



NIWA

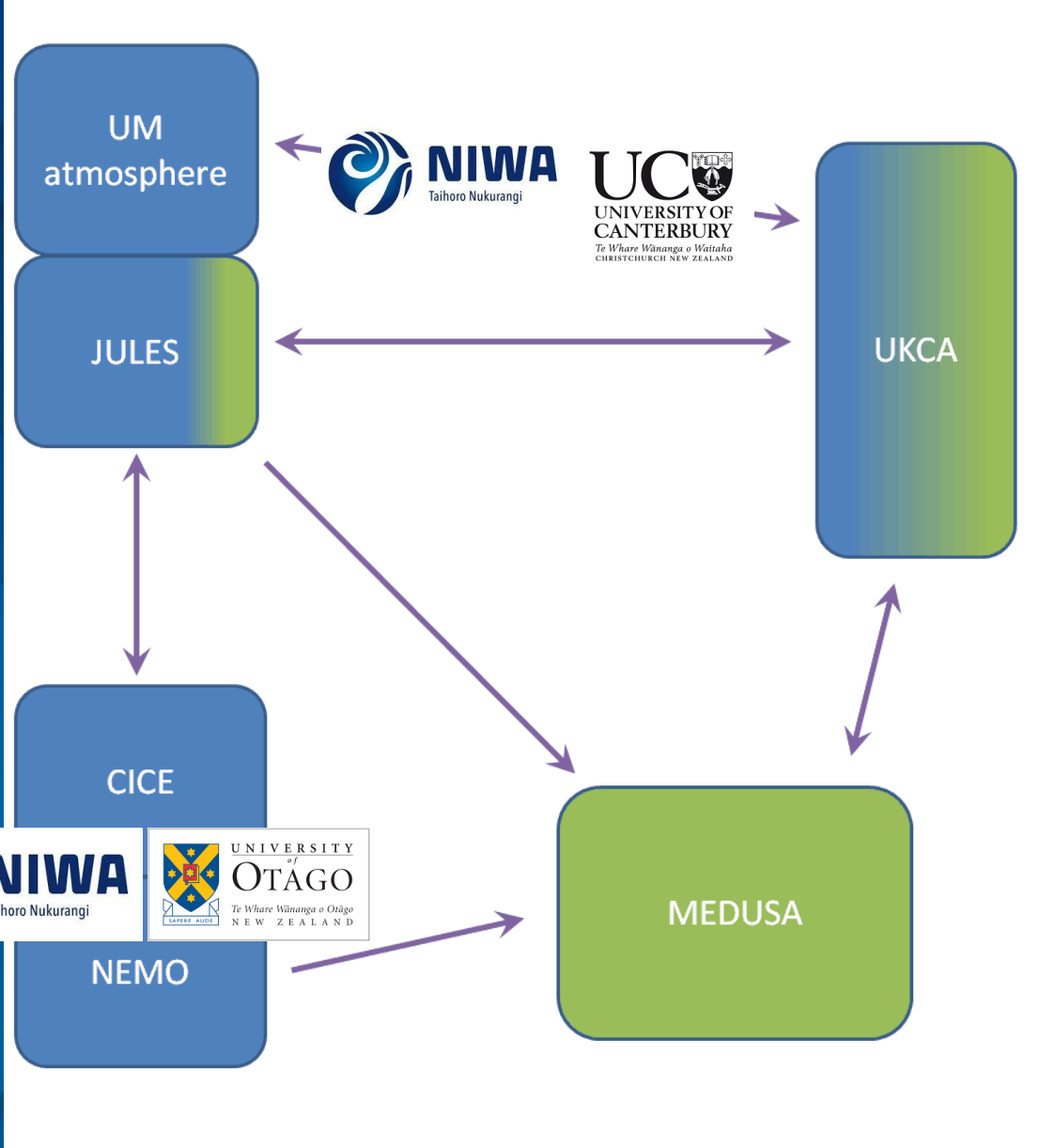
Taihoro Nukurangi



In this talk I will be concentrating on:

1. Global future climate projection scenario modelling.
2. Aerosol chemistry modelling as part of the next IPCC report.

Climate, Freshwater & Ocean Science



Key:

Physical component

ES component



Upper level winds

High level wind and jetstreams are processes of convection in the atmosphere, like currents are in the sea.

Ozone layer

The thickness and influence of the ozone layer differs dramatically throughout the world.

Solar energy

Solar gain depends on the seasons, but also the clarity of the atmosphere.

Snow and ice

Precipitation falling as snow and ice can be stored in glaciers and ice fields for decades.

Clouds

Clouds reflect sunlight, trap heat, store water vapour and release rain and snow. They are one of the most powerful inputs in any climate model, and one of the most challenging to get right.

Air-sea exchanges

A warm ocean can cool the air passing over it, or heat it sufficiently to generate a cyclone.

Land surface processes

The response of the land to rainfall and solar radiation can vary with the seasons, and changing patterns of land-use.

Realistic geography

The accuracy of land cover databases determines how well a model will reflect real world processes.

Human-produced emissions

Pollution from built up areas, and emissions from vehicles not only influence air clarity, but also the chemistry of the atmosphere.

Hydrologic cycle

As moist air rises, it cools and water vapour condenses to form clouds. Moisture is transported around the globe until it returns to the surface as precipitation.

Soil moisture and temperature

Through the year, moisture content in soils can vary wildly, not only influencing that which grows in the soil, but also how the land responds to weather events.

Sea ice

Sea ice floats free of the sea floor but can remain attached to land in shelves, powerfully influencing the structure of the environment beneath it.

Surface winds

Inland heat can generate sea breezes which cool the surface.

Ocean currents, temperature and salinity

Currents draw cold, saline water from the poles, and cycle warm water in the tropics.

Marine ecosystems

The ocean can be transformed by the life within it, blooming with plankton or acidifying as mean temperatures increase.

Vertical overturning

Cold water descends, warm water rises, and patterns of convection create mixing and currents in the sea that influence life on the surface.

Ocean bottom topography

Bathymetric features such as trenches, sea mounts and abyssal plains can influence currents and sea surface temperatures.

THE WORLD IN CUBES

How do you eat an elephant? One bite at a time, suggests the Indian proverb. How do you model the entire Earth? The same way.

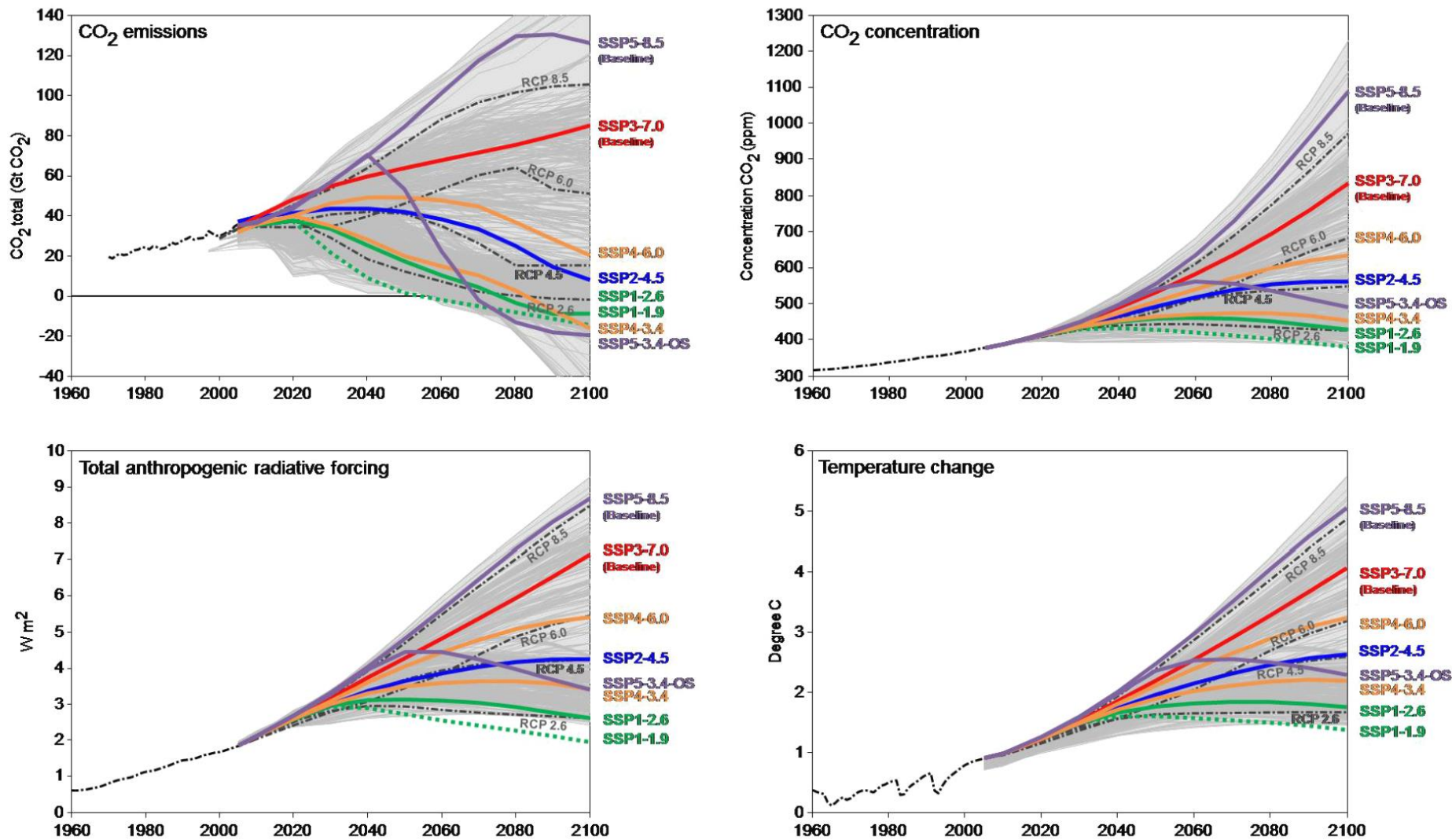
Imagine the surface of the planet divided into tiny cubes, each acted upon by an array of inputs, each input interacting with others, and the resulting outputs—such as the hypothetical cube illustrated above.

Rain and sunshine, cities and plankton blooms, cloud and currents—all can be captured by instruments and rendered in algorithms that allow scientists to define the rules of the model as developers might create a computer game. Thereafter, the accuracy is only a matter of resolution—the smaller the cubes, the more accurate the model.



NIWA

Taihoro Nukurangi



Source: Riahi et al, 2016

Figure 3. CO₂ emissions (a), concentrations (b), anthropogenic radiative forcing (c), and global mean temperature (d) for the 21st century scenarios in the ScenarioMIP design, from Riahi et al. (2016). Concentration, forcing, and temperature outcomes are calculated with a simple climate model (MAGICC version 6.8.01 BETA; Meinshausen et al., 2011a, b). Temperature outcomes include natural forcing in the historical period; projections assume zero volcanic forcing and maintain 11-year solar forcing cycles, consistent with the CMIP5 approach (Meinshausen et al., 2011c). Gray areas represent the range of scenarios in the scenarios database for the IPCC Fifth Assessment Report (Clarke et al., 2014).

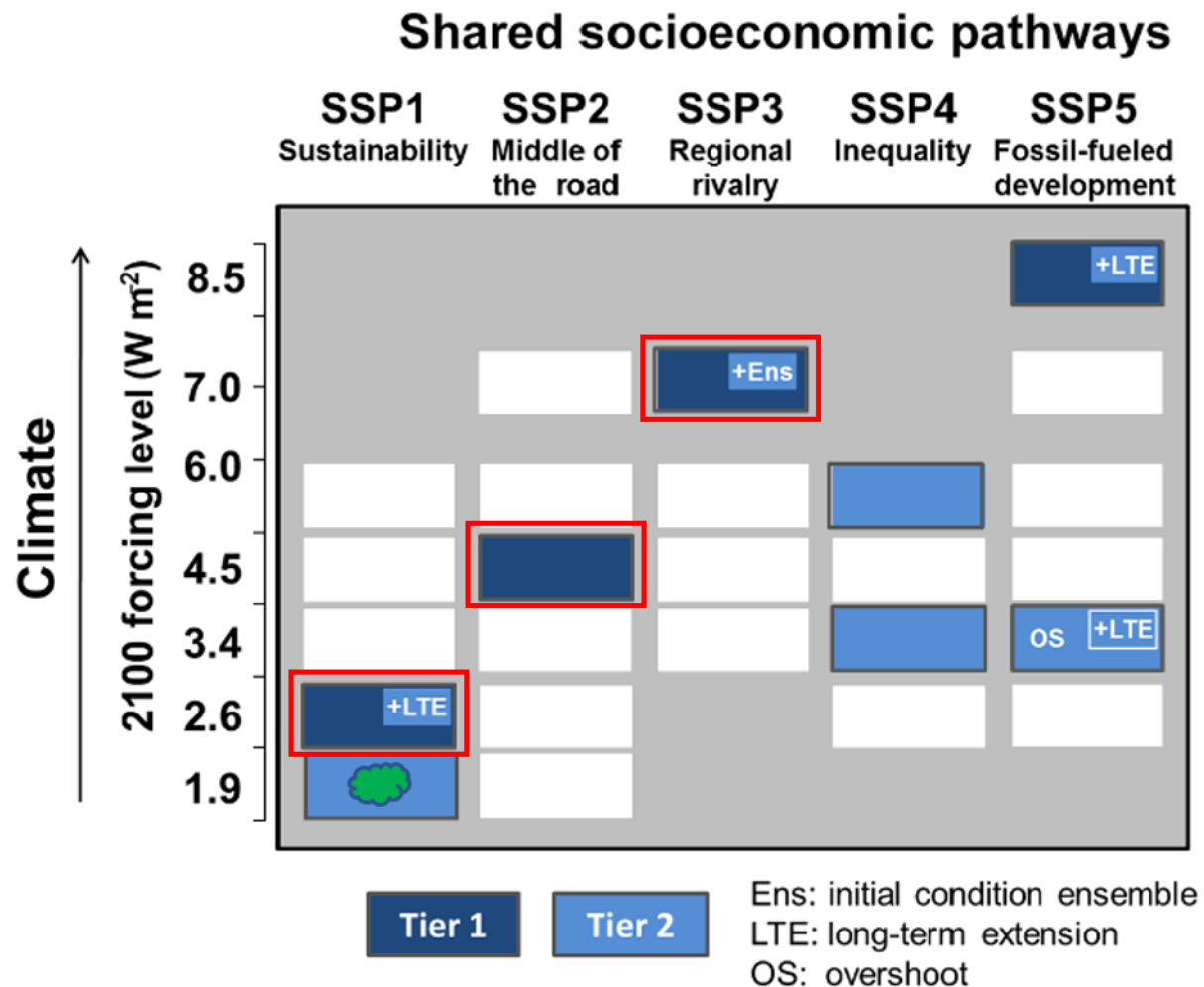


Figure 1: SSP-radiative forcing matrix from O'Neill et al. (2016). The red boxes indicate our recommendations as described in the text. The green cloud indicates a possible fourth scenario, which would depend on further funding.

At the moment we're running three scenarios but we want to do more

\$

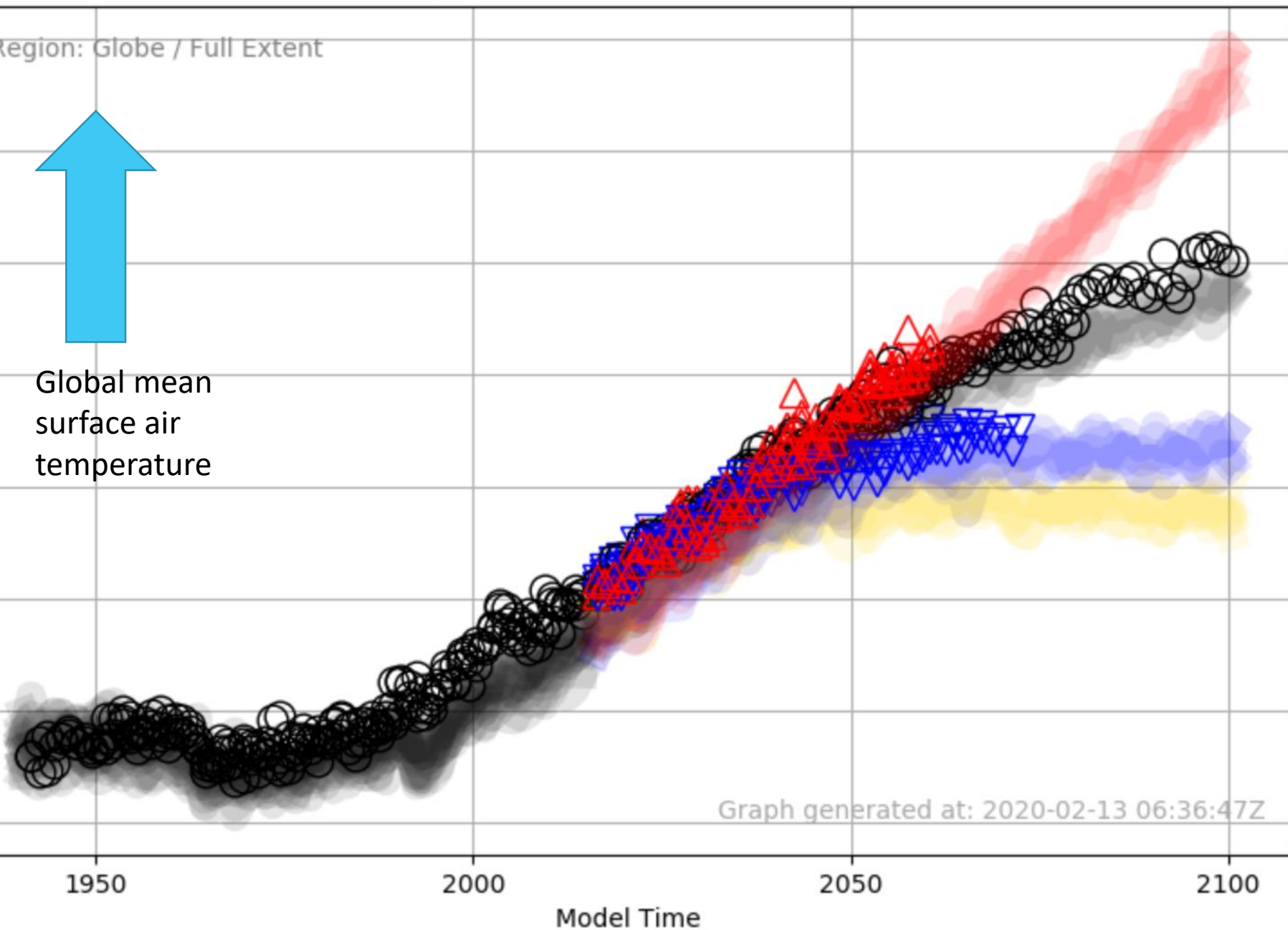
Each simulation costs about \$30k in NeSI core hours alone.

Area-Weighted Mean of Surface Temperature

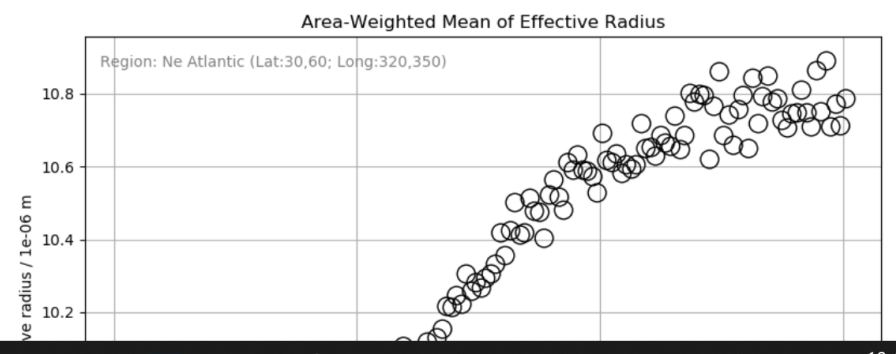
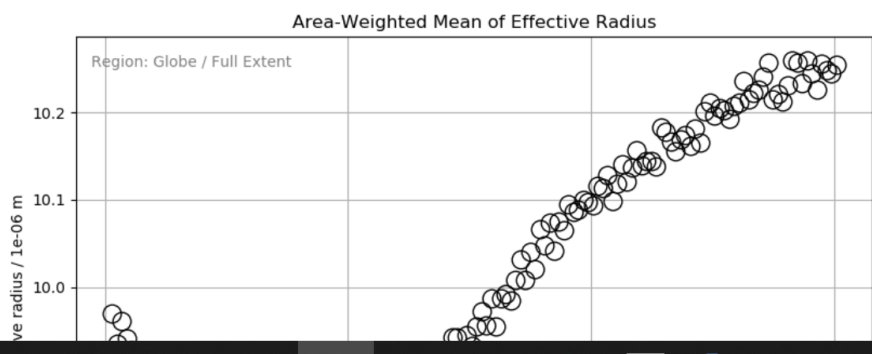
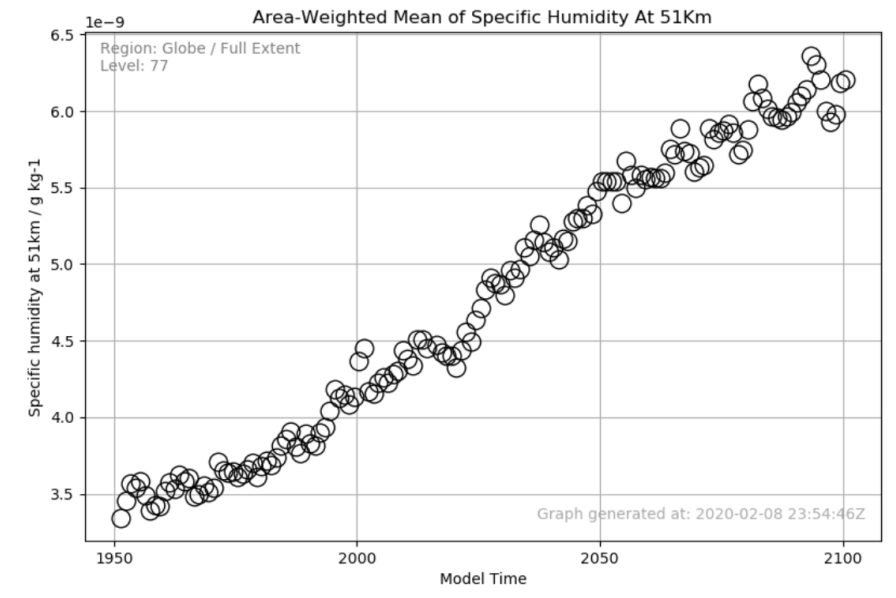
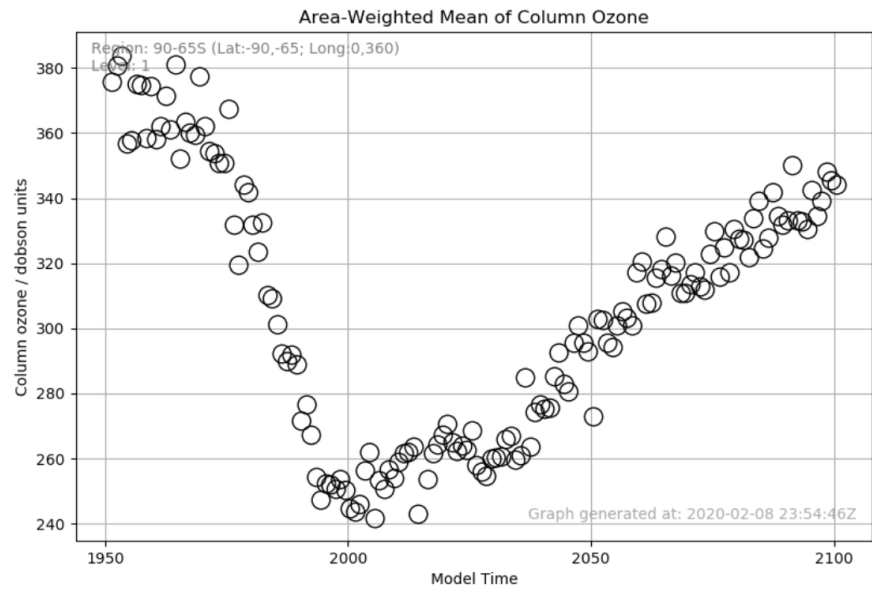
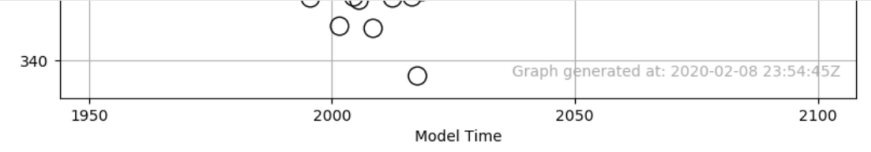
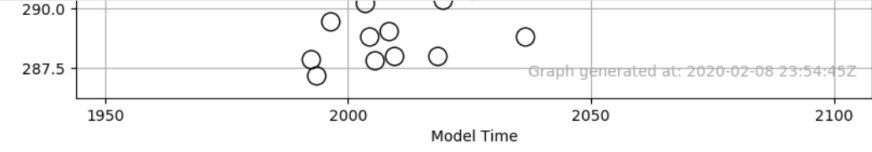
Region: Globe / Full Extent

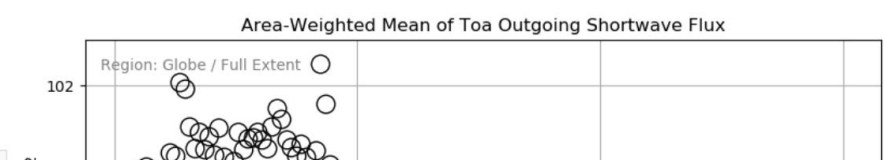
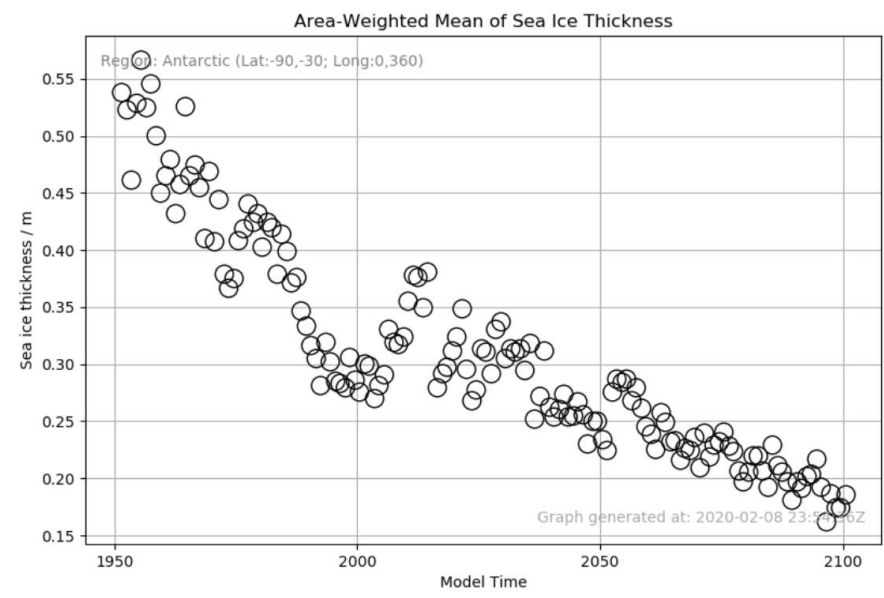
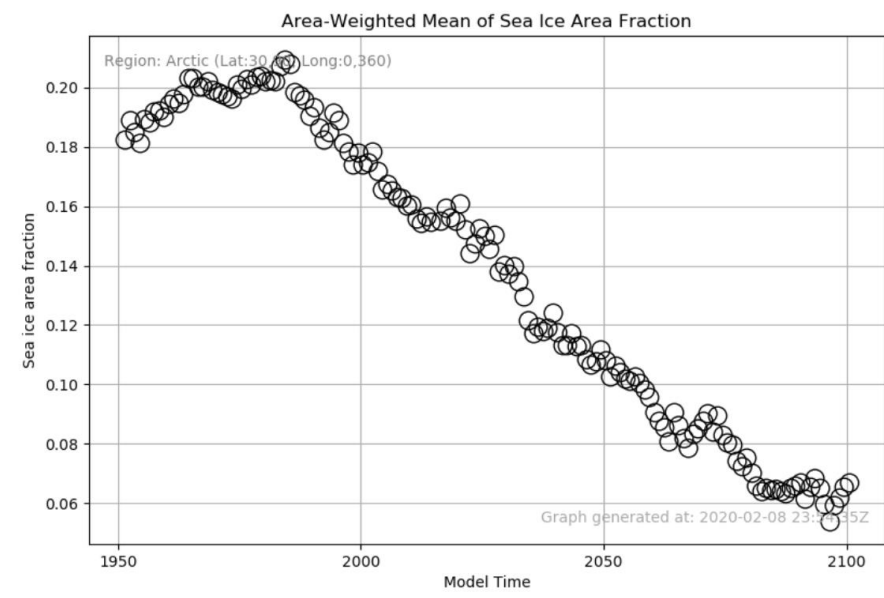
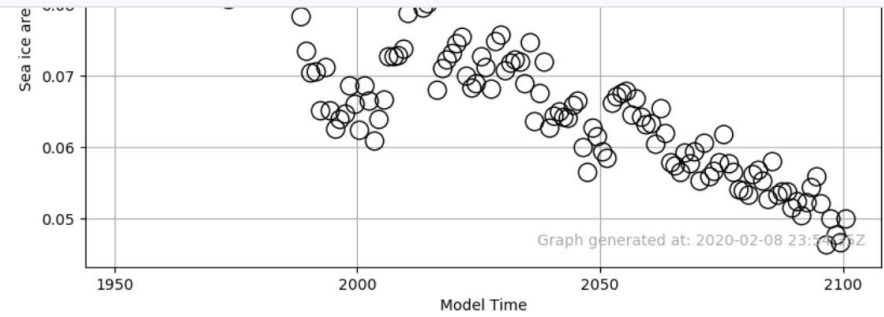
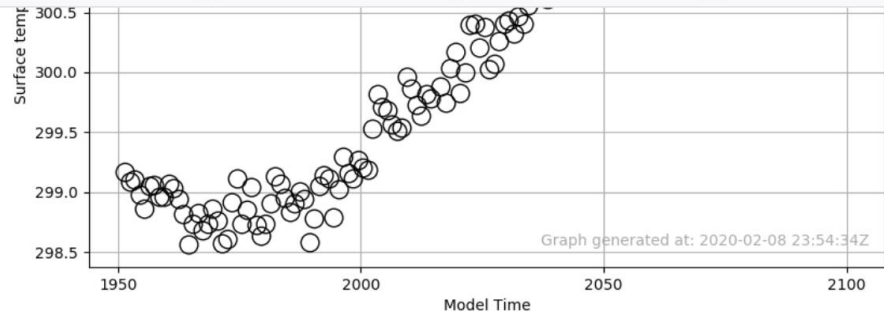


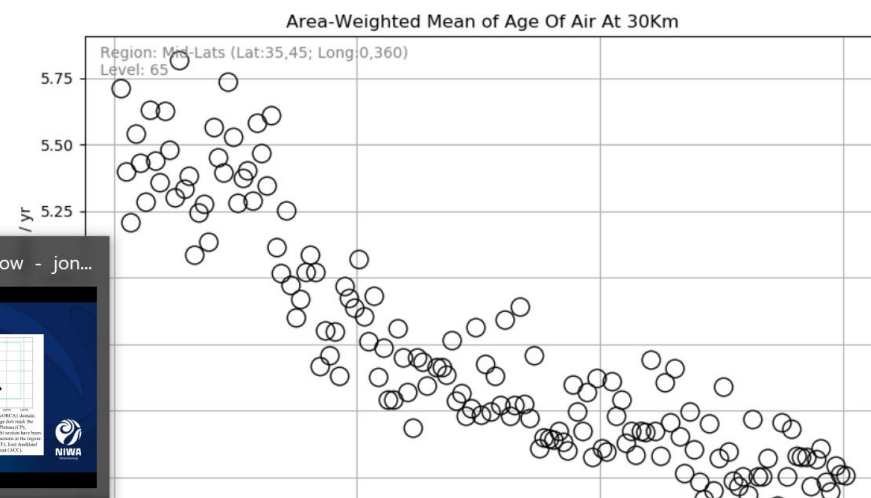
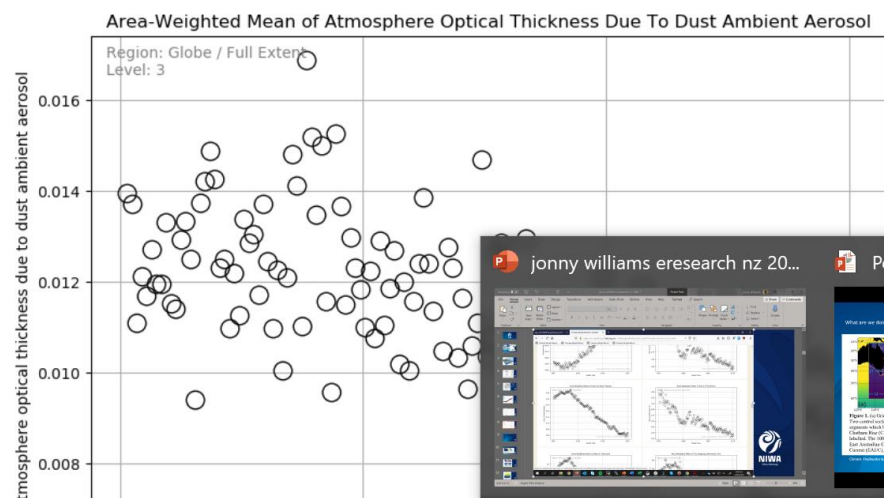
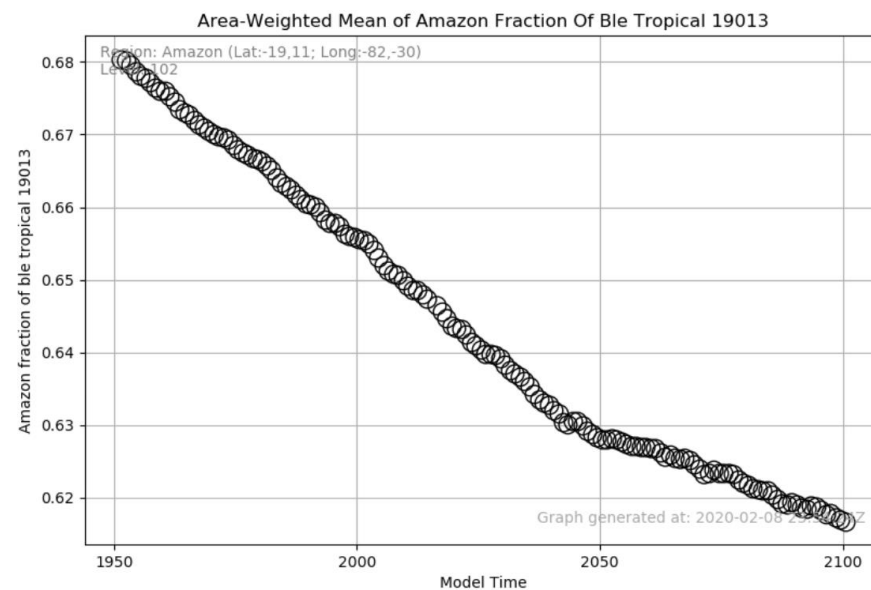
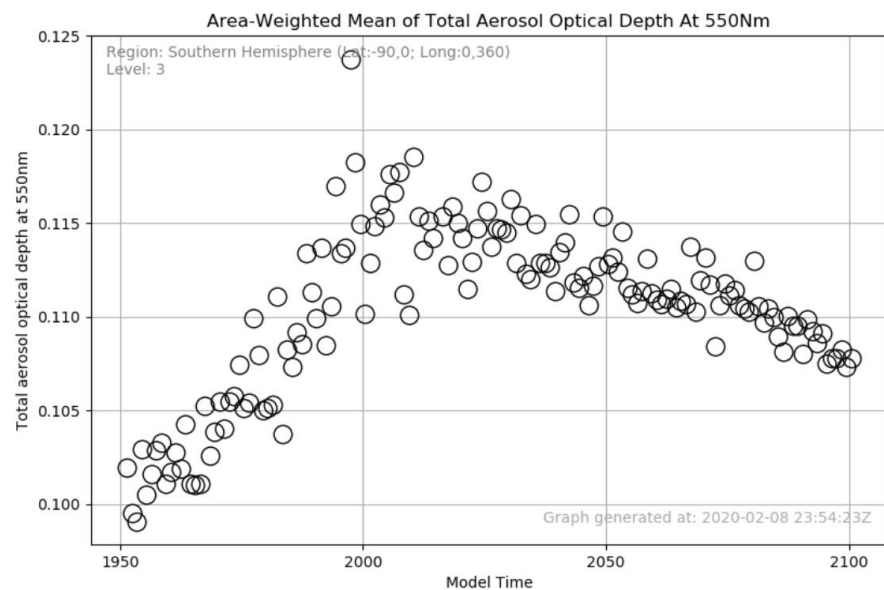
Global mean
surface air
temperature



NIWA
Taihoro Nukurangi







jonny williams eresearch nz 20...

PowerPoint Slide Show - jon...

What are we doing which is new and different?

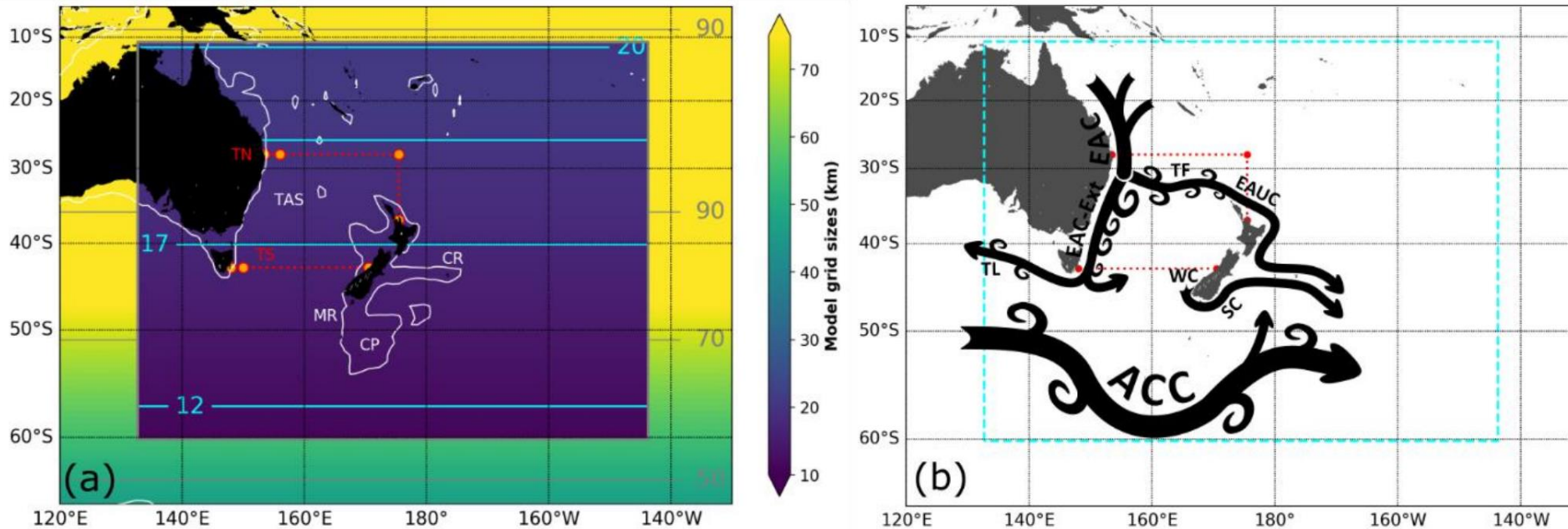


Figure 1. (a) Grid sizes of NZESM in km with high-resolution domain embedded into a global eORCA1 domain. Two control sections which run from Australia to New Zealand are shown in red dots. The orange dots mark the segments which have been used to calculate transports. The Macquarie Ridge (MR), Campbell Plateau (CP), Chatham Rise (CR), and Tasman Sea (TAS), Tasman North (TN) section and Tasman South (TS) section have been labelled. The 1000m iso-bath is shown by the white contour line. (b) Schematic of major ocean currents in the region: East Australian Current (EAC), East Australian Current Extension (EAC-Ext), Tasman Front (TF), East Auckland Current (EAUC), Westland Current (WC), Southland Current (SC), Antarctic Circumpolar Current (ACC).

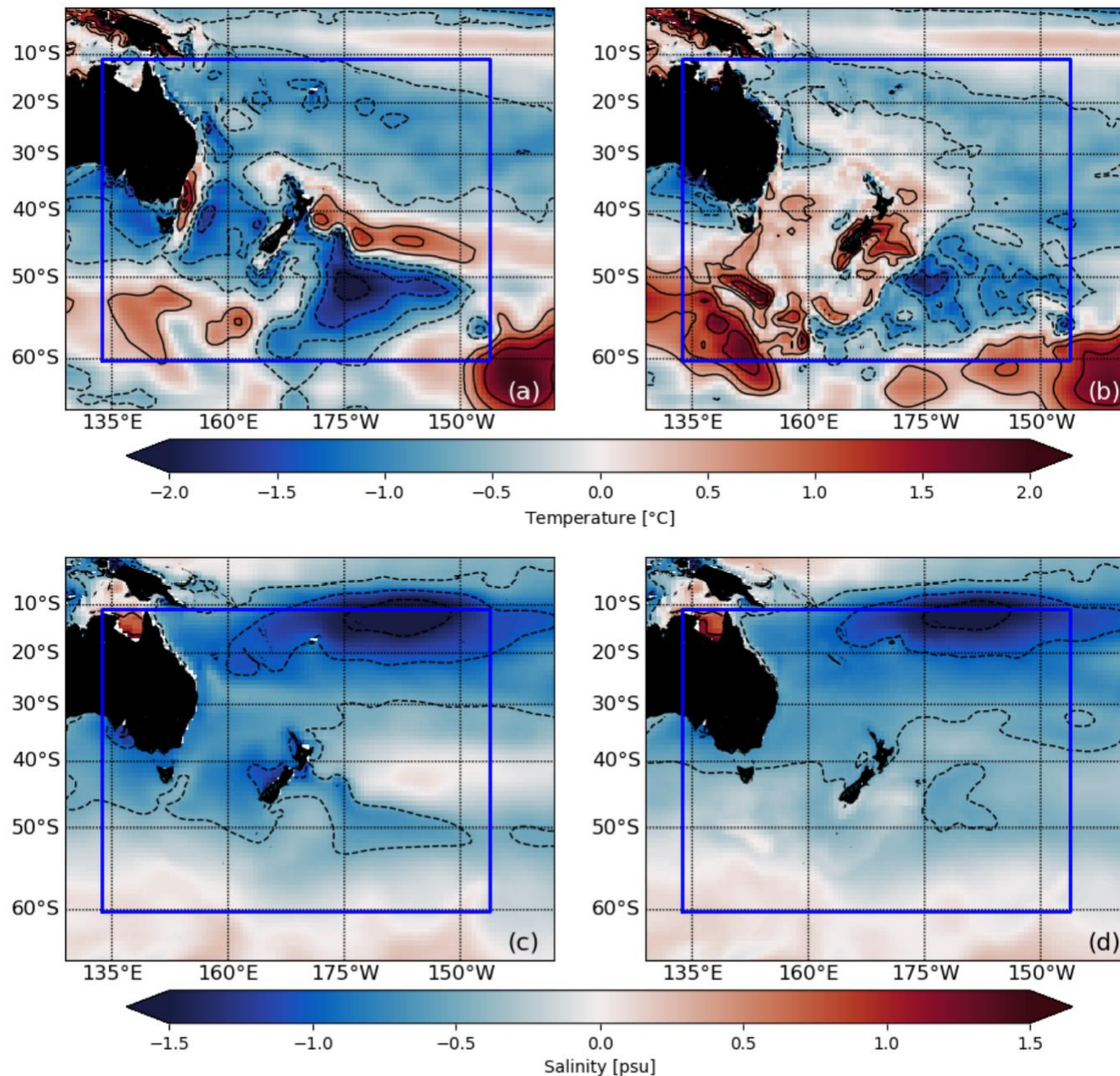
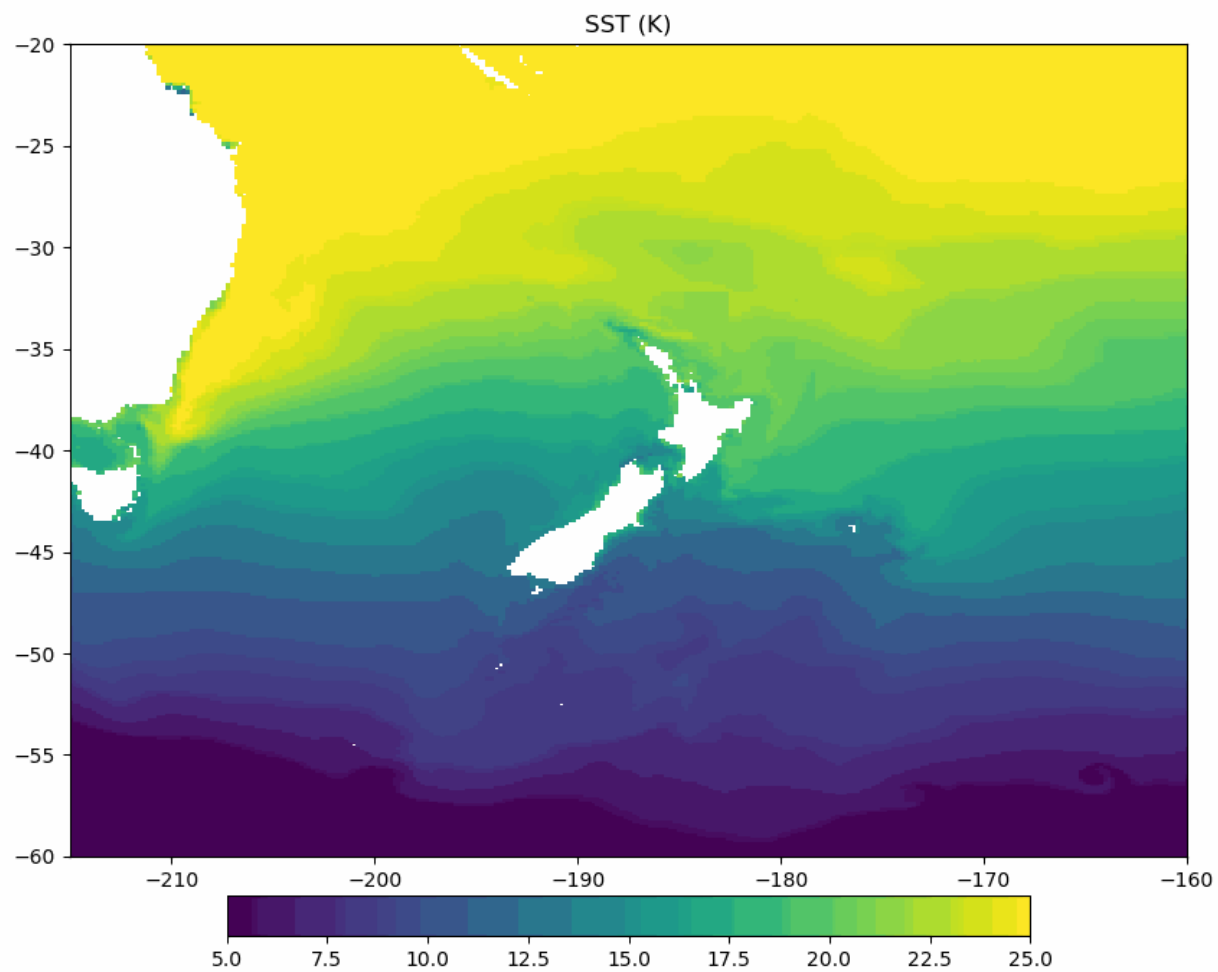


Figure 8: Surface model biases 1995-2014, compared to EN4. (a) SST UKESM, (b) SST NZESM, (c) SSS UKESM and (d) SSS NZESM. The dark-red box marks the region of the high-resolution nest. Contour interval for temperature is 0.5°C and 0.5psu for salinity.



Time

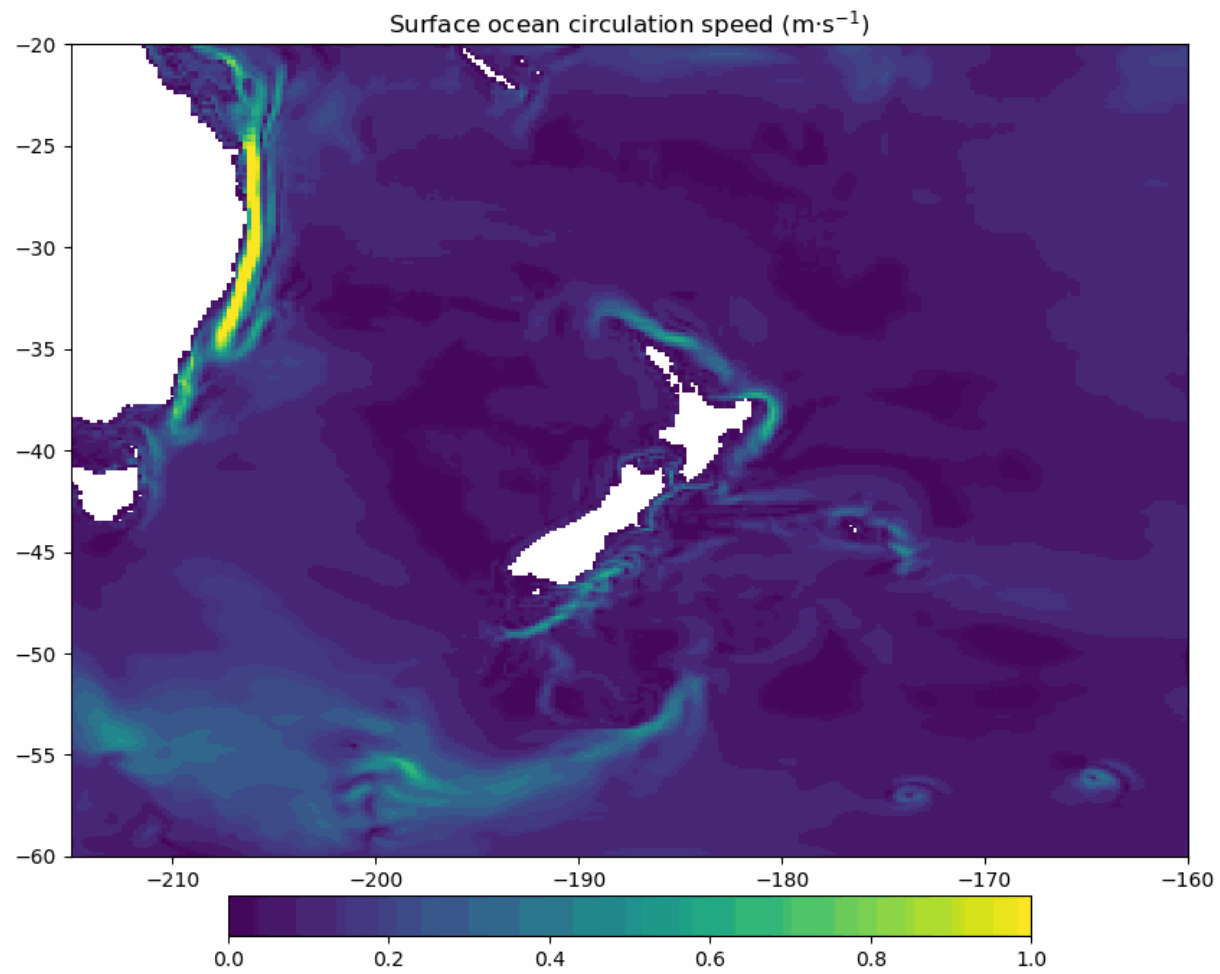
1950

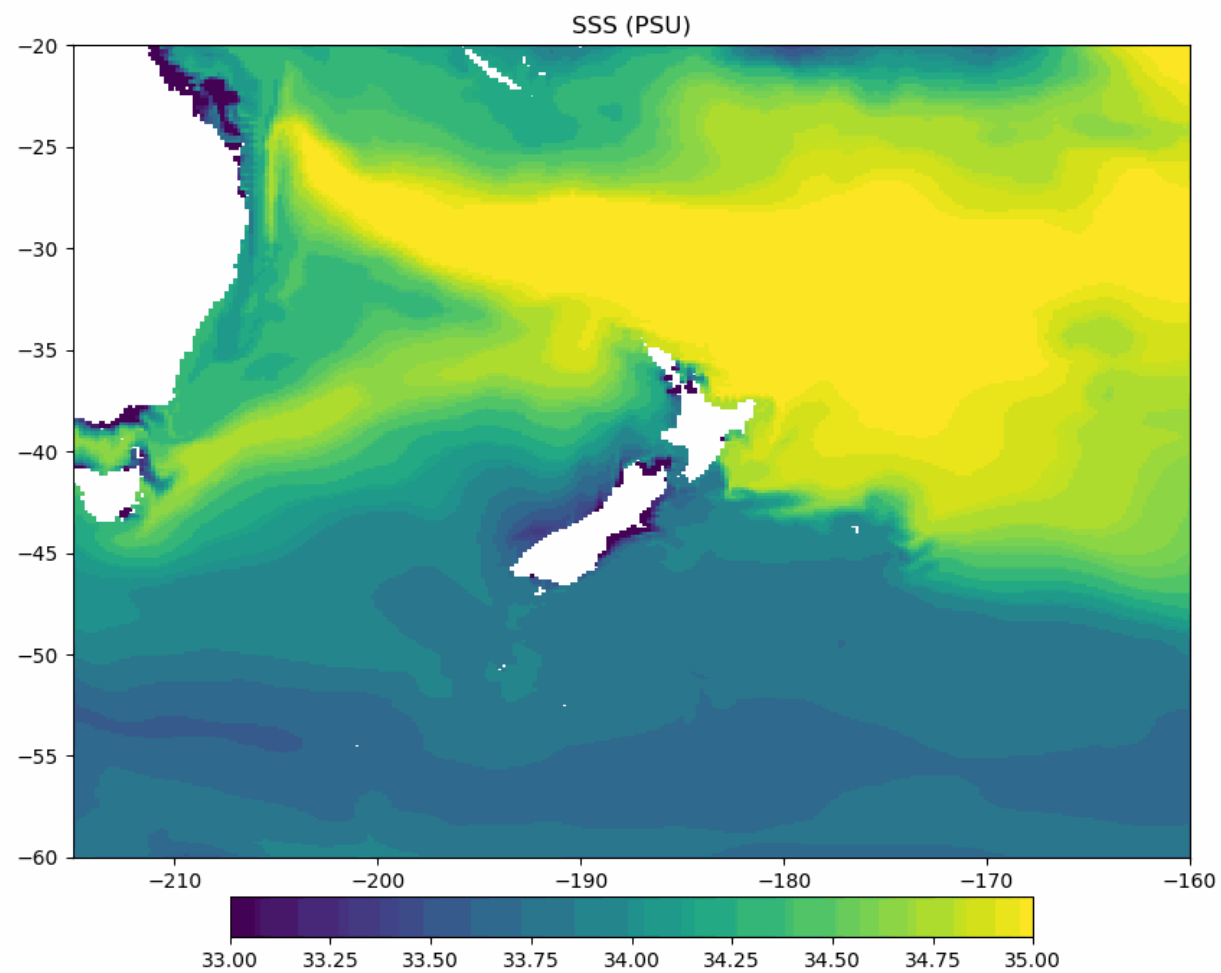
Pause



NIWA

Taihoru Nukurangi





Time

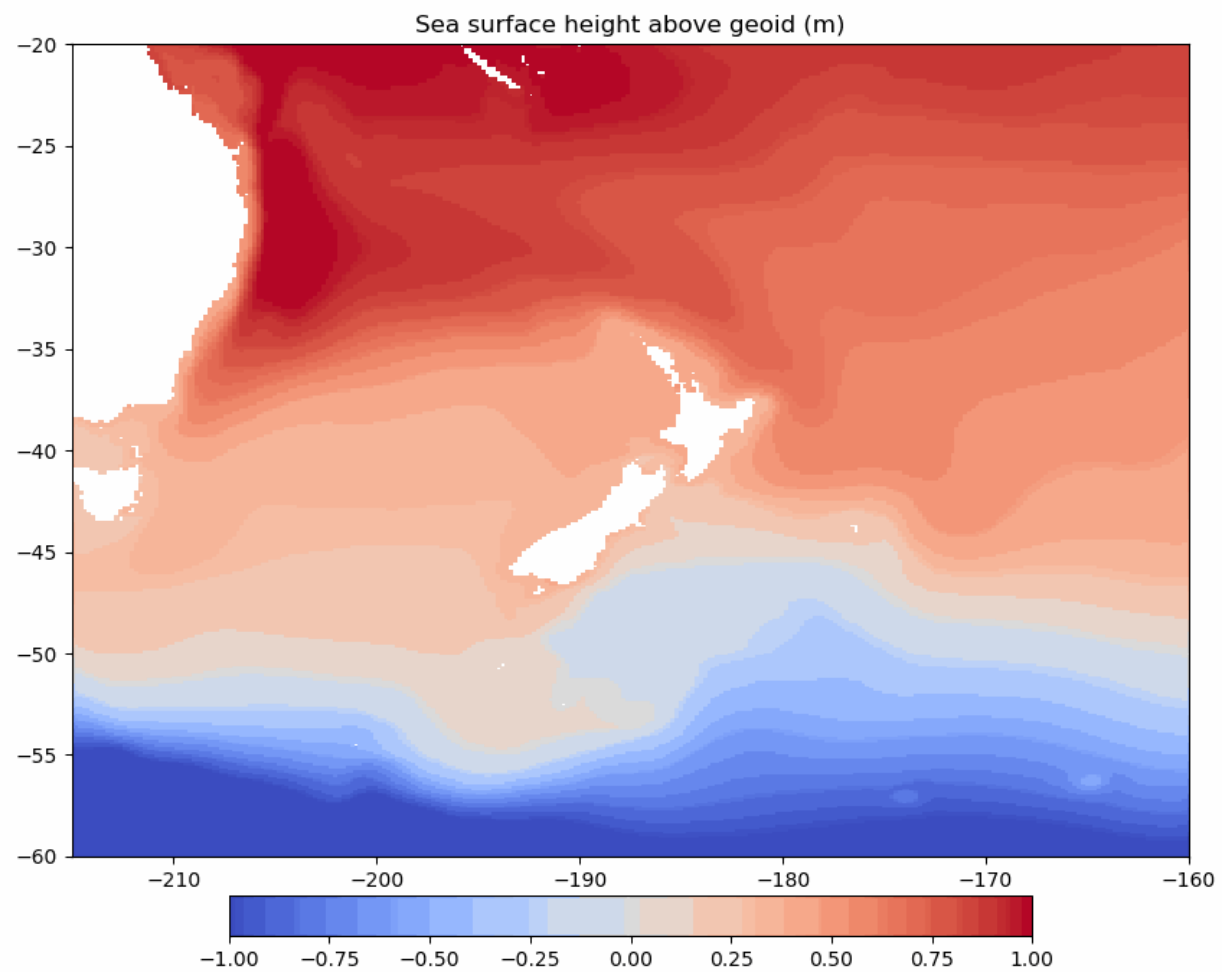
1950

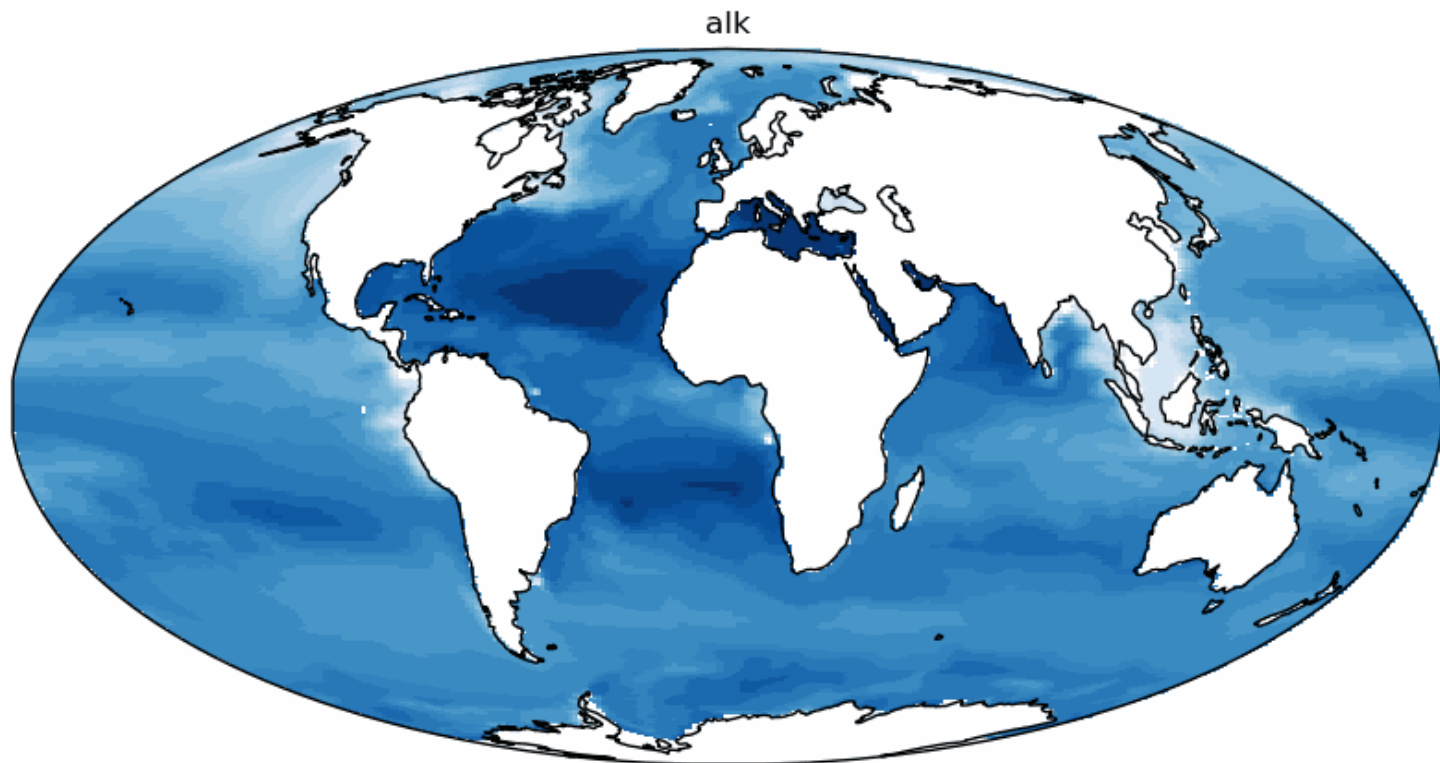
Pause



NIWA

Taihoru Nukurangi





Time

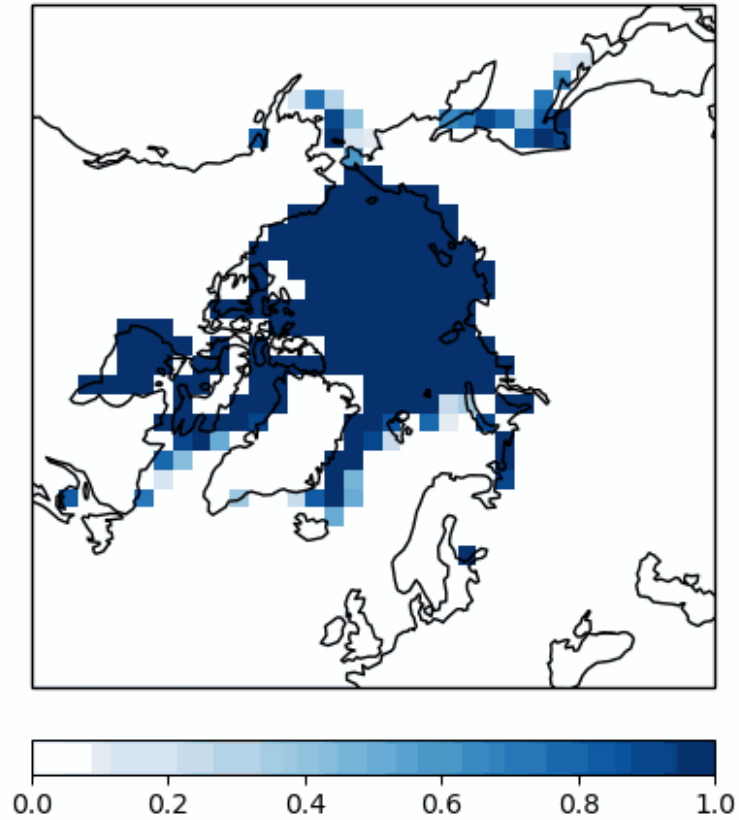
1950

Pause

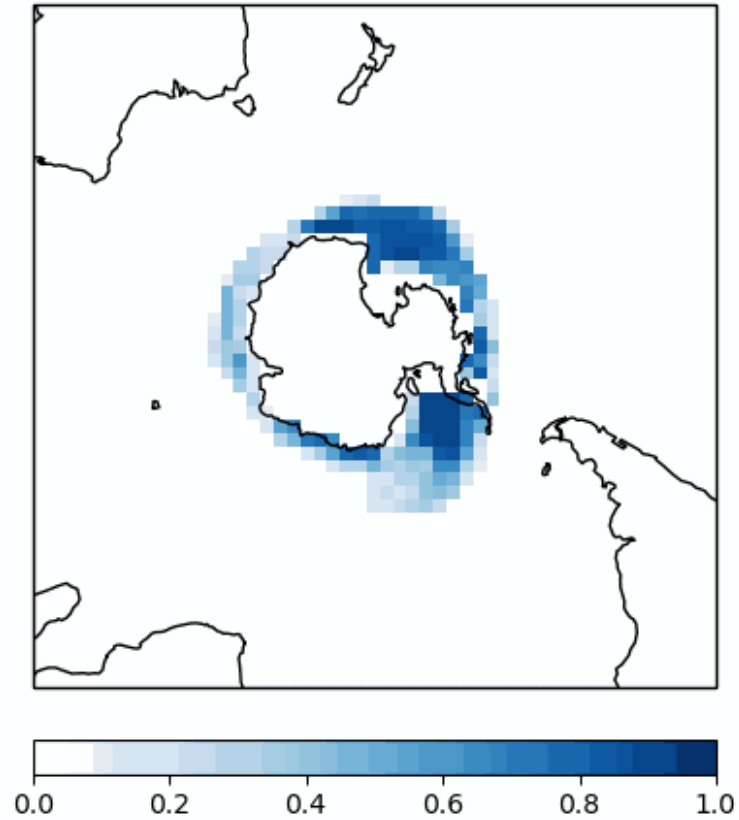


NIWA
Taihoro Nukurangi

Sea ice concentration (monthly)



Sea ice concentration (monthly)



Time

1950

Pause



NIWA
Taihoro Nukurangi

Geosci. Model Dev., 10, 585–607, 2017
www.geosci-model-dev.net/10/585/2017/
doi:10.5194/gmd-10-585-2017
© Author(s) 2017. CC Attribution 3.0 License.



Geoscientific
Model Development



AerChemMIP: quantifying the effects of chemistry and aerosols in CMIP6

William J. Collins¹, Jean-François Lamarque², Michael Schulz³, Olivier Boucher⁴, Veronika Eyring⁵, Michaela I. Hegglin¹, Amanda Maycock⁶, Gunnar Myhre⁷, Michael Prather⁸, Drew Shindell⁹, and Steven J. Smith¹⁰

¹Department of Meteorology, University of Reading, Reading, RG6 6BB, UK

²National Center for Atmospheric Research, Boulder, CO, USA

³Norwegian Meteorological Institute, Oslo, Norway

⁴Laboratoire de Météorologie Dynamique, IPSL, Université Pierre et Marie Curie/CNRS, Paris, France

⁵Deutsches Zentrum für Luft- und Raumfahrt, Institut für Physik der Atmosphäre, Oberpfaffenhofen, Germany

⁶School of Earth and Environment, University of Leeds, Leeds, UK

⁷CICERO – Center for International Climate and Environmental Research Oslo, Oslo, Norway

⁸University of California, Irvine, CA, USA

⁹Nicholas School of the Environment, Duke University, Durham, NC 27708, USA

¹⁰Joint Global Change Research Institute, Pacific Northwest National Laboratory, 5825 University Research Court, Suite 3500, College Park, MD 20740, USA

Correspondence to: William J. Collins (w.collins@reading.ac.uk)

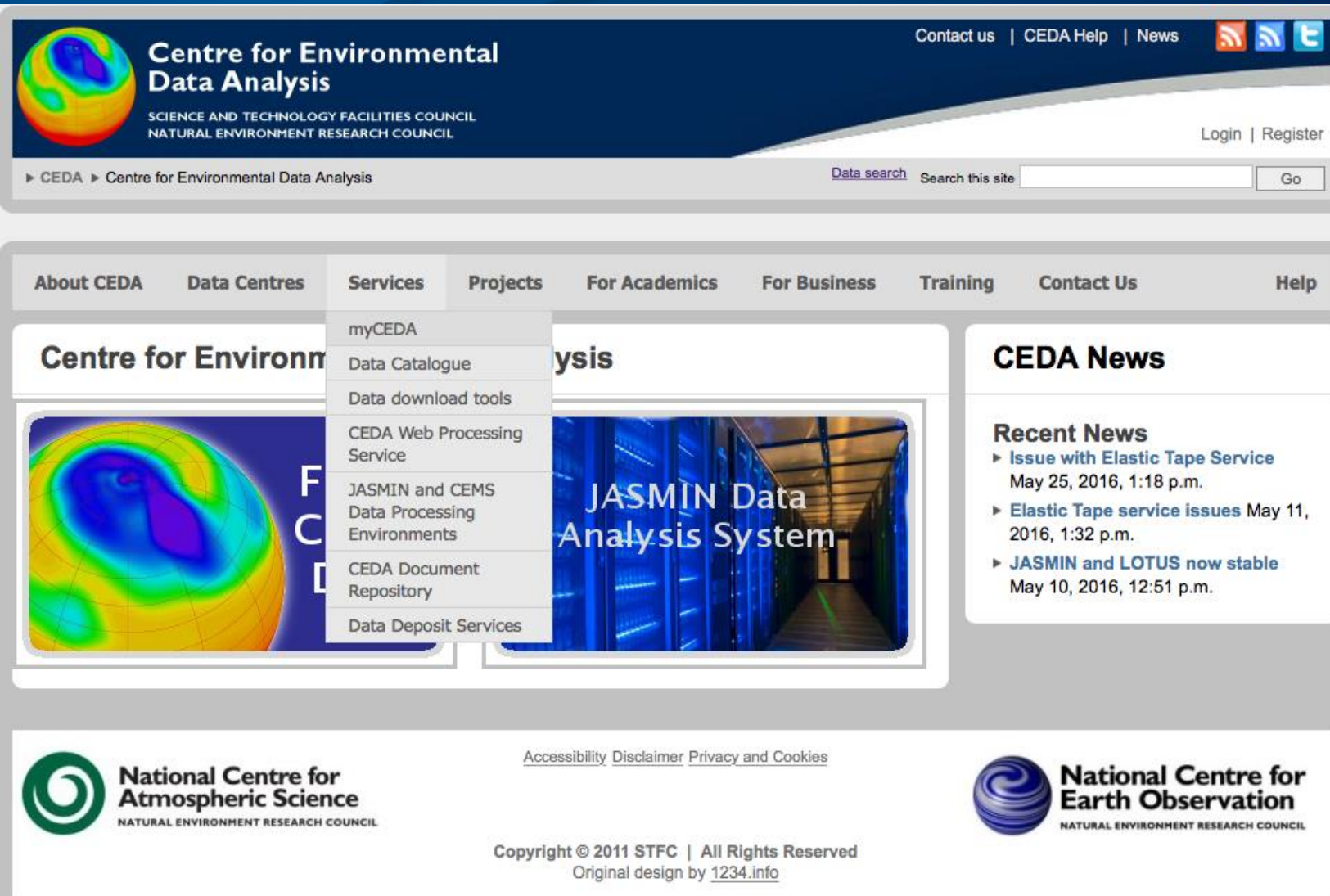
Received: 1 June 2016 – Discussion started: 12 July 2016

Revised: 16 December 2016 – Accepted: 4 January 2017 – Published: 9 February 2017

 Met Office



- We need to shift (regularly and reliably) ~10TB to the JASMIN platform.
- Doing this using rsync was simply too slow to be a viable solution.



Centre for Environmental Data Analysis
SCIENCE AND TECHNOLOGY FACILITIES COUNCIL
NATURAL ENVIRONMENT RESEARCH COUNCIL

Contact us | CEDA Help | News

Login | Register

► CEDA ► Centre for Environmental Data Analysis

Data search Search this site Go

About CEDA Data Centres **Services** Projects For Academics For Business Training Contact Us Help

myCEDA
Data Catalogue
Data download tools
CEDA Web Processing Service
JASMIN and CEMS Data Processing Environments
CEDA Document Repository
Data Deposit Services

JASMIN Data Analysis System

CEDA News

Recent News

- **Issue with Elastic Tape Service**
May 25, 2016, 1:18 p.m.
- **Elastic Tape service issues** May 11, 2016, 1:32 p.m.
- **JASMIN and LOTUS now stable**
May 10, 2016, 12:51 p.m.

National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

Accessibility Disclaimer Privacy and Cookies

Copyright © 2011 STFC | All Rights Reserved
Original design by 1234.info





Jana Makar
jana.makar@nesi.org.nz
Level 10, 70 Symonds St,
Auckland, New Zealand

Contact

NeSI launches national scientific Data Transfer platform

NeSI's national [Data Transfer platform](#) — operated in partnership with [Globus](#), [REANNZ](#) and multiple NZ institutions — is now available for users to move data to and from NeSI quickly and easily.

Since 2014, NeSI has partnered with Globus to offer a high-speed option for transferring large and distributed data nationally and internationally. Over that time, NeSI has been working with New Zealand research institutions to facilitate data transfer to and from existing and new Globus Data Transfer Nodes (DTNs).

Last year, NeSI reviewed its data transfer offering and has now implemented a new and improved service designed for use with NeSI's national [HPC platforms](#).

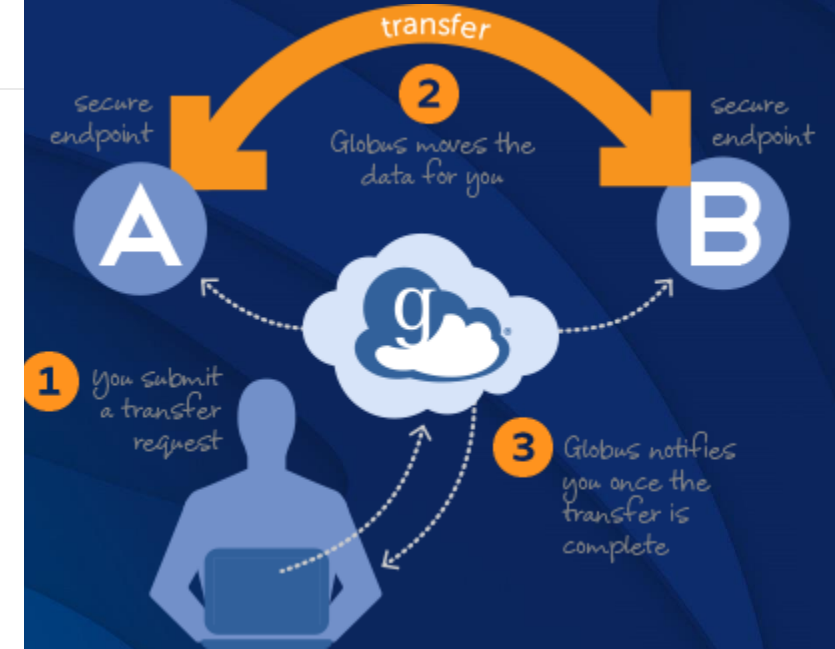
NeSI has plumbed Globus DTNs [directly into its new infrastructure platform](#), enabling access to data on both Māui and Mahuika HPC systems hosted at NIWA, as well as at data storage and research facilities at AgResearch, the University of Auckland, and the University of Otago.

These DTNs act as an interface between Globus' worldwide network of other endpoints.

"Bringing this new platform online has truly been a collaborative effort, involving collaborations with international partner Globus, [national advanced network provider REANNZ](#), and several innovative research institutions across the country," says Nick Jones, Director of NeSI.

It didn't take long for the platform's performance to be tested. In May 2018, tens of millions of files and hundreds of terabytes of data were moved over REANNZ's network as the first wave of NeSI users' research data was migrated from the Pan cluster at the University of Auckland to the new Mahuika supercomputer in Wellington, hosted at NIWA. [It was a record-setting moment for REANNZ](#) and a testament to the enhanced capabilities and performance of NeSI's new data transfer platform.

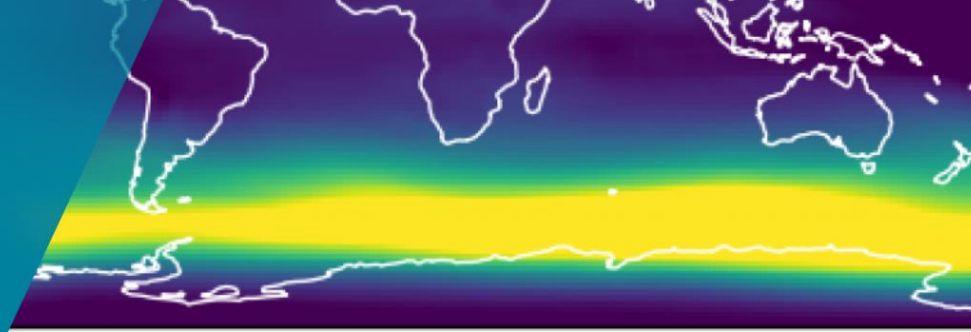
Data transfer nodes



NIWA
Taihoro Nukurangi

Climate modellers transfer 11 terabytes in 24 hours

NIWA climate scientist Dr Jonny Williams sent a massive 11 terabytes of data to research counterparts in the UK.



Caption: Dr Jonny Williams

When NIWA climate scientist Dr Jonny Williams sent a massive 11 terabytes of data to research counterparts in the UK, he didn't give the size of the transfer a second thought. The REANNZ advanced network seamlessly delivered the entire dataset within 24 hours, and without scrambling or dropping data.

TerminalSessionsViewX serverToolsGamesSettingsMacrosHelp

SessionServersToolsGamesSessionsViewSplitMultiExecTunnelingPackagesSettingsHelp

Quick connect...

2. w-clim01

jasmin-sci1.ceda.ac.uk|Thu Feb 13|20:58:05|~> mip-dataset-status CMIP6 /gws/nopw/j04/aerchemmip_vo

l1/data/u-bm459/esgf/CMIP6/AerChemMIP/NIWA/UKESM1-0-LL/histSST-1950HC/r1i1p1f2/day/vas/gn/v2020012

7/

Publication status for 1 MIP datasets:

CountDataset IDStatus

=====

1CMIP6.AerChemMIP.NIWA.UKESM1-0-LL.histSST-1950HC.r1i1p1f2.day.vas.gn.v20200127completed

=====

jasmin-sci1.ceda.ac.uk|Thu Feb 13|20:58:22|~>

Relative URL: ^/b/k/3/7/5/cdds

Repository Root: <https://code.metoffice.gov.uk/svn/roses-u>

Repository UUID: 7d42c781-efc1-4492-b88e-e6facad7bc31

Revision: 142371

Node Kind: directory

Schedule: normal

Last Changed Author: jonnywilliams

Last Changed Rev: 140301

Last Changed Date: 2019-12-01 23:16:00 +0000 (Sun, 01 Dec 2019)

jasmin-sci1.ceda.ac.uk|Wed Feb 12|01:21:

jasmin-sci1.ceda.ac.uk|Wed Feb 12|01:21:

03|u-bk375>

2 #27 histSST-piN20 u-bk375

3 #43 piClim-N20 u-bi883

4 #44 piClim-HC u-bi639

5 #47 piClim-SO2 u-bj009

6 #48 piClim-OC u-bi976

~

niwa-aerchemmip-runs3,1Bot

[jasmin] 0:ssh*"williamsjh@jasmin-sci1" 20:58 13-Feb-20

w-clim01.mau1.niwa.co.nz|Thu Feb 13|20:57:23|L242>

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>




WCRP CMIP6

World Climate Research Programme

[Home](#) [Contact Us](#) [Data Nodes Status](#)

You are at the [ESGF@DOE/LLNL](#) node

[Technical Support](#)

Last Search |  My Data Cart (16)
| [Clear Data Cart](#)

MIP Era

Activity

Model Cohort

Product

WARNING: Not all models include a variant "r1i1p1f1", and across models, identical values of variant_label do not imply identical variants! To learn which forcing datasets were used in each variant, please check modeling group publications and documentation provided through ES-DOC.

CMIP6 project data downloads are unrestricted. Please use the -s option to wget scripts to bypass the login prompt.

Enter Text:



Search

Reset

Display

10

results per page

[\[More Search Options \]](#)



Show All Replicas



Show All Versions



Search Local Node Only (Including All Replicas)

Search Constraints:  NIWA

Total Number of Results: 390

-1- 2 3 4 5 6 Next >>

[Add all displayed results to Data Cart](#) [Remove all displayed results from Data Cart](#)

Expert Users: you may display the search URL and [return results as XML](#) or [return results as JSON](#)

1. **CMIP6.AerChemMIP.NIWA.UKESM1-0-LL.histSST-1950HC.r1i1p1f2.AERmon.cheaqps04.gn**

Data Node: [esgf-data3.ceda.ac.uk](#)

Version: 20200127

Total Number of Files (for all variables): 2

Full Dataset Services: [\[Show Metadata \]](#) [\[List Files \]](#) [\[THREDDS Catalog \]](#) [\[WGET Script \]](#) [\[Show Citation \]](#) [\[PID \]](#) [\[Globus Download \]](#)
[\[Further Info \]](#)

 [Add to Data Cart](#)

2. **CMIP6.AerChemMIP.NIWA.UKESM1-0-LL.histSST-1950HC.r1i1p1f2.AERmon.chegps04.gn**

Data Node: [esgf-data3.ceda.ac.uk](#)

Version: 20200127

Total Number of Files (for all variables): 2

Full Dataset Services: [\[Show Metadata \]](#) [\[List Files \]](#) [\[THREDDS Catalog \]](#) [\[WGET Script \]](#) [\[Show Citation \]](#) [\[PID \]](#) [\[Globus Download \]](#)
[\[Further Info \]](#)

 [Add to Data Cart](#)



NIWA

Taihoru Nukurangi



JAMES

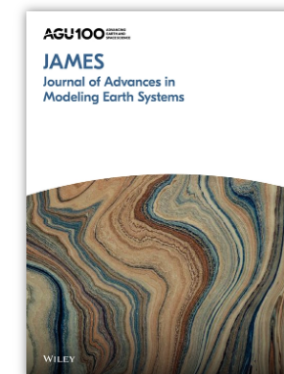
Journal of Advances in Modeling Earth Systems

Research Article | [Open Access](#) |

Implementation of UK Earth system models for CMIP6

Alistair A. Sellar✉, Jeremy Walton, Colin G. Jones, Richard Wood, Nathan Luke Abraham, Mirosław Andrejczuk, Martin B. Andrews, Timothy Andrews, Alex T. Archibald, Lee de Mora, Harold Dyson, Mark Elkington, Rich Ellis, Piotr Florek, Peter Good, Laila Gohar, Stephen Haddad, Steven C. Hardiman, Emma Hogan, Alan Iwi, Chris D. Jones, Ben Johnson, Douglas I. Kelley, Jamie Kettleborough, Jeff R. Knight, Marcus O. Köhler, Till Kuhlbrodt, Spencer Liddicoat, Irina Linova-Pavlova, Matthew S. Mizieliński, Olaf Morgenstern, Jane Mulcahy, Erica Neining, Fiona M. O'Connor, Ruth Petrie, Jeff Ridley, Jean-Christophe Rioual, Malcolm Roberts, Eddy Robertson, Steve Rumbold, Jon Seddon, Harry Shepherd, Sungbo Shim, Ag Stephens, Joao C. Teixeira, Yongming Tang, Jonny Williams, Andy Wiltshire
... [See fewer authors](#) ^

First published: 07 February 2020 | <https://doi.org/10.1029/2019MS001946>



Accepted Articles

Accepted, unedited articles published online and citable. The final edited and typeset version of record will appear in the future.

e2019MS001946



Related



Information

PDF

Help

Metrics



Details

☐ Computing the Climate: Building a Model World

Frontiers for Young Minds

2020-01-22 | journal-article

DOI: [10.3389/frym.2019.00161](https://doi.org/10.3389/frym.2019.00161)

Part of ISSN: 2296-6846

Source: Jonny Williams

★ Preferred source



☐ The sensitivity of Southern Ocean aerosols and cloud microphysics to sea spray and sulfate aerosol production in the HadGEM3-GA7.1 chemistry–climate model

Atmospheric Chemistry and Physics

2019-12-17 | journal-article

DOI: [10.5194/acp-19-15447-2019](https://doi.org/10.5194/acp-19-15447-2019)

Source: Crossref

★ Preferred source



☐ Improved simulation of clouds over the Southern Ocean in a General Circulation Model

2019-11-11 | other

DOI: [10.5194/acp-2019-884](https://doi.org/10.5194/acp-2019-884)

Source: Crossref

★ Preferred source



☐ Supplementary material to "Improved simulation of clouds over the Southern Ocean in a General Circulation Model";

2019-11-11 | other

DOI: [10.5194/acp-2019-884-supplement](https://doi.org/10.5194/acp-2019-884-supplement)

Source: Crossref

★ Preferred source



☐ The sensitivity of Southern Ocean aerosols and cloud microphysics to sea spray and sulfate aerosol production in the HadGEM3-GA7.1 chemistry-climate model

2019-08-15 | other

DOI: [10.5194/acp-2019-629](https://doi.org/10.5194/acp-2019-629)

Source: Crossref

★ Preferred source



Computing the Climate: Building a Model World

Authors



Jonny Williams

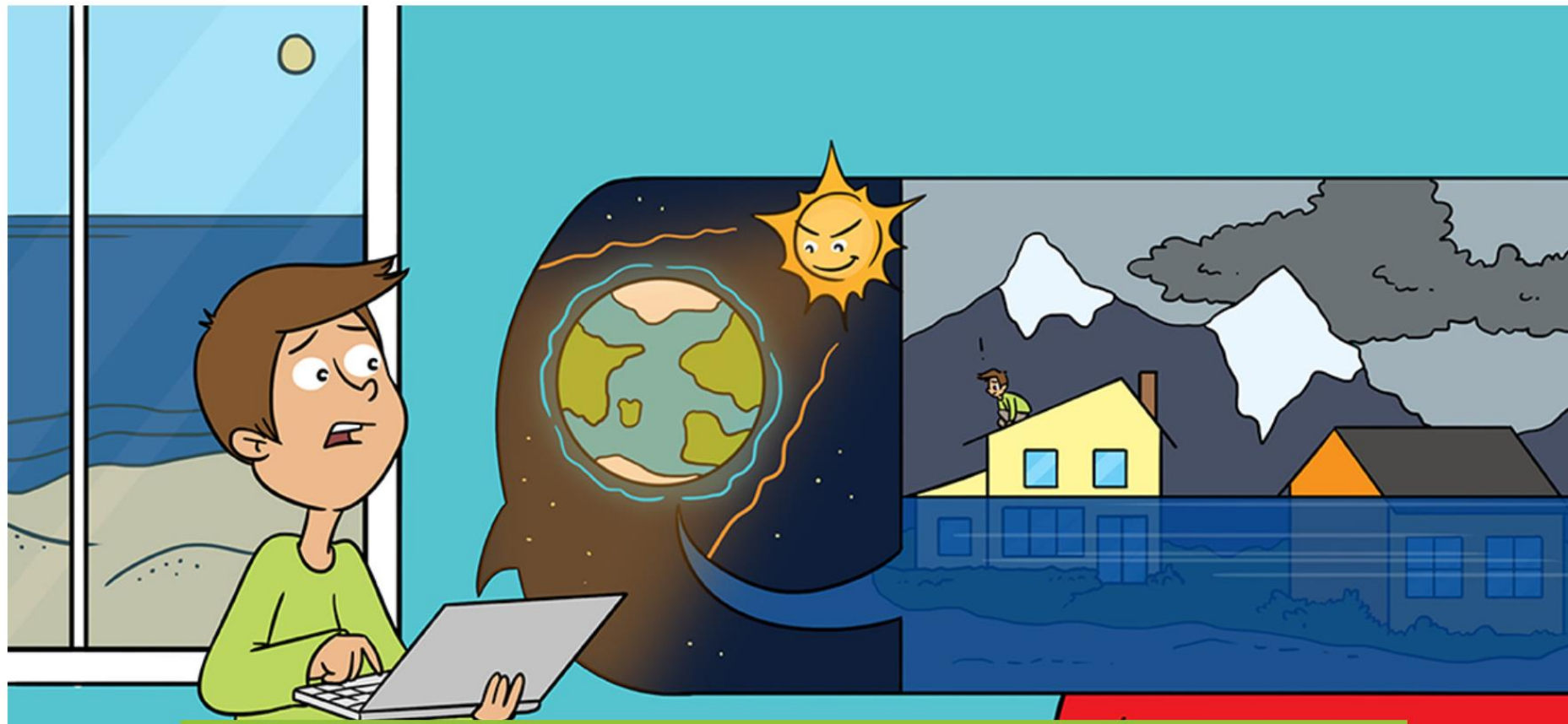
Young Reviewers



Nicolas

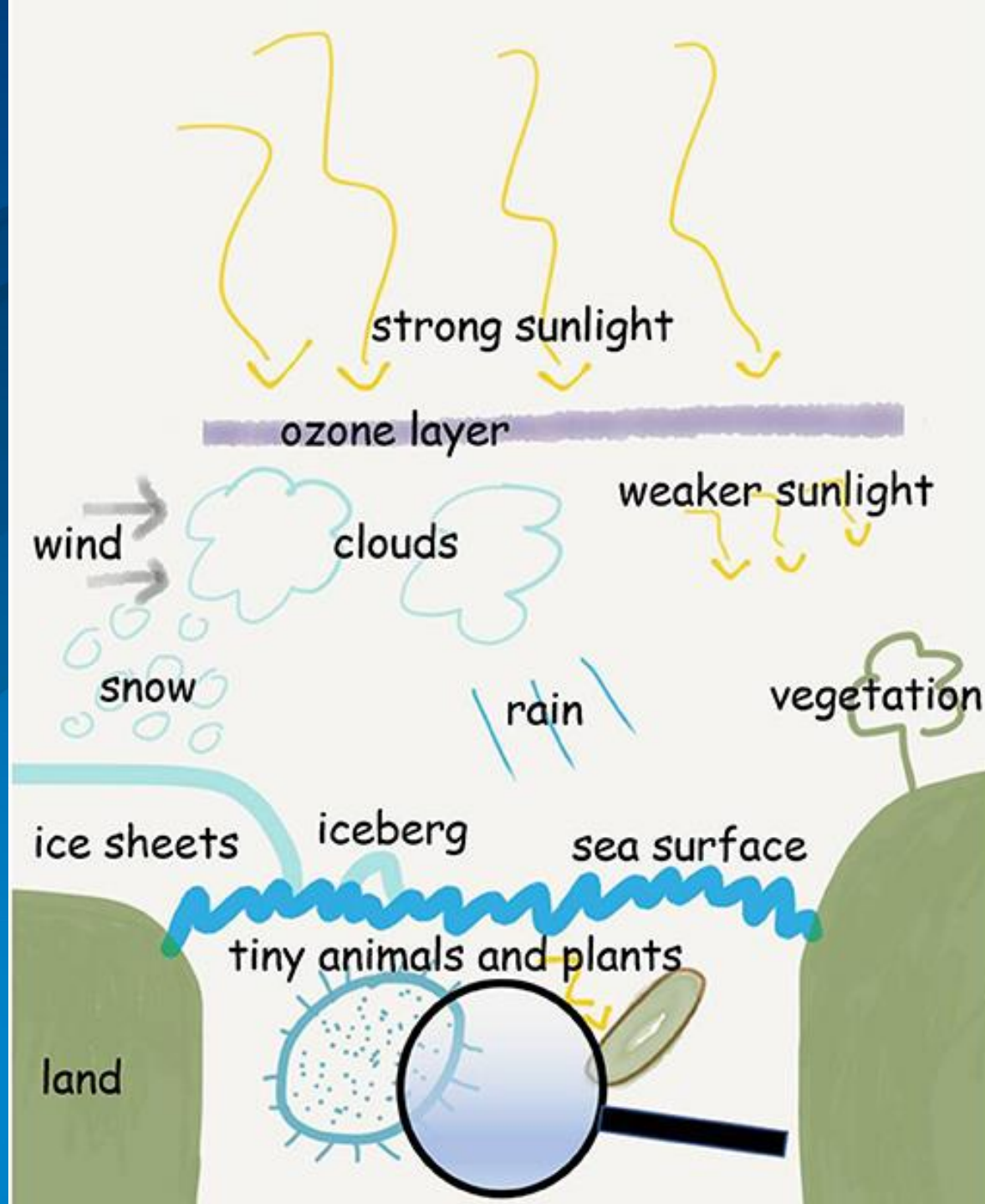


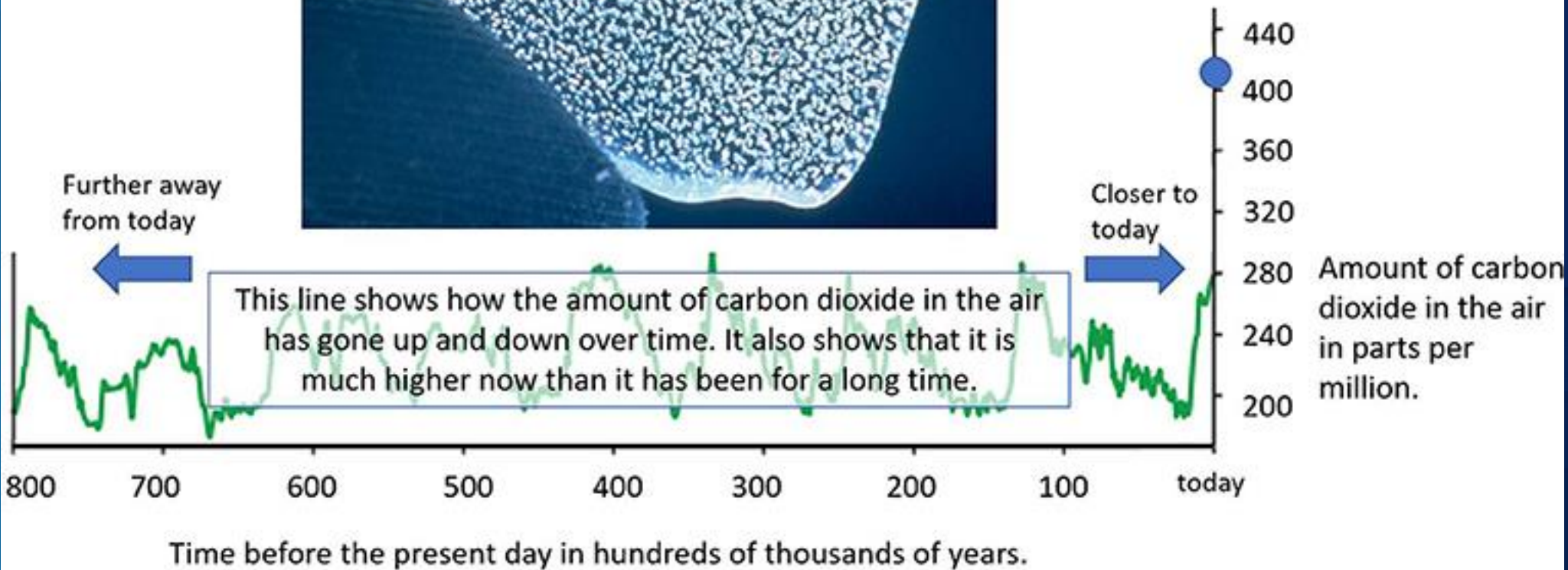
Omer

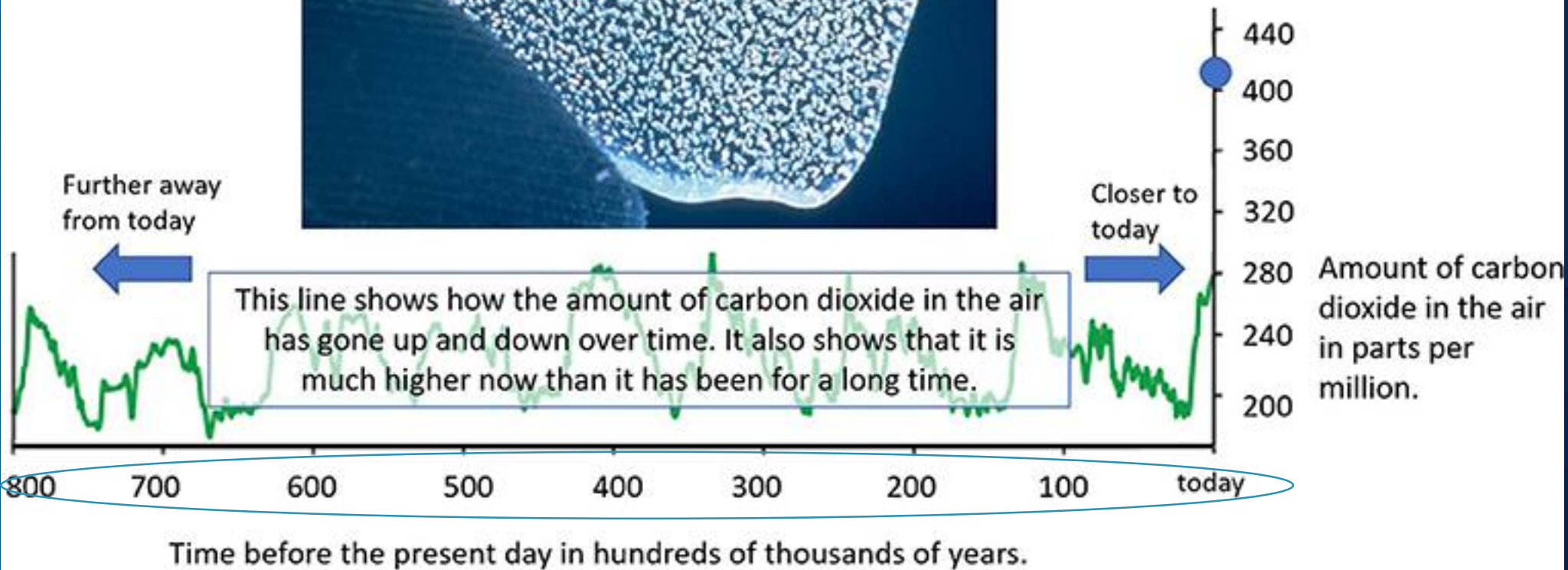
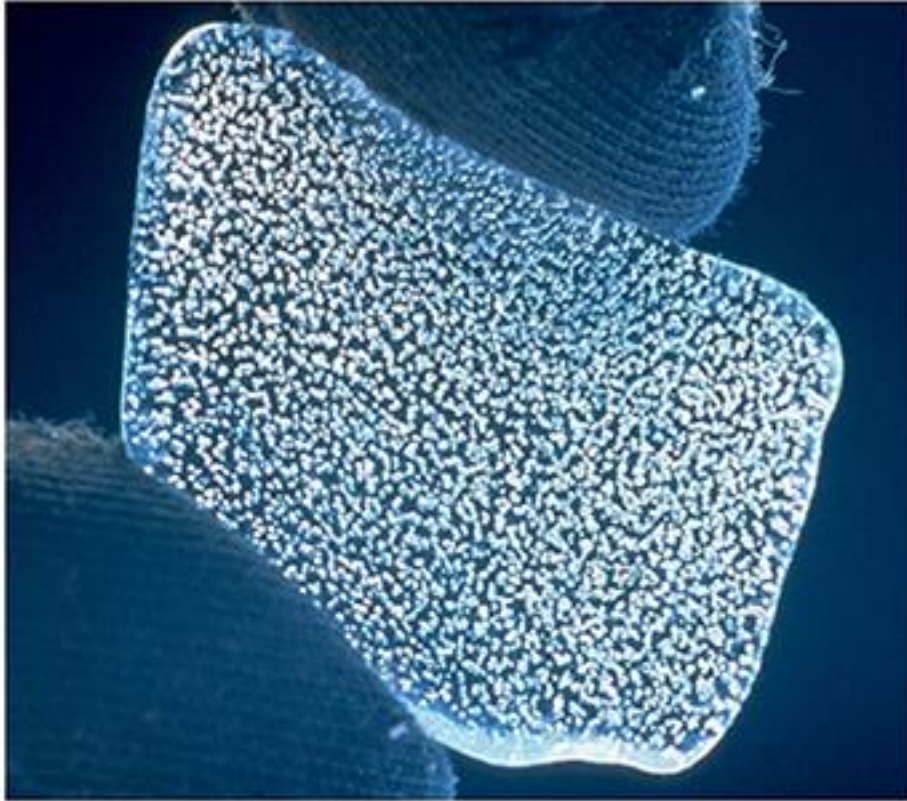


NIWA

Taihoru Nukurangi







YOU CAN HELP!

By using the power of the Internet, we can build a special type of computer together. Many people's computers are often switched on but not doing very much. What this means is that the spare computer power can be used to do some calculations about future climate change.

If you have a computer that you can use, then you can be a climate scientist too. If you want to get involved, then you can go to www.climateprediction.net. Here, you can sign up to run a model of the atmosphere on your own computer!

www.climateprediction.net is just one example of what is called a [citizen science](#) project. Citizen scientists are people who give some of their time to help answer a science question. What is great about these projects is that a lot can be achieved using teamwork! There are lots of these projects out there and you can start getting involved today.



climateprediction.net

the world's largest climate modelling experiment for the 21st century

[Home](#)[About](#)[People](#)[Join!](#)[Projects](#)[weather@home](#)[Climate science](#)[Publications](#)[Education](#)[Media](#)[News](#)[Support](#)

weather@home ›

In this section:

[Science Background](#)

[Regions](#)

[2015 December Extreme weather in the UK](#)

[Weather@home 2015: Western US Drought](#)

[Weather@home 2014: the causes of the UK winter floods](#)

[Weather@home ANZ 2013: the causes of recent heatwaves and drought in Australia and New Zealand](#)

[Weather@home Climate Accountability: the causes of extreme heat in the Western US](#)

[Weather@home ACE-Africa](#)

[Weather@home: High Resolution 2003 European Heatwave](#)

[Weather@home: Mexico](#)

weather@home

Weather@home is a group of regional climate modelling experiments within climateprediction.net

Follow live results from the [weather@home 2015 Western US Drought experiment](#)

Thanks to your support of climateprediction.net we are able to design experiments that answer questions we otherwise could not answer without large climate model ensembles. However, most extreme weather events take place on a much smaller scale that the global models can't show. For this we need the weather@home project!

Weather@home allows us to run regional climate models to answer the question: how does climate change affect our weather.

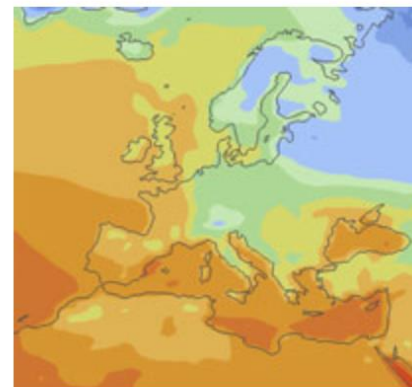
Weather@home helps us, and scientists all over the world, to answer this question. It is a family of regional climate models for a growing number of regions around the world. With weather@home we can investigate how the odds of extreme weather events change due to man-made climate change and natural climate variability.

With weather@home you can run the model simulating the weather in your native part of the world. Weather@home also makes climateprediction.net a truly international project, as participants and the scientists who analyse the data come from all over the world. The fact that local scientists are collecting and analysing the data is important as it means that any results from the project are underpinned by local knowledge, making them even more relevant to people's daily lives.

Related links:

weather@home is supported by [the Guardian](#)

Developed with financial assistance from [Microsoft Research](#)



Translate




NIWA

Taihoru Nukurangi


Coming soon, CONTAINERS!

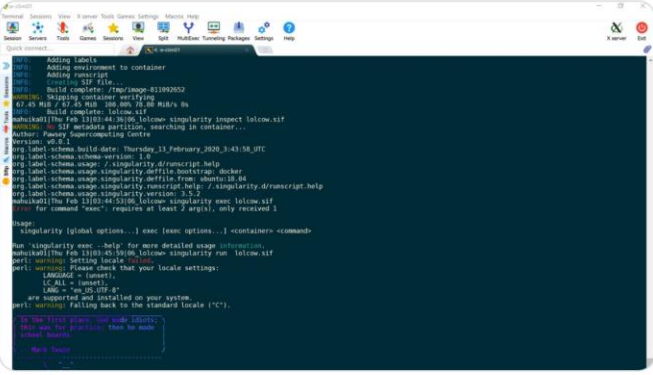




- Home
- Explore
- Notifications
- Messages
- Bookmarks
- Lists
- Profile
- More

Tweet


**Jonny Williams** @jonnyhtw · 16h
awesome container workshop at #eResearchNZ #eResearchNZ20. Thanks @blairbethwaite for leading it and to all the @NeSI_NZ staff for assistance.

I made a lolcow!! 🐮🐄


5


1

7


**Michael Fokin** @whiteGenomics · 16h
oh, yes, of course. do you know if this workshop is available somewhere? @NeSI_NZ ?

1

1


**Jonny Williams** @jonnyhtw · 16h
Here ya go nesi.github.io/ernz20-contain...

1

**Michael Fokin** @whiteGenomics


Search Twitter


Relevant people

**Michael Fokin** @white... Follows you

Following

Fungal genomics, plant-microbial interact, crop protection, bioinformatics, NGS, BGC, dad of two, weekday cyclist, marine ecology in the past. tweets are my own

**Jonny Williams** @jonnyhtw
Meteorology, Python, data viz etc at @niwa_nz. Prev. @CranfieldUni, @metoffice, @Eunomia_RandC, @BristolUni. Tweeting in a personal capacity, RT ≠endorsement 🌈

**Blair Bethwaite** @blairb... Follows you

Following

15% off - this week only!

Trends for you

Trending in New Zealand

Christchurch

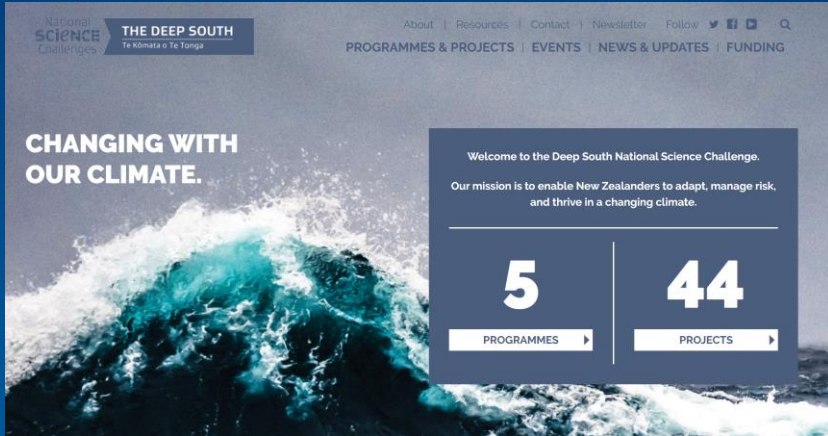
1,415 Tweets

Trending in New Zealand

Jacinda

Trending in New Zealand





Thanks for listening,
I'd be very happy to
take questions if you
have any.

@jonnyhtw

Climate, Freshwater & Ocean Science

