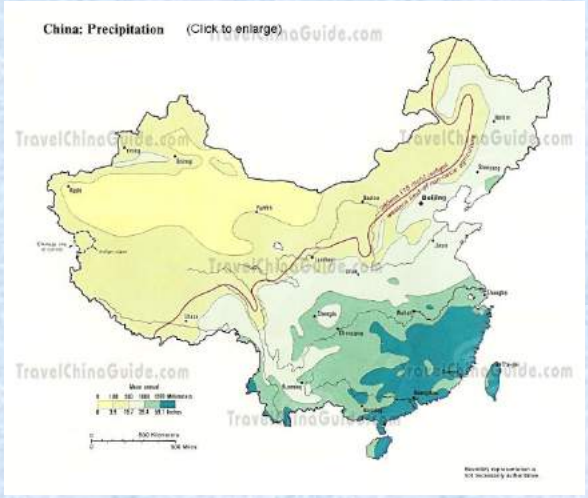
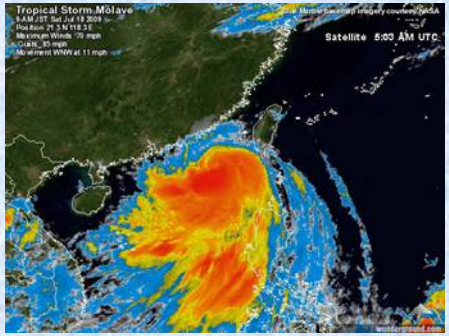




Met Office Hadley Centre

UNIVERSITY of WASHINGTON SEATTLE

NATIONAL ARCHIVES

中国气象局 CHINA METEOROLOGICAL ADMINISTRATION

NOAA

CIRES

CSSP China: WP1 - ACRE CHINA

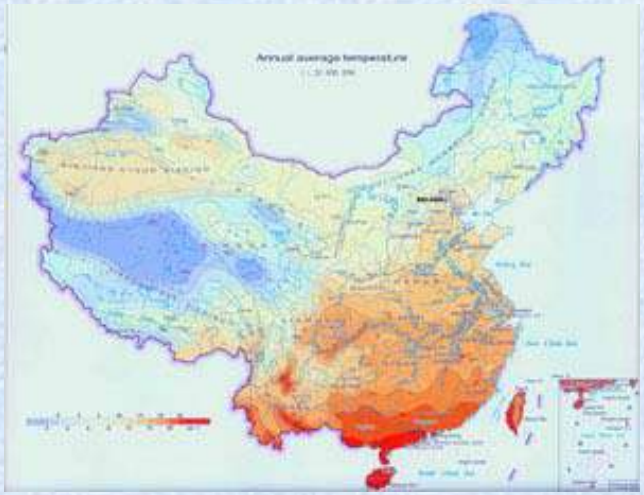
ACRE
Atmospheric Circulation Reconstructions over the Earth

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

University of BRISTOL

ZOONIVERSE
REAL SCIENCE ONLINE

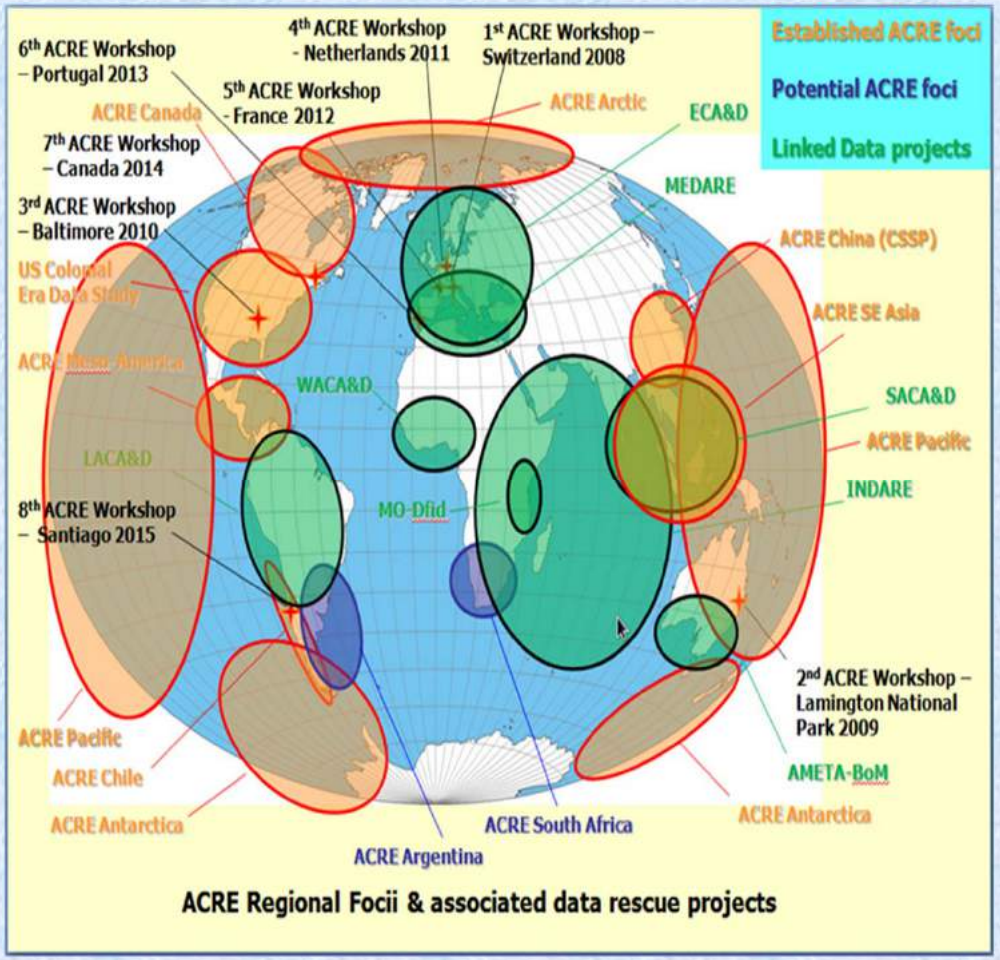
北京气候中心 BCC BEIJING CLIMATE CENTER



• ACRE China was part of the initial Memorandum of Understanding (MoU) between the Met Office (MO) and the Chinese Meteorological Administration (CMA)/Beijing Climate Centre (BCC) that evolved in the 2011-2013 period.

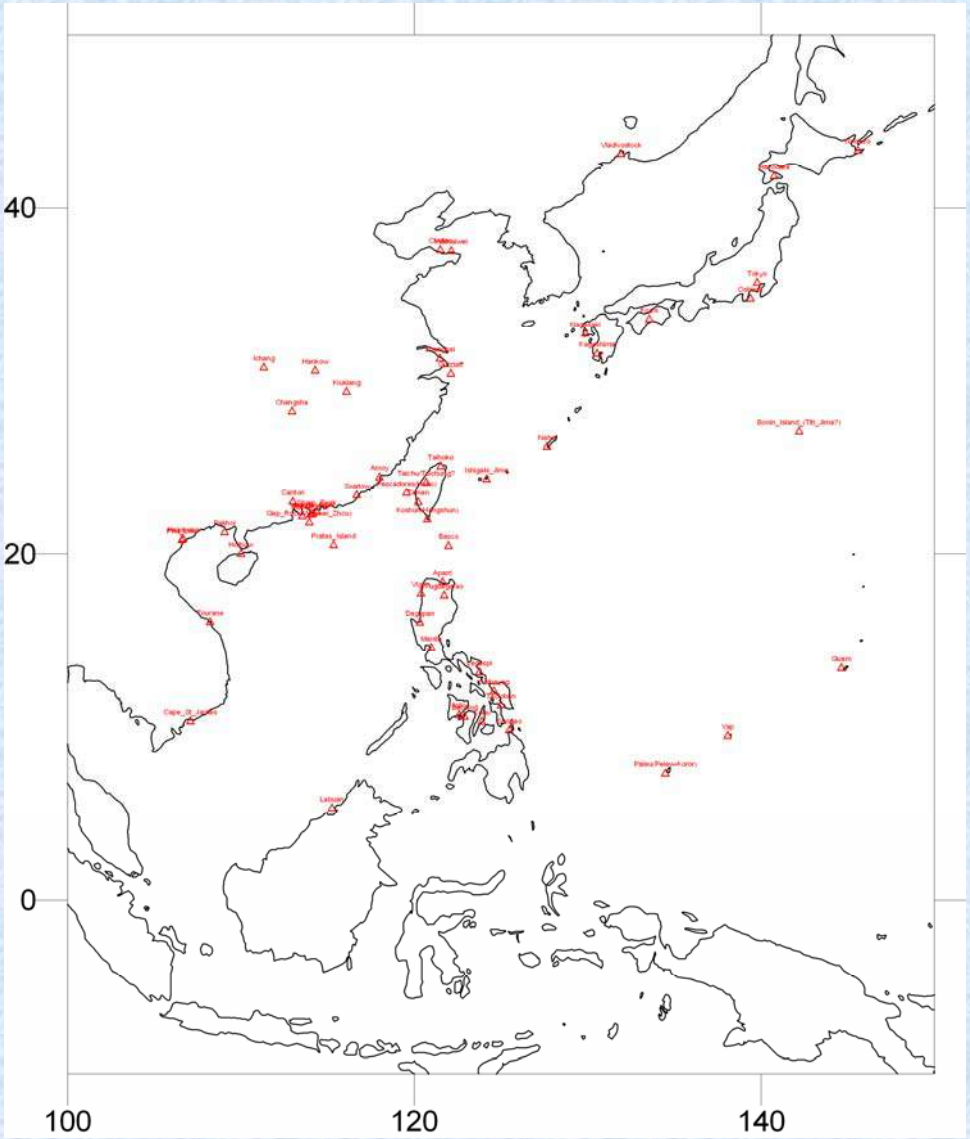
• It is thus well established, and is now an integral part of WP1 within the Climate Science for Service Partnership China (CSSP China).

ACRE China also links closely with ACRE SE Asia (Asia-Pacific Network for Global Change Research [APN]: 2013-2015), ACRE Pacific, the WMO/ACRE/GFCS **IN**dian Ocean **DA**ta **RE**scue (**INDARE**) initiative, the KNMI-BMKG **S**outheast **A**sian **C**limate **A**ssessment & **D**ataset (**SACA&D**) and **DiDaH** (Digitisasi Data Historis) project, plus the **J**apan **C**limate **D**ata **P**rogram (**JCDP**).



ACRE Regional Focii & associated data rescue projects

The international, UK and MO contributions to ACRE China over the last couple of years have been with the recovery, imaging and digitisation of historical daily to sub-daily terrestrial and marine data from various sources for stations in China and countries in and around the South China Sea and from the log books of ships in that region.M



China Coast Meteorological Register (CCMR) + Monthly meteorological bulletin
(sources: Hong Kong Observatory & Shanghai Observatory)

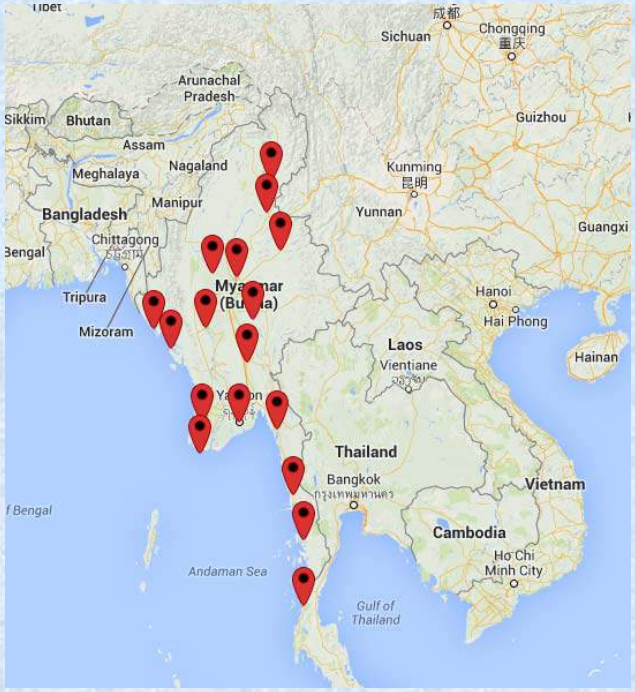
1873 -1893 (Hard Copy Met Office Archives)
1894 -1932 (NOAA Central Library Scanned images)
1906-1941 (Hard Copy Met Office Archives)

1894-1941 (*daily surface pressure observations*)
Digitised for ACRE by Alister Ferguson & Dan Bickle, supervised by Gail Kelly under original MO-CMA MoU

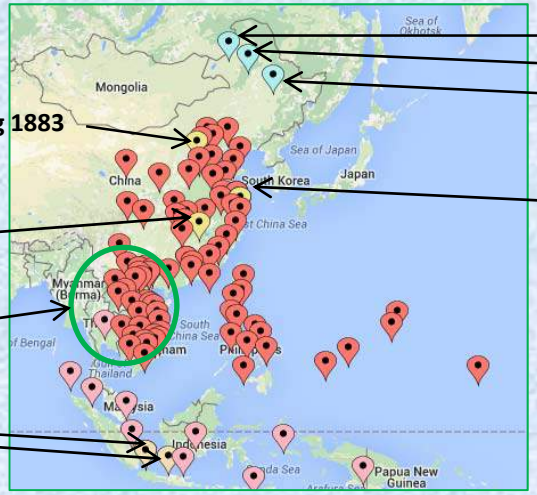
1873-1894 (*daily weather observations*)
Recovery & scanning by Robert Bickers students at the University of Bristol

Digitisation by Juerg Luterbacher's students at the University of Giessen, Germany plus independent via ACRE from Japanese colleagues (via Hisayuki Kubota)

In China, CMA/BCC has digitised historical sub-daily or daily air pressure records from 6 Chinese stations for the pre-1950 period, and these were provided to ACRE China in June 2014. Some data had already been digitized for Shanghai (1873-1941, UK) and Qingdao (1898-1914, Deutscher Wetterdienst [DWD] Germany), and efforts were made to find others in the CMA archives. Early year daily temperature data for the 6 stations were submitted to ACRE China in November 2014.



Burmese (Myanmar) daily weather observations 1920-1943 from Indian Daily Weather Reports (IDWRs) (source: Hard Copy Met Office Archives) (digitised by Gail Kelly)



Hailar 1899
Zalantun 1899
Harbin 1898
(Gail Kelly)

Tchang-kin-tchouang 1883
(Gail Kelly)

Zi-ka-wei 1876, 1880-1881
(Gail Kelly)

Hankou 1882
(Gail Kelly)

Daily pressure data for various stations in French Indo China 1898-1904
(Gail Kelly)

Batavia 1860
Semarang 1882-1891
(Gail Kelly)

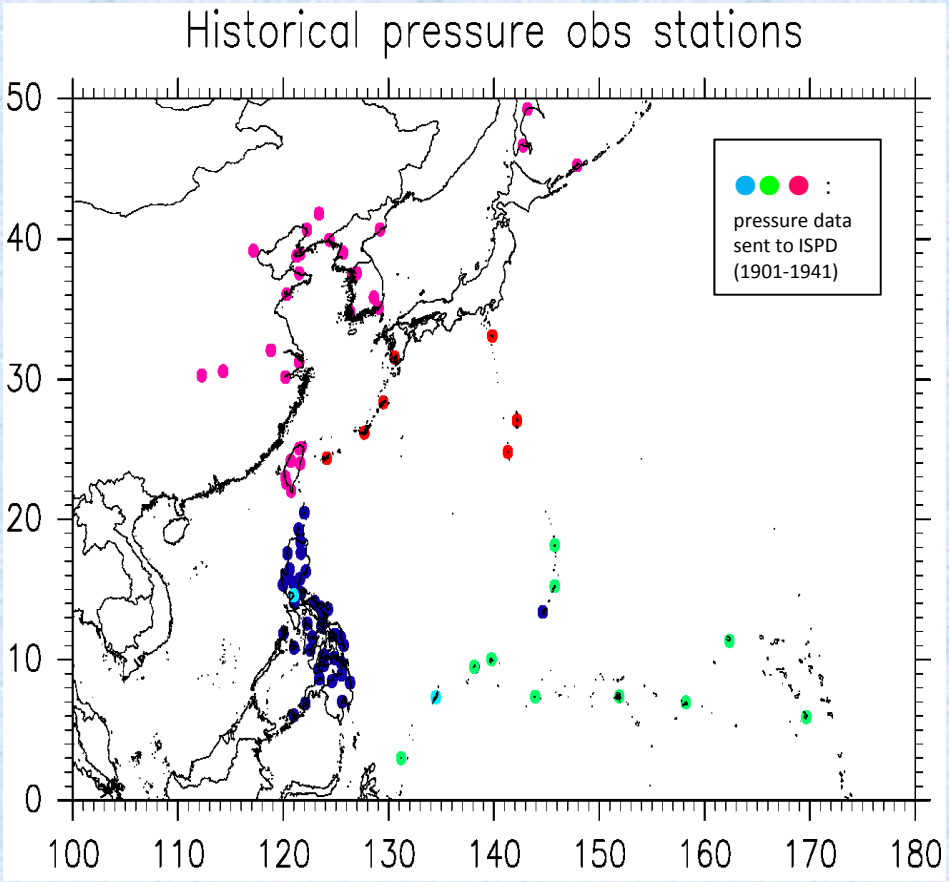
Various daily to sub-daily weather observations recovered & digitised for ACRE China

RED (China) = 1936-1937 (Jun Matsumoto's students under ACRE SE Asia)
RED (SE Asia & NW Pacific) = 1936-1940 (Jun Matsumoto's students under ACRE SE Asia)
LIGHT PINK (Indonesia & SE Asia) = 1936-1937 (Gail Kelly)

Similarly, digitised historical 19th-20th Century synoptic pressure data are being made available at no cost to ACRE China and its ACRE SE Asia focus by colleagues in Japan. This effort has particularly helped to:

- fill gaps in the daily *China Coast Meteorological Register (CCMR)* tabulations of weather variables being undertaken under ACRE China, and is leading to the completion of a full series of CCMR observations from 1873-1941

- link ACRE China to the new 5-year Japanese KAKENHI Project: *Asian monsoon variability during the past 120 years* [involving 8 Japanese universities; the **J**apan **A**gency for **M**arine-Earth **S**cience and **T**echnology (JAMSTEC)] and the **J**apan **C**limate **D**ata **P**rogram (**JCDP**).

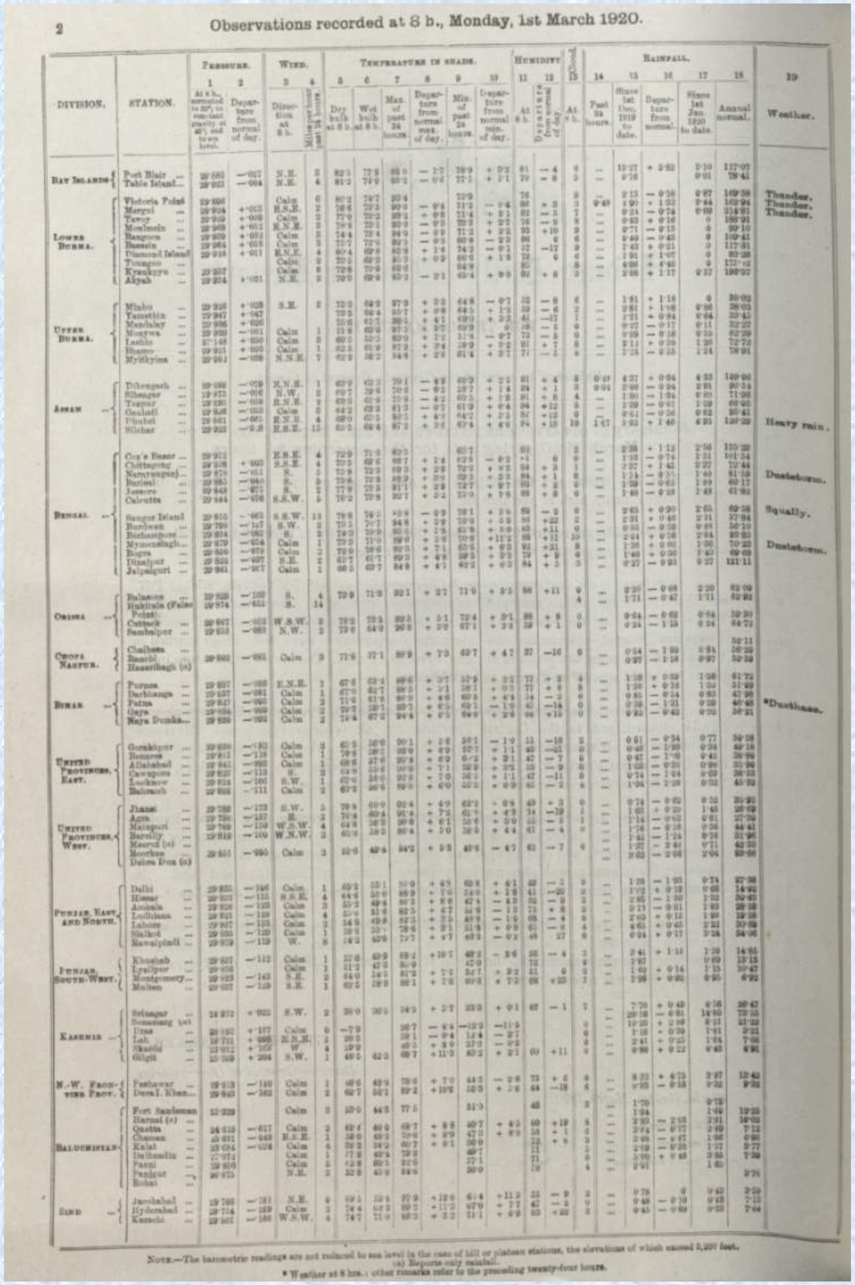


Station pressure data contributed to International Surface Pressure Databank (ISPD) v3 & v4 : 1901-1941

(Digitised data contributed by Japanese ACRE colleagues via Hisayuki Kubota)

They have also provided monthly pressure data from 34 stations in Taiwan, Korea, Manchuria, China, Sakhalin, and Kuril Islands from 1901 to 1941.

For the Indian Ocean and South East Asian region bordering China, the major accessible source of daily historical instrumental weather observations are Indian Daily Weather Reports (IDWRs): 1878 to the 1980s


2 Observations recorded at 8 h., Monday, 1st March 1920.

Imaging of Indian Daily Weather Reports (IDWRs) from countries and regions bordering China

Contract placed for imaging of IDWRs from periods missing in Met Office Archive holdings - June 1887-Dec 1888; Jul 1889-Dec 1919; Jul-Dec 1920; Jan-Dec 1921; Jul-Dec 1922; Jan-Jun 1923; Jul-Dec 1924; Dec 1925; 1931 and 1932. First volume shipped from NOAA to National Archives A1 for imaging (150-200 stations/day).

(Kevin Wood , University of Washington & US National Archives and Records Administration [NARA])

Historical marine weather data rescue & digitisation: WP1 – ACRE China

Building an inventory of marine data for the China region

Report produced: '*Sources of Historic Meteorological and Oceanographic Data for the North-West Pacific and Sea Areas of China sea South-East Asia*'.

Inventory of available logbooks under construction (Clive Wilkinson, University of East Anglia [UEA])

Historical US ship log book weather observations

Marine observations in US Archives from The Yangtze, North Pacific and China seas.

Inventory of relevant marine observations in US National Archives being produced.
(Kevin Wood , University of Washington and US National Archives and Records Administration [NARA])

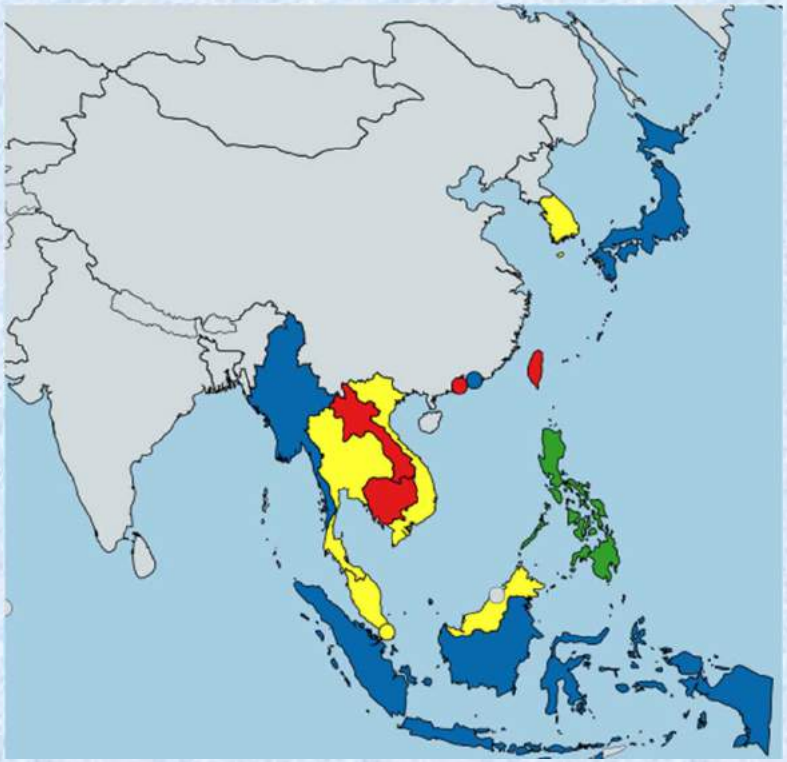
Digitisation of China region weather observations from:

1. ships in, and travelling between, Chinese ports (red markers) plus in the South China Sea and NW Pacific (Source: *Bulletin of International Simultaneous Observations,* US Signal Office: 1877-1884).

2. extracts of ship log books in Chinese seas from the Hong Kong Observatory in 1895

3. historical typhoons in published accounts 1840s-1940s. (various sources) (Gail Kelly)

Data rescue activities and needs in Myanmar, Laos, Cambodia, Thailand, Vietnam, Macau, Hong Kong, South Korea, Taiwan, The Philippines and Japan are linked to, and will provide data for, ACRE China and/or ACRE SE Asia, as are several countries that are part of the WMO/ACRE/GFCS **IN**dian Ocean **DA**ta **RE**scue (INDARE) initiative and the KNMI-BMKG **S**outheast **A**sian **C**limate **A**ssessment & **D**ataset (SACA&D).



Regional Data Liaisons & Collaborations

- NMHS visited under ACRE SE Asia (Fiona Williamson)
- NMHS visited under ACRE China (Fiona Williamson)
- Proposed visit in 2016 (Fiona Williamson)
- Collaborations via SACA&D, ACRE, INDARE

Recovery of Historical Weather Observations in the IDWRs for the Indian sub-continental region and 'Extra' India: the Indo-South East Asian Data Recovery Project

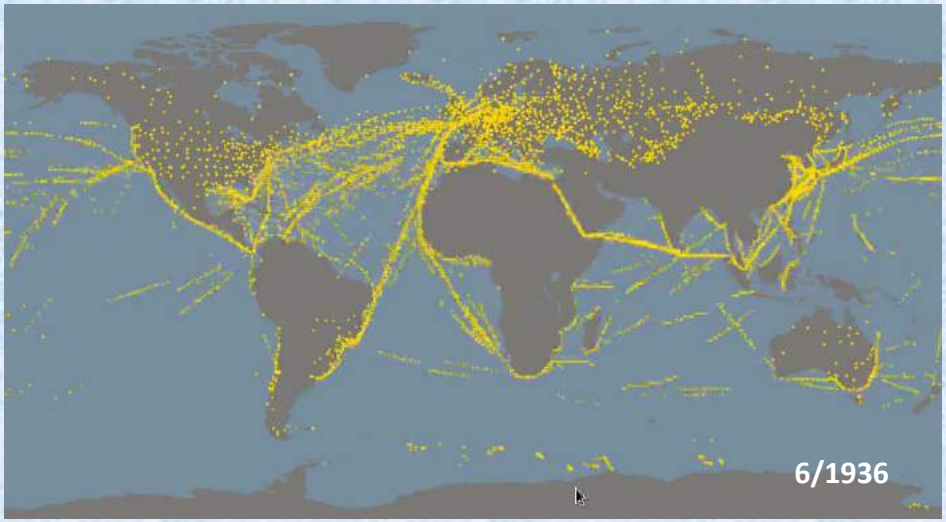
Proposal submitted to the Global Framework for Climate Services (GFCS) via the WMO/ACRE/GFCS Indian Ocean Data Rescue (INDARE) initiative

- **Engage the NMHS of Pakistan, Afghanistan, India, Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka, Seychelles, and the Maldives in the digitization and quality control of terrestrial and marine surface daily weather observations in the Indian Daily Weather Reports (IDWR).**
- **Digitize the scans of the IDWR volumes from 1878-1947 (prior to Indian Independence) in collaboration with (Juerg Luterbacher's students, University of Giessen, Germany over the next 3 years under ACRE China with funding from CSSP China.**
- **Make available the remaining 1948-1992 IDWR scans to NMHS in the Indo-South East Asian region from a central repository for them to aid the digitization and quality control of the data tabulated in them.**

ACRE Citizen Science: OldWeather and Weather Detective

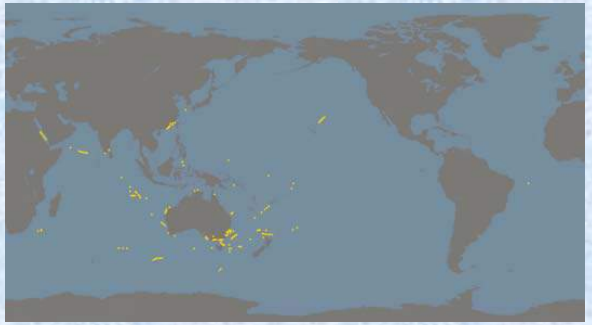
Capability expansion of the oldWeather.org citizen science platform under ACRE China

- New version of OldWeather for whaling logbooks is now operational (https://whaling.oldweather.org)
(Zooniverse, University of Oxford)



Additional historical marine weather observations (1888-1903)

- Ongoing Weather Detective (http://www.weatherdetective.net.au/)
(University of Southern Queensland & Australian Broadcasting Corporation [ABC])

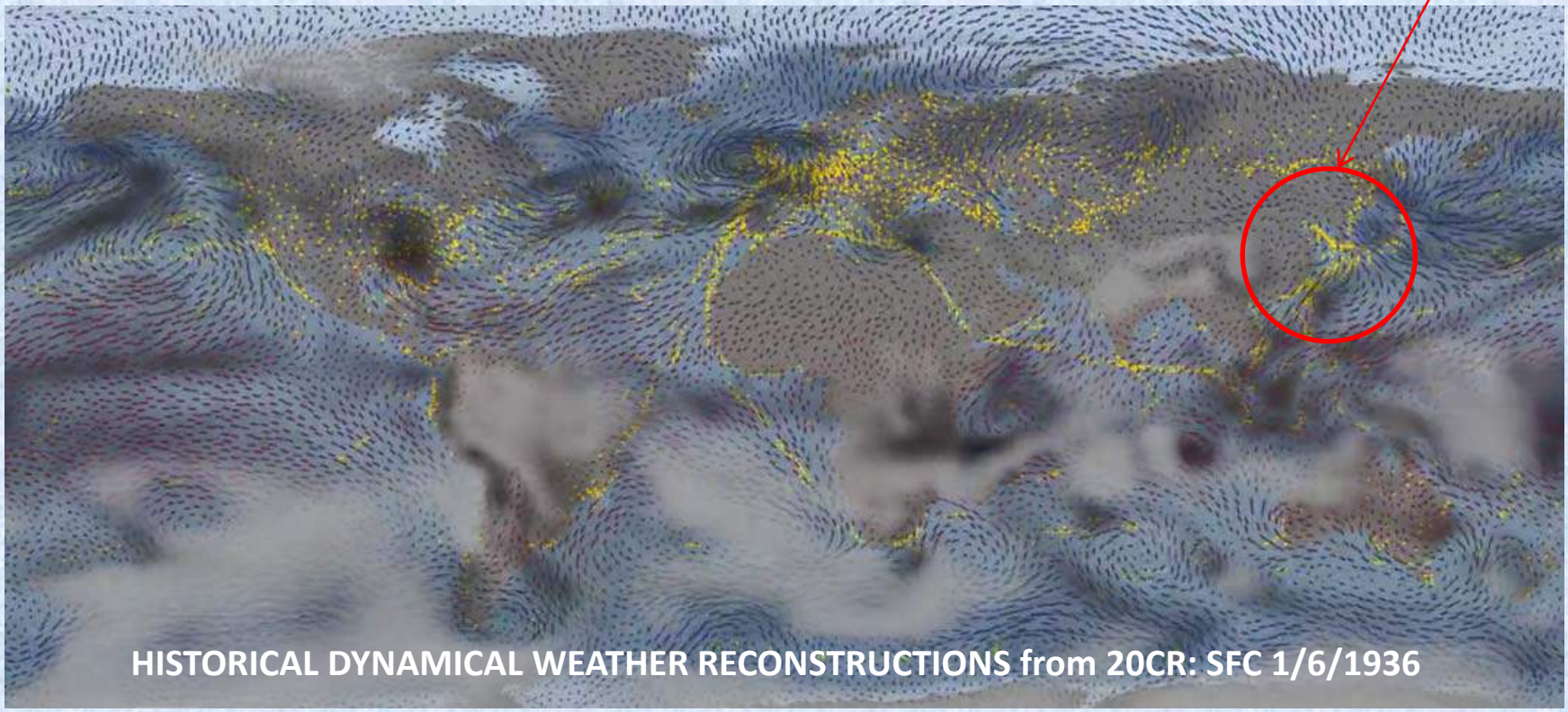


All of these data feed into existing international repositories, including the International Comprehensive Ocean Atmosphere Data Set (ICOADS), International Surface Temperature Initiative (ISTI), Global Precipitation Climatology Centre (GPCC), and the International Surface Pressure Databank (ISPD).

The surface weather observations are then available for assimilation into all global dynamical 4D reanalyses, especially the ACRE-facilitated 20th Century Reanalysis Project (20CR). The current version extends from 1850 to near-present, with various experiments ('scout runs') looking to push 20CR back into the early 19th century.

ACRE CHINA PROGRESS: ISPD & ICOADS DATA => REANALYSIS (20th Century Reanalysis [20CR])

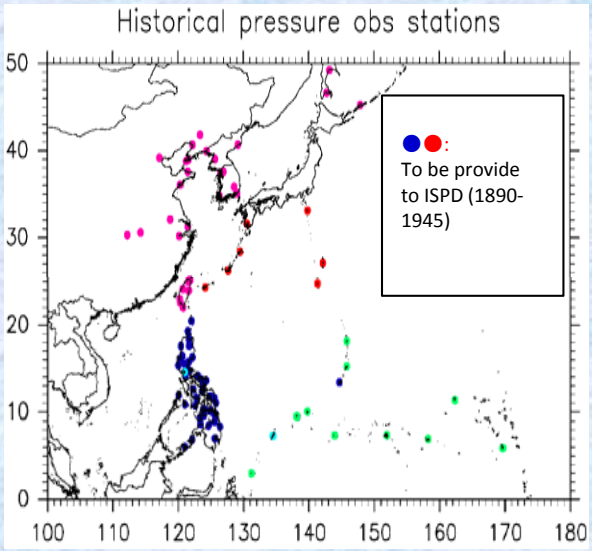
Improvements already in Chinese region with more observations from ACRE China, even more observations will make a major difference to the reconstruction.



Mean-sea-level pressure (contours, solid=low, dashed=high), 10m wind (vectors), 2m temperature (colours), and precipitation (black smudges) from version 2C of the Twentieth Century Reanalysis (20CRv2). Yellow dots mark the terrestrial and marine surface pressure observations used in the analysis. Grey fog marks regions where the reconstructed weather is very uncertain (because there are too few local observations).

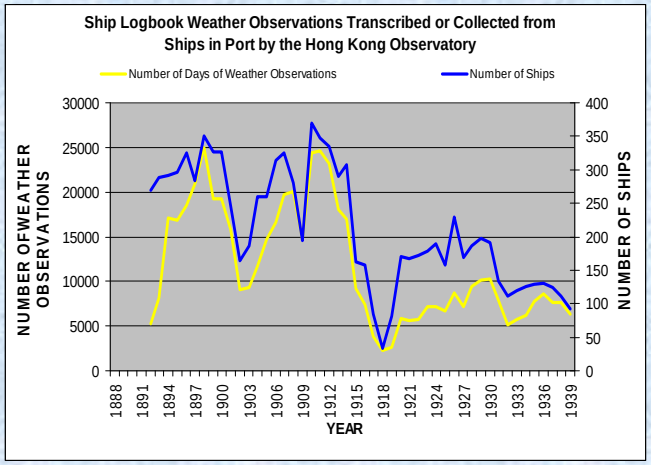
ACRE CHINA PLANS

Consolidation of all Chinese and SE Asian terrestrial data in conjunction with ISPD: What has been done, where are there still gaps?



Station pressure data to be contributed to International Surface Pressure Databank (ISPD): 1890-1945

Digitised by Japanese ACRE colleagues via Hisayuki Kubota



Search for the rest of the ship logbooks collected by the Hong Kong Observatory

In conjunction with Hong Kong Observatory

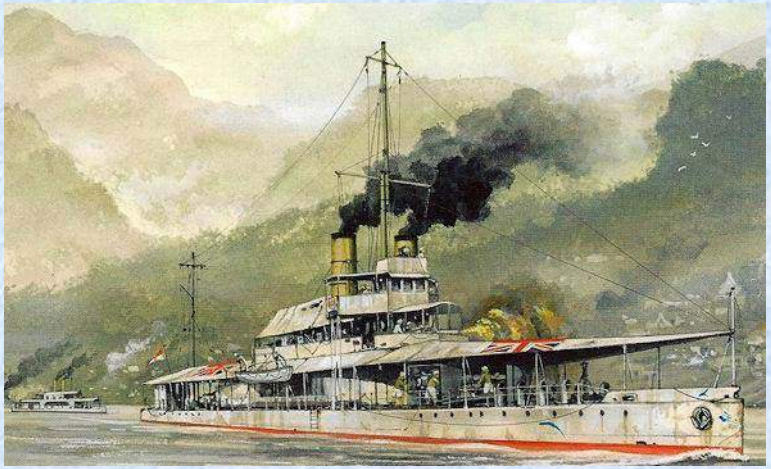
Royal Navy 'stationary' ships making weather observations:

Hong Kong 1842-1920
Shanghai 1861-1869

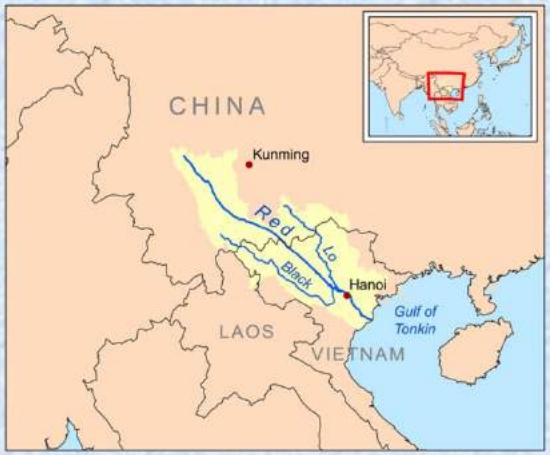
Scanning & digitisation of the weather data in their logs (Source: UK National Archives) (Gail Kelly)

Historical stations around the borders of China with long weather records

Yellow = mid 1800s =>; Blue => 1890s =>; Red = 1900s =>; Green = 1930s =>



Historical weather observations from ships on rivers



The **Yangtze Patrol, from 1854 to 1941**, was a prolonged naval operation to protect American interests in the Yangtze River's treaty ports and the Yangtze as far inland as Chungking, (Chongqing), and beyond. By the 1920s some were on the **Yellow River**.

With the increase in trade, the **Royal Navy established the China Station in 1865 to patrol the coastal and treaty ports** plus up the **Yangtze** and **Xi rivers** in order to protect British traders and interests.

Inventory of US Yangtze Patrol vessel log books 2015-2016 (Kevin Wood, University of Washington & US National Archives and Records Administration [NARA])

Scanning and digitisation 2016-2017 (Kevin Wood University of Washington & US National Archives and Records Administration [NARA])

Inventory of UK Royal Navy vessels patrolling Chinese coasts, ports & rivers (Clive Wilkinson, University of East Anglia [UEA])

What of ships of other colonial nations?
Germany, France (Red, Lo, Black Rivers), Italy, Japan, Austro-Hungarian, Portugal, Russia (Clive Wilkinson, University of East Anglia [UEA])

1. **Propensity to use the Met Office Providing REgional Climates for Impacts Studies (PRECIS) (http://www.metoffice.gov.uk/precis) regional climate modelling system to downscale 20CR output down to finer resolution (25 km to 100 m) over China.**

2. **Work towards finalising the inventory of all available historical logbooks in the Chinese region (Clive Wilkinson, University of East Anglia [UEA]).**

3. **Continued work on enhancing the capability of the oldWeather.org citizen science platform (Zooniverse, University of Oxford).**

4. **Complete the imaging and digitisation of the weather observations in the IDWRs and work on historical US ship log book weather observations (Kevin Wood, University of Washington and US National Archives and Records Administration [NARA]), Juerg Luterbacher's students at the University of Giessen).**

5. **Continue to recover and digitise historical weather records for China and the surrounding SE Asian region (Gail Kelly, Juerg Luterbacher's students at the University of Giessen, Fiona Williamson, National University of Singapore, Japanese ACRE colleagues)**

6. **Incorporate newly digitised historical weather observations into international datasets for reanalyses (especially 20CR with Gil Compo, NOAA ESRL and CIRES University of Colorado)**

7. **Liaise with CMA and Chinese partners in all of the above activities.**

ACRE China regional workshop, Beijing, 23rd – 25th August 2016

Centre for Marine-Meteorological and Oceanographic Climate Data (CMOC) China, Tianjin, 29th-31st August 2016

At the request of CMA/BCC, an ACRE China regional workshop will be held in China from the 23rd – 25th of August 2016. Both ACRE China and ACRE SE Asia are actively engaging with various National Meteorological Services (NMS) in SE Asia involved in data rescue and digitisation to secure their attendance and participation in this ACRE China regional workshop.

Of the countries engaging in data rescue activities in the region with links to ACRE China and ACRE SE Asia, Burma, Laos, Cambodia, Thailand, Vietnam, Macau, Mongolia, Hong Kong, South Korea, Taiwan, Indonesia, Malaysia and Japan, most of them have indicated that they would like to attend the 2016 ACRE China regional workshop, and this information has been passed onto CMA/BCC.

During the following week, there will be a Centre for Marine-Meteorological and Oceanographic Climate Data (CMOC) China meeting in Tianjin (134 km SE of Beijing) to discuss the latest developments with a CMOC China focusing on historical metadata and data rescue, developing metadata schema for integrated and specialized datasets, a demonstration data integration project focusing on the Asia Pacific, higher quality control, and regional capacity development, etc.