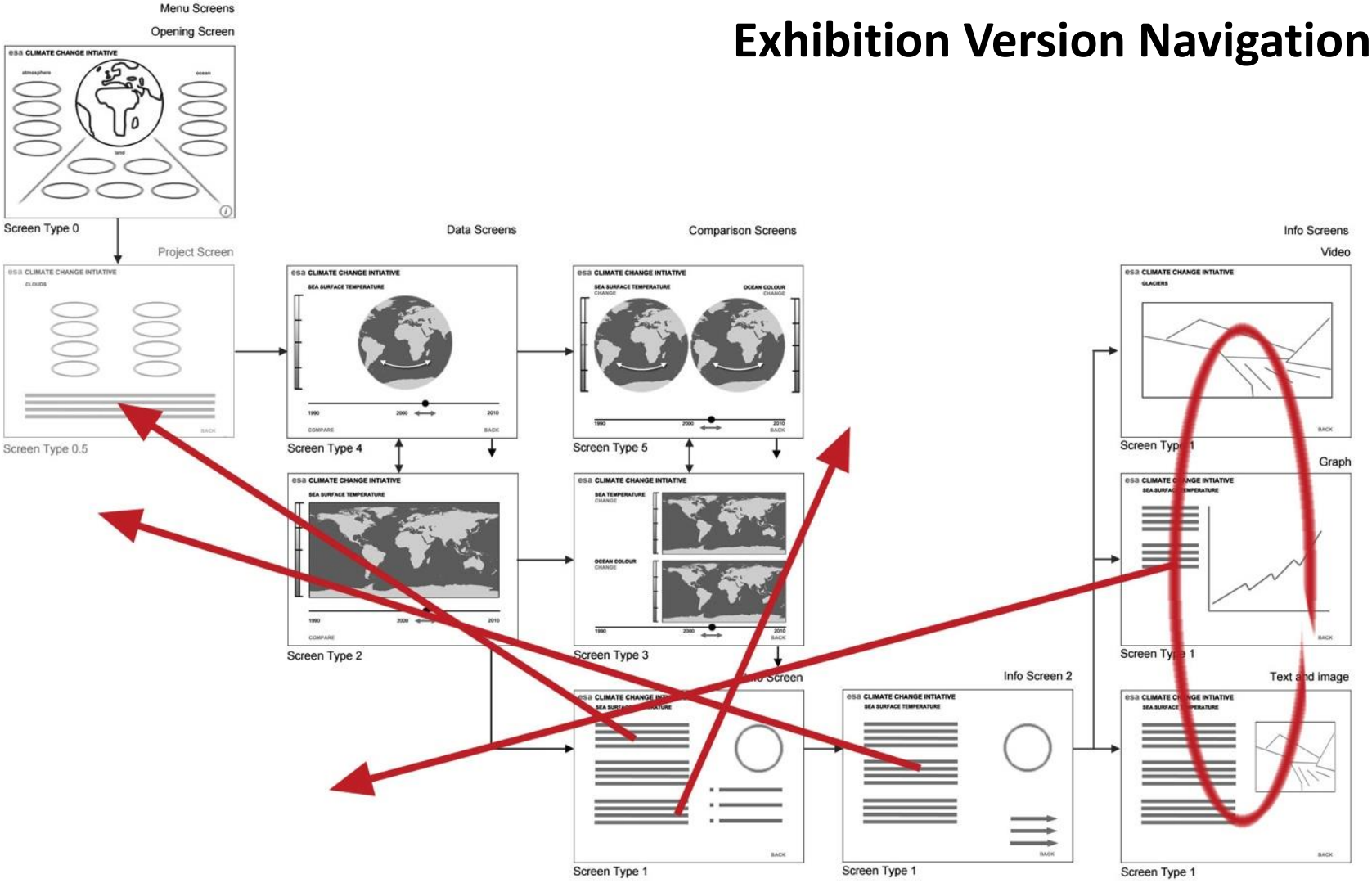
CCI Visualisation Corner

Exhibition Version Navigation



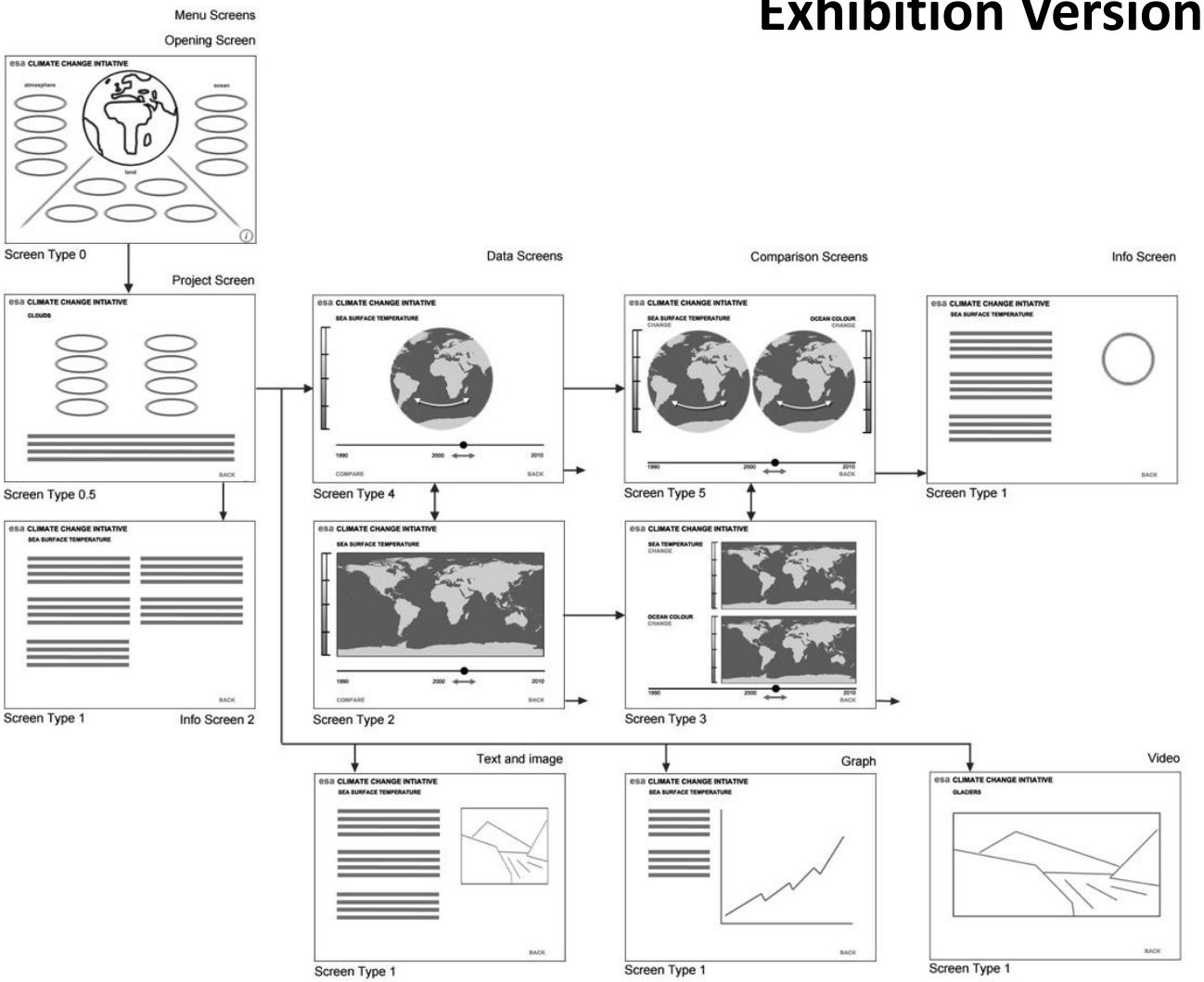
CCI Visualisation Corner

Exhibition Version Navigation



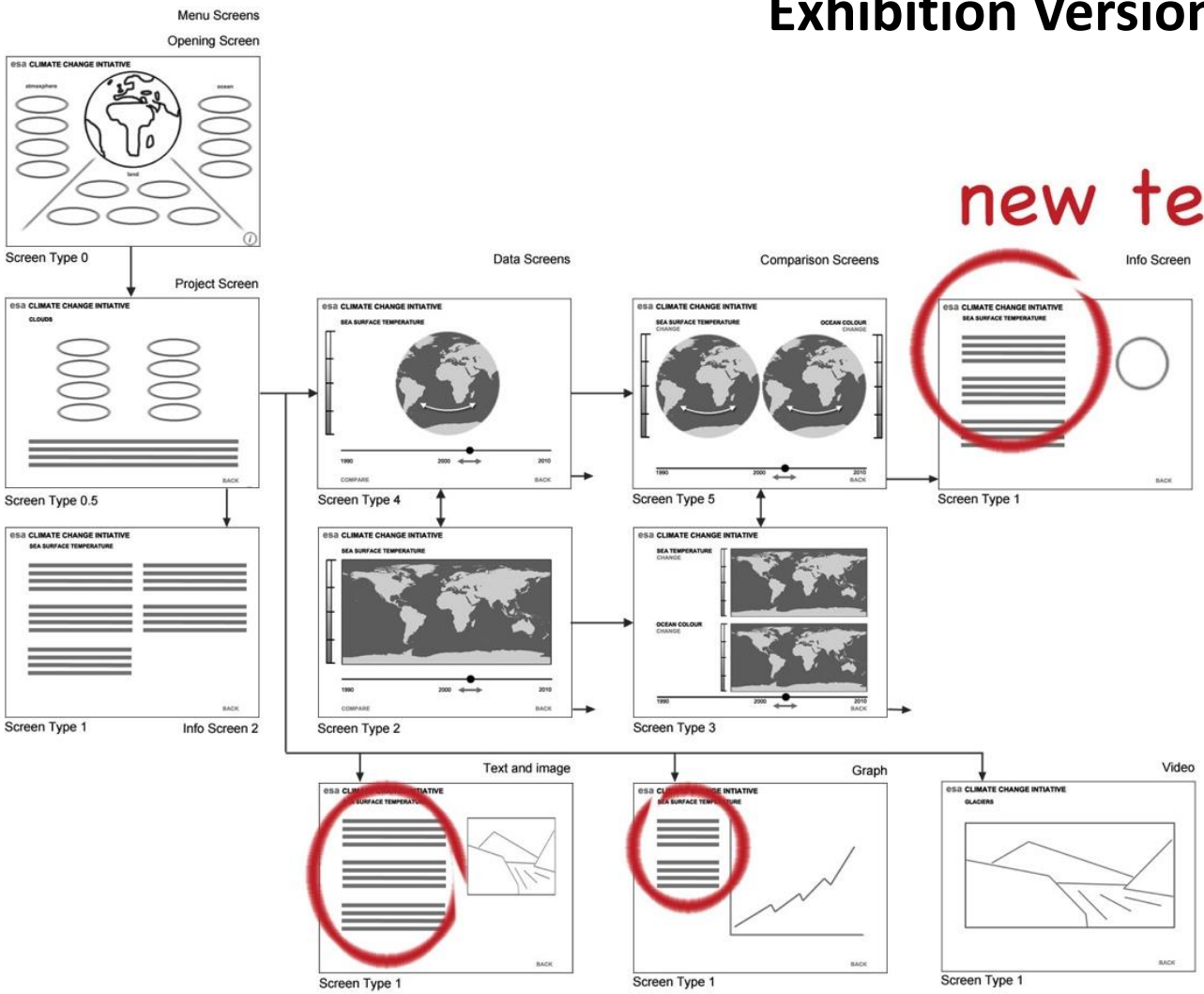
CCI Visualisation Corner

Exhibition Version 2 Navigation



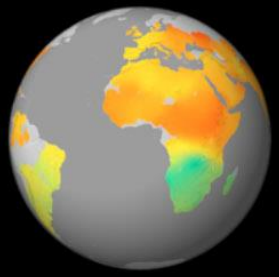
CCI Visualisation Corner

Exhibition Version 2 Navigation

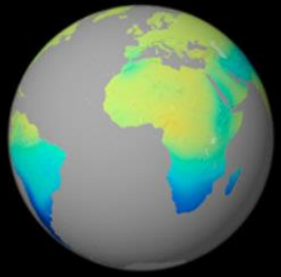


cci Greenhouse Gases

esa



CO_2 mixing ratio



methane mixing ratio

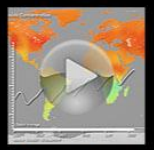
40%
increase in atmopsheric carbon dioxide since pre-industrial times (IPCC AR5, 2013)

800,000 YEARS
since greenhouse gas concentrations were last this high (IPCC, 2013)

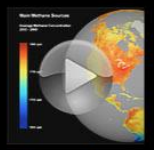
0.5 - 1.3 °C
global mean surface warming 1951-2010 due to greenhouse gases (IPCC, 2013)

400 PPM
atmospheric carbon dioxide recorded at Mauna Loa, May 2013 (NOAA/Scripps)

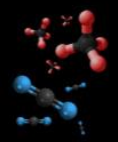
It is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by anthropogenic forcings, including the increase in greenhouse gas (GHG) concentrations. Continued emissions of GHGs will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of GHG emissions.



Atmospheric Carbon Dioxide



Atmospheric Methane

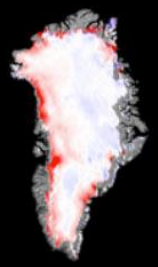


GHG Molecules

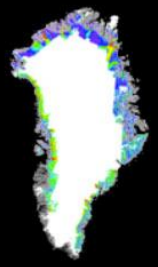
Learn more ›

cci Ice Sheets

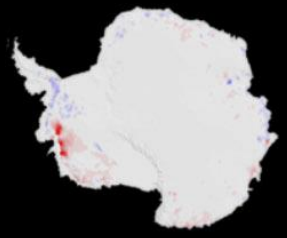
esa



Greenland elevation change



Greenland ice velocity



Antarctic elevation change

215 GIGATONNES PER YEAR
ice lost from Greenland 2002-2011, and accelerating

147 GIGATONNES PER YEAR
ice lost from Antarctica, mainly from Peninsula and West Antarctica

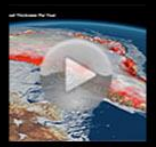
3 - 20 CM
sea level rise likely from Greenland and Antarctic ice sheets combined by 2100

7 METRES
sea level rise potential from loss of Greenland Ice Sheet (over 1000 years)

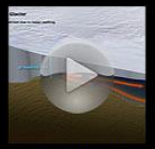
source: IPCC AR5, 2013

Ice sheets today are found only in Greenland and Antarctica. Together, these masses of glacial land ice contain over 99% of the freshwater ice on Earth. In the past decade, satellite, airborne and in situ observations have greatly improved our ability to identify and quantify change in the vast polar ice sheets of Antarctica and Greenland.

Store Glacier



Ice Sheet Mass Balance

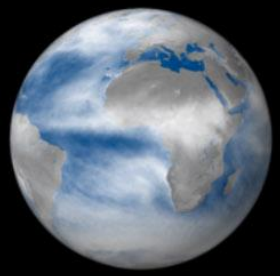


Pine Island Glacier

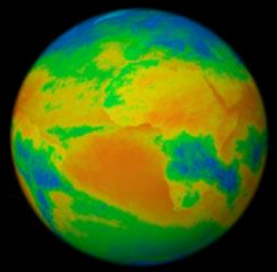
Learn more ›

cci Cloud

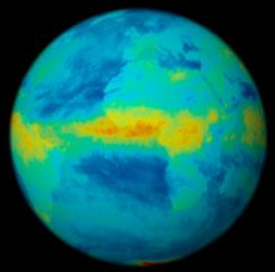
esa



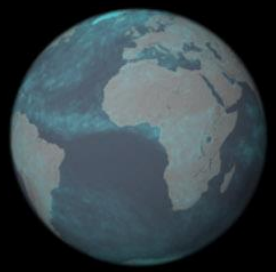
cloud fraction



cloud top temperature

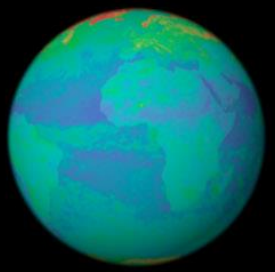


cloud top height



ice water path

liquid water path



effective radius

2/3
of the globe is covered by clouds

20%
of incoming solar energy is reflected by clouds and they absorb about 3%

-20 W/m²
net global mean cloud radiative effect, combining negative albedo effects and positive greenhouse effects

QUANTIFICATION
of cloud and convective effects in climate models continues to be a challenge

source: IPCC AR5, 2013

Clouds are a key uncertainty in understanding what drives climate change. Cloud amounts and properties are extremely variable in space and time, making observation and analysis very hard. The net radiative feedback of all cloud types combined is likely to be positive. Uncertainties in the sign and magnitude of the cloud feedback are primarily due to continuing uncertainties in the impact of warming on low clouds.

optical thickness

Learn more ›

cci Sea Level

CCI CONTRIBUTION

CCI Sea Level developed a new methodology to reprocess seven different satellite altimetry missions. The project produced new data sets for a Sea Level ECV that are specifically designed for climate applications. Time series of gridded Sea Level Anomalies have been calculated after merging all the altimetry mission measurements together into monthly grids with a spatial resolution of a quarter degree. The data sets have been improved on several scales:

• The Global Mean Sea Level derived from ESA missions (ERS-1, ERS-2, Envisat) has been improved; errors have been reduced and the inter-annual signal is now more consistent with other data sets.

• Regional Mean Sea Level trends have also been significantly improved, providing more detailed patterns of sea level change at a local level.

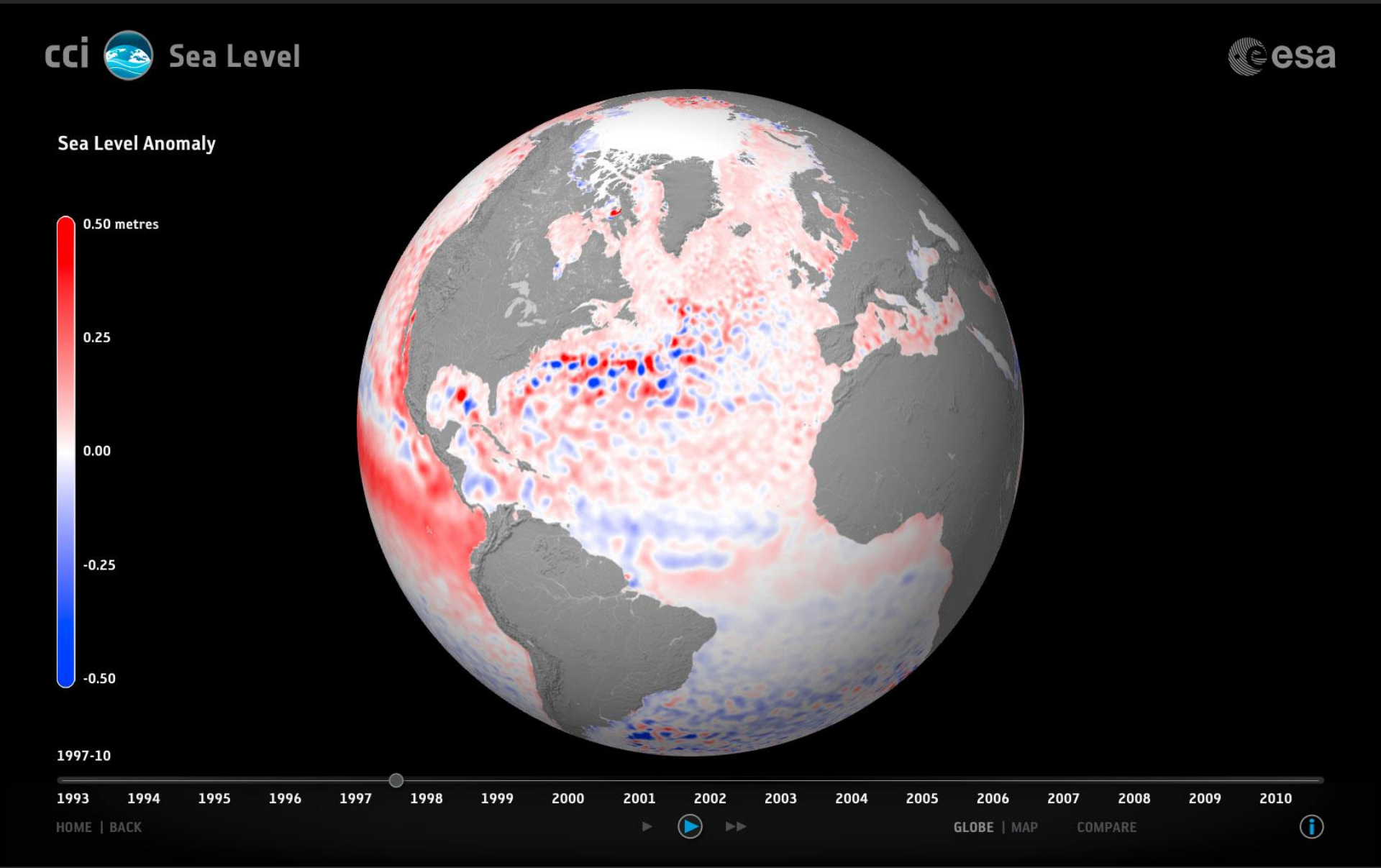
PROJECT TEAM

Collecte Localisation Satellites (CLS)
Technical University of Denmark National Space Institute (DTU-Space)
European Centre for Medium-range Weather Forecasts (ECMWF)
German Research Centre for Geosciences (GFZ)
isardSAT
Laboratoire d'Études en Geophysique et Oceanographie Spatiales (LEGOS)
Logica
Nansen Environmental and Remote Sensing Centre (NERSC)
Universität Hamburg

HEADLINE SOURCES

IPCC, 2013: Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [T F Stocker, D Qin, G-K Plattner, M Tignor, S K Allen, J Boschung, A Nauels, Y Xia, V Bex and P M Midgley (eds)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

OECD, 2008: R J Nicholls et al, *Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes: Exposure Estimates*, OECD Environment Working Papers, No. 1, OECD Publishing.


cci Sea Level
esa
Sea Level Anomaly
0.50 metres
0.25
0.00
-0.25
-0.50
1997-10
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
HOME | BACK
GLOBE | MAP
COMPARE

cci Sea Level

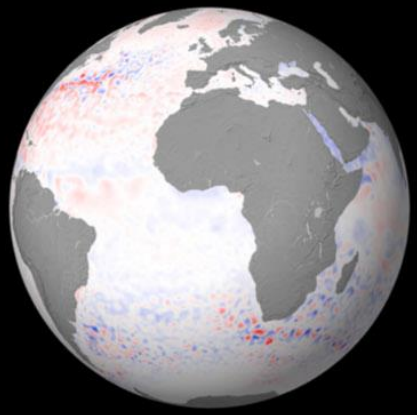
esa

Sea Level Anomaly

Placeholder text: This text is available to explain what the parameter is and how it is measured. Some details of the satellites, data and algorithms used may be given at a reasonably technical level. Could also include discussion of difficulties and long-terms goals specific to this parameter that are not covered in the project "contribution" text on the previous page.

DATA SOURCE

Monthly sea level anomaly 1992-2010 based on radar altimeter measurements from ERS-1, ERS-2, Envisat, Topex/Poseidon, Jason-1, Jason-2, Geosat-Follow-On (1993-2010 shown here).



Store Glacier

Store Glacier flows off the western edge of the Greenland Ice Sheet. With a 5km-long calving front, Store is an iceberg factory, discharging 13-17 cubic km of ice into the North Atlantic each year.

Eric Rignot, NASA JPL

esa

CryoSat-2
Europe's ice mission, CryoSat, in orbit over the Antarctic Peninsula.

CryoSat's Radar Altimeter is used to measure sea ice freeboard, from which sea ice thickness may be derived.

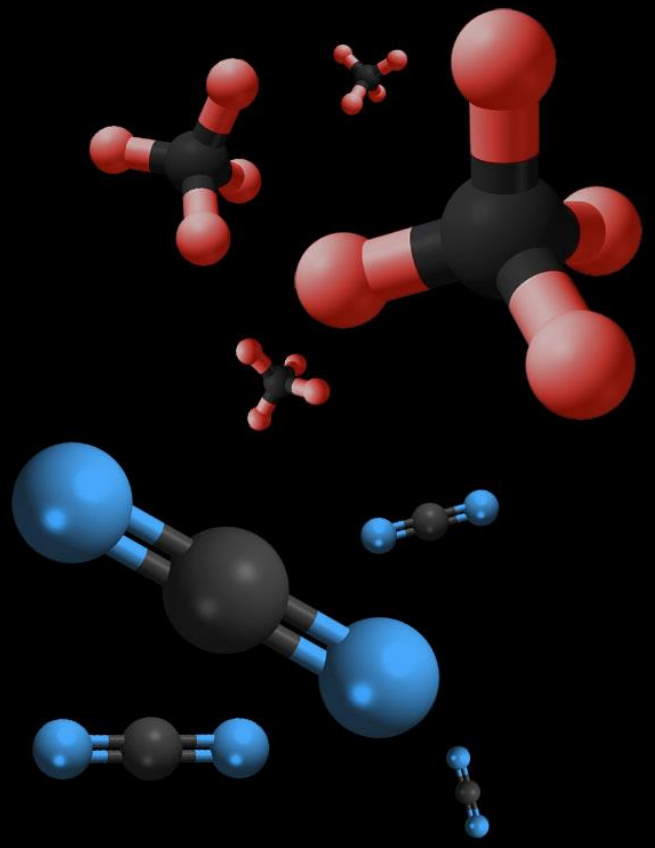
Planetary Visions/ESA/NASA

esa

GHG Molecules

Heat is absorbed by a molecule if the atoms inside can vibrate at the frequency of infrared radiation. More complex molecules have more vibrational modes, so more opportunites to absorb heat, making them more powerful greenhouse gases.

A methane molecule, with one carbon atom (grey) and four hydrogen atoms (red), can absorb more heat than a carbon dioxide molecule, with one carbon atom and two oxygen atoms (blue). Although a more powerful greenhouse gas, methane is much less abundent in the atmosphere than carbon dioxide, so contributes only about one quarter of the warming contributed by carbon dioxide.



cci Sea Level

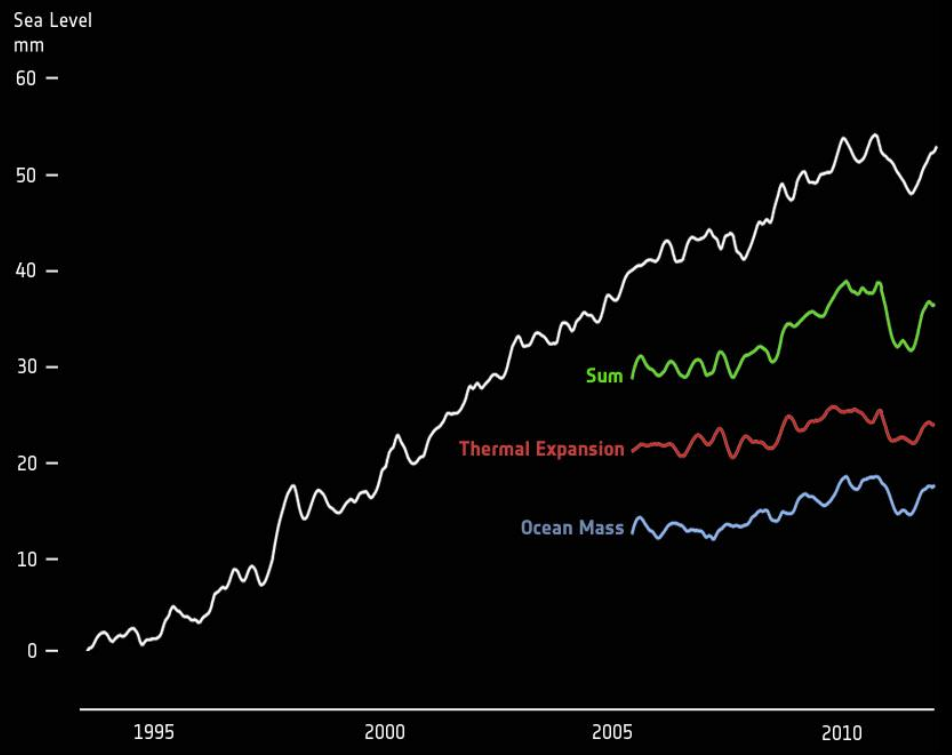
esa

GLOBAL MEAN SEA LEVEL 1993-2011

CCI Global Mean
Altimetry-based global mean sea level from CCI altimetry grids

Thermal Expansion
ARGO global mean (thermosteric sea level)

Ocean Mass
GRACE global mean (ocean mass from GRGS)



(Laboratoire d'Etudes en Géophysique et Océanographie Spatiales)

CCI Visualisation Corner 2

TASK 1 Exhibition Version

WP1000 Exhibition Master Version 2

Additional Functionality

- Playlist mode
- Automatic playback
- Customised Front Screen
- Display options incorporated in the user interface

CCI Visualisation Corner 2

Exhibition Version Playlist

```
# <h1>Playlist covering all the projects</h1>
#
5 : index.qml
# Sea Surface Temperature
#
15 : project.qml?project=sst
5 : show.qml?mode=G&project=sst&data=SST/SST&view=0.0,0.0,1.0&play=1
5 : show.qml?mode=M&project=sst&data=SST/SST&view=0.0,0.0,1.0&play=1
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5 : show.qml?mode=G&project=sst&data=SST/SST&view=-120,-20,1.0&play=1
5 : compare.qml?project=sst&data=SST/SST&auxproject=sealevel&auxdata=SeaLevel/Anomaly&mode=
2 : compare.qml?project=sst&data=SST/SST&auxproject=sealevel&auxdata=SeaLevel/Anomaly&mode=
5 : compare.qml?project=sst&data=SST/SST&auxproject=oceancolour&auxdata=OceanColour/Chloroph
5 : compare.qml?project=sst&data=SST/SST&auxproject=oceancolour&auxdata=OceanColour/Chloroph
5 : datainfo.qml?project=sst&data=SST/SST
10 : projectinfo.qml?project=sst
#
5 : index.qml
# Ocean Colour
#
15 : project.qml?project=oceancolour
5 : projectinfo.qml?project=oceancolour
5 : show.qml?mode=G&project=oceancolour&data=OceanColour/Chlorophyll&view=0.0,0.0,1.0&play=1
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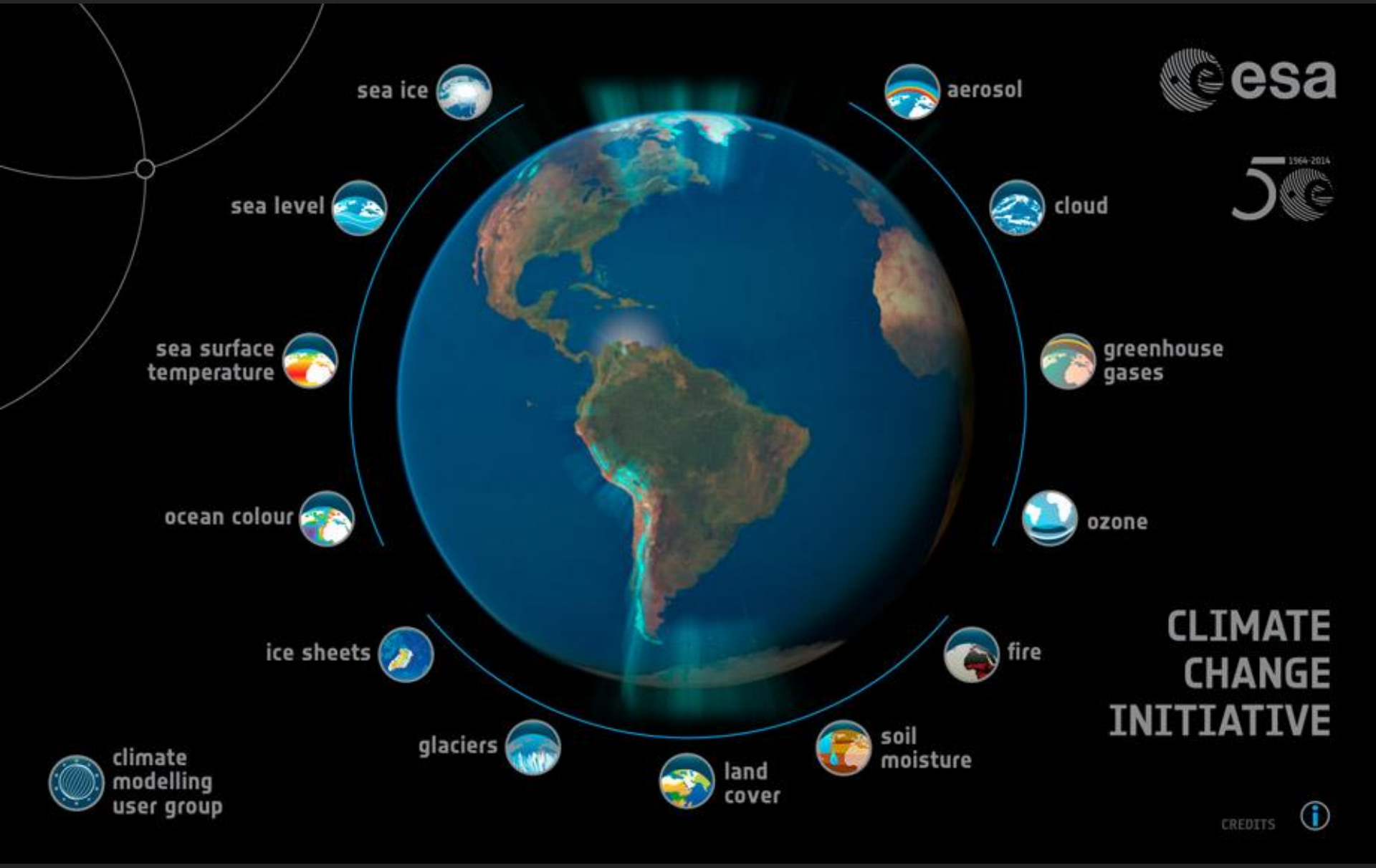
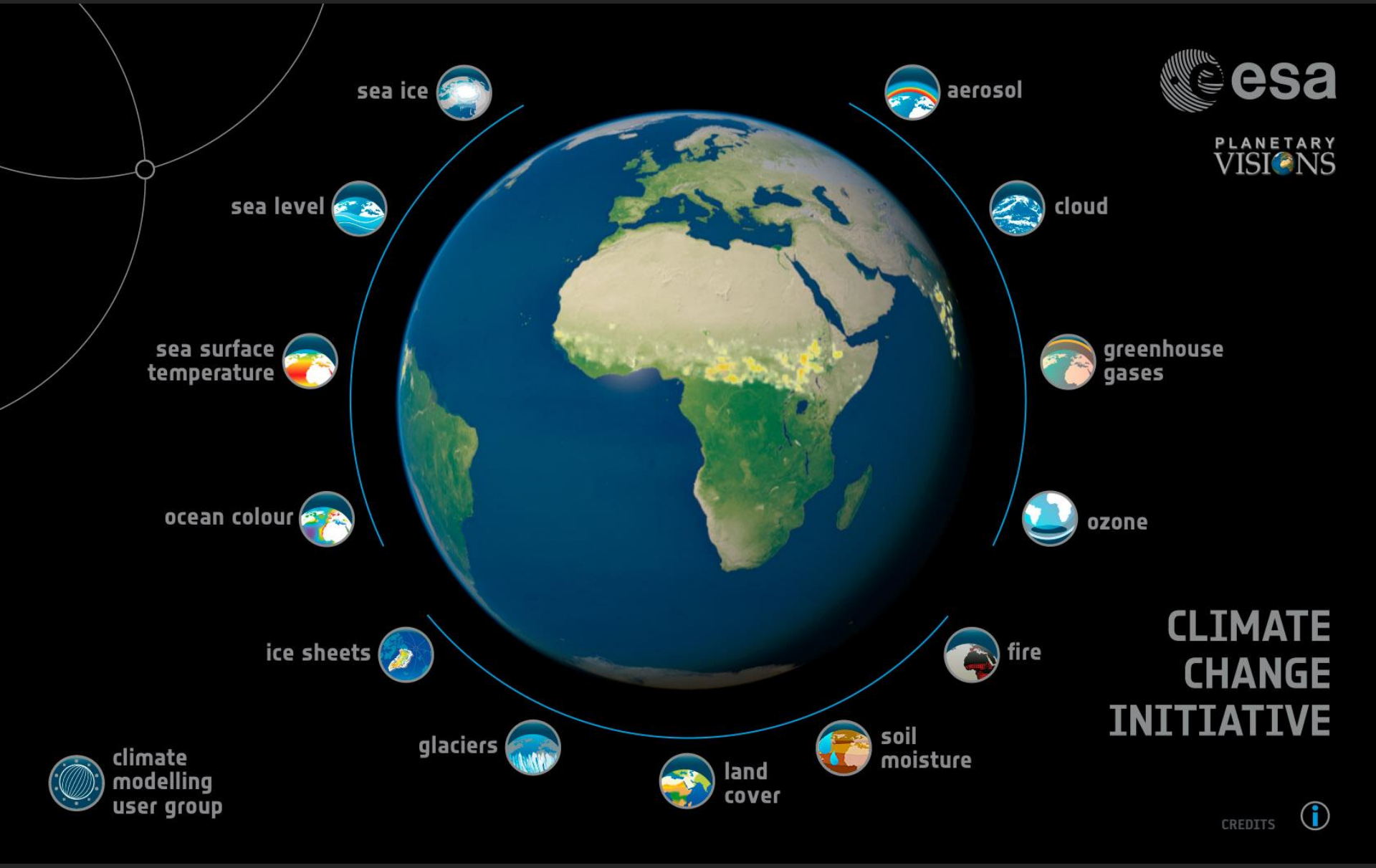

esa
1964-2014
sea ice
aerosol
sea level
cloud
sea surface temperature
greenhouse gases
ocean colour
ozone
ice sheets
fire
glaciers
soil moisture
land cover
climate modelling user group
CLIMATE CHANGE INITIATIVE
CREDITS


esa
PLANETARY VISIONS
sea ice
aerosol
sea level
cloud
sea surface temperature
greenhouse gases
ocean colour
ozone
ice sheets
fire
glaciers
soil moisture
land cover
climate modelling user group
CLIMATE CHANGE INITIATIVE
CREDITS

CCI Visualisation Corner 2

TASK 2 Tablet Version

CCI Visualisation Corner 2

TASK 2 Tablet Version

WP2100 Tablet Version on iPad

- wider audience – interested public as well as non-expert scientists
- opportunity (and expectation?) of richer content and high visual quality
- long-form reading, more personal, more of an e-book than a ppt presentation
- data volume limit due to download time and device capacity (16-64GB)
- more data/more detail could be delivered via in-app upgrades
- deployable widely as a published app through iTunes Store

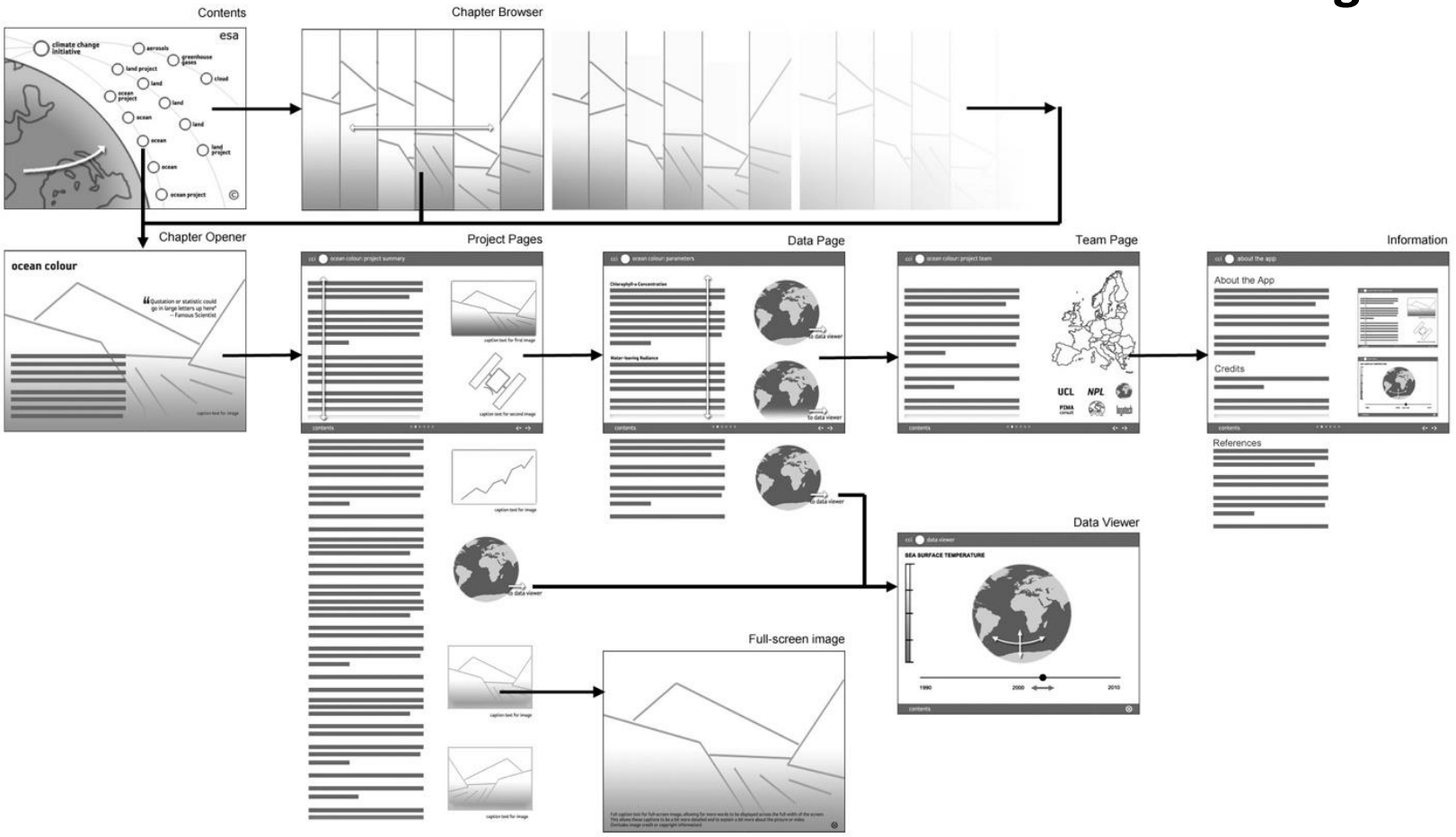
  (6 week Apple approval process)

WP2200 Tablet Version on Android

- based on iPad version
- greater hardware diversity, so target a particular hardware spec

CCI Visualisation Corner

Tablet Version Navigation




esa

esa

CLIMATE CHANGE INITITTIVE

European Space Agency
CLIMATE CHANGE INITIATIVE

the data behind climate science...

...taking the pulse of planet Earth


esa
introduction
ozone
greenhouse gases
sea ice
glaciers
cloud
sea surface temperature
land cover
aerosol
ocean colour
soil moisture
sea level
climate modelling user group
fire
ice sheets
CLIMATE CHANGE INITIATIVE


esa
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cci intro
sea level
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ocean colour
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climate modelling user group
soil moisture
→ CLIMATE CHANGE INITIATIVE


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cci intro
CLIMATE CHANGE INITIATIVE


glaciers
land cover
soil moisture
fire
ice sheets


enter


→ Fire
enter


→ GLACIERS
Although glaciers appear static,
they are incredibly dynamic and
in continuous evolution ...

Subheader

Ice covers about 10 percent of the world's land surface. Most glaciers are located in the polar regions (Greenland, Canada and Antarctica), but we can find them on all five continents.

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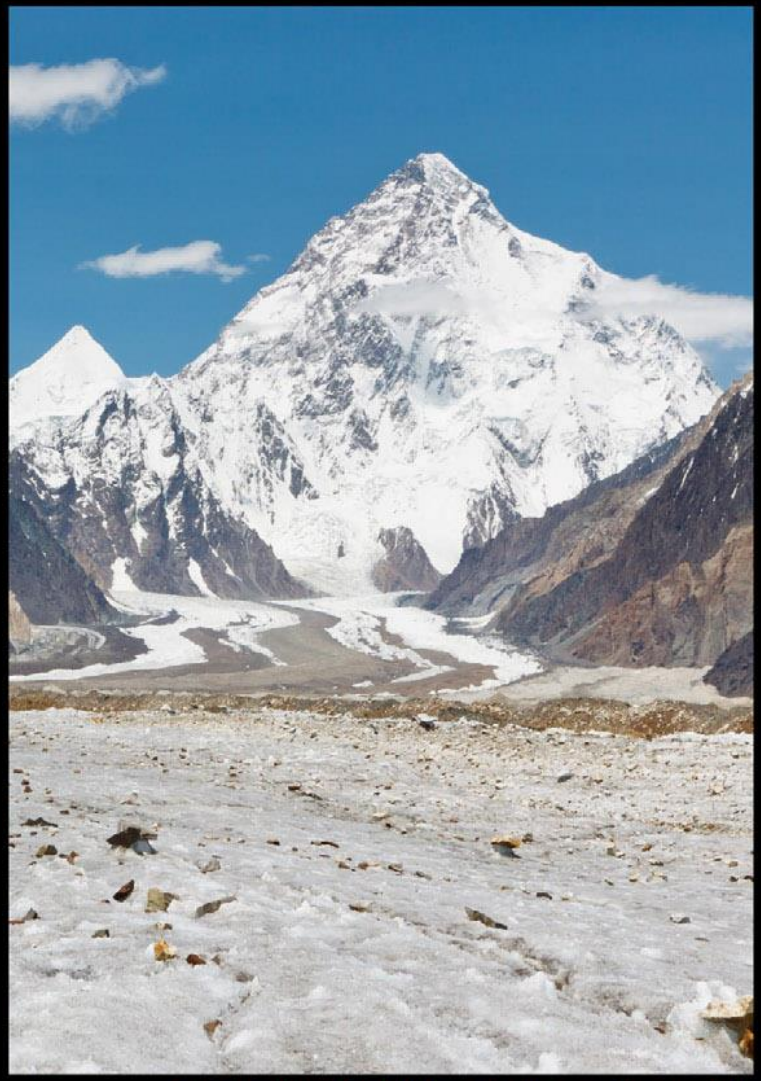
Glaciers are important natural laboratories for Earth



Caption or description text for 2 or 1 image – 3 lines maximum
ReykjavikAGauge 28pt on 32pt leading. BOX FILL R0,G0,B0. 85% Opacity.
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Caption or description text – ReykjavikAGauge 28pt on 32pt leading.
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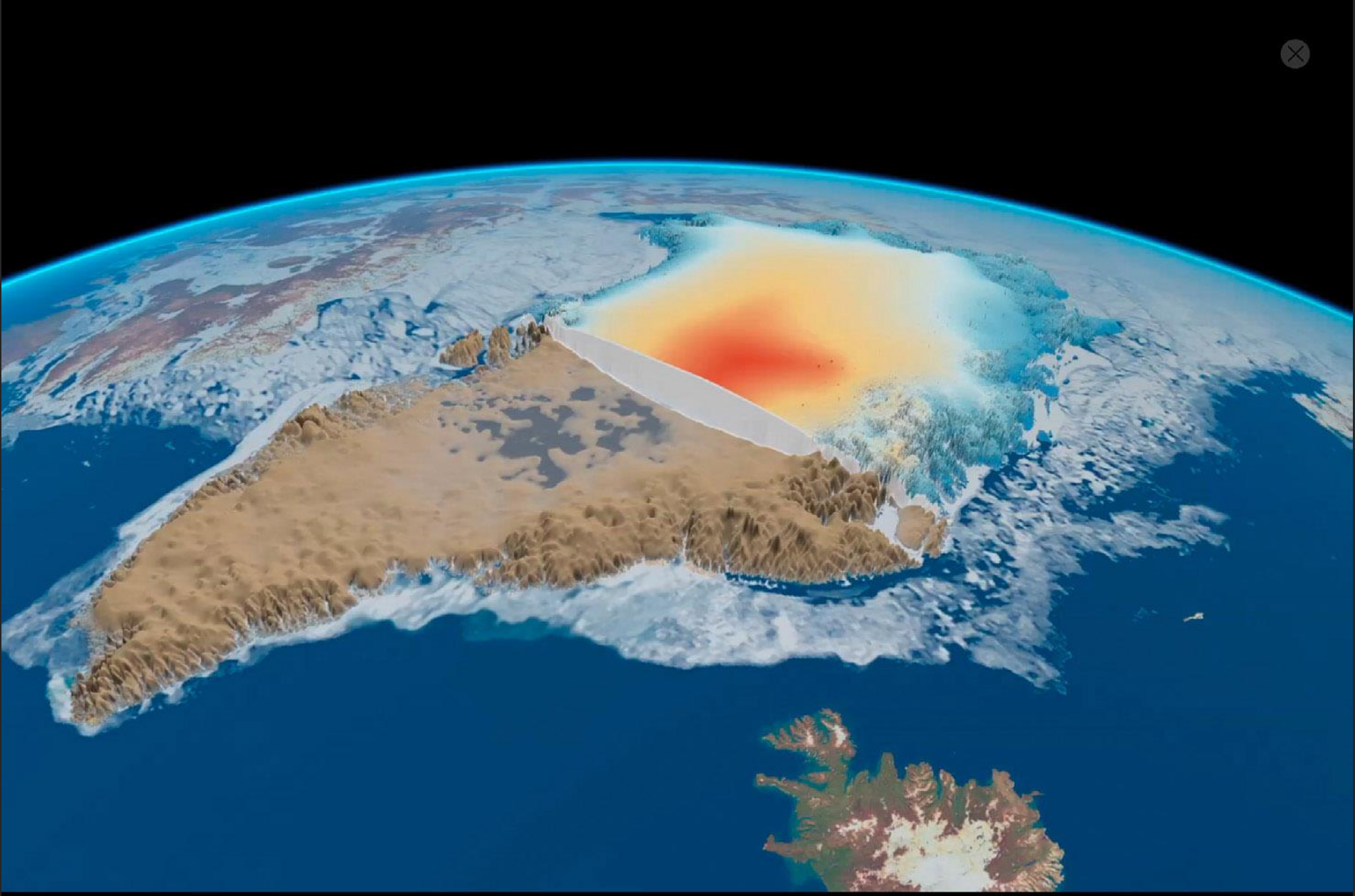
BOX FILL 85% R0,G0,B0. Center text in box, text is right aligned up to
50 words – vary depth of box to suit text length, box is bottom algined on 1458px



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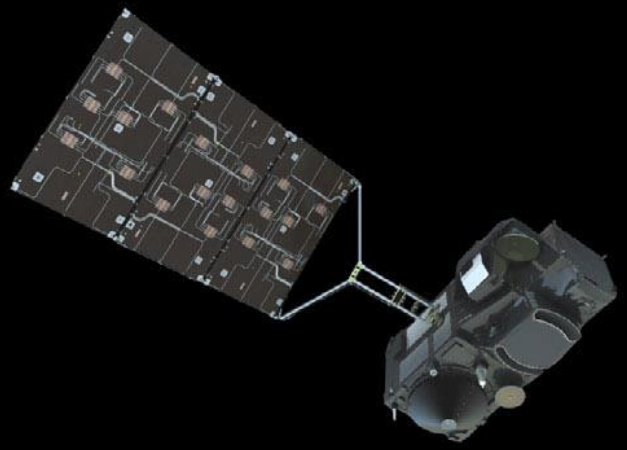

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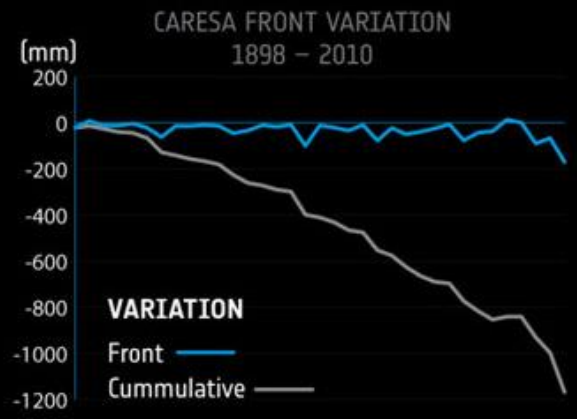

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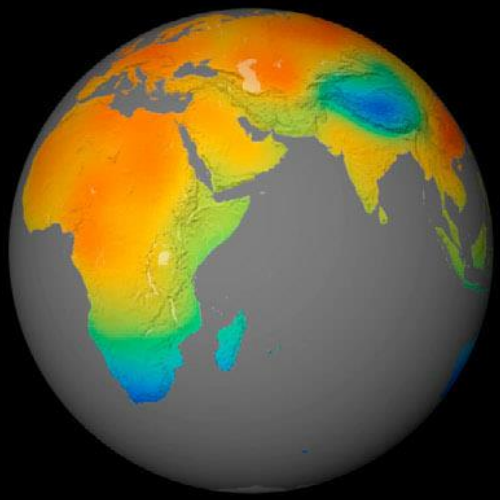

Caption or description text for 2 or 1 image – 3 lines maximum
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45% increase
in glacier volume loss
over 20 years

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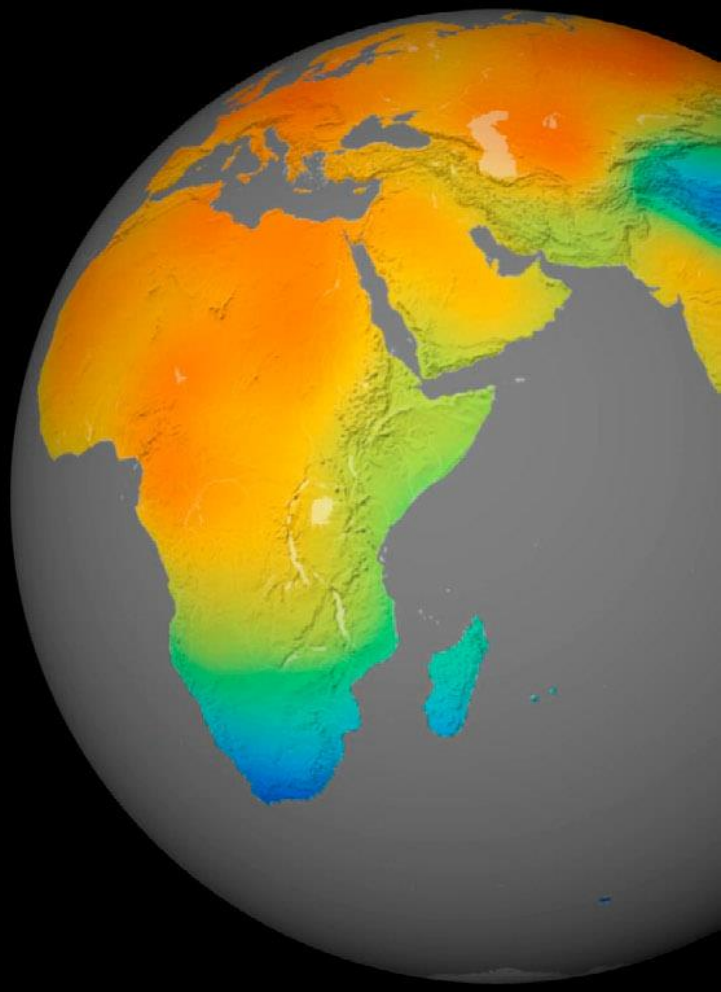

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Dr Scientist Caption

Descriptor Excepteur sint occaecat cupidatat non proident

Subheader

Space after

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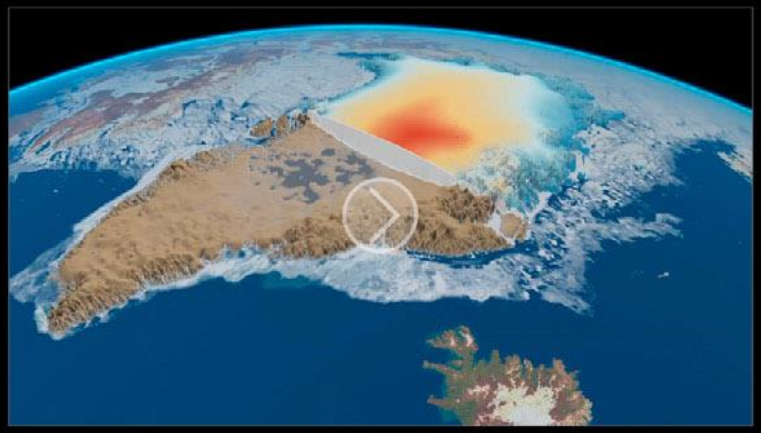

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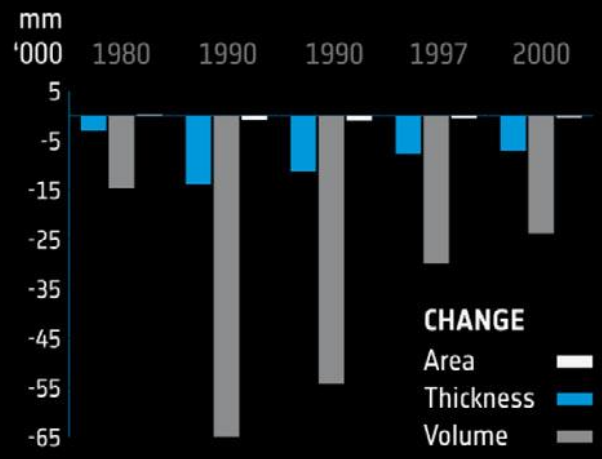

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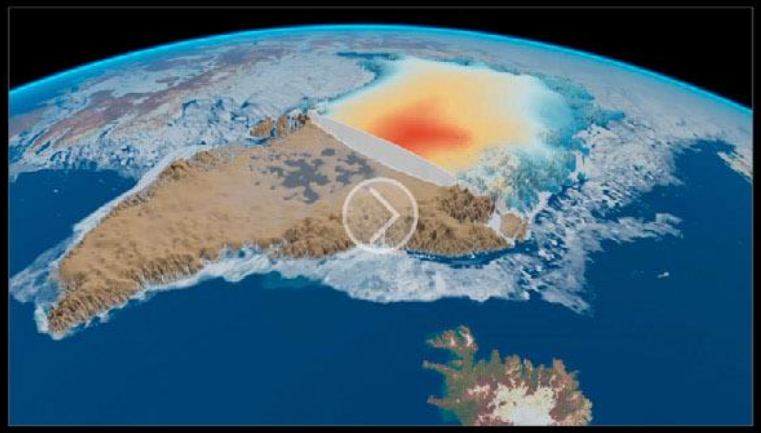

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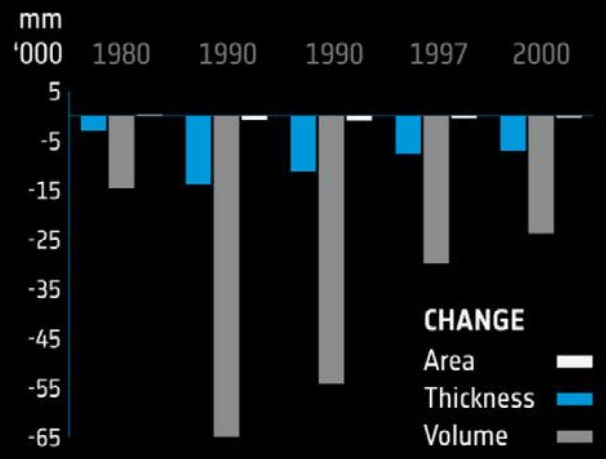

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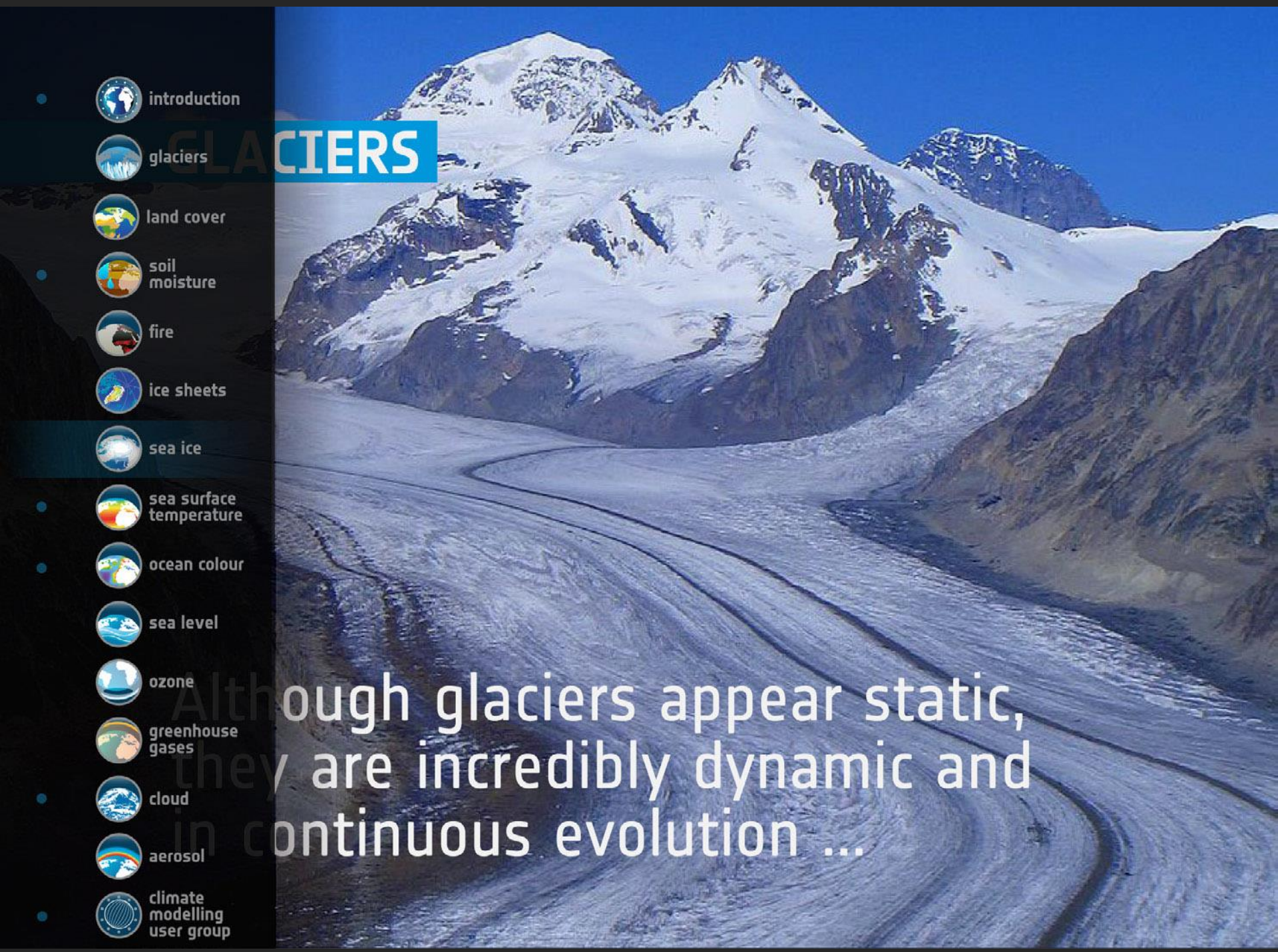
introduction
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GLACIERS
Although glaciers appear static,
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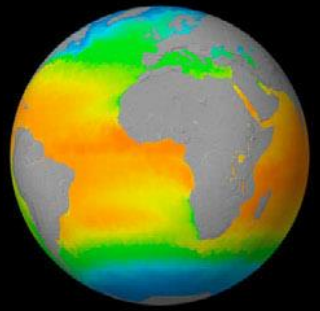
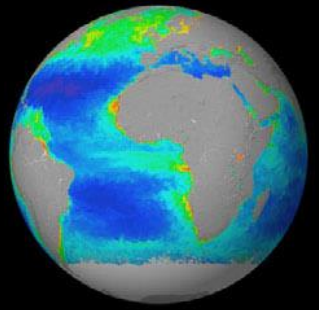
Subheader
Space after

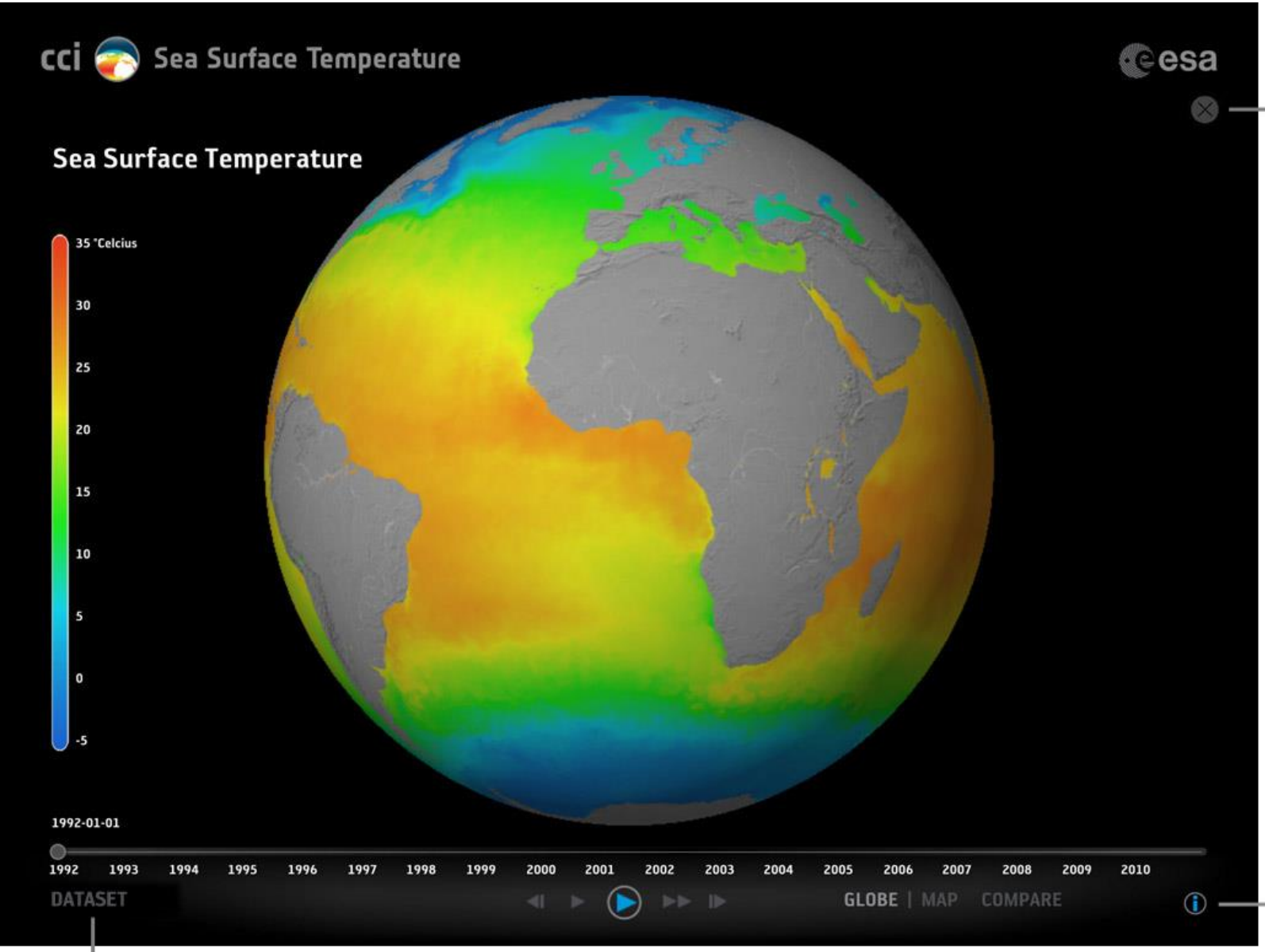
GLACIER OUTLINES
Glacier outlines are sourced from Landsat TM/ETM+ satellite images acquired around a nominal baseline date of 2000. Automated multispectral classification of both ice and snow was followed by additional manual classification operations to optimize the identification of ice boundaries.

ELEVATION CHANGE
Elevation change and mass balance has been measured for some glaciers in regions of high interest (Himalaya, peripheral glaciers of Greenland).



FLOW VELOCITY
Optical and radar images from different dates have been used to compute glacier flow rates for certain glaciers. Interferometry techniques are used on the SAR image sequences and feature-tracking on the optical images.





close
(return to text)

how to use
the data viewer

project or data menu

Subheader

University of Zurich (Science Leader and Project Manager)

EO Science team:
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Aristotle University of Thessaloniki
Chalmers University of Technology
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Finnish Meteorological Institute (FMI)
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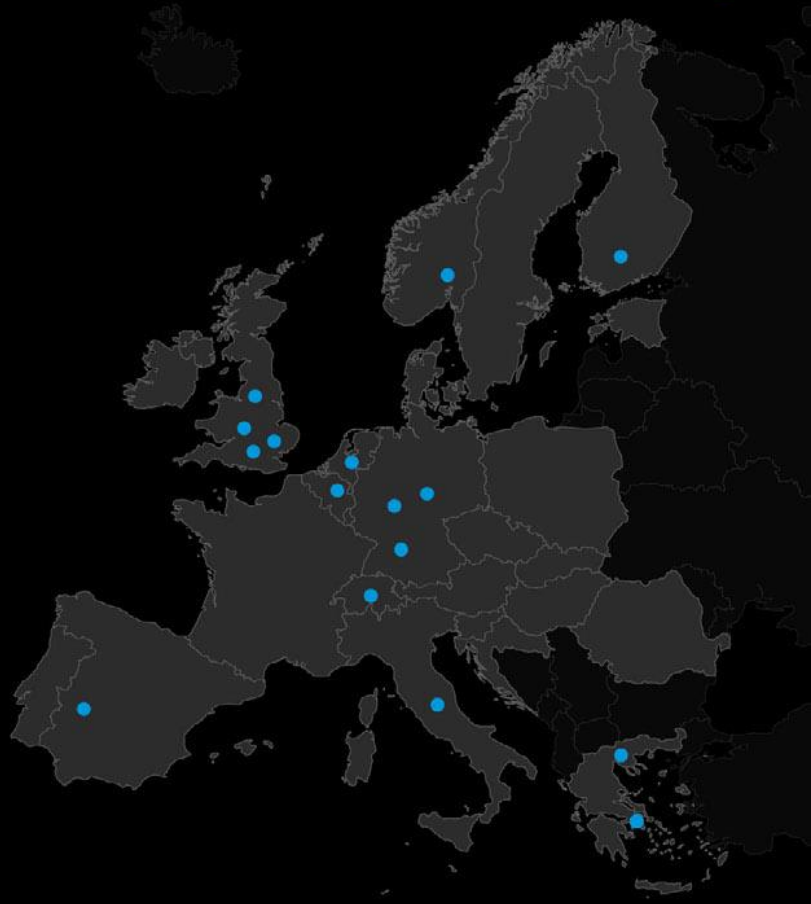

University of Bristol
enveo
University of Bristol
University of Leeds
GAMMA REMOTE SENSING
University of Zurich
University of Bristol

Subheader

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Karlsruhe Institute of Technology (KIT)
Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS)
Royal Meteorological Institute of Belgium (KMI-IRM)
Royal Netherlands Meteorological Institute (KNMI)
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University of Athens
University of Bremen Institute of Environmental Physics (IUP)
University of Cambridge
University of Saskatchewan
University of York

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CCI Visualisation Corner 2

TASK 2 Tablet Version

Draft Contents

CCI Visualisation Corner 2

TASK 2 Tablet Version

Word Count

chapter opener (single sentence)	20 words
typical background page x3 screens	540 words
typical project page x3 screens	540 words
typical parameter block 50 words x3	150 words
typical project total =20+540+540+150	1,250 words
total for 14 projects + intro	**18,750 words**

Illustrations

images, graphs, videos x5 x15	**75+ illustrations**

CCI Visualisation Corner 2

TASK 2 Tablet Version

Editorial Content

Author: Fulvio Marellli

- **Web survey of science teams**
- Text Research
- First Draft/Edit
- **Science team check**
- Second Draft/Edit
- Picture Research
- Picture Layout, including data links
- Integration into software

CCI Visualisation Corner

Tablet Version App Icon

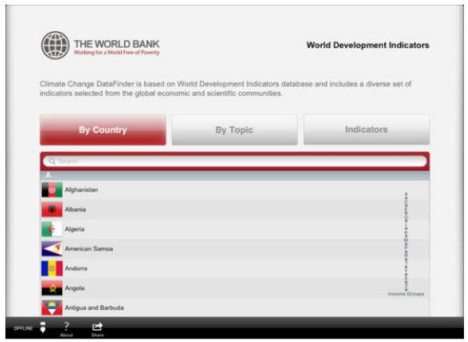
CCI Visualisation Corner

Tablet Version App Icon

iPad 10:41 61%

iPad Only | Any Price | All Categories | By Relevance | All Ages | climate change

World Bank Climate Change…
World Bank
GET



Climate Mobile
GeoOptics Inc.
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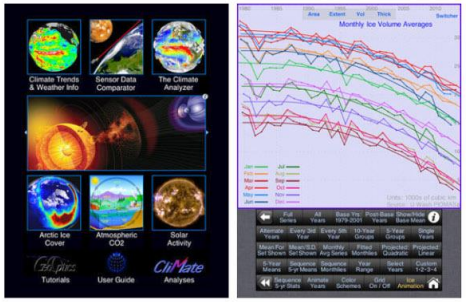

Global Warming - How to Talk to a…
Giacomo Balli
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In-App Purchases

Al Gore – Our Choice: A Plan…
Push Pop Press, Inc.
£3.99

Images Of Change
NASA
GET

Climate from Space
ESA - European Spa...
GET
In-App Purchases

Featured | Top Charts | Explore | Purchased | Updates 7


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CLIMATE CHANGE INITIATIVE

CCI Visualisation Corner 2

TASK 3 Animations

Ten animations in total, three for the first year:

1) **CCI Promotional Video** – all projects

2) **Seal Level Rise Contributions** – ice sheets, glaciers, sst, sea level

3) **Ocean-Atmosphere Interations** – sst, ocean colour, cloud, ice, soil mosture

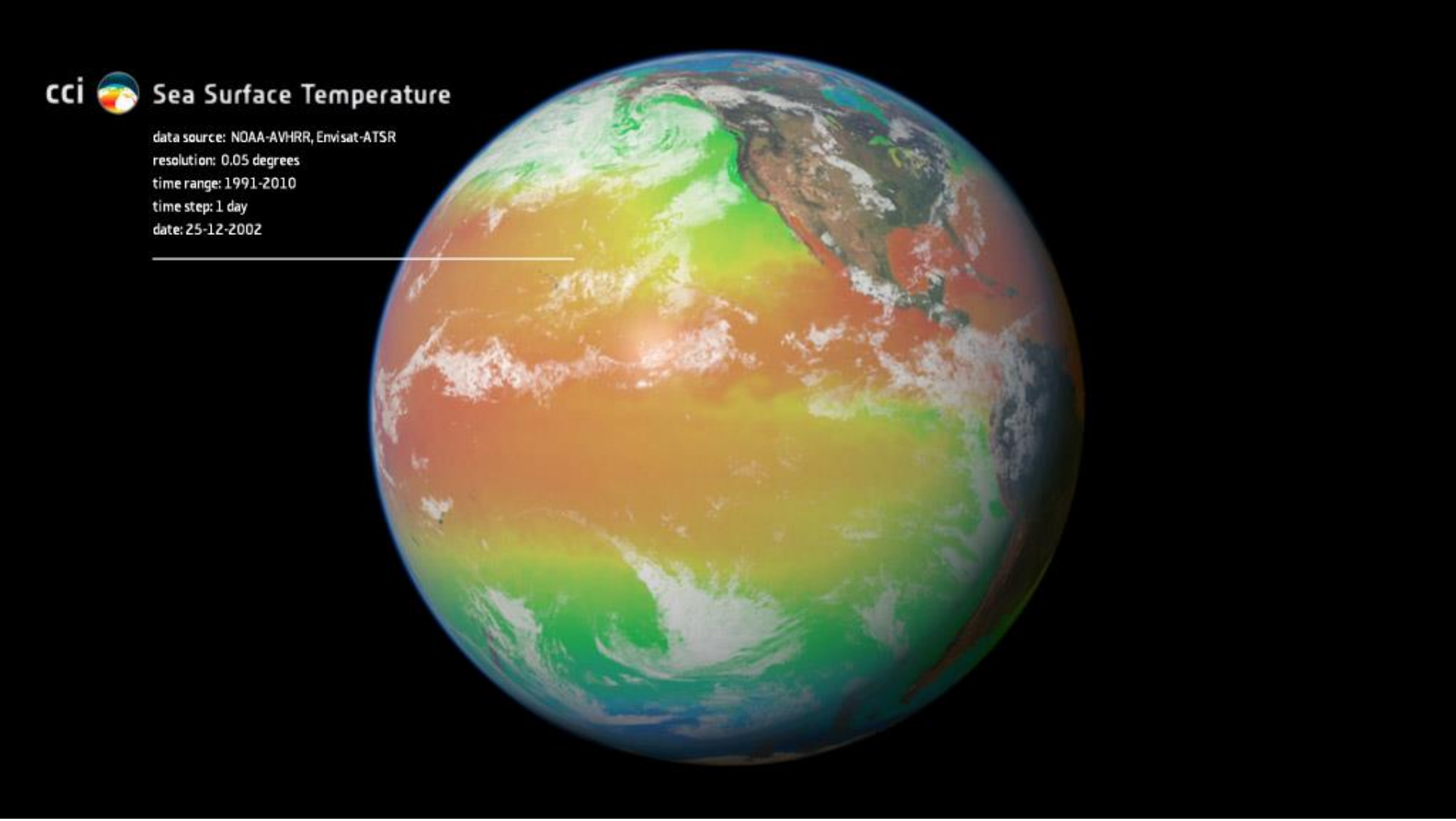
CCI Visualisation Corner 2

TASK 3 Animations

1. CCI Promotional Video

- To illustrate the CCI projects and highlight their data products.
- To show parameters from different projects working together.
- A guided tour of the data products, highlighting physical features and events.
- An engaging style suggesting scanning the planet to “take its pulse”
- Layers of information overlaid in a “head up display”.

1. After ESA logo, CCI title, show realistic Earth rotating, with moving clouds.



2. SST data sequence shows through cloud cover. Bring up CCI project ID and data specification, including running date

cci Sea Surface Temperature

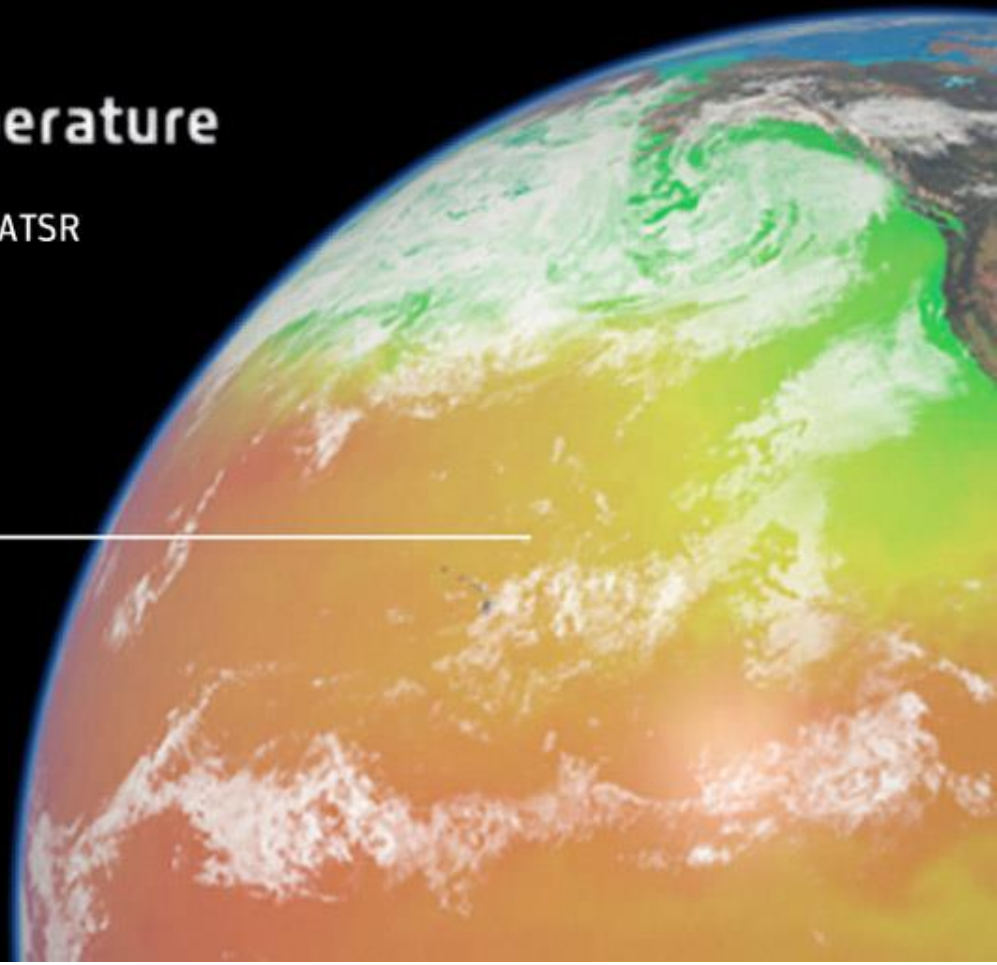
data source: NOAA-AVHRR, Envisat-ATSR

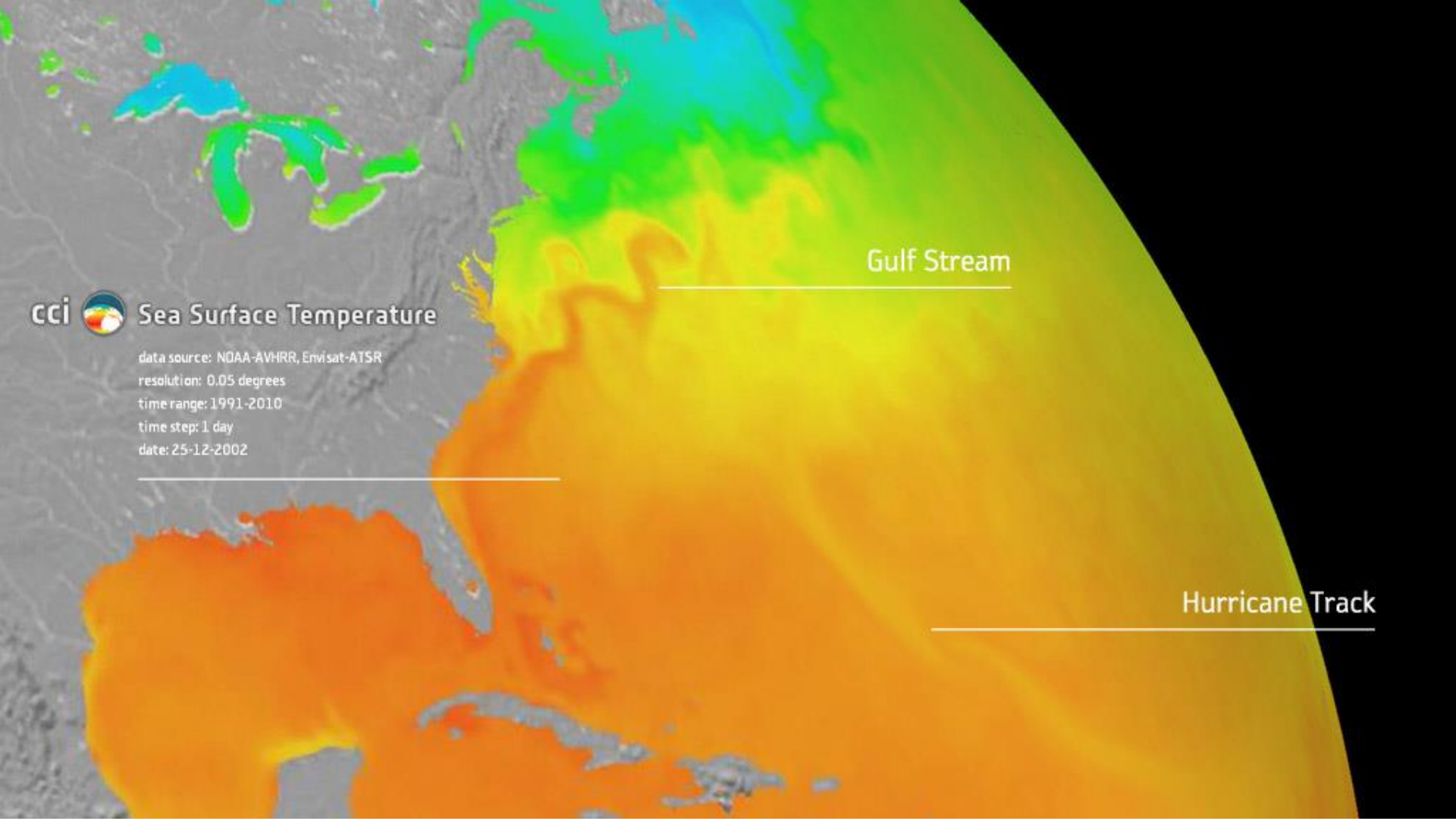
resolution: 0.05 degrees

time range: 1991-2010

time step: 1 day

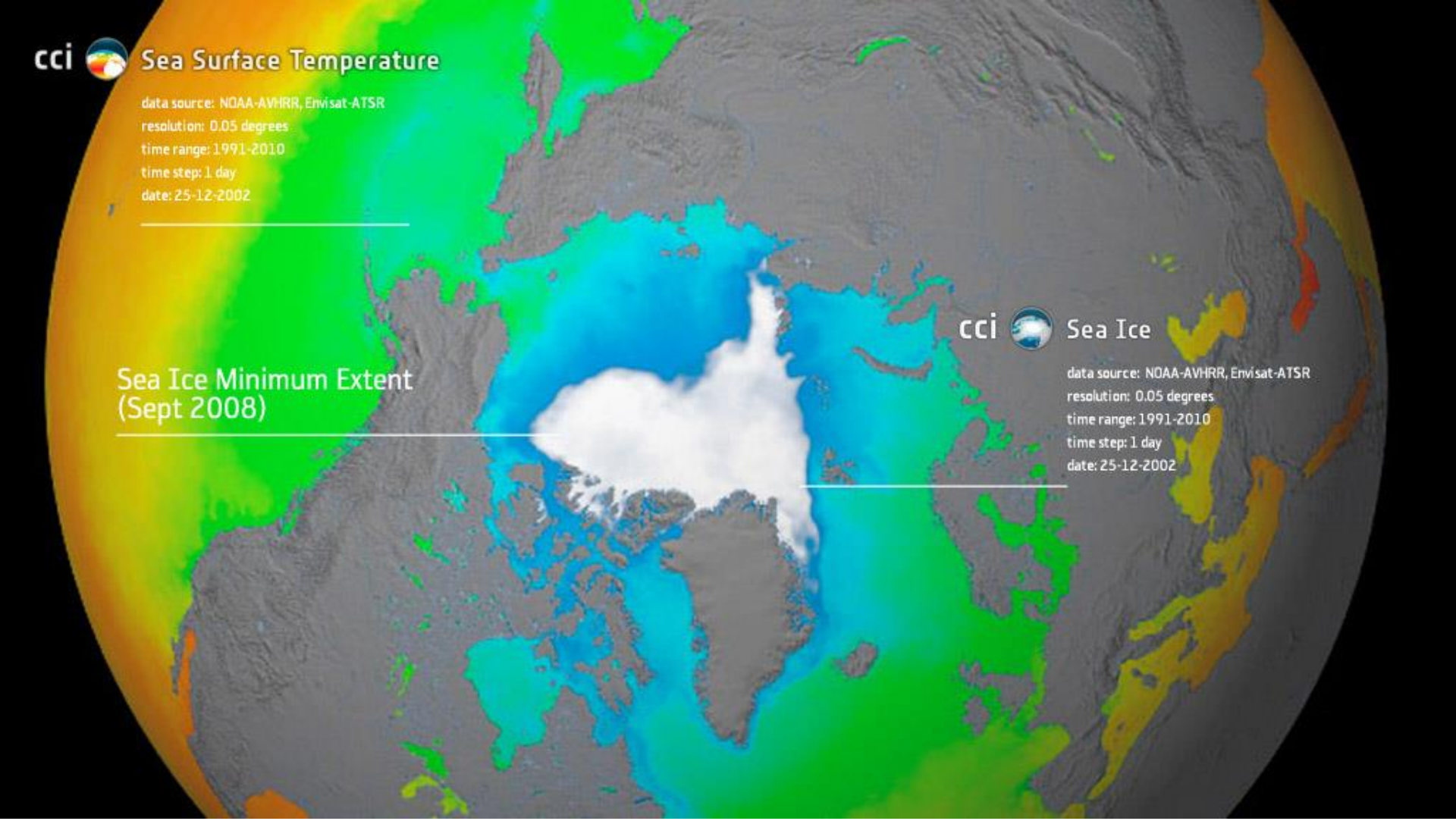
date: 25-12-2002



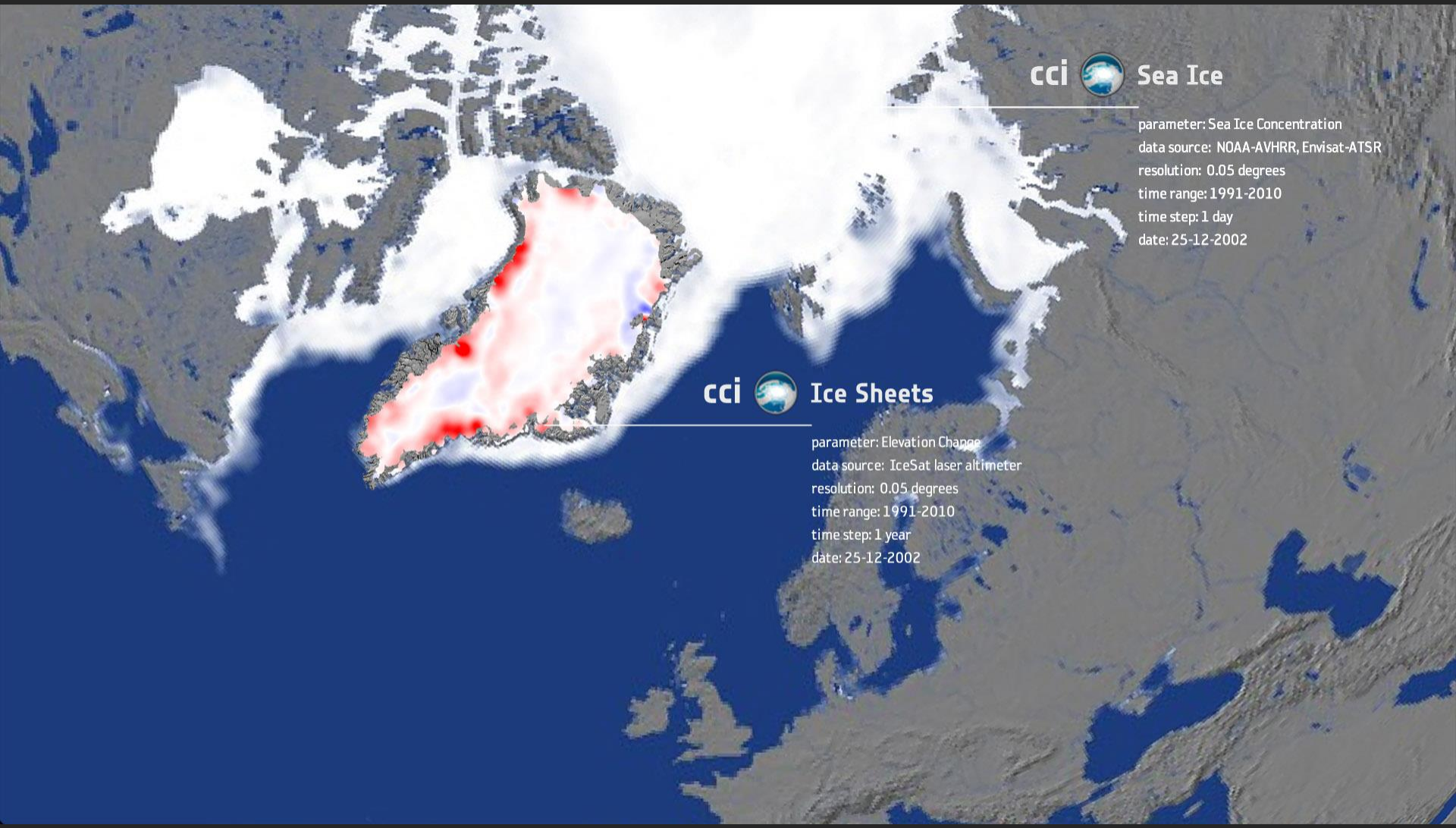


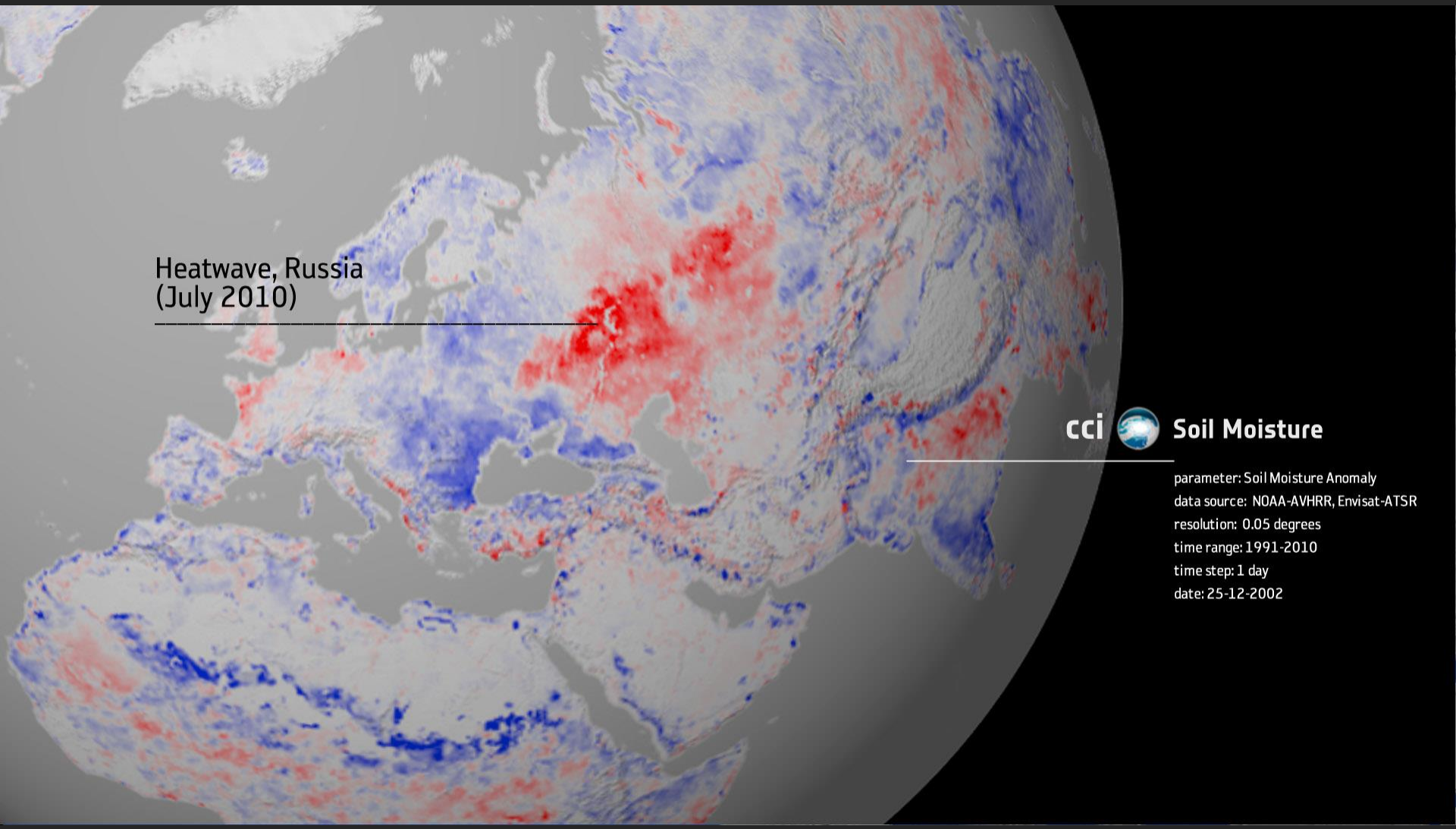
3. Move in/around globe to show detail of data and label physical features, eg Gulf Stream, hurricane tracks.

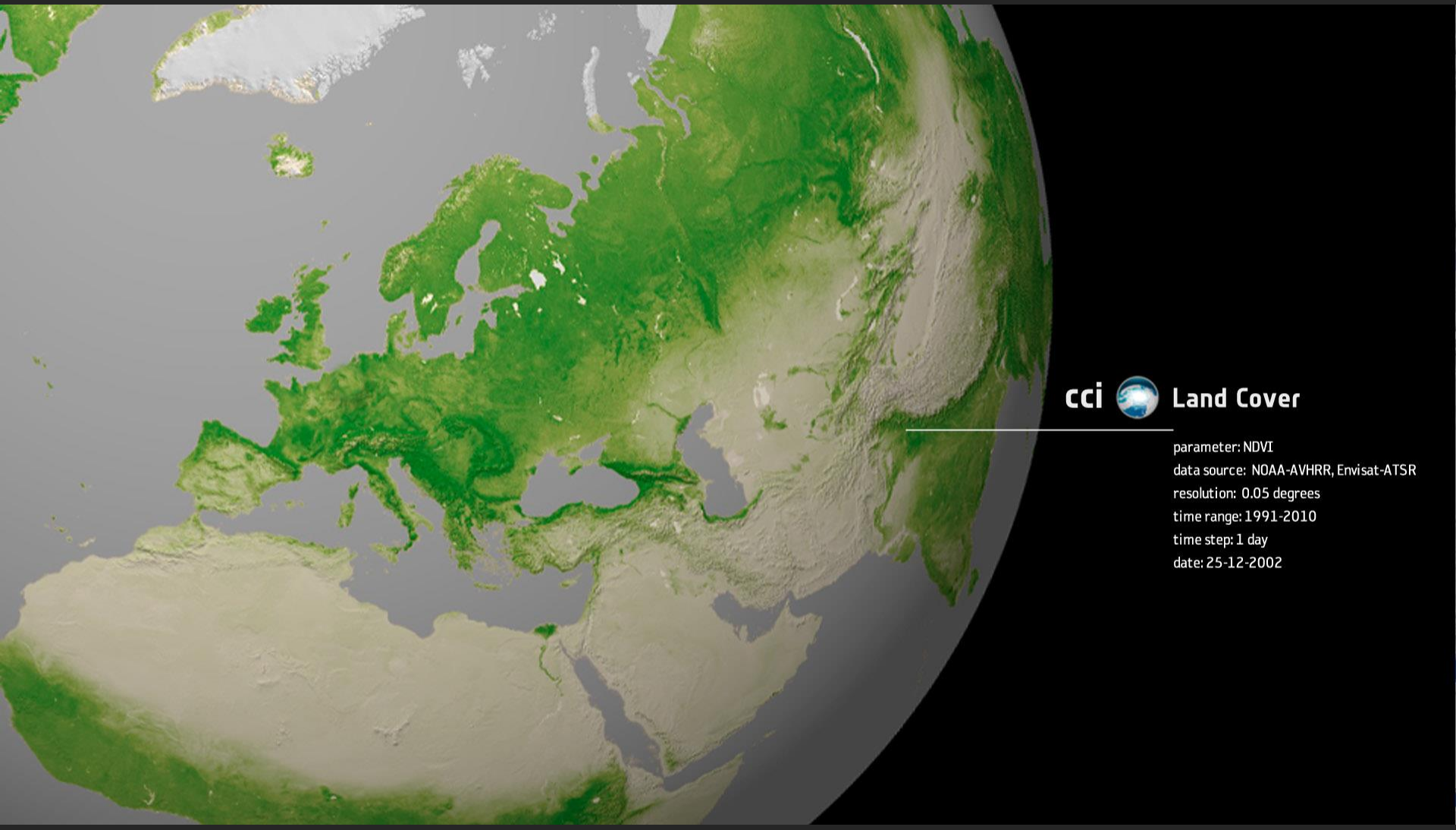
ID/spec and labels move around the globe, as if tracking features

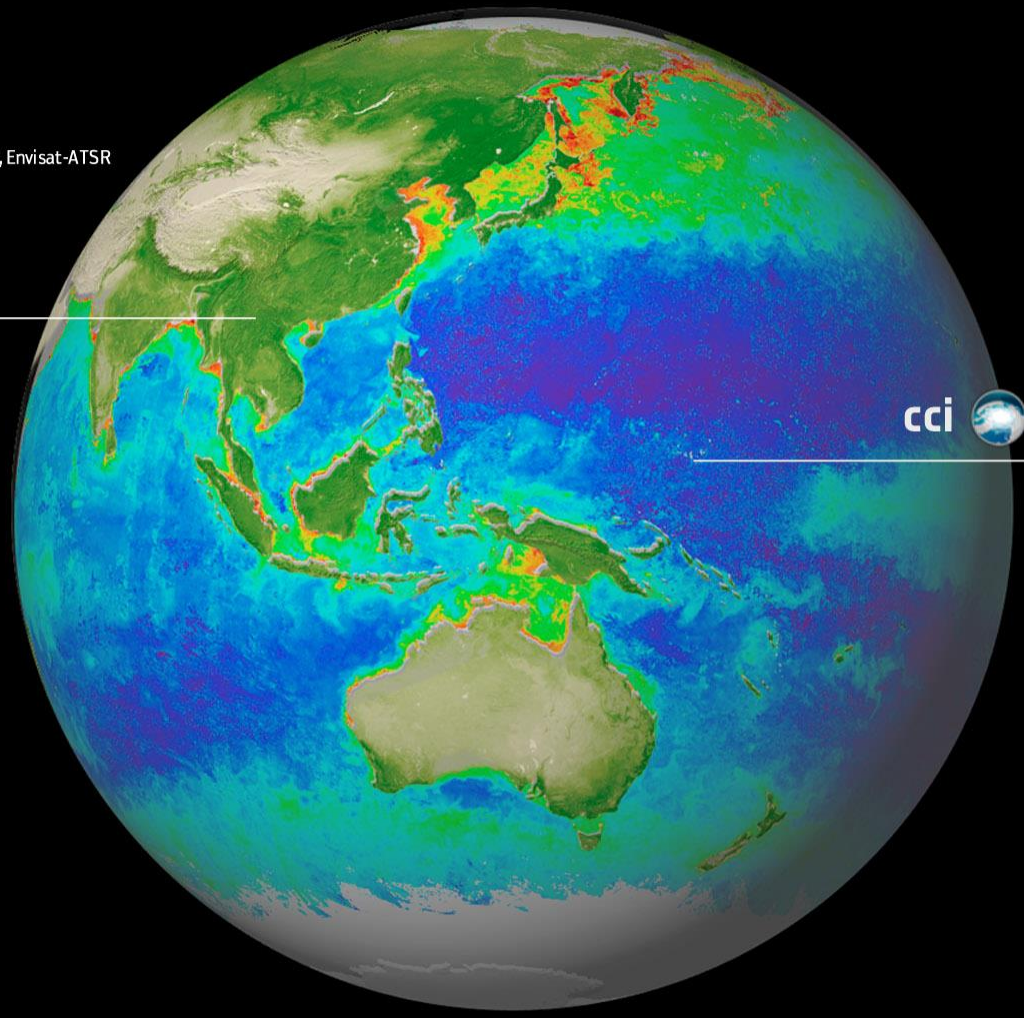


4. Move to Arctic region. Overlay sea ice concentration data, ID/spec, label Sea Ice Minimum Extent.


cci Sea Ice
parameter: Sea Ice Concentration
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002
cci Ice Sheets
parameter: Elevation Change
data source: IceSat laser altimeter
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 year
date: 25-12-2002


Heatwave, Russia
(July 2010)
cci
Soil Moisture
parameter: Soil Moisture Anomaly
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002


cci
Land Cover
parameter: NDVI
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002

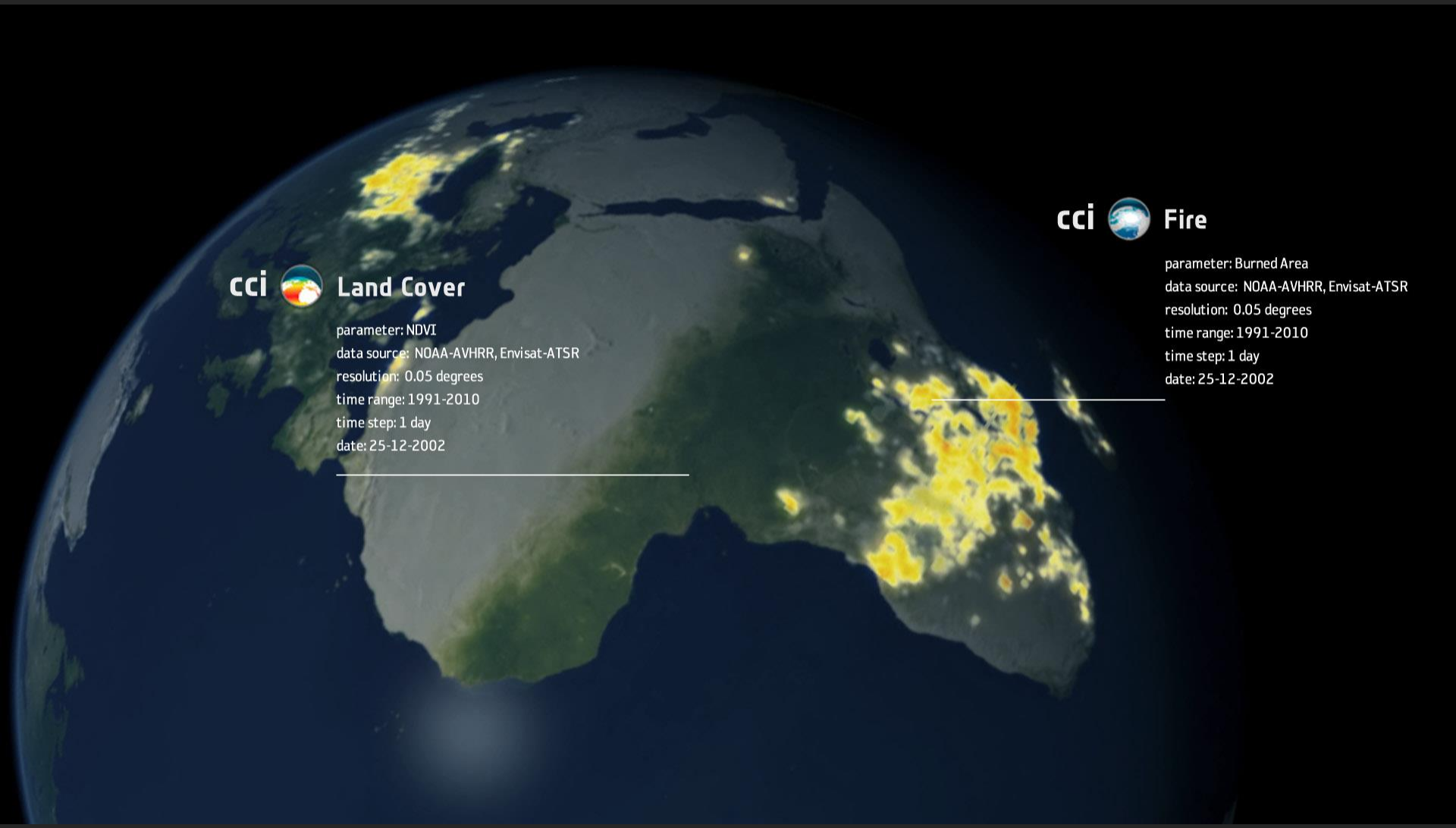


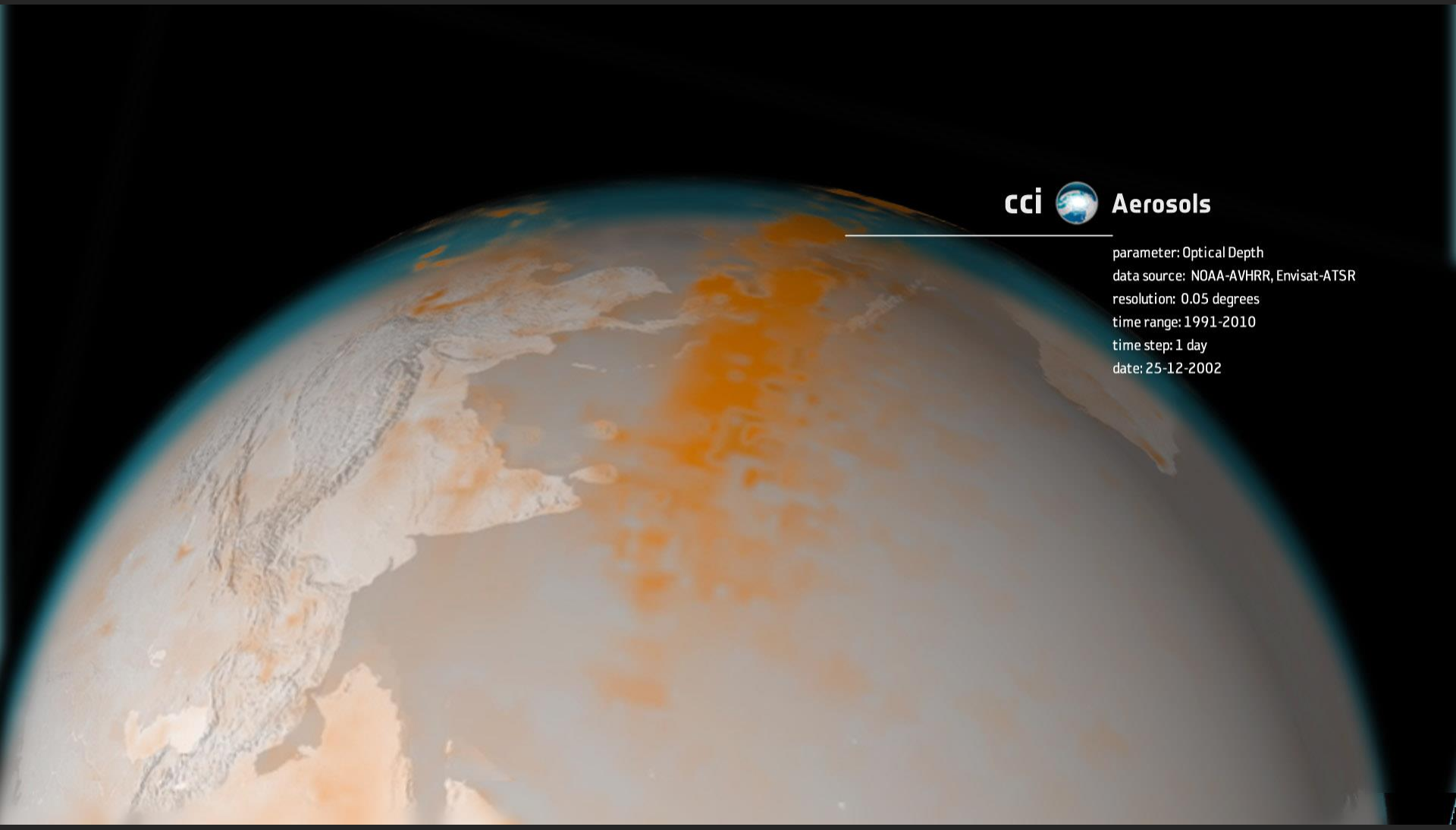
cci Land Cover

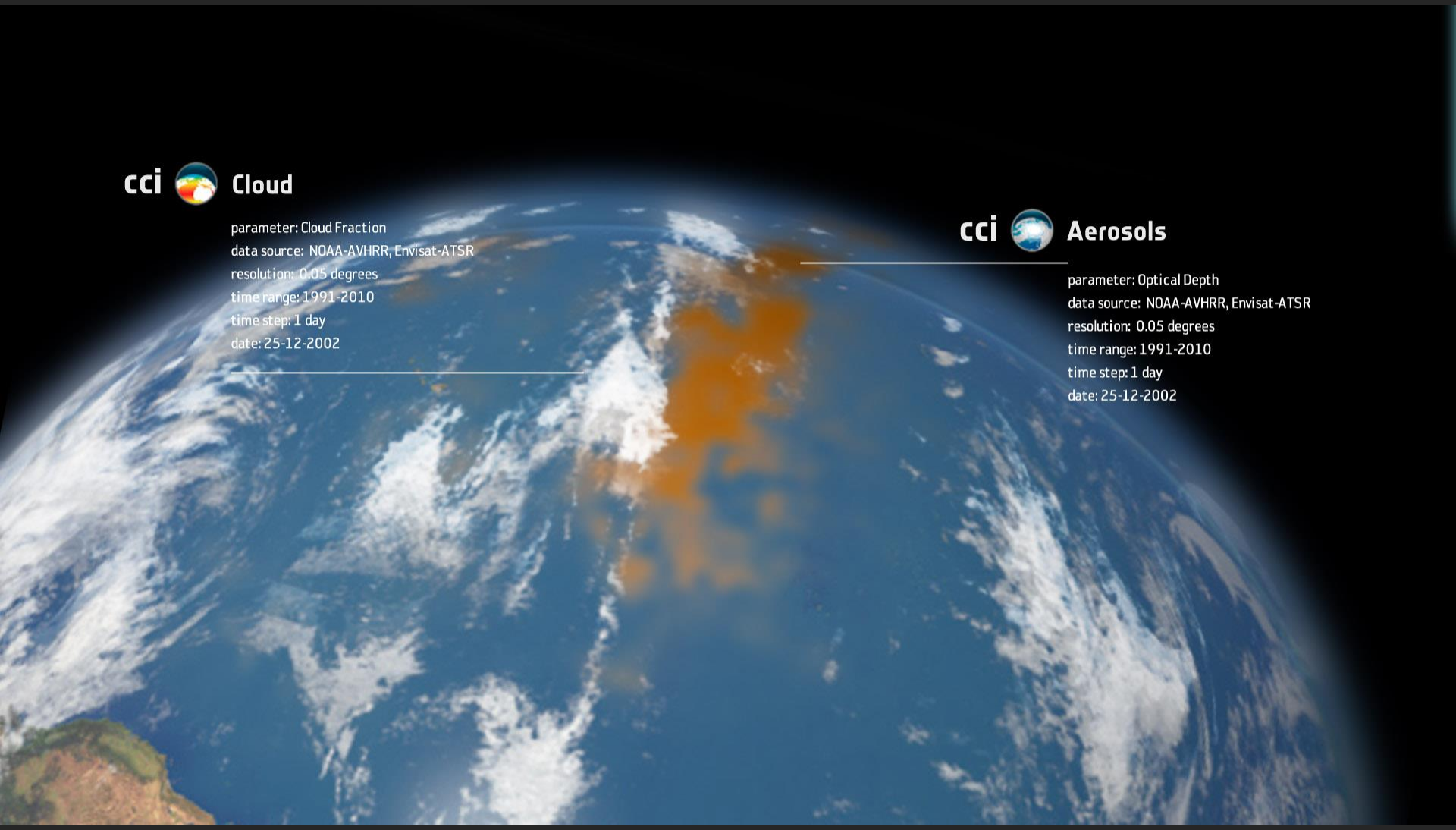
parameter: NDVI
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002

cci Ocean Colour

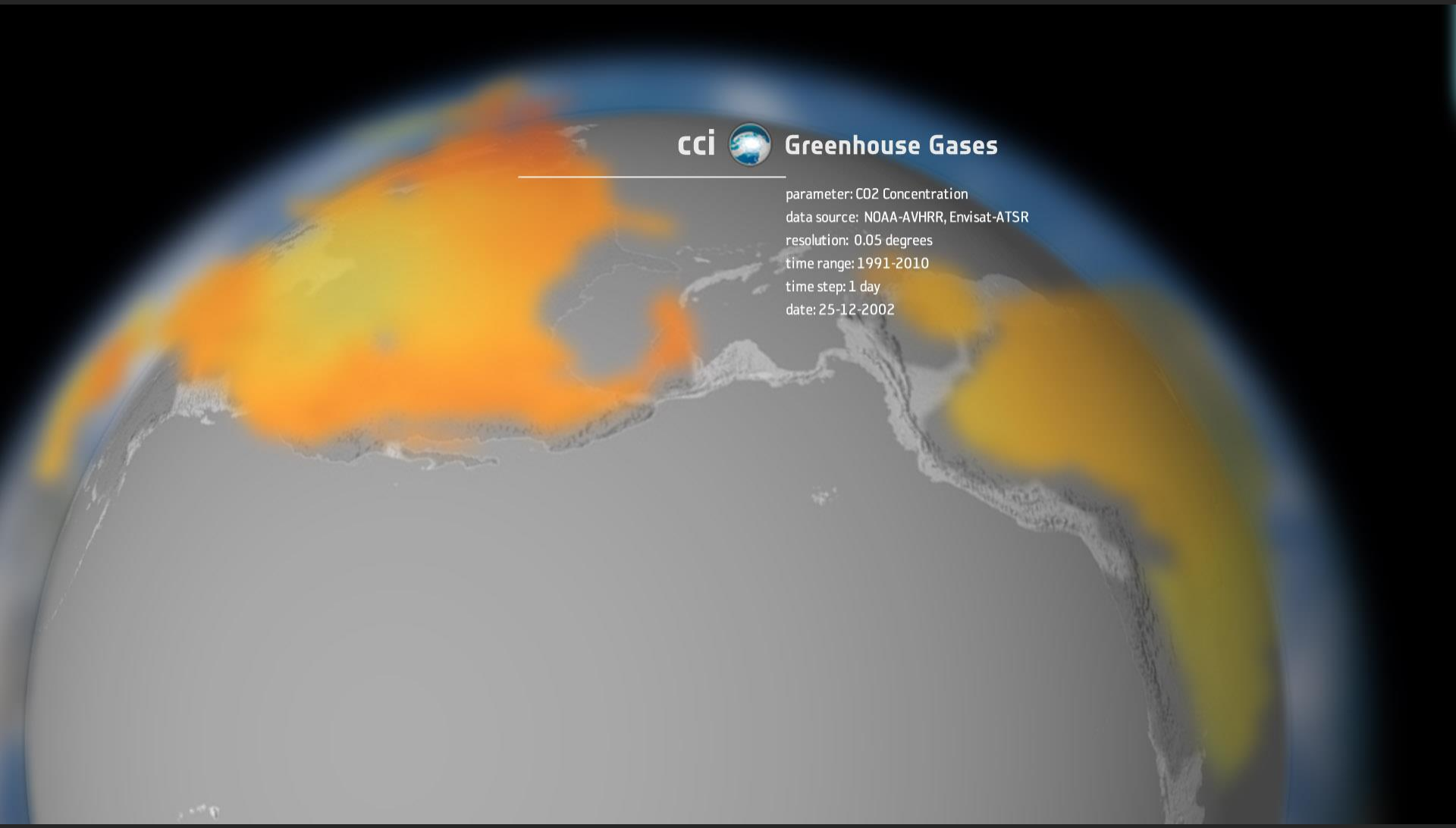
parameter: Chlorophyll-a Concentration
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002

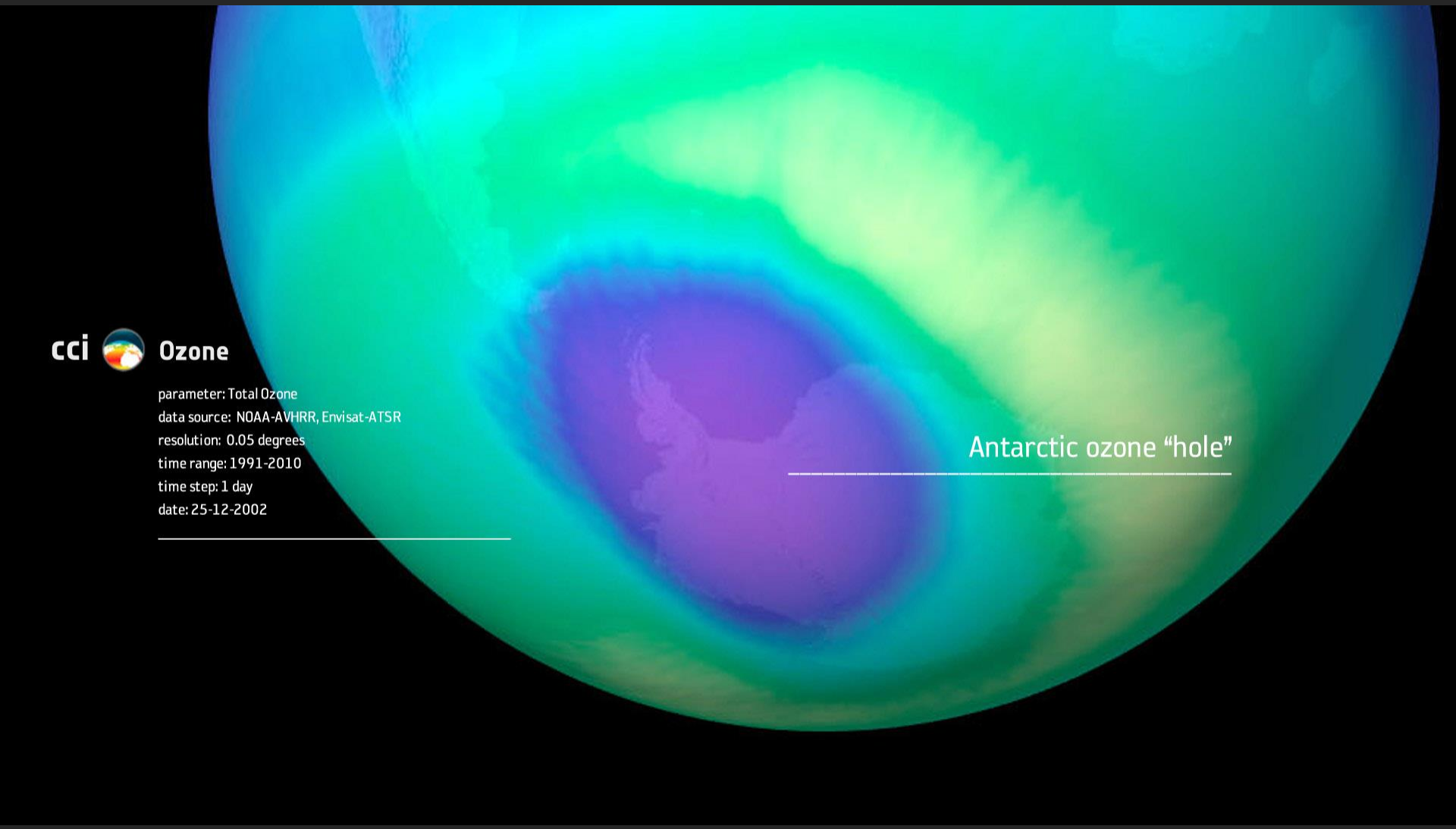

cci Land Cover
parameter: NDVI
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002
cci Fire
parameter: Burned Area
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002

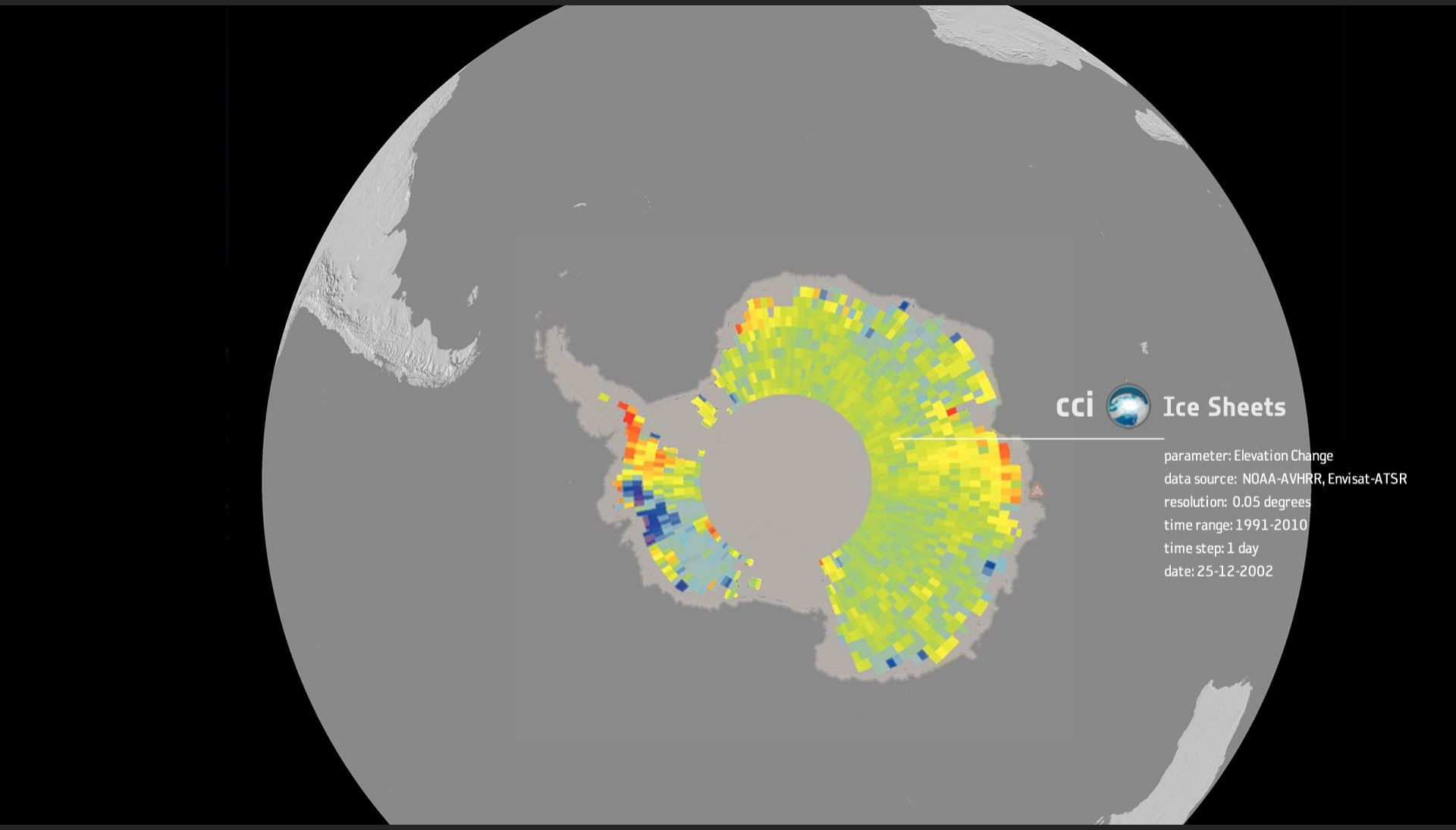

cci Aerosols
parameter: Optical Depth
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002


cci Cloud
parameter: Cloud Fraction
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002
cci Aerosols
parameter: Optical Depth
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002

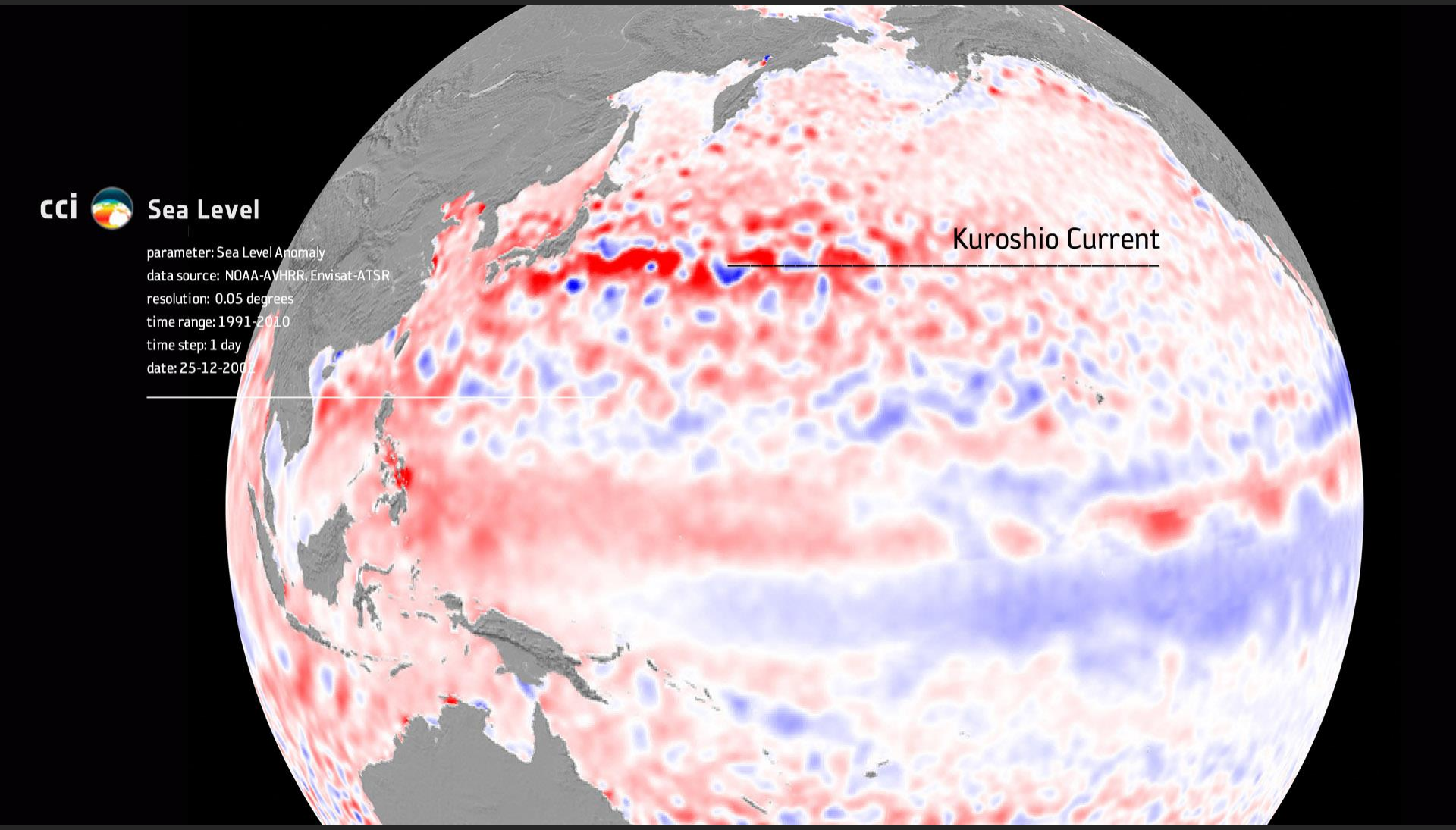

cci Clouds
parameter: Cloud Fraction
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002


cci
Greenhouse Gases
parameter: CO2 Concentration
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002


cci
Ozone
parameter: Total Ozone
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002
Antarctic ozone “hole”


cci Ice Sheets
parameter: Elevation Change
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002


cci
Glaciers
parameter: Glacier Area
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-2002


cci
Sea Level
parameter: Sea Level Anomaly
data source: NOAA-AVHRR, Envisat-ATSR
resolution: 0.05 degrees
time range: 1991-2010
time step: 1 day
date: 25-12-200
Kuroshio Current

CCI Visualisation Corner 2

TASK 3 Animations

2. Sea Level Rise Contributions

- Sea level rises due to various contributions, eg:
- Glacier melt (land ice)
- Ice sheet melt (Antarctica and Greenland)
- thermal expansion of oceans
- Sea level doesn’t rise evenly across the globe
- Over the past 20 years, global average sea level has risen at 3 mm/yr (= 60mm in 20 years)

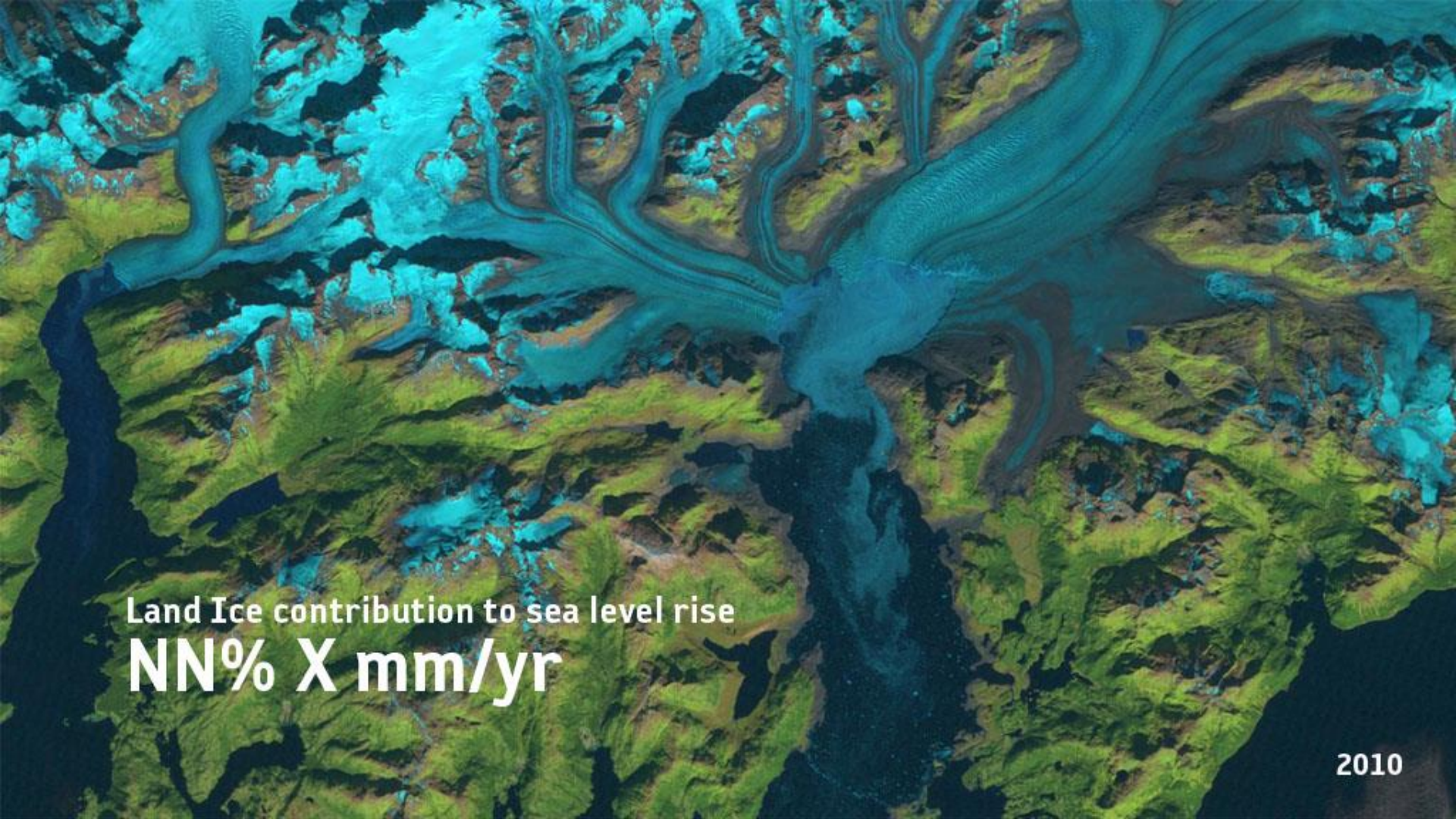
1. Open on a natural view of the Earth, rotating.

2. Remove clouds to show ocean surface, with a bit of sunglint to draw attention to the ocean (and perhaps semi-transparent surface to show the seafloor topography?)

Glaciers

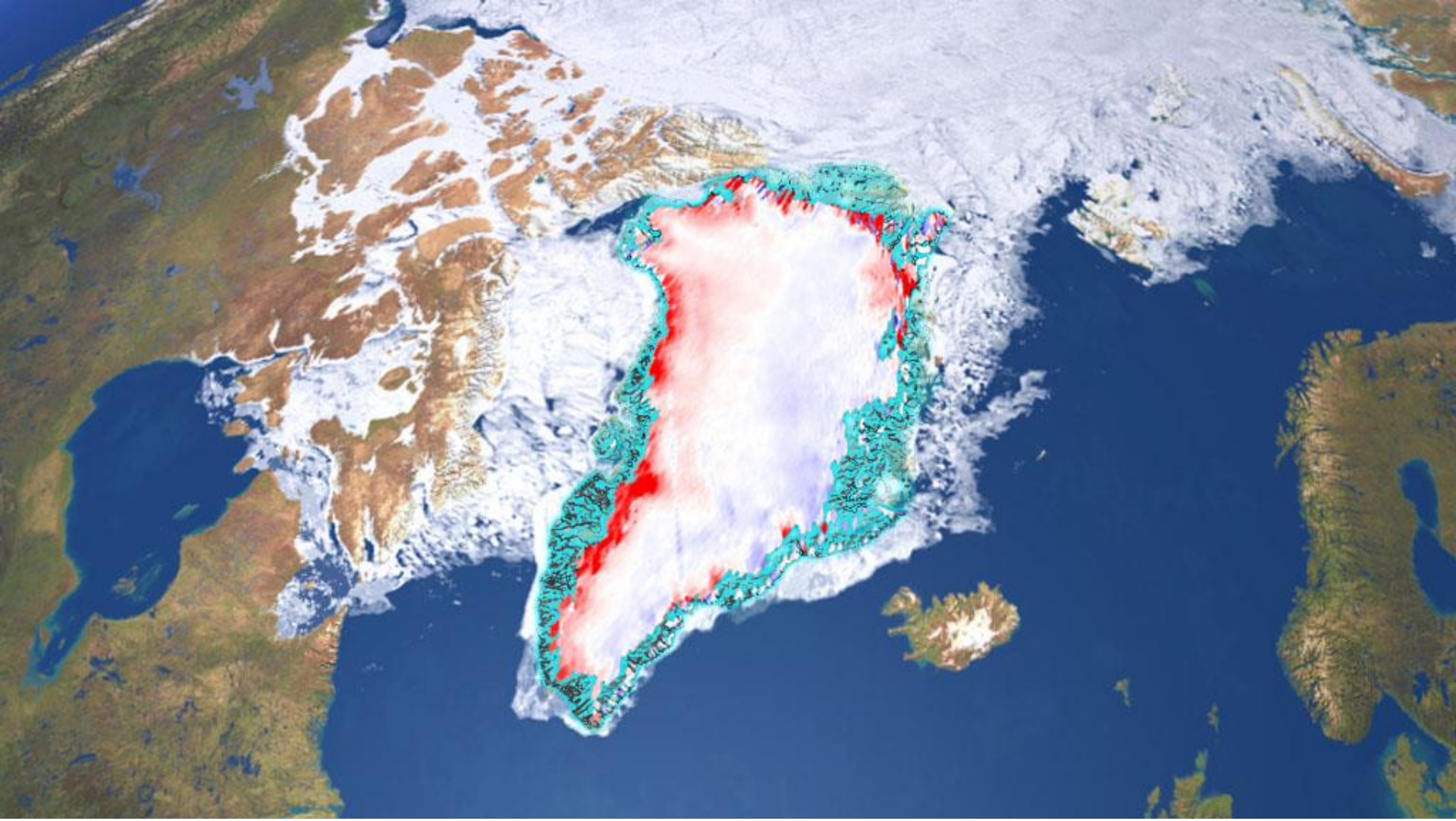
3. Highlight worldwide distribution of glaciers

4. Zoom down to inspect one glacier.



5. Landsat data sequence showing glacier retreat over a number of years.
(new data from CCI Glaciers.)

Perhaps headline the land ice contribution to sea level rise, as % or mm?



6. Zoom out past Greenland, showing ice sheet thickness sequence.

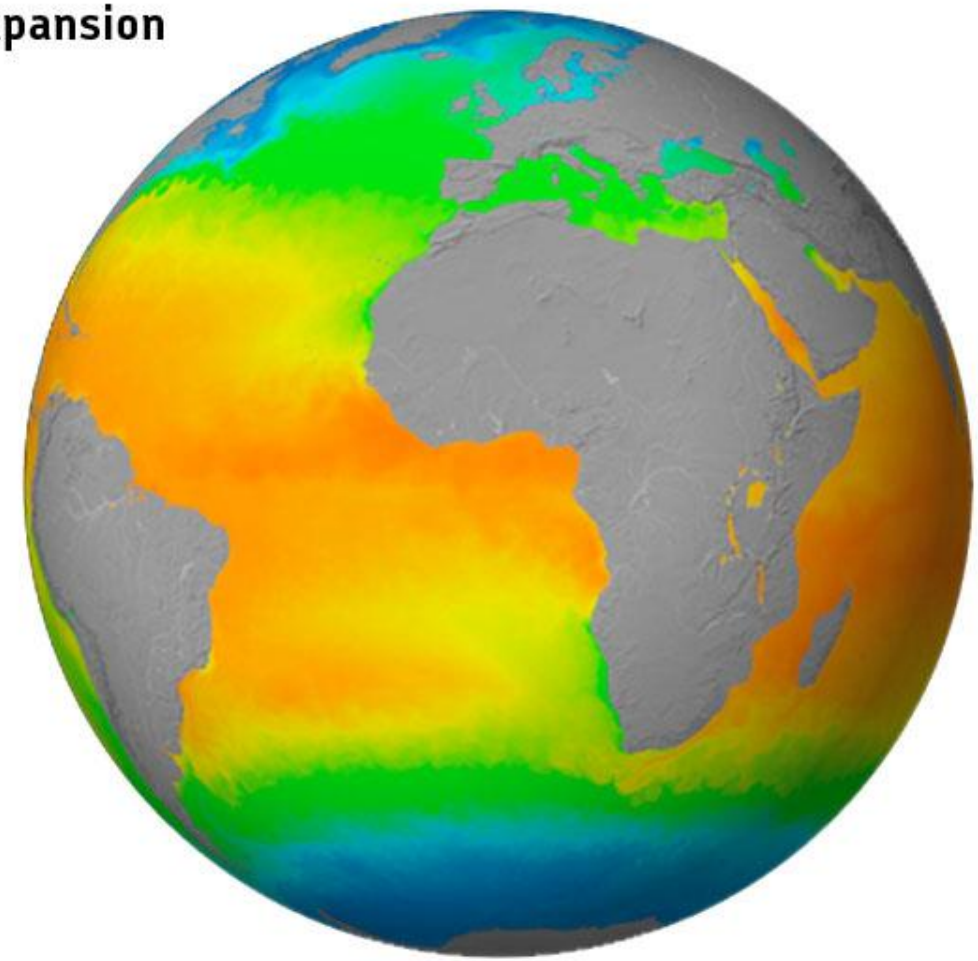
Ice sheets

NN%
YYmm/yr

7. Continue zoom out to global view, showing ice sheet thickness sequence for Antarctica.

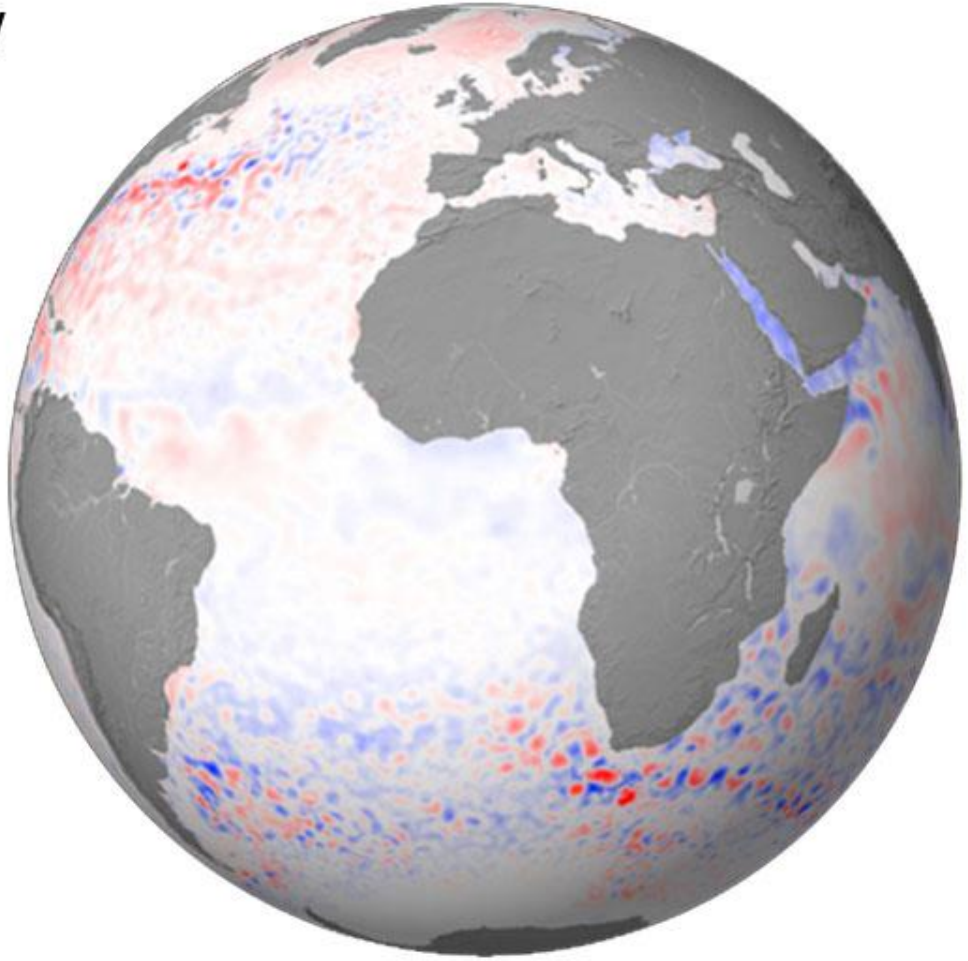
Ocean thermal expansion

NN%
YYmm/yr



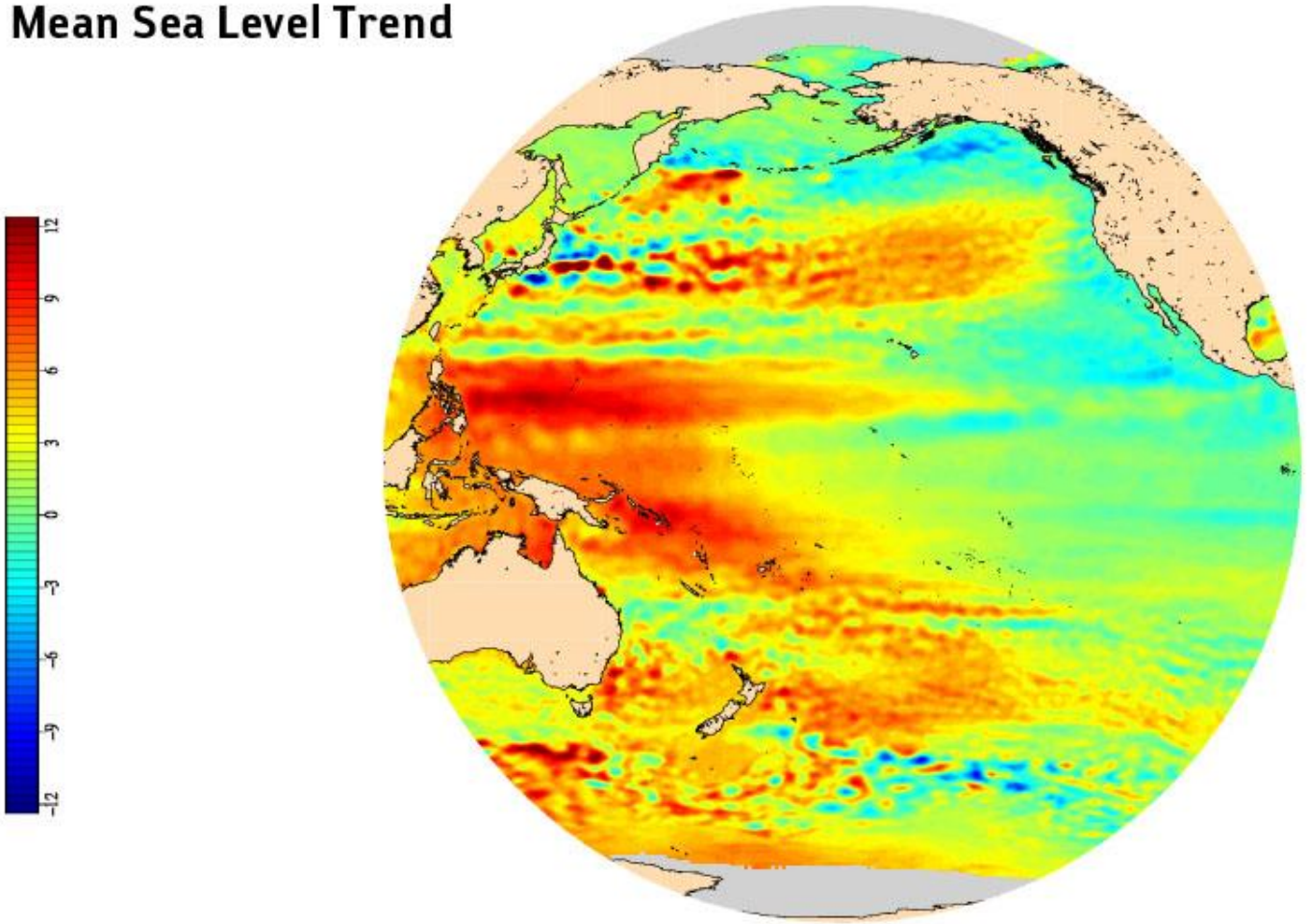
8. Return to Equatorial viewpoint and show global SST sequence as Earth rotates.

Sea Level Anomaly



9. Show sea level anomaly sequence

Mean Sea Level Trend

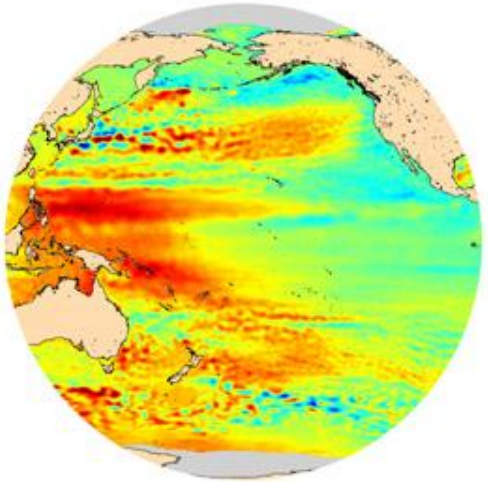


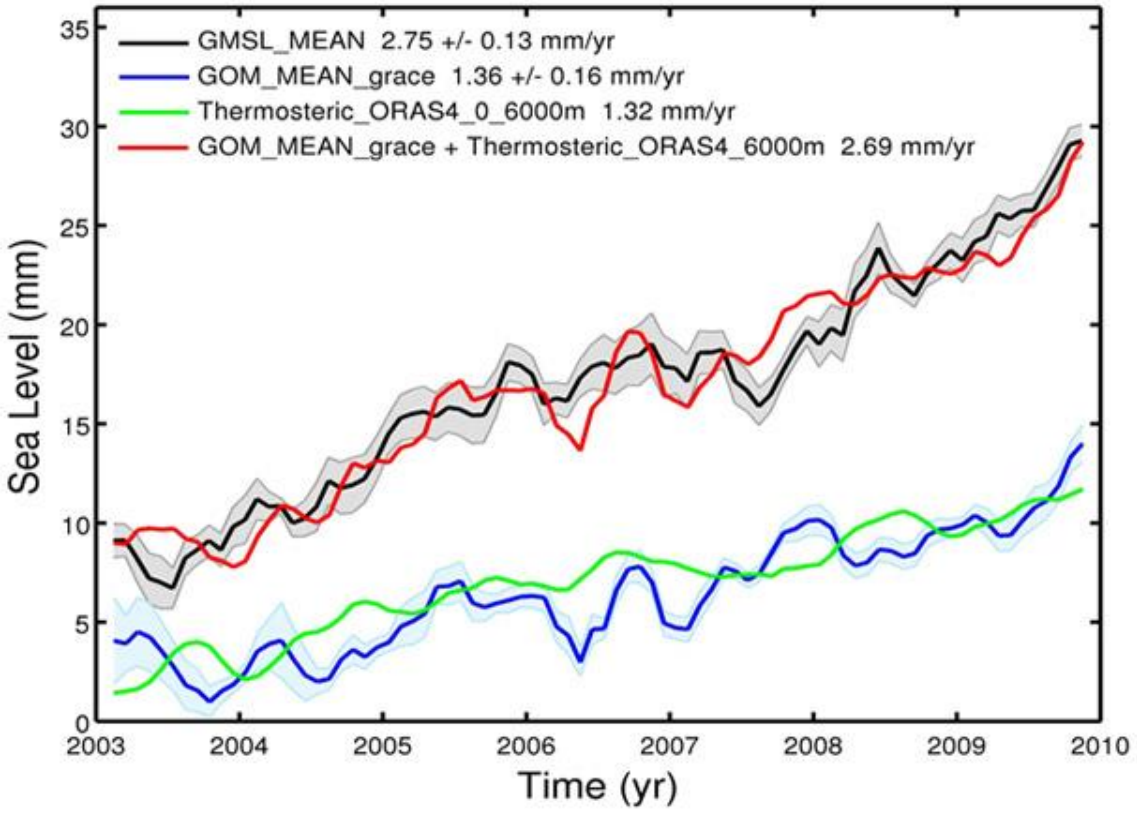
10. Show mean sea level trend map as Earth rotates.

Mean Sea Level Trend

1993-2013

2.69 mm/year





1. Draw out mean sea level graph, with ocean mass and thermal expansion components, and altimetry-measured total.

Perhaps continue rotating Earth behind or beside graph?

CCI Visualisation Corner 2

TASK 3 Animations

3. Interactions of Ocean and Atmosphere

• The oceans and atmosphere interact.

• Variations in SST modify the circulation of the atmosphere and therefore ultimately influence the weather.

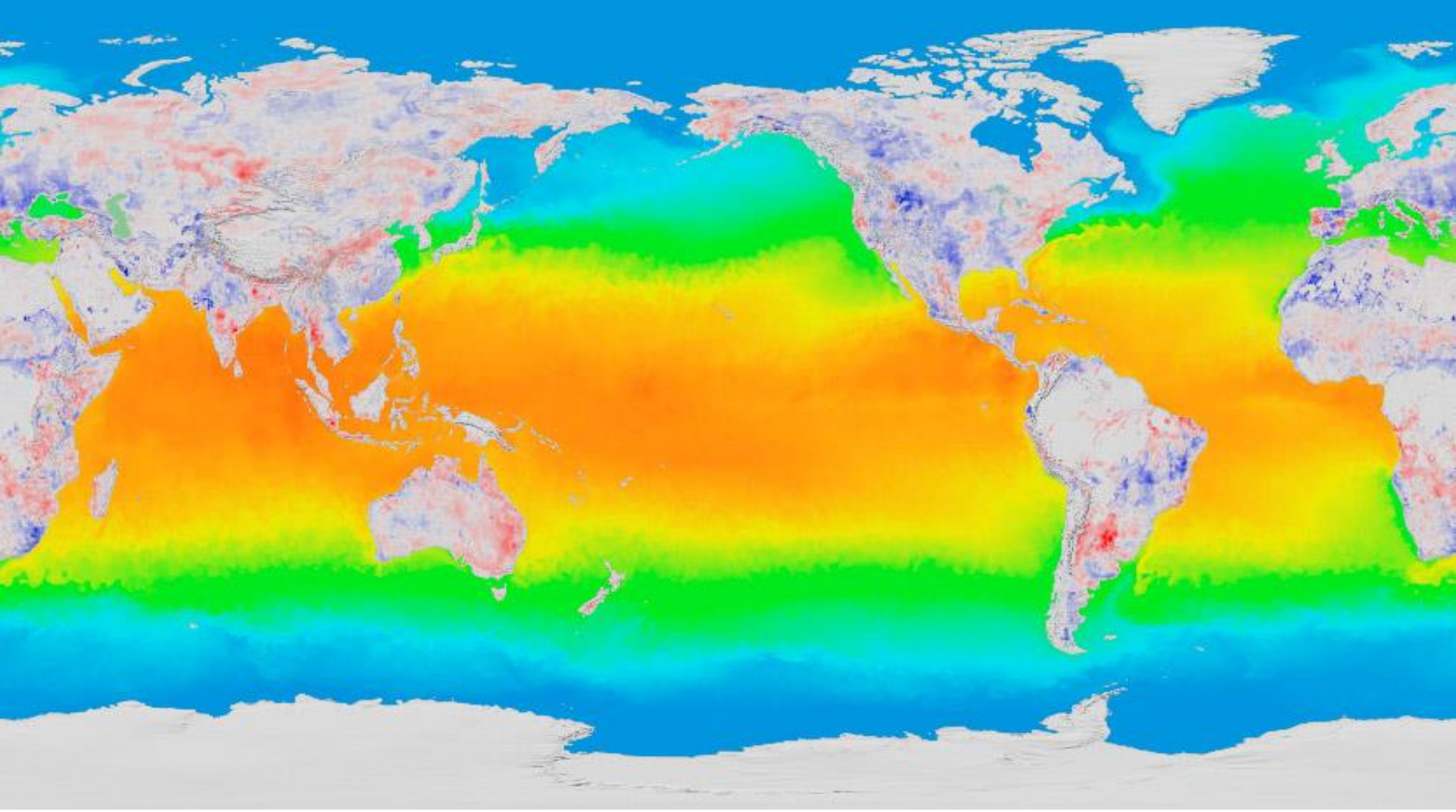
• The atmosphere also affects the ocean and changes SST.

• eg, formation of cold water following the passage of a hurricane.

• Along coasts, offshore winds affect upwelling of deep waters to the surface.

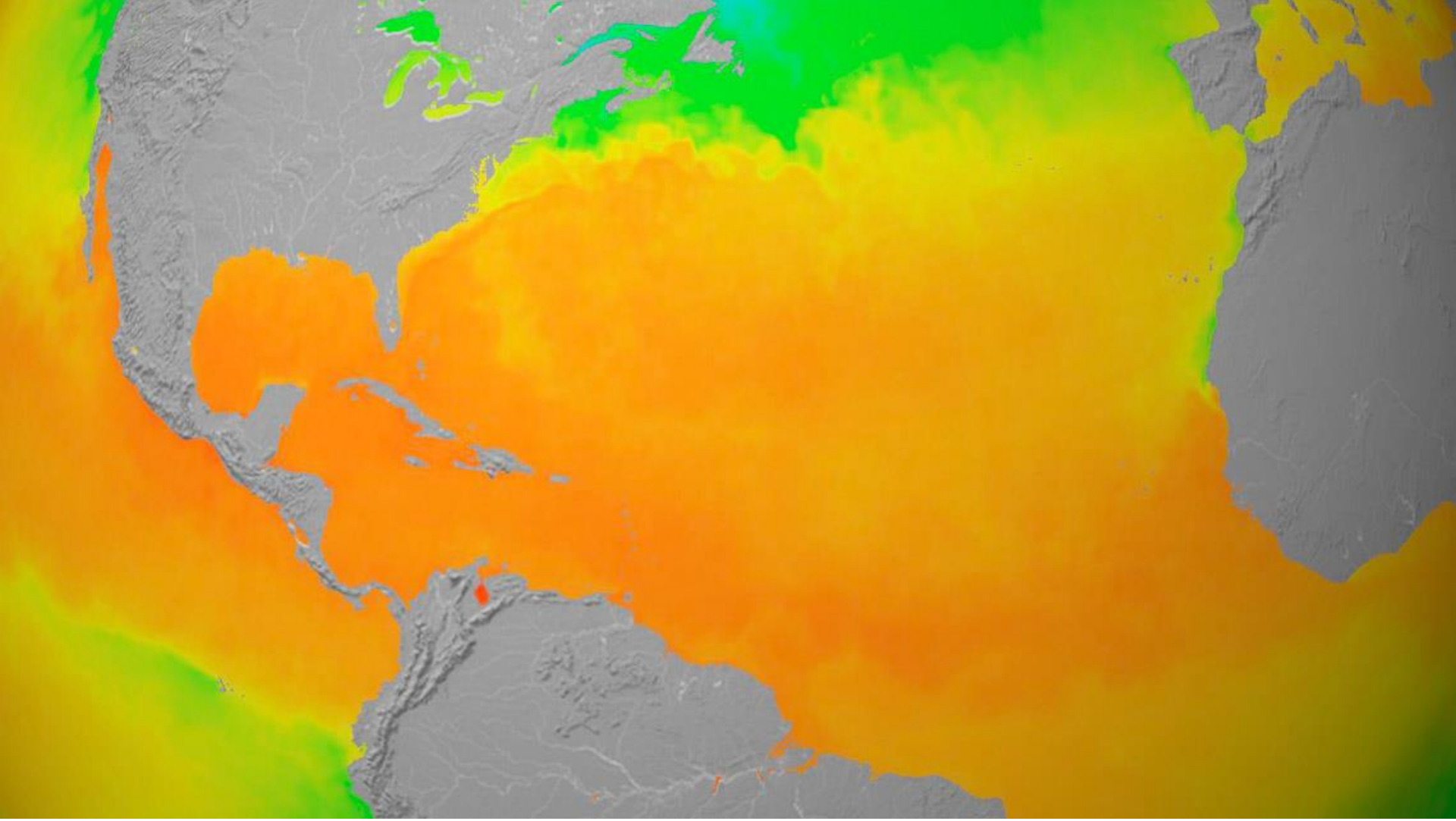
• This also brings nutrients to the surface, triggering an increase in phytoplankton.

• In recent years, atmospheric conditions in the arctic have promoted enhanced summer sea ice loss (eg, summer 2007). This is a potential positive feedback on climate change, since ice free areas can absorb additional energy from the sun, raising the SST.



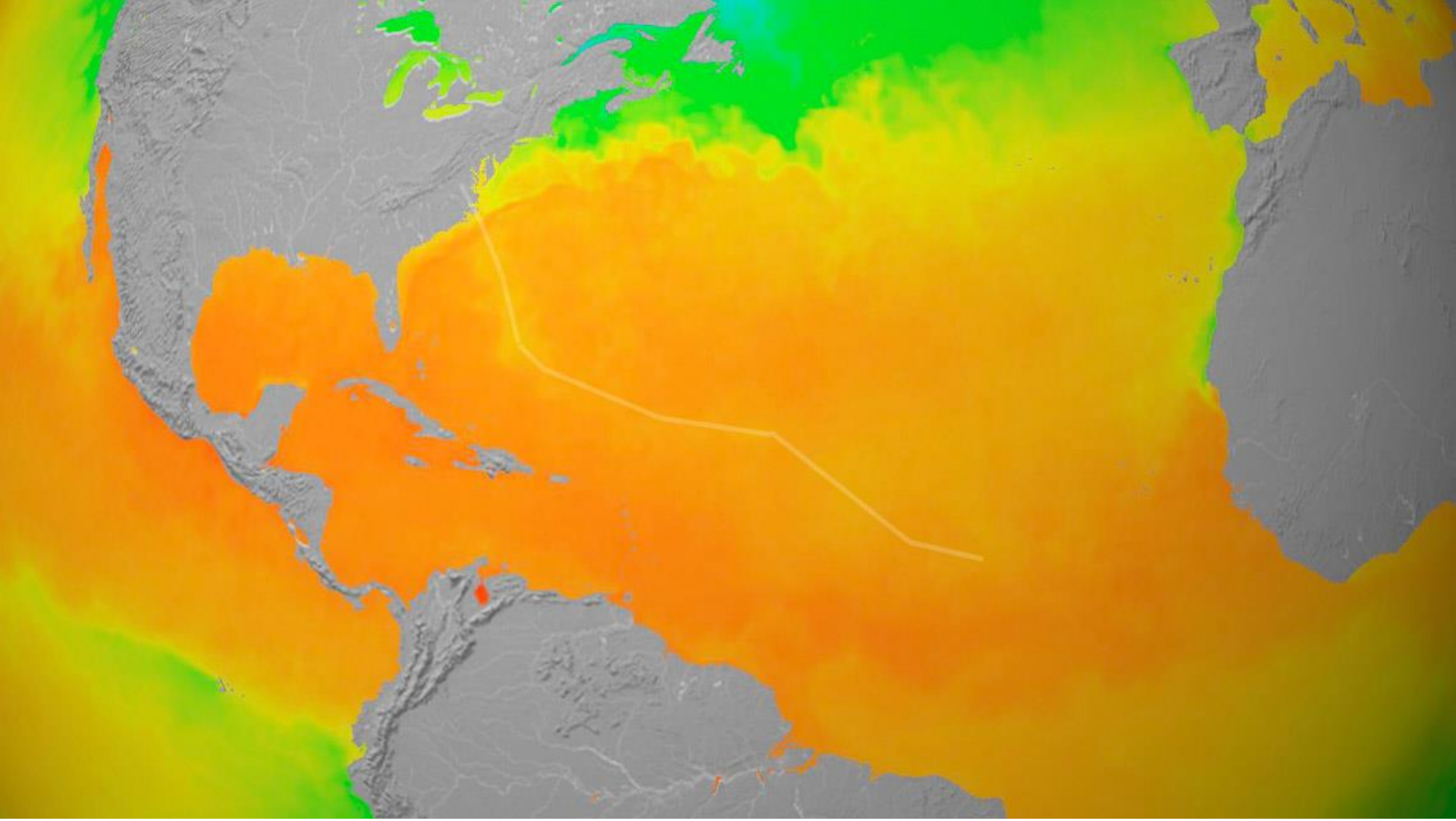
1. The oceans and atmosphere interact. Variations in SST modify the circulation of the atmosphere and therefore ultimately influence the weather.

(Animation of SST Anomaly during ENSO/La Nina variations with fire disturbance and soil moisture varying on the land as a result. eg Jan 1997?)

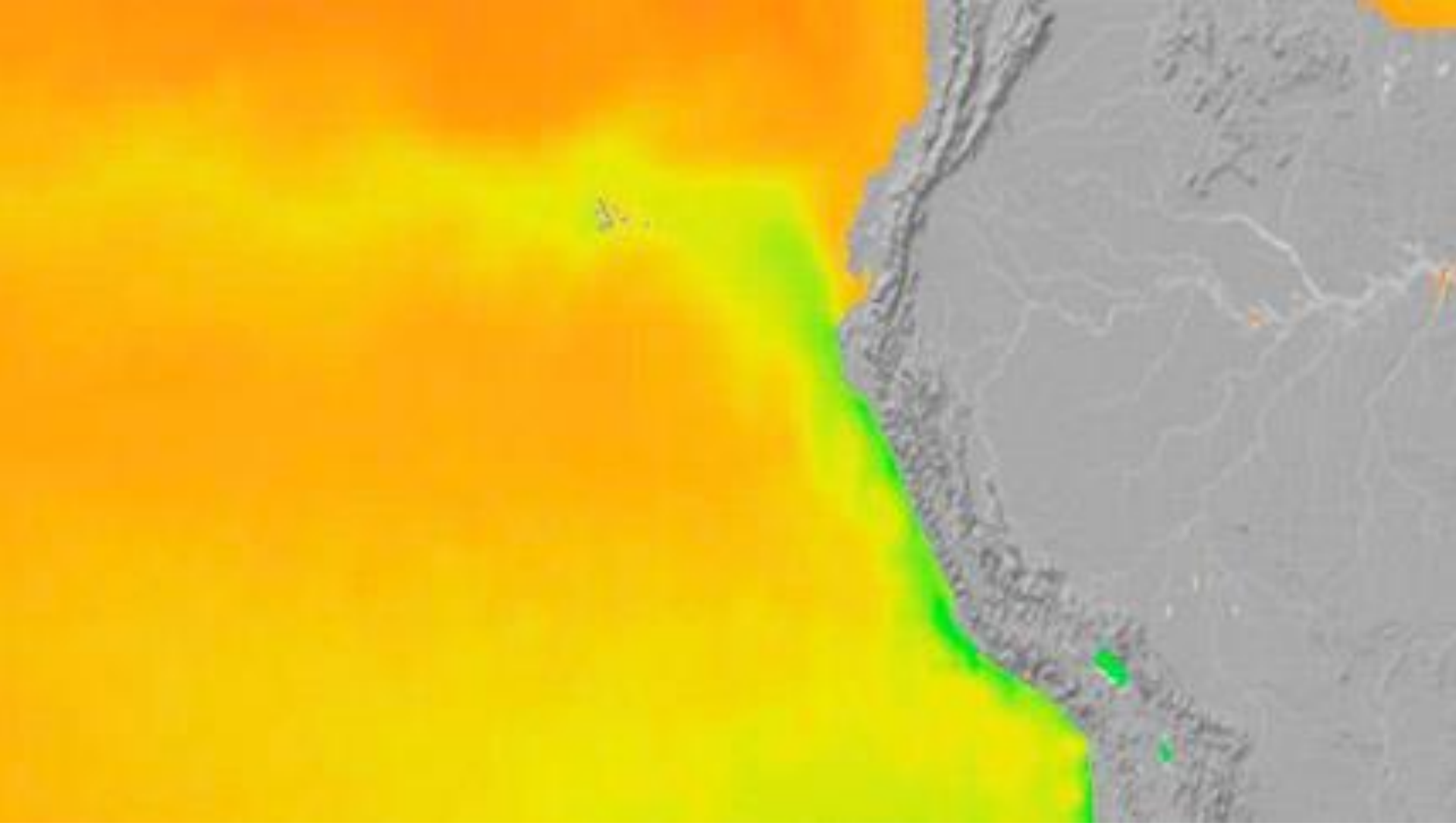


2. The atmosphere also affects the ocean and changes SST.
eg, formation of cold water following the passage of a hurricane.

(Animation of SST (Anomaly?) wake, overlaid with winds, possibly clouds (CCI? GOES?))

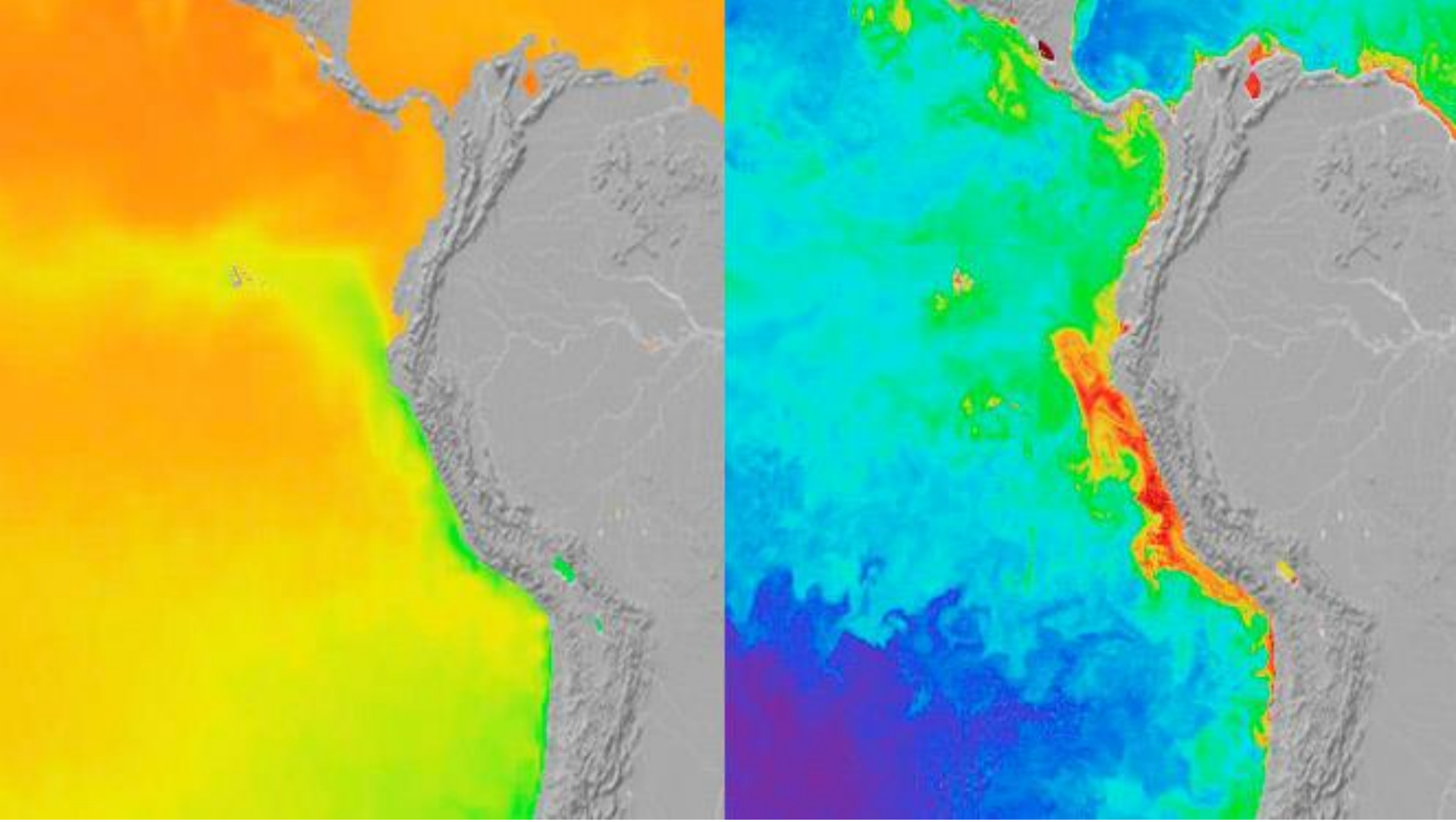


2a. Hurricane track?
eg, Sept 2010 Hurricane Igor, July 2008 Hurricane Bertha,
Sept 2003 Hurricane Isabel (pictured with track))



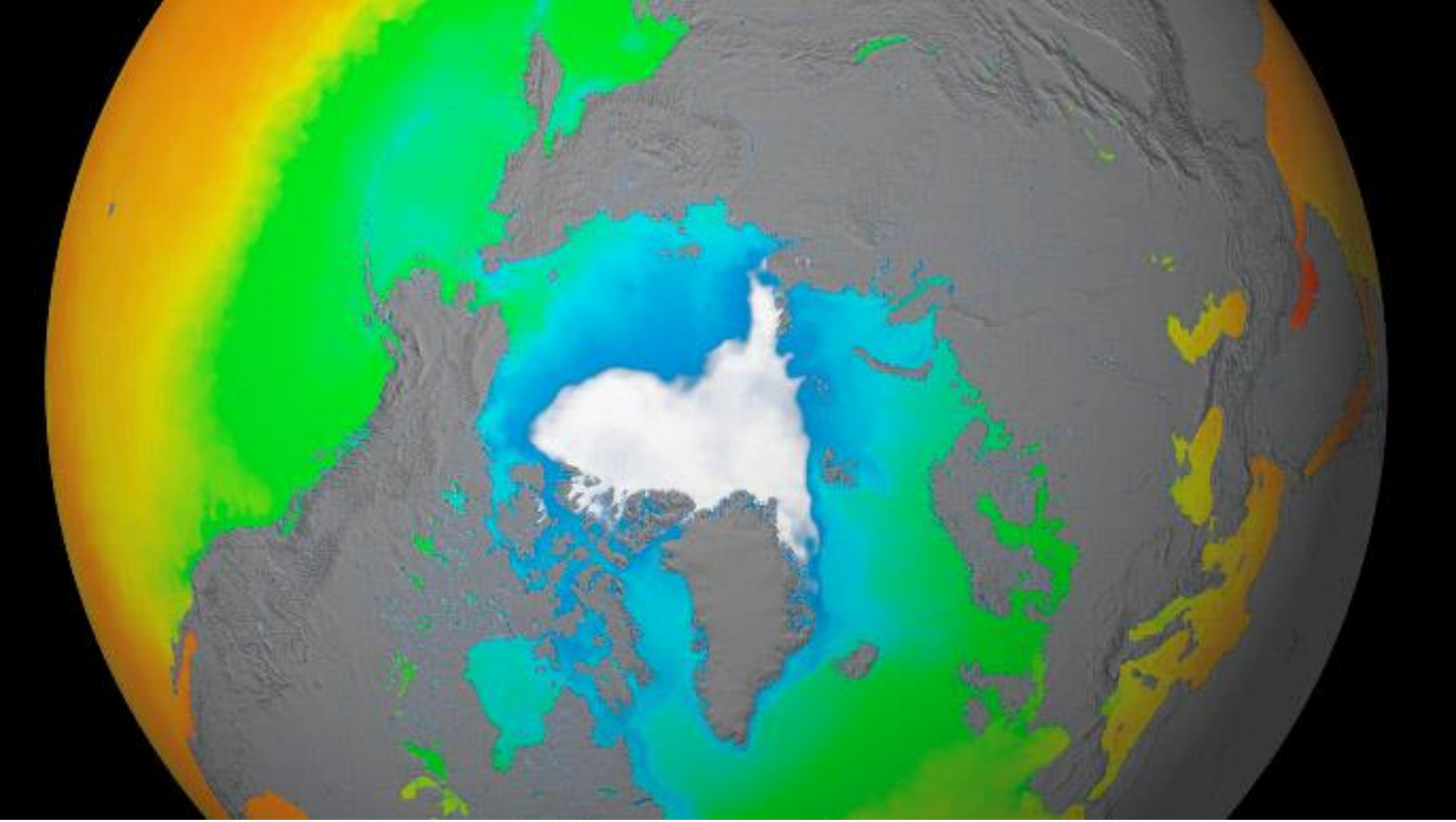
3. Along coasts, offshore winds affect upwelling of deep waters to the surface.

(Animation of upwelling off coast of Peru)



4. This also brings nutrients to the surface, triggering an increase in phytoplankton.

(Compare SST sequence with Ocean Colour sequence.)



5. In recent years, atmospheric conditions in the arctic have promoted enhanced summer sea ice loss (eg, summer 2007). This is a potential positive feedback on climate change, since ice free areas can absorb additional energy from the sun, raising the SST.

(Move to Arctic. Show combined SST/Sea Ice Concentration sequence for summer 2007. Perhaps overlay or compare wind and cloud cover?)

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