

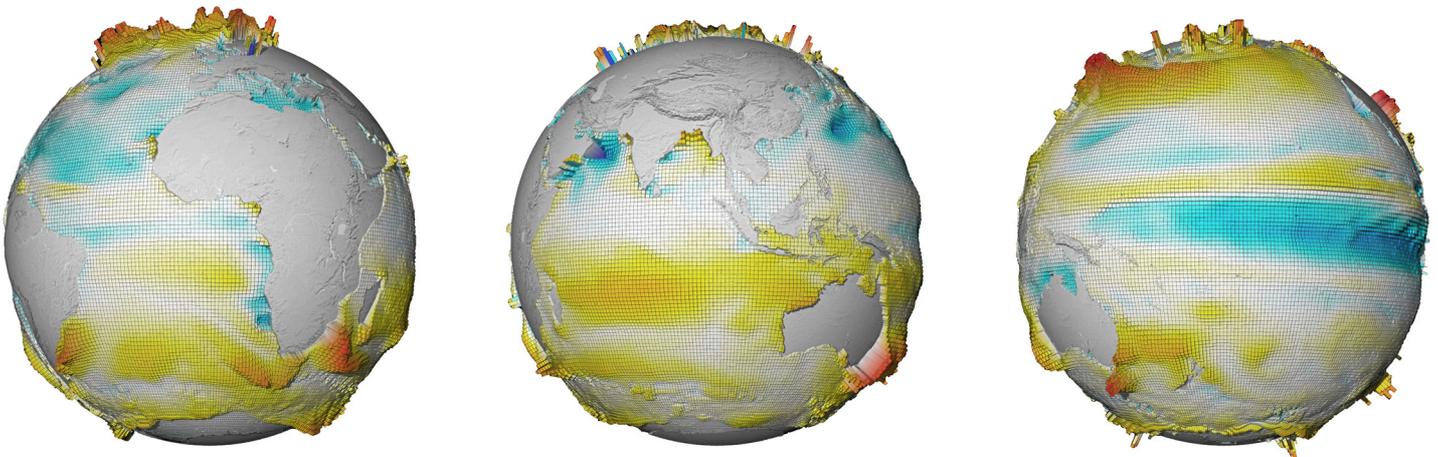
## CCI Visualisation Corner 2

Presentations of  
ESA's Climate Change Initiative

*Year 4 Report  
Draft 0.1*

7<sup>th</sup> August 2018  
ref CCI2-YEAR4

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## **0. Introduction**

The purpose of this document is to summarise the results of the fourth year extension of the *CCI Visualisation Corner 2* project, carried out for ESA by Planetary Visions Limited between July 2017 and August 2018 (ref ESA-CCI-EOPS-KNOW-SW-17).

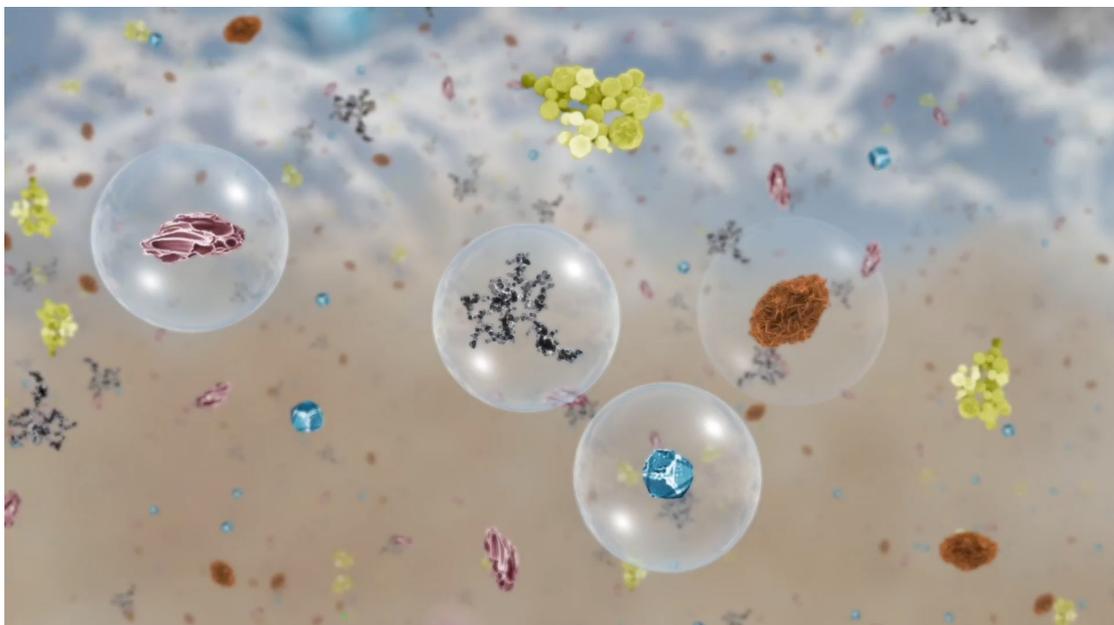
According to the project's Statement of Work, the activity would "allow the Visualisation Tool, in both Exhibition and Tablet App formats, to be kept up to date with new software and CCI data product deliveries."

The project was broken down into four main tasks (with an additional task for management and reporting):

1. Exhibition Software Maintenance.
2. Exhibition Content Update.
3. Tablet Software Maintenance.
4. Tablet Content Update.

Progress on each task is described in sections 1-4 below. In addition to the main tasks, some software development was also undertaken to improve the user interface. Delayed deliverables from Year 3 were also completed, principally two animations, as described in section 5.

Deliverable items are recorded at the end of the appropriate task, and chronologically in Section 6. Section 7 makes recommendations for future development of the work.



**Fig 1.** 3D computer graphics are used to show aerosols seeding cloud formation in the *Atmospheric Climate Variables* animation.

## 1. Task 1 Exhibition Software Maintenance

Final versions of year 3 software deliverables were delayed by problems with the software development environment moving across to Qt5.7 and XCode8 in July 2017. Changes were required to certificate signing and device authorisation under XCode8 before some updates could be distributed.

The software has continued to run without problem at PVL on various MacOS versions since 10.10, including the latest version 10.13, and under Windows 7 and 10. An additional update to the prototype iPad version was delivered in October 2017 ahead of expiry of that version's ad-hoc distribution certificate.

### 1.1 Development

The absence of further maintenance issues made one of the planned Windows maintenance updates redundant. Available effort was instead put into improvements to the user interface of the dataviewer, which is common to Exhibition and Mac versions, and to video playback:

- The data viewer is now more dynamic with automatic globe rotation.
- Text styling (drop shadow) improves title and key legibility over some maps.
- Data viewer controls were enlarged and a new button added to start/stop globe rotation.
- Video playback has improved timeline control and automatic return to the calling screen at the end of the movie.
- New option ' &spin=0 ' disables auto-rotation in playback-mode scripts.



*Fig 2. Exhibition Master version on iMac and iPad.*

The following major versions of the Exhibition software were presented or delivered to ESA:

6 Oct 2017	D.1108	Exhibition Master update 4 (part 2) (v8.2.11)
18 Oct 2017	D.1204	Exhibition for iPad update 2 (part 2) (v8.2.16, iOSv2.2)
25 Oct 2017	D.1303	Exhibition for Windows Update 2 (Windows v2.2)
7 May 2018	D.401	Exhibition Mac Maintenance 1 (v8.4.6, MacOS v2.3)
3 July 2018	D.403	Exhibition Mac Maintenance 2 (v8.5.5, MacOS v2.4)
7 Aug 2018	D.404	Exhibition Windows Maintenance 2 (v.8.5.4, Windows v2.4)

### 1.2 Conferences

The Exhibition Version has been presented at the following conferences and science meetings over the course of the year:

6-17 Nov 2017	UN Climate Change Conference COP23, Bonn
8-13 April 2018	European Geosciences Union, Vienna
2-5 June 2018	International Weather & Climate Forum, Paris
26 June 2018	UKSA SatelLife Challenge, Harwell

## 2. Task 2 Exhibition Content Update

Content updates for the Exhibition version have included data updates, new data, text updates, new animations and additional illustrations from the Tablet version. Over a terabyte of data has been ingested and processed for the project to date, including around 140GB in the last year. New and updated content has been supplied to ESA as and when completed, with two nominal content updates, in December 2017 and June 2018.

### 2.1 Updated Data

Data updates this year include:

- GHG version 2 data (final colours, new key, including higher range of values)
- Fire burned area version 5 (2001-2016)
- Greenland Ice Sheet elevation change (2yr means 2011-15, then 1994-2015), ice velocity
- Antarctic Ice Sheet elevation change (monthly 2010-2015)

The CCI Soil Moisture update covering 2015 only provides daily coverage, which is extremely sparse, rather than the monthly data from the previous version. Monthly data is now provided by the same team through the Copernicus Climate Change Service (C3S), although the most meaningful anomaly parameter is only publically available in map form (not data). The science team were approached direct for the SM anomaly data.

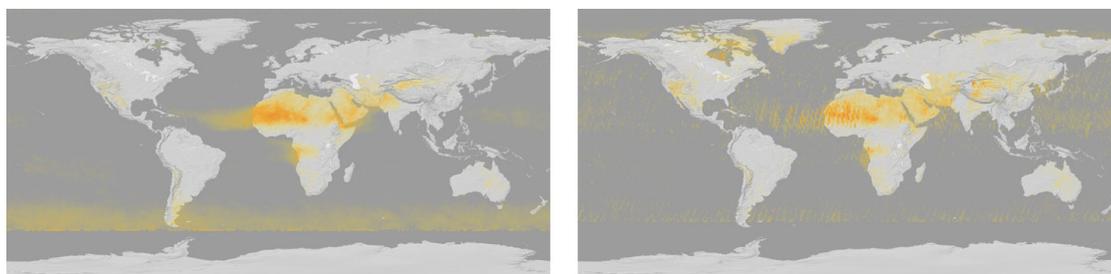
Surface Elevation Change (SEC) is available for both Greenland and Antarctic ice sheets, but from different teams. The Greenland team provided their data as periodic change (5-year, 2-year or annual means), but the Antarctic team provided their data as cumulative change (annual or monthly). To present more consistent data we acquired periodic change maps from the Antarctic team, but found that the change was relative to an arbitrary datum representing an average across the entire time span of the data, rather than to the start of each time period. This inevitably shows mostly negative “change” in the first half of the data time span and positive “change” in the second half. Since this gives a misleading impression to the non-expert viewer, and since it seems non-trivial for the science team to address within the time available, we have kept the cumulative Antarctic SEC change data.

### 2.2 New Data

New data includes:

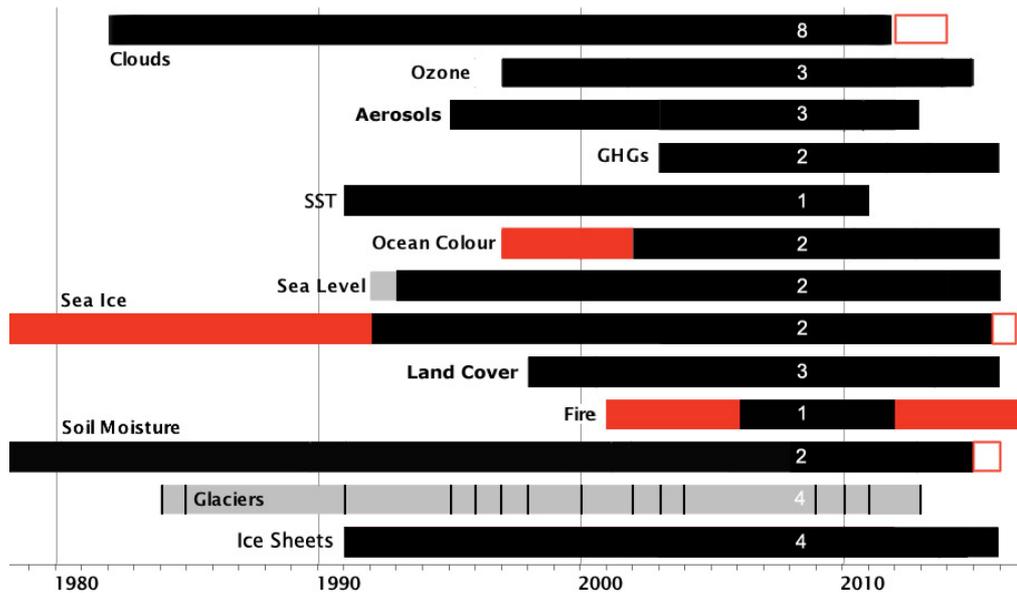
- Aerosol absorbing aerosol index
- High Resolution Land Cover
- Ice Sheets gravimetric mass balance x2, Antarctic ice velocity
- Fire annual average burned area and small fires database

Due to the same problem described above for Antarctic SEC being present with the new Gravimetric Mass Balance (GMB) product, both GMB datasets are presented as static maps only.



**Fig 3.** Absorbing aerosol index monthly maps from 1980 (left) and 1996 (right). Missing data and gaps in coverage are explained in the data info text: There is a data gap between the failure of Nimbus-7 in 1993 and the launch of ERS-1 in 1995. Data coverage remains sparse until the launch of the OMI sensor in 2004.

### ESA CCI Data Timespans



**Fig 4. CCI Data Time Spans Update**

Grey lines represent full CCI data timespan. Black lines represent data processed and presented in the Exhibition Version. Red lines represent data added in Year 4. Ocean Colour and Sea Ice updates had previously been applied to the Tablet version. The number of ECV parameters is shown for each project. All projects originally overlapped for the 'golden year' of 2008, but this now extends 2003-2010.

	Exhibition Version		Tablet Version
	Desktop	iPad	
<i>minimum time step</i>	<b>1 day</b>	<b>8 days</b>	<b>16 days</b>
Sea Surface Temperature	5718	574	48
Sea Ice	2183	269	117
Ocean Colour	789	121	120
Greenhouse Gases	37	37	37
Sea Level	117	117	117
CMUG	358	361	48
Aerosols	156	156	15
Soil Moisture	210	210	38
Land Cover	234	235	185
Ozone	132	132	12
Cloud	366	366	47
Fire	87	87	87
Glaciers	37	37	33
Ice Sheets	18	12	14
<b>Science Data</b>	<b>10442 MB</b>	<b>2714 MB</b>	<b>918 MB</b>
<b>Video</b>	<b>903 MB</b>	<b>732 MB</b>	<b>653 MB</b>
<b>Info, Images, Metadata</b>	<b>116 MB</b>	<b>86 MB</b>	<b>105 MB</b>
<b>Software</b>	<b>50 MB</b>	<b>23 MB</b>	<b>84 MB</b>
<b>TOTAL</b>	<b>11,511 MB</b>	<b>3,555 MB</b>	<b>1,760 MB</b>

#### download time at

Fibre broadband	50 Mbps	<b>5 min</b>
UK average*	22 Mbps	<b>11 min</b>
Typical ADSL2	8 Mbps	<b>29 min</b>
Basic ADSL	3 Mbps	<b>78 min</b>

(\*source: Ofcom, Feb 2015)

**Table 1. Software Data Budget**

The current data budget for Exhibition (desktop and iPad v2.2) and Tablet versions: 11GB for Exhibition on desktop; 3.5GB for Exhibition on iPad; 1.7GB for the Tablet version. Data volumes for iPad are reduced to maintain performance on the less capable platform. Data volumes for the Tablet version are further reduced in order to limit the download time for the app.

## 2.3 Updated Text

Data info text has been adjusted as and when updated or new data has been brought in. Additional animations and illustrations required in some cases adjustment to the headline/bullet points, since there is now only room for three, rather than the original four.

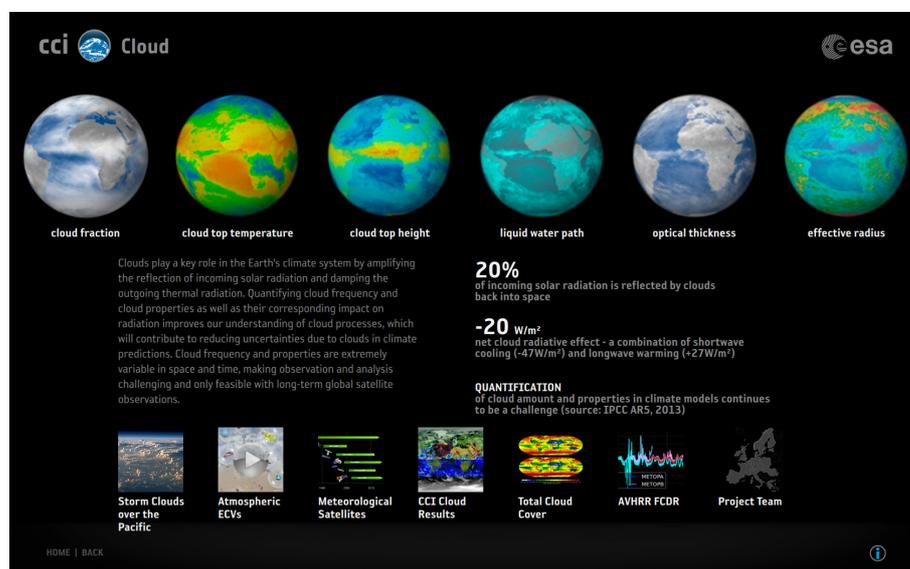
The date of all static data in the data viewer is now reported under the data title. New data listed above required updates to the relevant comparison menus, as well as updates to project page layout, metadata and data info files.

In addition, a comprehensive update of all the text was undertaken with the science teams in the spring of 2018 to ensure it is not only accurate but also up-to-date. A transcript of all the text at that time, together with screen grabs of each project screen, was compiled and provided to each science team for comment (ref ESACCI-infotext-v5). Text for most projects has been updated to reflect the current state of projects, products and teams (ref ESACCI-infotext-v6): Sea Level, Ice Sheets, Glaciers, Land Cover, Fire, Ozone, Sea Ice, Soil Moisture, Cloud, Aerosol and CMUG.

## 2.4 Additional Illustrations

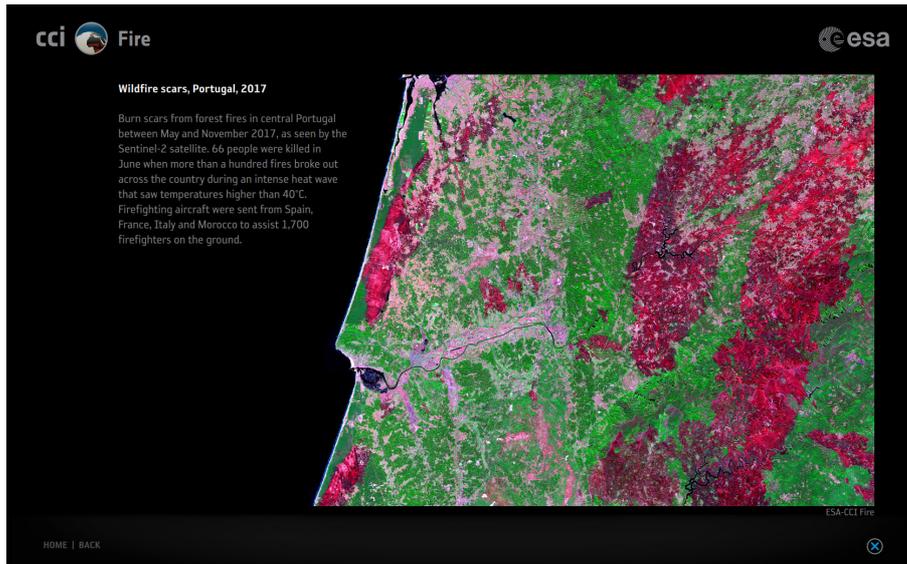
The six CCI animations completed to date were added to the appropriate project pages in December 2017. Remaining animations *Carbon Cycle* and *El Niño* were included in August 2018. Animations are generally included on all projects that contributed data to the animation (those where other illustrations took priority are shown in brackets):

- Sea Level Contributions: Sea Levels, SST, Ice Sheets, Land Cover, Glaciers
- Ocean-Atmosphere Interactions: Sea Ice, SST, Ocean Colour
- Carbon Dioxide Air-Sea Flux: Ocean Colour, CMUG
- Ozone Distribution: Ozone, (Aerosol)
- Atmospheric Climate Variables: Fire, Ozone, GHG, Cloud, Aerosol
- Land Cover: Land Cover
- Carbon Cycle: Land Cover, Fire, GHG, CMUG, (Ocean Colour)
- El Niño: SST, Ocean Colour, Sea Level, Cloud, Soil Moisture



**Fig 5.** A “fully loaded” project page, with six ECV parameters across the top and seven illustrations across the bottom of the screen.

Team maps, lists and logos from the Tablet version were added for content update 1 in December 2017. Updates were included in update 2 for Ice Sheet, Land Cover, Fire, Aerosol, CMUG. Additional illustrations and their captions were included from the Tablet version for Fire, Cloud, Soil Moisture, SST and Sea Ice, ensuring that all projects had a full complement of seven illustrations for content update 2 in June 2018.



**Fig 6.** Additional illustration using one of the new images from the Tablet version: Sentinel-2 image of wildfire scars in Portugal, 2017.

The following major updates to the Exhibition content were delivered to ESA:

5 Dec 2017 D.405 Exhibition Content Update 1  
 30 June 2018 D.406 Exhibition Content Update 2

### 3. Task 3 Tablet Software Maintenance

The Tablet software is an app for iPad and Android tablet devices called *Climate from Space*.

Considerable effort was spent at the start of this phase, and some at the midpoint, dealing with updates to the target tablet operating systems – Android 7 in summer 2017 and iOS11 in the autumn. Nevertheless there was time available to implement some improvements to the functionality and performance and, in the second half of the year, design and user interface of the Tablet version.

Each Android and iPad build is tested internally to confirm any new or updated content or software changes, before uploading to each platform's app store for store review. Major updates to the iPad version are additionally available for external (client) review through Apple's TestFlight service. The iPad app is the lead Tablet version, so any changes as a result of iPad review are included in the Android version.

#### 3.1 Android Maintenance

Year 4 started with the bedding down of the move to Qt5.7 / XCode 8, and rearranged file structure required for Android 7, including setting up a "live" content development area for future updates. Some changes significantly reduced the startup and in-use consumption of certain resources, which should enable the app to start up on less capable devices than the target (Galaxy Tab S2). The Android version was physically tested on a variety of devices using Amazon Web Services' remote device farm.

The Android version's metadata was used to limit compatibility to "tablet class" devices. Some time was spent on preliminary investigations of Google Play Store deployment. Google Play now allows a separately-downloadable expansion file, up to 2GB, hosted on the Play Store, to get around the limit on app file size. This removes the need for ESA to host the content bundle if we deployed to the Play Store.

### 3.2 iPad Maintenance

To maintain a common content bundle, the iPad version was adapted to the Android 7 file structure. Similarly the internal MacOS version for authoring development.

Fonts and icons were moved from the executable to the content part of the app bundle to overcome the 80MB limit on Apple app store executable size (new content tipped us over). There was an issue with swipeable content on some older iOS10 hardware. Some improvements to memory efficiency (image preload cache) were made while investigating this, but the error proved transient, and was non-repeatable on identical hardware/software.

There was also an issue with icon assets related to iOS11: some backward-compatibility that was built-in to the app is no longer allowed, so iOS8 is now the minimum operating system requirement. There was some work associated with changes to the way apps are packaged for deployment through the new iTunes App Store, and some issues with the renewal of ESA's distribution keys.

### 3.3 Development Version

An updated development version of the app was required to accommodate the new content structure. Running under MacOS and Linux, the development version has authoring options to pack and unpack the content so it can be amended.

While this work was underway, we took the opportunity to make the MacOS version behave more like it does on a tablet (locked 4:3 aspect ratio), to include keyboard shortcuts from the Exhibition version (F, Q, Esc), to fix a few bugs (authoring options; interview video scaling; interview caption scaling), and to make it more easily deployable to users through the Mac App Store. The first three of these make it possible to demonstrate the Tablet version in a presentation on a Mac laptop, without having to swap to a tablet device. The last allow would us to offer the app to the science teams or the public on a desktop platform.



*Fig 7. Climate from Space on MacBook, iPad Pro and Samsung Galaxy Tab S2.*

### 3.4 App Functionality

A number of functionality improvements were made:

- Implementation of the Exhibition version's close-up datasets with hotpot-zoom for the static globes in the Land Cover and Glacier projects.
- Auto-rotation of the data viewer globe, with new rotation control button.
- Video playback controls were added, using the same style timeline and play/pause button as the data viewer, fading off after a few seconds without use.
- Performance improvements, including QML resources separated from content, improving responsiveness and eliminating pause when a page first opened.

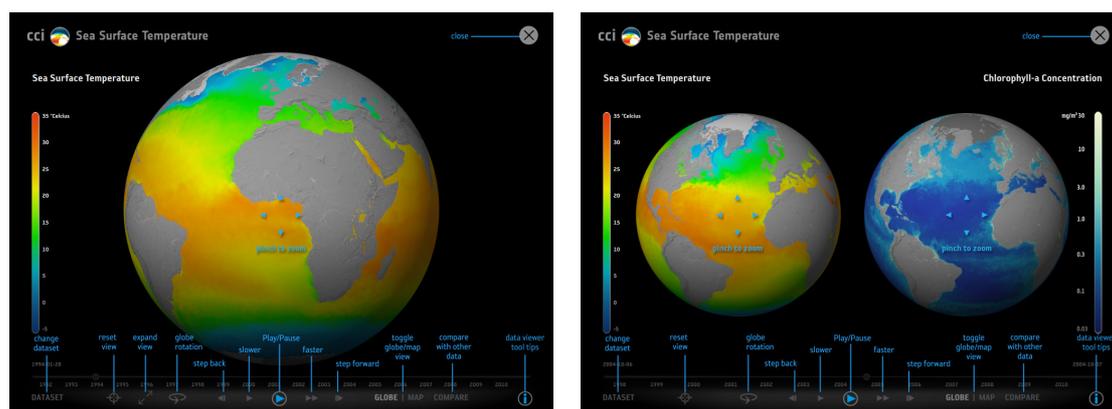
Bug fixes include:

- Page-turning now enabled over interview movies (also tap pause/play, double-tap restart).
- Dataviewer URL history now being cleared correctly.
- Correct rendering of custom colour keys in comparison mode.

### 3.5 App User Interface

User interface improvements include:

- Edge-to-edge images on the opening page of each chapter give more impact, appear more modern and layered, and give a visual rhythm to the pages within each chapter.
- Increased transparency of the dark block behind image captions.
- Sliding in new pages on page turn.
- Text styling (drop shadow) improves title and key legibility over some maps.
- *Globe rotation* and *expand view* buttons are hidden when inactive (in map and comparison modes respectively).
- Updated tooltips info for globe rotation, adaptive to globe, map or comparison mode.
- New app icon showing the app title.
- Shorter bundle text 'ESA Climate' to avoid truncation and ellipsis on home screen.
- Splash image (app icon) displays rather than blank screen while software loading.



**Fig 8.** The data viewer in globe mode (left), and globe comparison mode (right), showing adaptive button display and tooltips overlay.

### 3.6 App Distribution

The following updates to the Tablet Version software were published:

- |             |       |  |
|-------------|-------|--|
| 6 Mar 2018  | D.501 | Tablet iPad update 1 (v8.3.6, iOS v1.1)      |
| 7 Mar 2018  | D.502 | Tablet Android update (v8.3.5, Android v1.1) |
| 3 July 2018 | D.503 | Tablet iPad update 2 (v8.5.5, iOS v1.2)      |
| 6 July 2018 | D.504 | Tablet Android update (v8.5.5, Android v1.2) |

*Climate from Space* is available for free download from the Apple and Amazon app stores:

<https://itunes.apple.com/us/app/climate-from-space/id1061553589?mt=8>

<https://www.amazon.com/European-Space-Agency-Climate-from/dp/B01NBKKHYK>

Total app downloads to 30 June 2018 are:

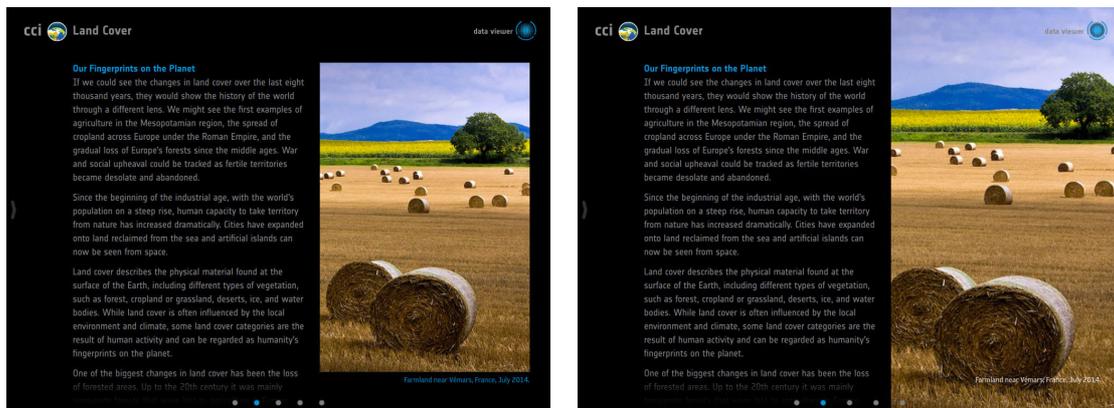
- 4,230 for iPad since 5 Mar 2016
- 195 for Android since 1 Feb 2017

## 4. Task 4 Tablet Content Update

Two content updates were completed; the first, in January 2018, bringing data content up to date with the Exhibition version and adding the six new animations; the second, in July, including further data updates as well as updated team lists/maps, some updated text and new illustrations including the Carbon Cycle animation, and a design refresh.

### 4.1 Design Tasks

Some of the updated team lists required the update of the team maps and the creation of new team member logos. The globe rotation control required some design work for the new button and tooltips overlay. Edge-to-edge image display for the first project pages required some images to be re-cropped or adjusted to accommodate caption overlay, and the creation of a transparent version of the data viewer icon. Some new and updated datasets required associated data viewer menu icon updates. Various options were designed and previewed on app store and iPad home screens for an update to the app icon with text.



**Fig 9.** *Climate from Space* design refresh. Left: first project page with original framed image; Right: with new edge-to-edge image.



**Fig 10.** *Climate from Space* app icon: option 1 is the original; option 4 was chosen for update 2.

### 4.2 Updated Data

The following updated data was included in the Tablet version content:

- GHG carbon dioxide, methane
- Ice Sheets surface elevation change, ice velocity
- Land Cover closeup/hotspots.
- Glaciers closeup/hotspots

Some static datasets were re-presented as rotating globes in the data viewer, rather than as static images:

- Cloud temperature, height, water path, effective radius, optical thickness
- SST Anomaly
- Aerosol absorbing aerosol index
- Fire annual average burned area

Ice Sheet datasets were regrouped by parameter rather than by geography.

### 4.3 New Data

The following new data was included in the Tablet version content:

- High Resolution Land Cover
- Aerosol absorbing aerosol index
- Ozone profile (still)

- Ice Sheets gravimetric mass balance (x2), Antarctic ice velocity
- Fire annual average burned area, small fire database

Some new datasets required associated data viewer menu icon updates, and the new map pin zoom functionality was populated for Glaciers and Land Cover.

#### 4.4 Updated Text

Some team lists were updated at science team request. Interview captions were updated to the new scalable styling. New data description texts were written as new data came in, and some data descriptions were updated in response to science team comments on the Exhibition version info text. The opening of the Fire chapter was rewritten, to be more up-to-date.

#### 4.5 New Illustrations

Some new images were included to show more recent events (eg, Sentinel-2 images of wild fires in Portugal and California, 2017). The new CCI animations were added in an appropriate part of an appropriate chapter. In some cases this required the replacement of a legacy placeholder animation or of a still image:

- Sea Level Contributions: Sea Level page 1, Contributions to Sea Level Rise
- Ocean-Atmosphere Interactions : SST page 1, Climate Regulator
- CO2 Ocean Flux: Ocean Colour page 1, Carbon Sponge
- Ozone: Ozone page 1, Ozone and Climate (replaces *Springtime ozone hole over Antarctica*)
- Atmospheric Climate Variables: Aerosols page 1, Global Cooling
- Land Cover: Land Cover page 2, Mapping Land Cover
- Carbon Cycle: GHG page 1, Sources and Sinks
- El Nino: Sea Level page 2, Highs and Lows

All ECV chapters now have at least one animation.

The following updates to the Tablet Version content were completed:

29 Jan 2018 D.505 Tablet Content Update 1 (published on iOS 9 Mar 2018)  
 1 July 2018 D.506 Tablet Content Update 2 (published on iOS 3 July 2018)

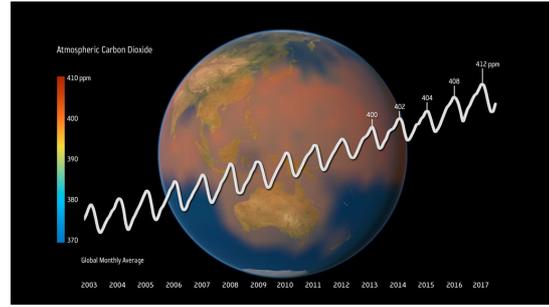
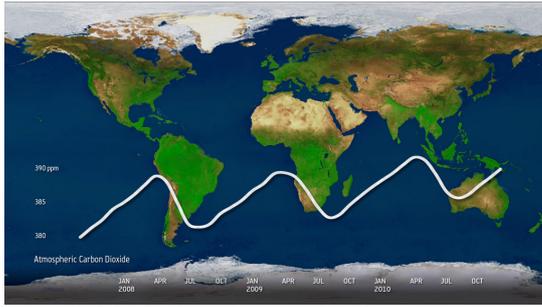
## 5. Related Activities

Production of animations on the main project was delayed. Two animations remained incomplete at the start of this phase, but have now been completed as described below, and incorporated into the software products.

ESA Communications requested caption changes to previously-delivered *Ozone* and *Ocean-Atmosphere* animations, and a Spanish translation of the Overview animation for use in an exhibition. The captions changes required a reintegration of the animations into the Exhibition Version content. The translation required the transcription of the caption texts and replacement of the original captions with the Spanish translations, compositing, video encoding and delivery. CCI Climate Office approved inclusion of this work under the content update workpackage.

### 5.1 Carbon Cycle Animation

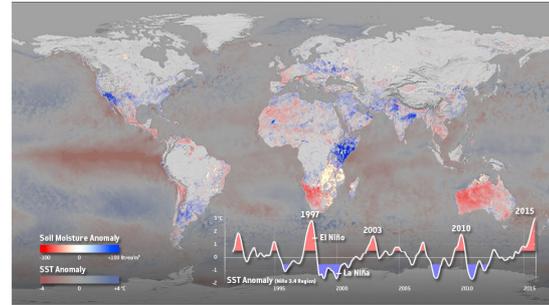
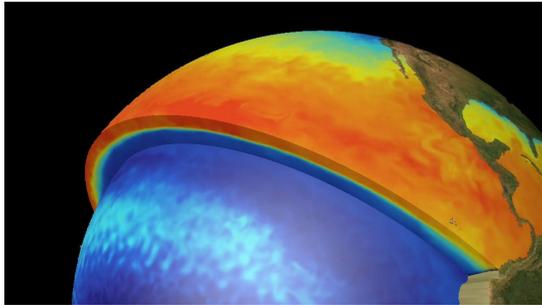
The Carbon Cycle storyboard (version 5) was approved by ESA at the annual review meeting in July 2017. Production commenced in August, with motion rushes including caption placement presented in October. Graph style was adjusted in response to client comments and a colour key was added to air-sea flux section. The satellite-derived night-time lights map was updated to the latest dataset and the chlorophyll colour was strengthened. The animation was delivered in HD with representative stills for web in February 2018.



**Fig 11. CCI Carbon Cycle animation**

## 5.2 El Niño

ESA requested further revisions to the El Niño storyboard in May 2017, with additional data external to the project (SST with depth, ENSO Index). The source of this data was identified by ESA in October 2017, allowing a revised storyboard to be presented, with captions, in December 2017. The additional data was processed, computer graphics textures and 3D elements put in place, and motion and timing set up by March 2018. Production was then delayed by contractor's other commitments, resuming in June 2018, with preliminary rushes presented in July and delivery in August 2018.



**Fig 12. CCI El Niño animation**

The following animations were delivered in this phase:

- 27 Oct 2017 D.3304 Animations Year 3 Ozone (redelivery)
- 29 Nov 2017 CCI Overview (Spanish captions)
- 4 Dec 2017 D.3202 Animations Year 2 Ocean-Atmosphere (redelivery)
- 20 Feb 2018 D.3301 Animations Year 3 Carbon Cycle
- Aug 2018 D.3203 Animations Year 2 El Niño

The CCI animations were published on the ESA website under the following titles (viewing figures reported up to 6 Aug 2018):

- 5 June 2017 [Contributors to sea-level rise](#) (5111 views)
- 14 Nov 2017 [Monitoring ozone](#) (5875 views)
- 11 Dec 2017 [Carbon dioxide ocean-atmosphere exchange](#) (3258 views)
- 8 Jan 2018 [Ocean and atmosphere interactions](#) (4086 views)
- 19 Jan 2018 [Changing lands](#) (2418 views)
- 5 Feb 2018 [Change in atmosphere](#) (2672 views)
- 21 Feb 2018 [Carbon cycle](#) (5291 views)

## 6. Management and Meetings

Progress has been reported to ESA by email on an ad hoc basis throughout the year, and at the progress meetings and milestone reviews. The agenda was set for these meetings, and minutes recorded, by PVL.

### 6.1 Meetings

In addition to the contracted progress meetings, the contractor attended at ESA's request the annual CCI Colocation Meeting to report progress, demonstrate the software, collate science team feedback, and to meet the new science teams for CCI+. Planetary Visions staff have attended the following meetings:

19 July 2017 Year 4 Kick Off Meeting, ESA-ECSAT Harwell (PE, KMT)  
26 Oct 2017 Progress Meeting 10, ESA-ECSAT Harwell (KMT, PE by Skype)  
15 Mar 2018 Progress Meeting 11, ESA-ECSAT Harwell (PE, KMT)  
20-22 Mar 2018 CCI Colocation Meeting, Univ of Oxford (PE)  
5 Jul 2018 Year 4 Review Meeting, ESA-ECSAT Harwell (PE, KMT)

### 6.2 Project Documents

In addition to progress reports and meeting minutes, various documents have been prepared and circulated within the project team and to the wider CCI science team as required. A list of project documents is provided below (not including quarterly project reports and minutes):

10 Nov 2017 cci2-carboncycle-storyboard-v7 Carbon Cycle storyboard v7  
13 Dec 2017 cci-elnino-storyboard-v5 El Niño storyboard v5  
10 Mar 2018 ESACCI-infotext-v5 CCI Viztool Info Text v5 (for review)  
22 June 2018 ESACCI-infotext-v6 CCI Viztool Info Text v6 (amended)  
25 Oct 2017 CCI2-YEAR4 Year 4 Report (this document)

### 6.3 Deliverables

The following deliverable items have been completed and delivered in Year 4:

6 Oct 2017 D.1108 Exhibition Master update 4 (part 2) (v8.2.11)  
18 Oct 2017 D.1204 Exhibition for iPad update 2 (part 2) (v8.2.16, iOSv2.2)  
25 Oct 2017 D.1303 Exhibition for Windows Update 2 (Windows v2.2)  
27 Oct 2017 D.3304 Animations Year 3 Ozone (redelivery)  
4 Dec 2017 D.3202 Animations Year 2 Ocean-Atmosphere (redelivery)  
5 Dec 2017 D.405 Exhibition Content Update 1  
20 Feb 2018 D.3301 Animations Year 3 Carbon Cycle  
6 Mar 2018 D.501 Tablet iPad update 1 (v8.3.6, iOS v1.1)  
7 Mar 2018 D.502 Tablet Android update (v8.3.5, Android v1.1)  
7 May 2018 D.401 Exhibition Mac Maintenance 1 (v8.4.6, MacOS v2.3)  
30 June 2018 D.403 Exhibition Mac Maintenance 2 (v8.5.0, MacOS v2.4)  
30 June 2018 D.406 Exhibition Content Update 2  
1 July 2018 D.404 Exhibition Windows Maintenance 2 (v.8.5.4, Windows v2.4)  
3 July 2018 D.503 Tablet iPad update 2 (v8.5.5, iOS v1.2)  
3 July 2018 D.504 Tablet Android update (v8.5.5, Android v1.2)  
?? Aug 2018 D.3203 Animations Year 2 El Niño



## **7.2 Exhibition Version Distribution**

Deployment of the Exhibition Version and subsequent incremental data updates could be made easier by development of an installer/updater. This would allow the user to choose the weight of content (heavy or light), according to the capabilities of their hardware or their interest in particular CCI projects, under GUI control. Data package options could range from the full Exhibition version (currently 15GB) to the Exhibition on iPad (3GB) to the Tablet version (1.6GB), perhaps allowing different weights for different ECVs. It would also ease the download and installation of individual data parameter updates. The ability to tailor the content becomes even more important with the additional projects and consequently higher data volumes expected in CCI+.

## **8. Conclusion**

All major items under Tasks 1-4 have now been completed, together with outstanding items from earlier phases of the project. Some additional software improvements have been made that were offered to ESA as part of this phase, but not funded. Recommendations for further development of the software have been made. Additional requests from ESA outside the scope of the contract have been fulfilled, including a language translation of one of the animations and attendance at this year's CCI Colocation meeting.

