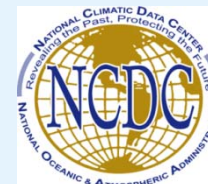




# ACRE, Citizen Science and OldWeather

Drs Rob Allan and Philip Brohan,  
Met Office Hadley Centre,  
Exeter, Devon, United Kingdom



# What is ACRE doing & aiming to produce?

- Undertaking & facilitating the recovery, imaging and digitisation of millions of historical instrumental surface terrestrial & marine global weather observations (<ftp://ftp.ncdc.noaa.gov/pub/data/ispd/add-station/>)
- to underpin reanalyses, particularly successive dynamical 4D global weather reanalyses assimilating only surface synoptic pressure, monthly SST & sea-ice observations over the last 200+ years being led by ACRE's US partners

*20th Century Reanalysis Project: 1891-2008 [Autumn 2009]*

*20th Century Reanalysis Project: 1871-2008 [Autumn 2010]*

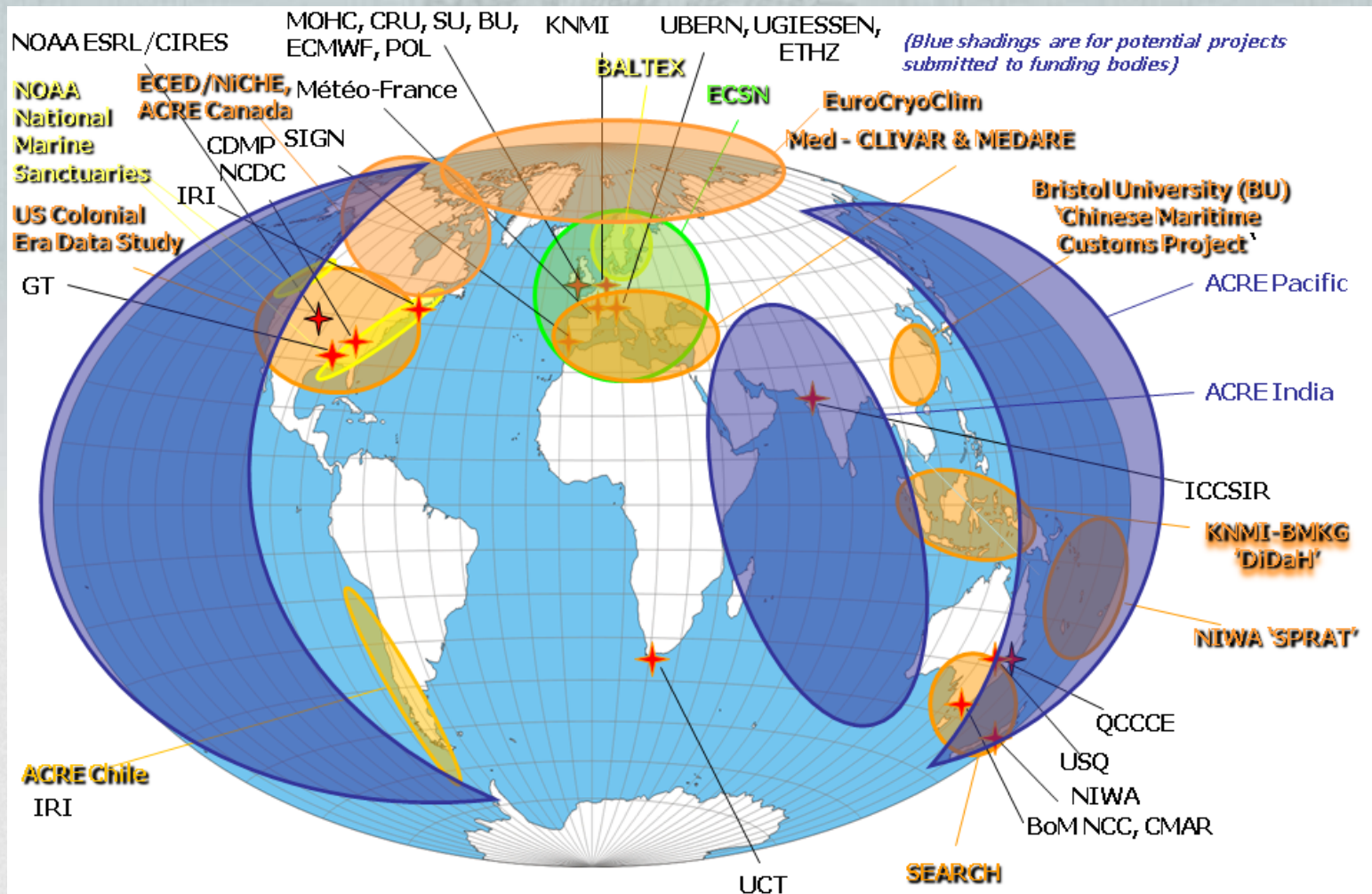
*Sparse Input Reanalysis for Climate Applications (SIRCA): 1800-2016 [2014- 2017]*

- for global climate research; climate applications, extremes, risks and impacts needs; educators & students, & the general public
- via a web-based interface that will store, allow access to, & enable visualisations of, the raw data, data images, meta data through to all of the variables generated by the 4D global weather reanalyses

**Met Office-Technology Strategy Board-IBM Open Platform**

# Who else is involved internationally?

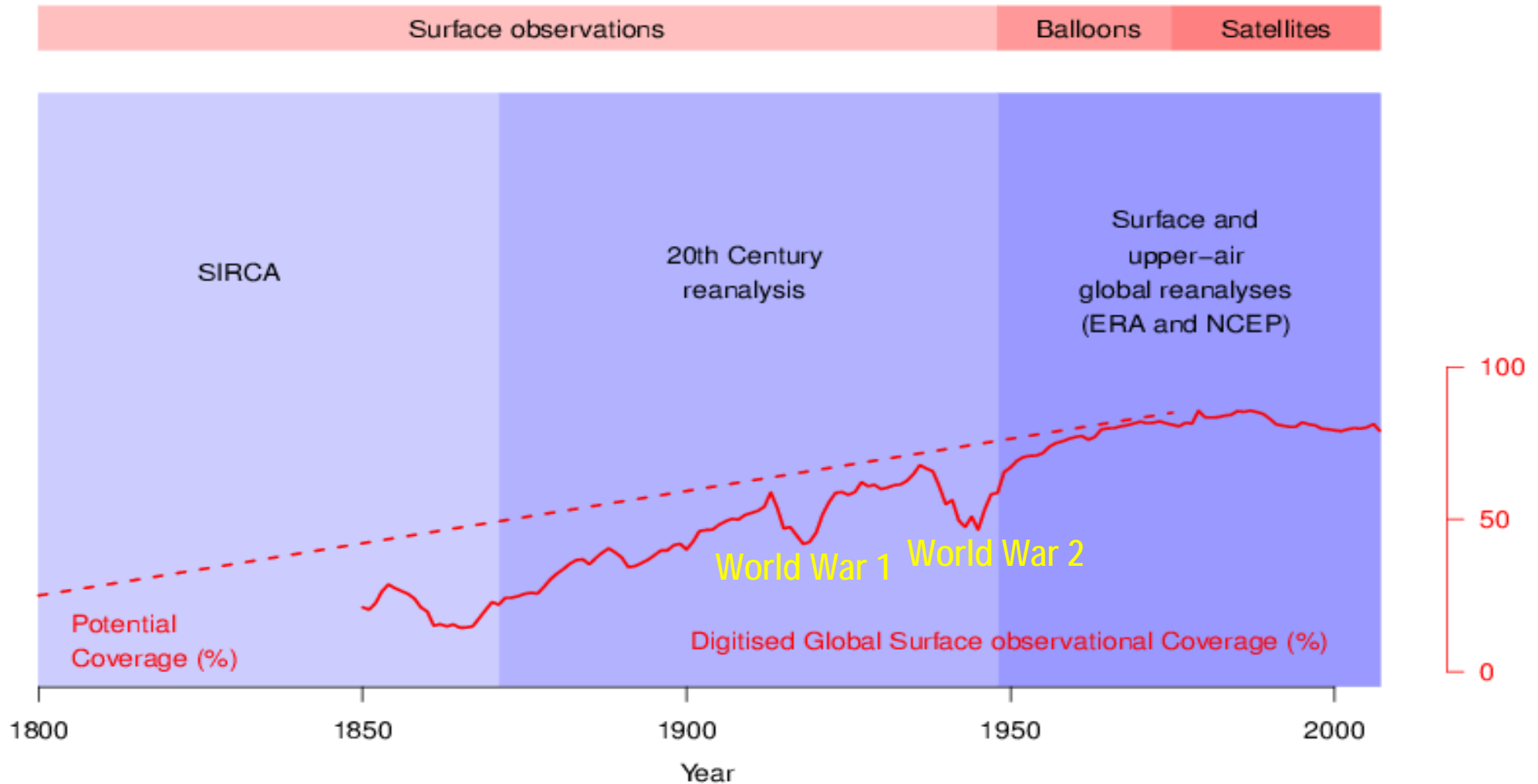
With WMO, GEO, GCOS endorsement, wide international support & the aid of various working groups of GCOS & WCRP, ACRE provides an umbrella that links together some 35+ projects, data rescue, climate science, climate applications, education, & outreach activities around the globe



## International Projects, Sources & Repositories linked to ACRE

IEDRO    ICOADS    ISPD    WMO DARE    RECLAIM    GLOBE    GLOSS    ETCCDI    VACS    ICHM    Galaxy Zoo  
 CoRRaL    EUFP7: EURO4M    EU FP7: ERA-CLIM    NERC: AUSTRAL    Reanalysis.org

# What data improvement is needed for historical reanalyses?



**'PRIOR TO WORLD WAR 2,  
AS MUCH SURFACE DATA HASN'T BEEN DIGITISED AS HAS BEEN  
DIGITISED'**

# ACRE & ACRE-linked Data Recovery, Imaging & Digitisation Projects

- The English East India Company (EEIC) (1780s-1830s)
- CoRRaL: UK Colonial registers and Royal Naval Logbooks (<http://www.corral.org.uk>)
- An extended period during and following World War 1 (1914-1923)
  - UK hydrographic and survey vessel remarks books (1759-1909)
  - Expeditions, travels, circumnavigations and ships of exploration
    - China and South China Sea
      - ACRE Chile
- South Eastern Australian Recent Climate History (SEARCH <http://climatehistory.com.au/>)
  - KNMI-BMKG 'DiDaH'



# Regional Data Recovery, Imaging & Digitisation Foci under ACRE

**ACRE Chile** - initial funding from EC FP7 ERA-CLIM

**ACRE Pacific** - led via NIWA, NZ; initial French Pacific Fund project

**ACRE India** - linked to British Library-India initiative

**Eastern Mediterranean-Middle East-SE Asian** -  
funded by the University of Giessen, Germany

**ACRE Arctic** - being developed by the Atmosphere/Climate Working Group (WG) of the International Arctic Science Committee (IASC)

**ACRE Africa** - event at UNFCCC CoP17, Durban, South Africa

**ACRE China** - start via a project with Bristol University

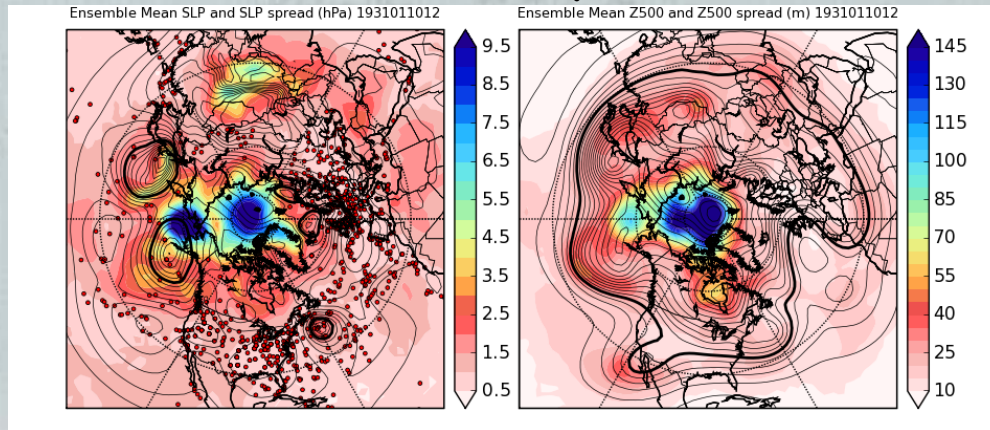




# What has ACRE produced for climate science?

Historical 4D global weather reanalyses: 1908-1958; 1891-2008; 1871-2008

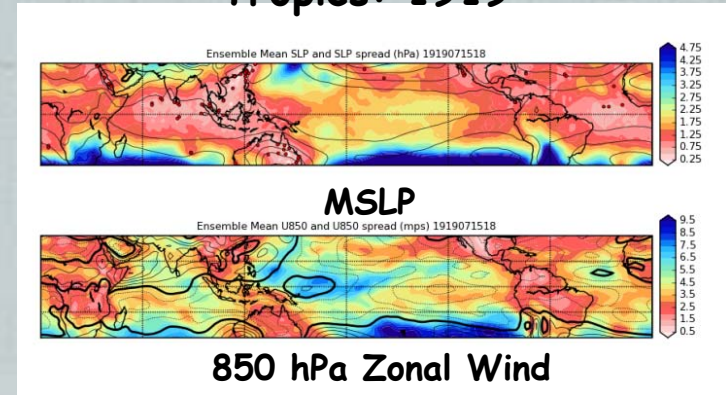
## Northern Hemisphere: 1931



MSLP

500 hPa GPH

## Tropics: 1919



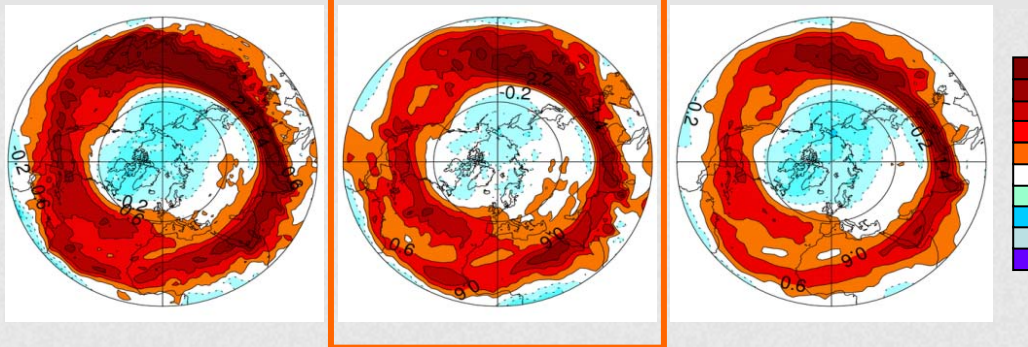
MSLP

850 hPa Zonal Wind

Contours- ensemble mean  
Shading- blue: more uncertain, white: more certain

## Storm Track

Skewness of Northern Hemisphere 250 hPa *daily*  
Vorticity (Dec-Feb) 1989/90-2005/06

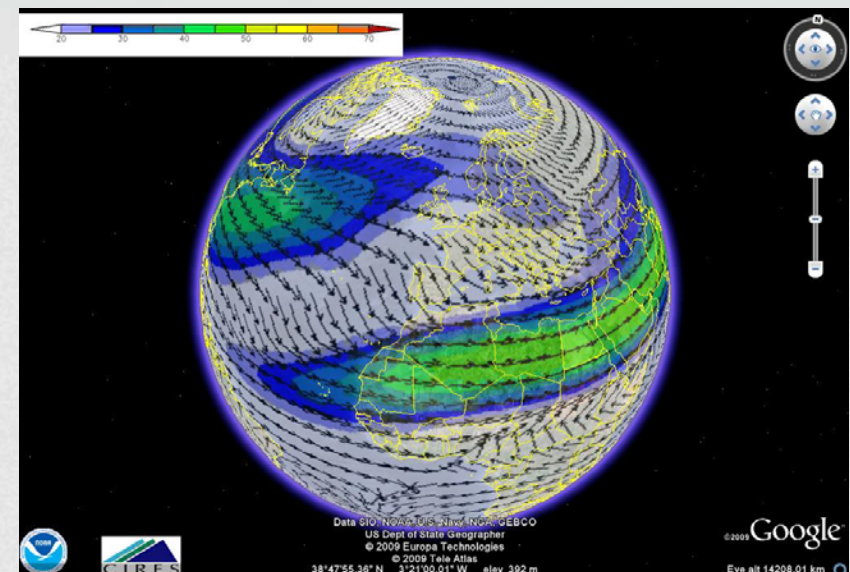


ERA Interim  
(~50km)  
Uses satellite  
data

20CRv2 (~200km)  
Surface pressure  
only

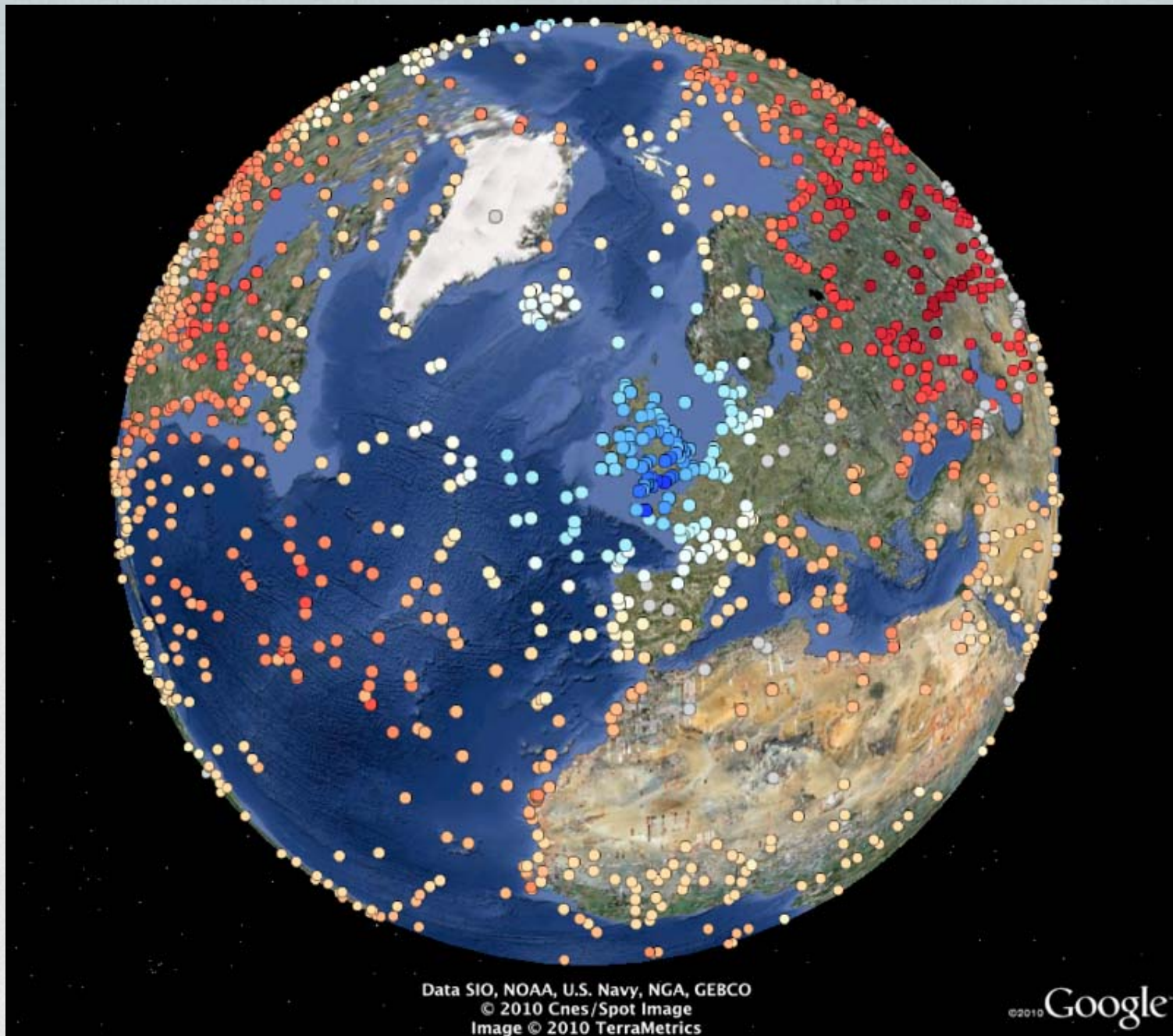
NCEP-NCAR  
(~200km)  
Uses satellite data

Google Earth: 200 hPa wind vectors  
Jan 1908-58



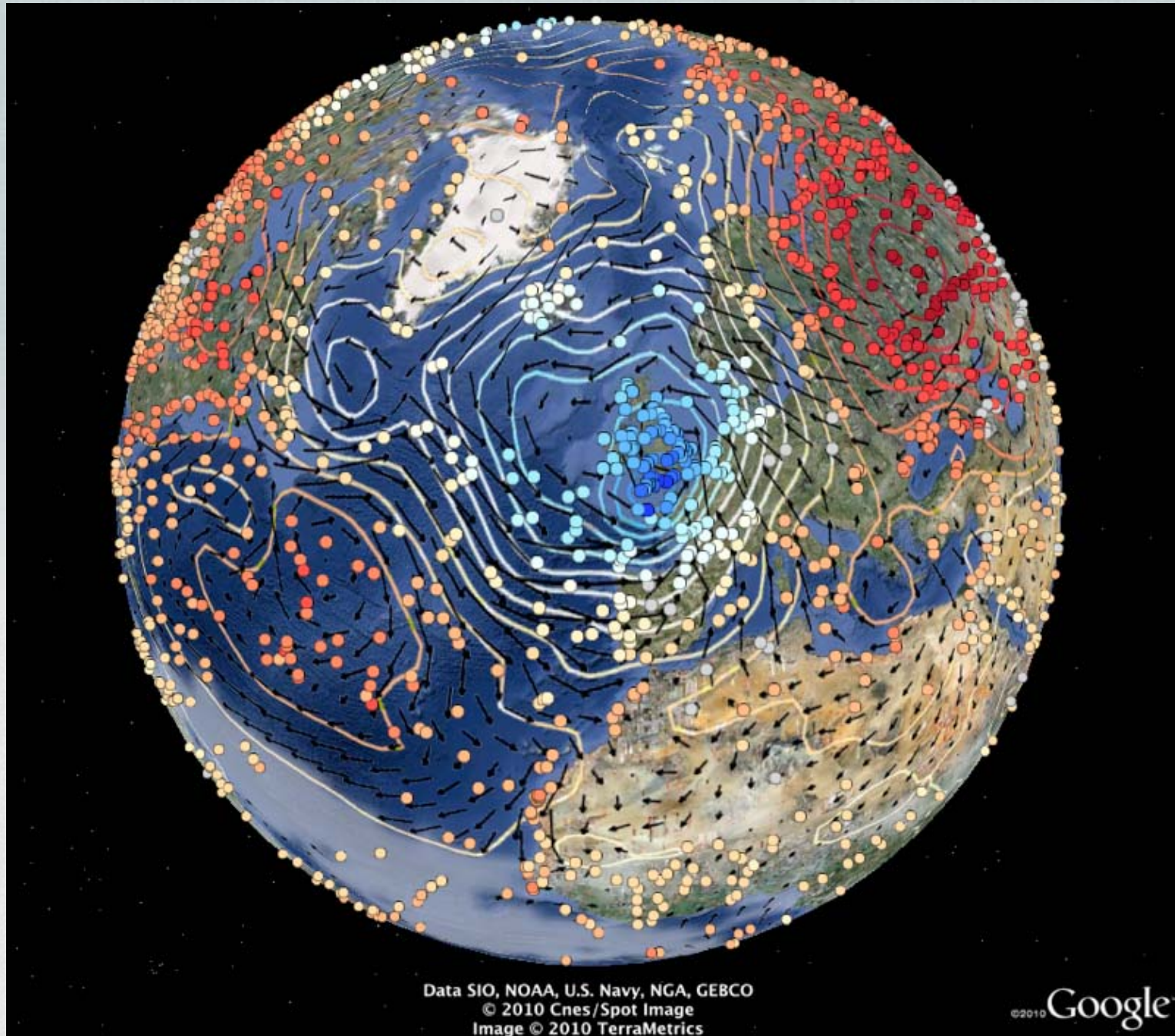


# October 16<sup>th</sup>, 1987



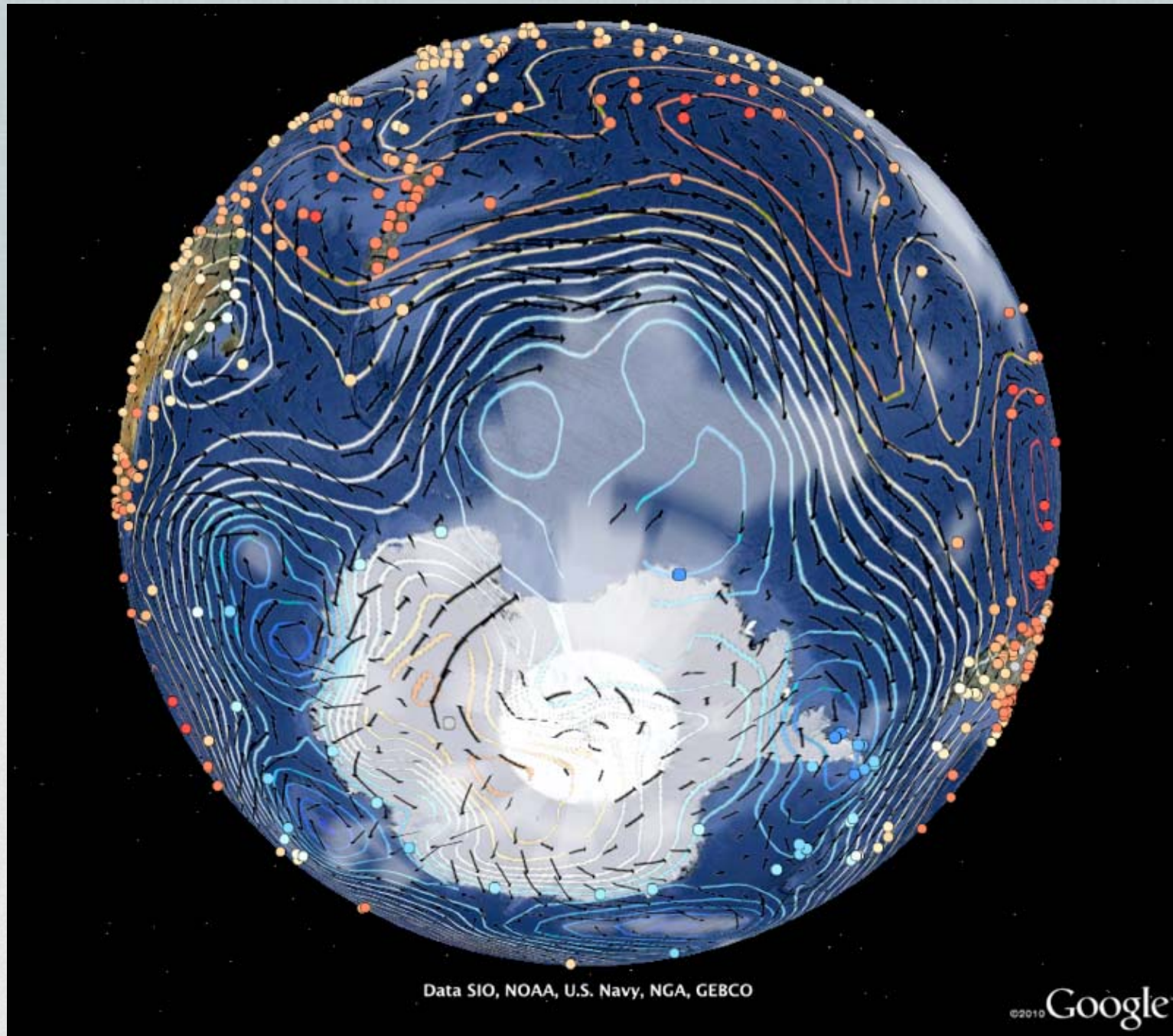


# October 16<sup>th</sup>, 1987



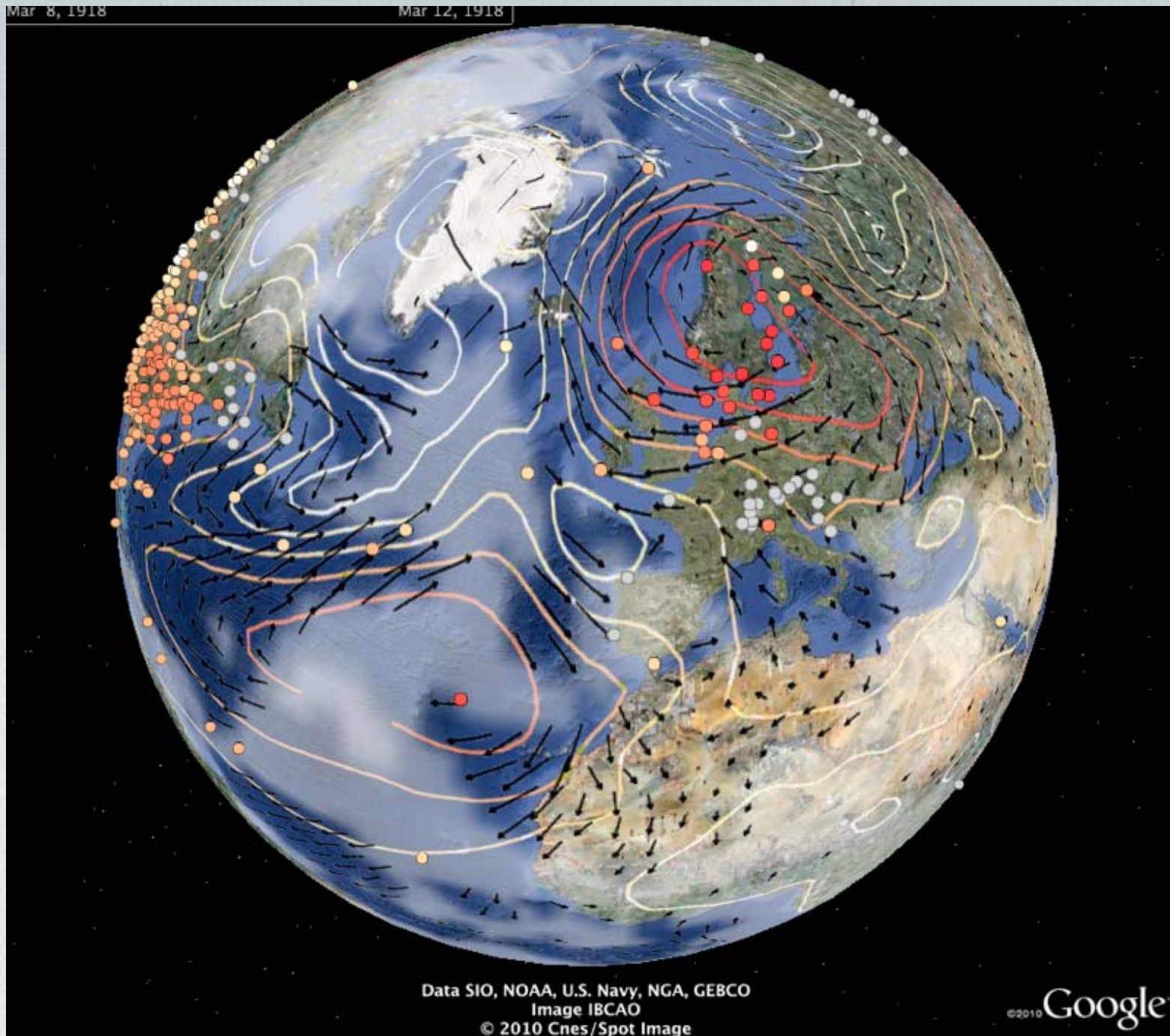


# October 16<sup>th</sup>, 1987

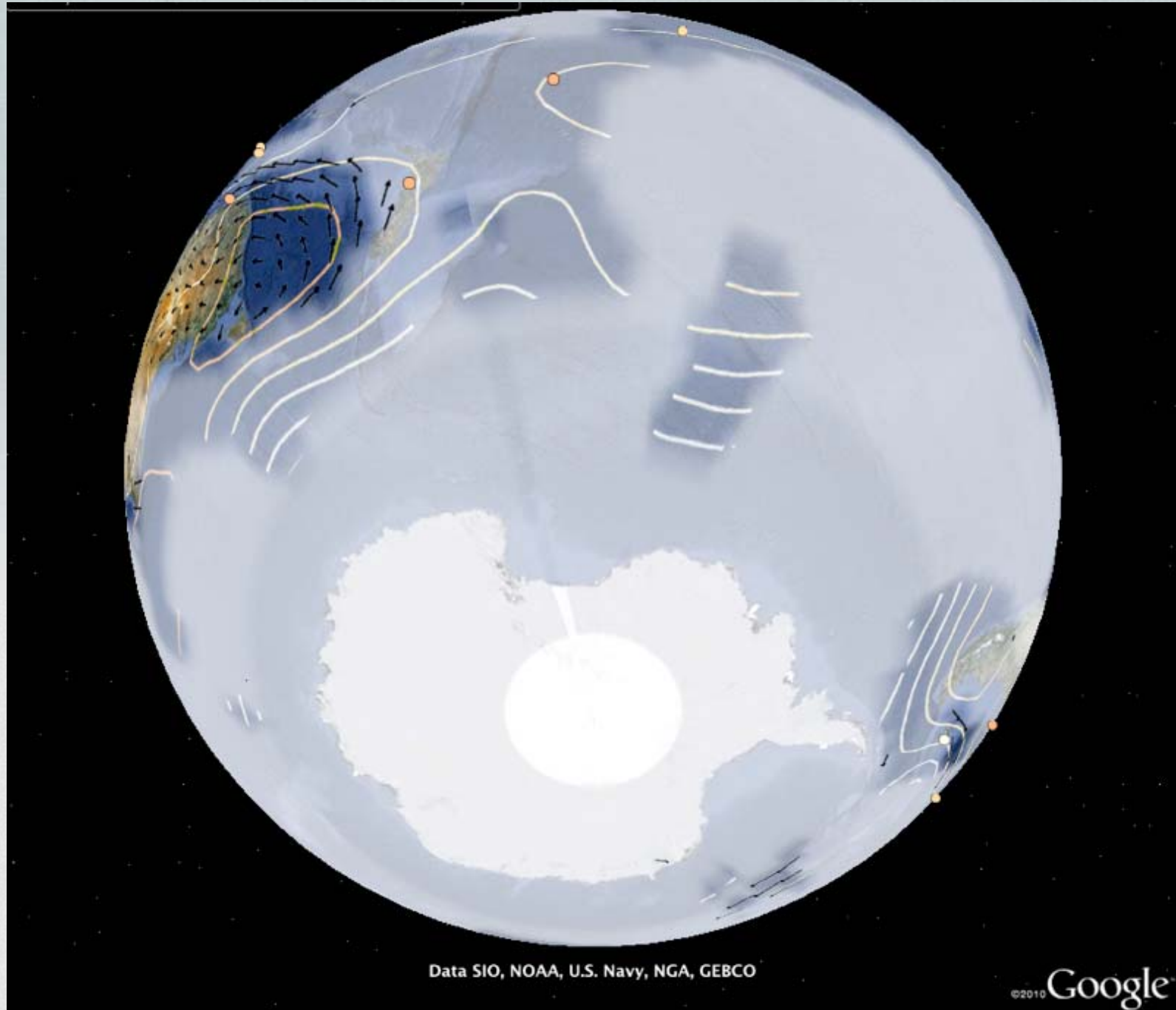




# March 8<sup>th</sup> 1918



# March 8<sup>th</sup> 1918





# Archives



**The National Archives:  
Kew, London**



**The British Library:  
London**



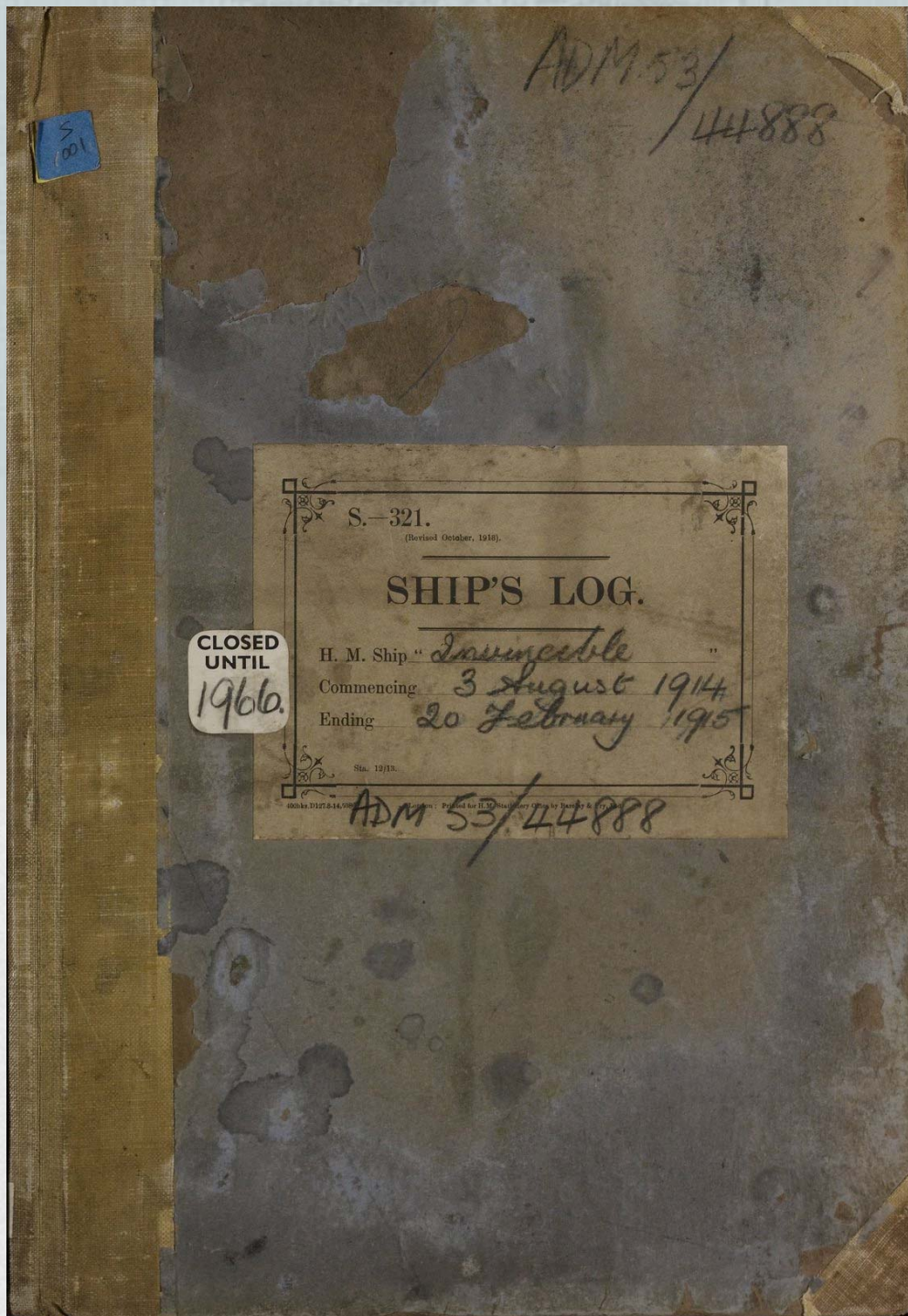
**Museo Naval y Maritimo:  
Valparaiso, Chile**



**The Asiatic Society,  
Kolkata, India**



# A treasure from the archives







24<sup>th</sup> September 1914: 8 a.m.

*W. & Be. 24.9.14*  
*Leave to water till 10.0*

*S.S.W.*

*1*

*be.*

*30.09*  

---

*68*

*57*

*56*

*4.0*

*Cleaning shop etc*



H.M.S. "Invincible", Tuesday 8<sup>th</sup> day of December, 1914.  
 From \_\_\_\_\_ To \_\_\_\_\_, or At Freetown?

Hours	Patent Log	Distance Run		Standard Compass Courses	Deviation of Standard Compass	Revolutions per minute	Wind		Weather	State of the Sea	Height of Barometer and Attached Thermometer	Temperature			Position	Latitude	Longitude	REMARKS
		Miles	Tenths				Direction	Force				Air	Wet Bulb	Sea				
1																		A.M.
2																		
3																		
4							SSe	1	bc		30.03	70	37	4.0				5.10 Collier "Helawan" alongside 6.07 Commenced coaling Aves clearing shaft propeller
5																		
6																		
7																		
8																		
9																		8.0 8.20 Negative coaling. Unrigging coles & preparing shaft for
10																		8.30 Action Station, worked in to 2 shafts. 9.55 Worked
11																		8.0 Change vessel reports from shipper 9.40 took out Station, on horizon to Southward.
12																		8.20 Stopped coaling, unrigged coles. 9.00 masts in sight of Port William 9.25 Canopus opened fire 9.40 that Collier coaling in chase of 9.45 that Collier coaling in chase of 9.55 that Collier coaling in chase of (Action of Admiral Court on page 2)

Hours	Variation	True Bearing and Distance	Currents in the 24 hours ending at Noon	Latitude	Longitude	Number on Sick List	Provisions received	Fresh Water		Fuel
								Received	Expended for all purposes	
				D.R. 51.58 S	D.R. 57.0 W	11		lbs.	Tons	Tons
				Obs. —	Obs. —					
							Fresh Meat	Distilled	Oil	Remaining
							Vegetables	Expended	Coal	Tons
							Bread	Remaining	Oil	

Hours	Patent Log	Distance Run	Standard Compass Courses	Deviation of Standard Compass	Revolutions per minute	Wind	Weather	State of the Sea	Height of Barometer and Attached Thermometer	Temperature	Position	Latitude	Longitude	REMARKS
1														P.M.
2														German, Bremen, Dresden and keeping the following ships also under way, Canisvon, Cornwall, Kent, Glasgow, Bristol, Macedonia.
3														12.55 Inflexible opened fire 12.57 Inflexible opened fire 1.00 Inflexible light cruiser observed to proceed to Starboard.
4														1.00, Schanhorst & German ahead course to port together and came into action.
5														2.45 Observed fire rigged ship steering about 17 (true)
6														4.0 Schanhorst hauls out of fire & to Starboard.
7														4.7 Schanhorst strikes. The Canisvon now in company & engaged. Later Cornwall, Glasgow, Kent, and Bristol engaging. Canisvon light cruiser, but not in sight.
8														6.0 German stopped and steering to Starboard.
9														6.2 German sinks. Inevitable inflexible and Canisvon proceeded at full speed to pick up survivors.
10														7.20 Proceeded Sobito - 18 kt.
11														
12														8.0

# Log of HMS Invincible, 8<sup>th</sup> December 1914

Initials of the Officer  
of the Watch

# Climate Science





# CITIZEN SCIENCE MASS DIGITISATION

Galaxy Zoo is a ZOO NIVERSE project

## GALAXY ZOO

2

M82

ZOO'SHOW ▶

[Home](#) [The Story So Far](#) [The Science](#) [How To Take Part](#) [Classify Galaxies](#) [Forum](#) [Zoo Media](#) [Blog](#) [FAQ](#) [Contact Us](#)

### Welcome to Galaxy Zoo, where you can help astronomers explore the Universe

**New, more detailed images added** - see here for details

The Galaxy Zoo files contain almost a quarter of a million galaxies which have been imaged with a camera attached to a robotic telescope (the [Sloan Digital Sky Survey](#), no less). In order to understand how these galaxies — and our own — formed, we need your help to classify them according to their shapes — a task at which your brain is better than even the fastest computer.

More than 150,000 people have taken part in Galaxy Zoo so far, producing a wealth of valuable data and sending telescopes on Earth and in space chasing after their discoveries. Zoo 2 focuses on the nearest, brightest and most beautiful galaxies, so to begin exploring the Universe, click the 'How To Take Part' link above, or read 'The Story So Far' to find out what Galaxy Zoo has achieved to date.

Thanks for your help, and happy classifying.

The Galaxy Zoo team.

### Classifier Log In

[Click here to log in](#)

- [Register](#)
- [Forgotten Password?](#)

### Change language

- [English](#)
- [Polski](#)
- [Deutsch](#)

### Latest News

#### Hello From Palomar

by robert - Dec 11, 2009

I'm Robert, an astronomer at the California Institute of Technology working on the Palomar

## Moon Zoo

Explore the Moon in unprecedented detail using images from NASA's Lunar Reconnaissance Orbiter.

[JOIN IN](#)

## Galaxy Zoo: Hubble

The latest version of the original Zooniverse project. Help astronomers figure out how galaxies form and evolve by classifying their shape. Now with added Hubble galaxies.

[JOIN IN](#)

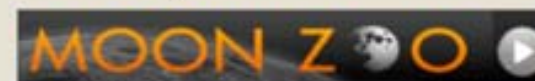
## Solar Stormwatch

Help spot explosions on the Sun and track them across space to Earth. Your work will give astronauts an early warning if dangerous solar radiation is headed their way. And you could make a new scientific discovery.

[JOIN IN](#)

## Galaxy Zoo: Mergers

## Live Projects



## Zooniverse Activity

Total Volunteers: **315,059**





http://oldweather.org

oldWeather

TUTORIAL

VESSELS

FAQ

WHY SCIENTISTS NEED YOU

ABOUT

SIGN IN

GET STARTED

HOME

The image shows a map of the United Kingdom with a callout box for the vessel HMS Invincible. The callout box is dark grey with white and red text. It contains the following information:

- HMS Invincible** (in red)
- Portsmouth → Scapa Flow
- 0% COMPLETE (with a progress bar)
- stuart.lynn is the Captain of 1 other users following this vessel (with a small orange circle icon)
- Jump Aboard** (in a white arrow)

The map shows the location of Portsmouth in the south of England. A small orange icon of a ship is placed over Portsmouth. The map data is attributed to ©2010 Tele Atlas.

# Old Weather: our weather's past, the climate's future

## What we need

Help scientists and historians find and record weather observations and ship movements made all over the world by Royal Navy ships around the time of

## Project Statistics

Old Weather transcriptions so far



Cadet philip.brohan

0 pages contributed to this voyage. 9 pages more for promoting to Captain

1. DATE

2. LOCATION

3. WEATHER

4. OTHER

5. FINISH

## HMS Invincible

Portsmouth → Scapa Flow



HMS Invincible was a battlecruiser of the British Royal Navy, the lead ship of her class of three, an... [Learn more](#)

### Map and timeline



DATE

POSITION

HM.S. "Invincible" 5<sup>th</sup> day of August, 1914

From Portsmouth To Scapa Flow

Hours	Patrol Log	Distance Run Miles	Standard Compass Course	Number of Signals	Revolutions per minute	Wind			Direction of surface current	Direction of bottom current	Direction of surface current	Temperature Air	Temperature Wet Bulb	Sea	REMARKS
						Direction	Force	Velocity							
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															

9.4 Commissioned ship, Captain...  
 During...  
 ...



Portsmouth → Scapa Flow



HMS Invincible was a battlecruiser of the British Royal Navy, the lead ship of her class of three, an... [Learn more](#)

Enter the date of the logbook

Date Location Weather Event

Day : Month : Year

6

August

1914

OK

*the 6<sup>th</sup> day of August  
or At Portsmouth.*

Revolutions per minute	Direction	Force	Weather	State of H	and Attached Thermometer	Air	Wet Bulb	Sea	8.0 a.m.		REMARKS
									8.0 p.m.		
									A.M.		
											<i>Provisioning ship. drawing up deck</i>

## Map and timeline





Enter a weather reading

Date Location Weather Event

Wind

Force

B Code

Heights

air

bulb

sea

SW

to 4

i.c.p.

9.76 / 64

69

49

OK

SW

54<sup>6</sup> b.c.p

29.76 / 64

69

49

12

Latitude

Longitude

Number on

Variation

True Bearing and Distance

Currents in the 24 hours ending at Noon

Fresh Meat 362  
Vegetables 800  
Bread 800

Received  
Distilled  
Expended 19  
Remaining 72

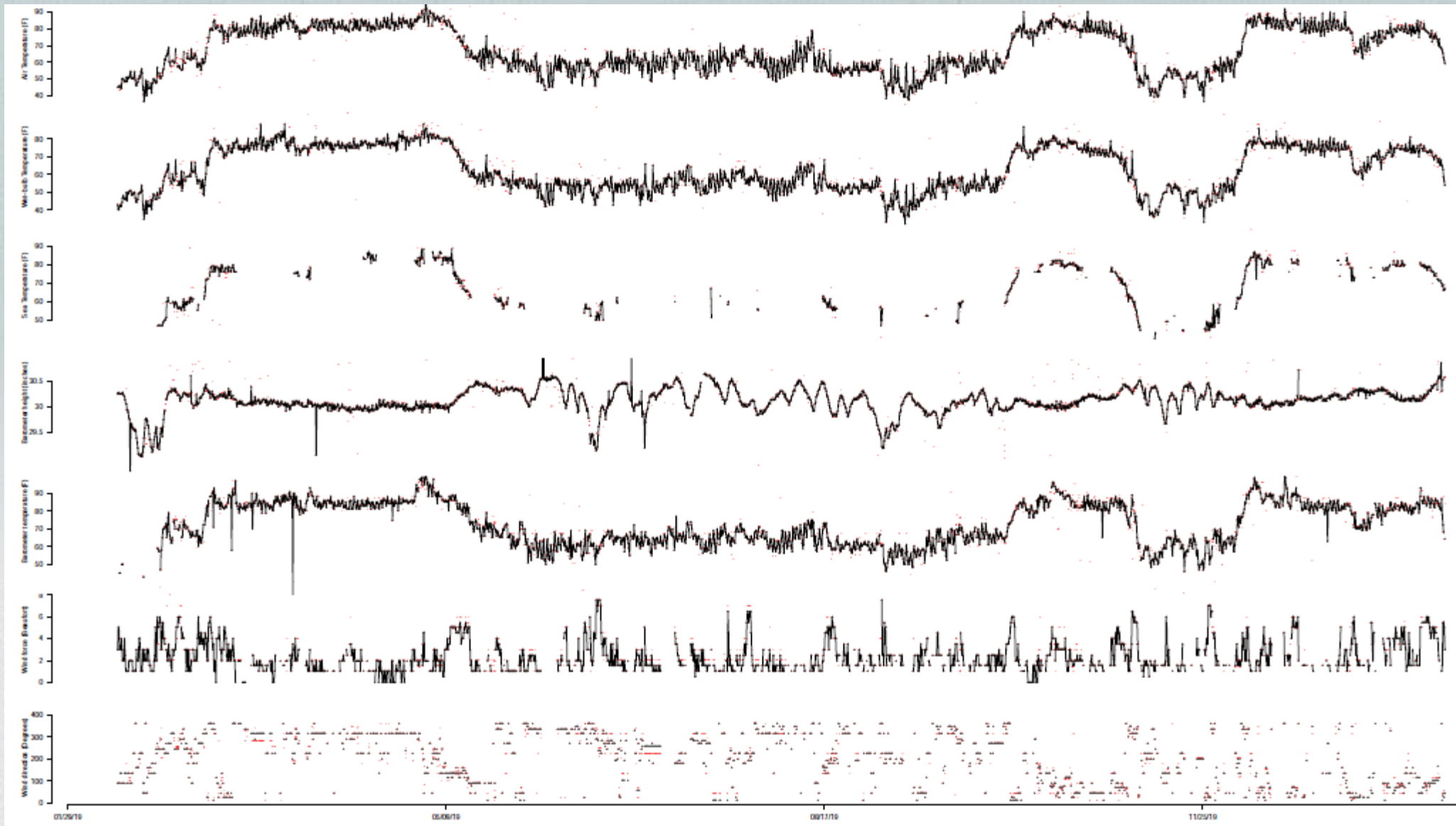
Coal  
Oil  
Remaining  
Coal  
Oil

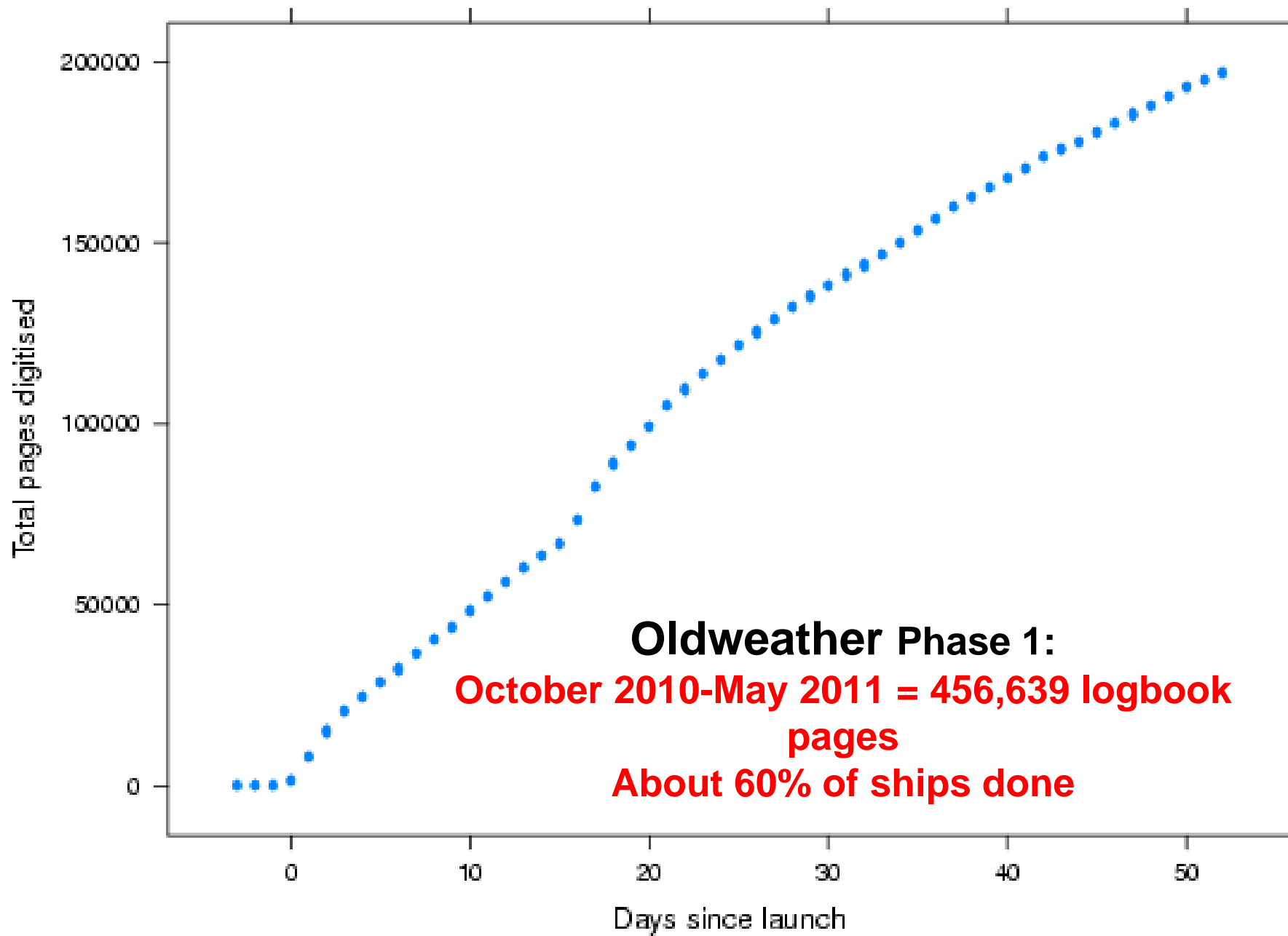
P.M.

Provisioning, drawing stores etc.



# HMS New Zealand in 1919 (circumnavigation)







<http://oldweather.org/voyages>

**SATURDAY 3RD NOVEMBER 1917** [SEE LOGBOOK](#)

FRIDAY 2ND NOVEMBER 1917

THURSDAY 1ST NOVEMBER 1917

WEDNESDAY 31ST OCTOBER 1917

4 SICK

TUESDAY 30TH OCTOBER 1917

4 SICK

MONDAY 29TH OCTOBER 1917

ST HELENA VISITED --

3 SICK

SUNDAY 28TH OCTOBER 1917

3 SICK

SATURDAY 27TH OCTOBER 1917

4 SICK

FRIDAY 26TH OCTOBER 1917

4 SICK

THURSDAY 25TH OCTOBER 1917

4 SICK

[JOIN IN AT OLDWEATHER.ORG](#)

**HMS Africa**  
Saturday 3rd November 1917  
[More Information](#)

Select Ship

See also:

- Blog - <http://blogs.zooniverse.org/oldweather/>
- Forum - <http://forum.oldweather.org/>
- Follow oldweather on twitter.

# NATIONAL MARITIME MUSEUM, GREENWICH, UK

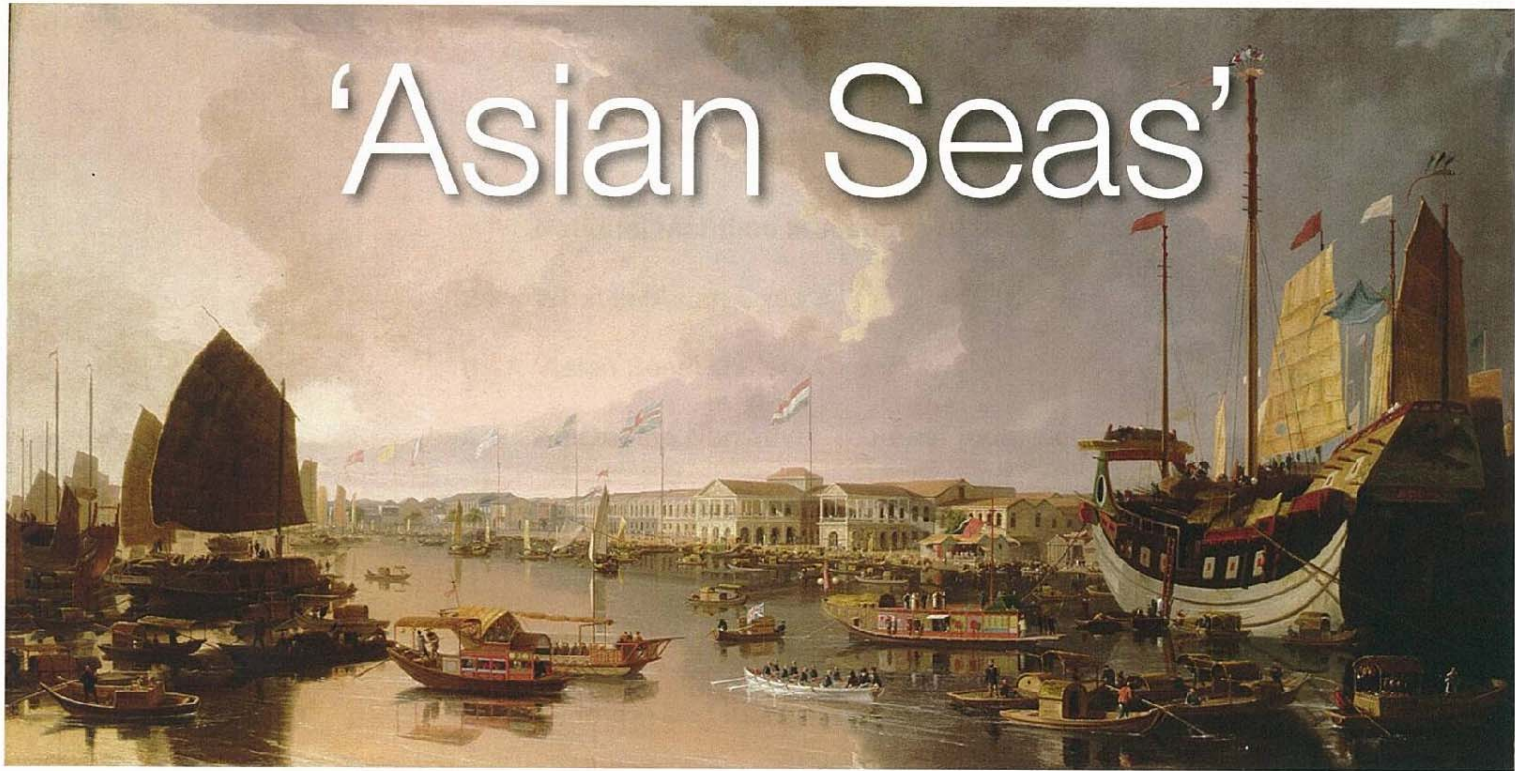


Due to open in time for the London 2012 Olympics, the Sammy Ofer Wing





# 'Asian Seas'



*A View of the European Factories at Canton,*  
by William Daniell, c. 1790 ZBA1231

**A Permanent Gallery**  
at the  
**National Maritime Museum**  
Opening late summer 2011

**Now online!**

**Data rescue at home** is an internet-based attempt to digitize historical weather data from all over the globe and make the digitised data available to everybody. Two projects are currently online: German radiosonde data from the Second World War and meteorological station data from Tulagi (Solomon Islands) for the first half of the 20th century.

Join the community effort to digitize precious historical climate data.

For more options and personalized settings please



NOAA Photo Library



<http://www.data-rescue-at-home.org>



**UNIVERSITÄT  
BERN**

**OESCHGER CENTRE  
CLIMATE CHANGE RESEARCH**



Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich



# International ACRE Project Manager

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Climate Monitoring and Attribution Group,

Met Office Hadley Centre

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Alternative E-mail: [allarob@googlemail.com](mailto:allarob@googlemail.com)

ACRE WWW Site: <http://www.met-acre.org/>

Old Weather WWW Site: <http://www.oldweather.org/>

Phone: +44 (0)1392 886904

Fax: +44 (0)1392 885681

Address: FitzRoy Road

Exeter EX1 3PB

U.K.



## The 4<sup>th</sup> Atmospheric Circulation Reconstructions over the Earth (ACRE) Workshop

in conjunction with EC FP7 EURO4M and ERA-CLIM plus AHRC *Historic Weather*  
KNMI, De Bilt, The Netherlands,  
21<sup>st</sup>-23<sup>rd</sup> September 2011



ERA-CLIM

