White paper on an International Data Rescue Portal (I-DARE)

Executive summary
This white paper aims at stimulating the development of an International Data Rescue Portal (I-DARE). It describes the idea and benefits of I-DARE, recommends items to be displayed on such a Portal, suggests two possible structures for I-DARE's integration into the WMO Information System (WIS), presents resource requirements, and proposes a timeline for further actions. The paper also briefly assesses several existing DARE websites in terms of content, functionality and layout, and provides some initial content for the I-DARE portal.

1. Introduction

Importance of DARE
Data Rescue (DARE) is the ongoing process of securing current and past hard copy data, and imaging and digitizing it into computer compatible forms. This both prevents the data from being lost due to deterioration of the original medium or inaccessibility of obsolete digital media formats, and provides easy access to the data in convenient electronic formats. By improving the availability of climate observational data DARE is critically important for enabling the assessment of natural variability, detection and attribution of climate change, and for obtaining long records of climate data for various applications. It is therefore given a high priority within WMO Programs, the Global Framework on Climate Services (GFCS), and beyond.

I-DARE and WMO
During its meeting in October 2013, the CCl Management Group was informed of, and welcomed, an OPACE-I initiative to develop a plan for the establishment of an International Data Rescue Portal (I-DARE) that is expected to serve as a single entry portal to DARE worldwide, see ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/tc_reports/english/pdf/1054_en.pdf, section 4.6. This initiative responds specifically to ToR N°4 'To set up an International Data Rescue Web Portal' of CCl's TT-DARE, see http://www.wmo.int/pages/prog/wcp/ccl/opace/opace1/et-dare.php. Preliminary discussions about a possible model have been conducted at OPACE-, Task Team and expert levels, with general agreement that the I-DARE portal should be a well-structured and attractive source of information including: (i) inventory reports of rescued and to-be-rescued data; (ii) guidance on best practices, technology and tools; as well as (iii) links to existing data rescue sites. WMO provides a webpage on DARE via http://www.wmo.int/pages/prog/wcp/wcdmp/CDM_2.php.

I-DARE and GFCS
I-DARE is part of strengthening the Observations and Monitoring component of GFCS. The aim of this component is to establish a strong foundation for observational data and related data management to underpin climate services. A

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diagram of the GFCS components is shown in Figure 1. In the implementation plan of GFCS (http://www.gfcs-climate.org/implementation-plan) one of the high priority projects is the support to existing and new global and regional data rescue and digitization initiatives. For the implementation of these projects it is recommended to work with existing entities, to build upon activities already underway, to identify and engage with the organizations most involved in the priority activities, and to learn lessons from the initial projects in order to move steadily toward sustainable and valued service offerings. To coordinate DARE activities globally, I-DARE is proposed as a single point-of-truth site, summarizing and providing a discoverability facility for DARE activities globally, and providing best-practice guidance on DARE techniques.
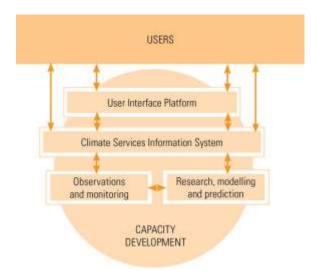

Figure 1 – Global Framework for Climate Services (GFCS) components diagram

Applications and value of DARE
Rescued climate data has enormous value to humankind, as it can be applied to improving services in various climate-sensitive societal sectors, such as agriculture, coastal defence, water resource management, human health, disaster risk reduction, energy, construction, transport, and insurance. Conversely, these sectors might themselves provide sources for unique meteorological and other data that could be digitized and used as well. These could include measured data, such as agricultural soil temperature and moisture at various depths, or impacts data, such as on crop yields or river navigability. Certain sectors have specific indices associated with them, for instance: the length of the growing season and the number of frost days (agriculture /food security), the occurrence of heat waves or cold waves (health), and the number of consecutive dry days (water management). Long time series resulting from DARE activities can put present climate extremes in a historical perspective. The scientific importance of DARE is considered in Annex 6.

Aim of this paper
The aim of this paper is to outline the concept of, and stimulate the development of, an I-DARE portal. The paper should enable CCl experts to understand the idea of I-DARE, identify its benefits and get an idea of what I-DARE could look like.

2. The idea and benefits of I-DARE

The idea of I-DARE is to provide one portal for DARE activities worldwide. The portal aims to stimulate new DARE activities and promote discoverability of, and convergence between, existing DARE activities. The establishment of an I-DARE portal has many benefits. In particular, it is intended that I-DARE:

- gives at a glance a global overview of (to be) rescued data, including terrestrial, marine, surface, and upper air data;
- enhances visibility of existing DARE activities;
- stimulates sharing relevant information, experience, and software;
- promotes the use of (rescued) climate data;
- stimulates the start of new DARE activities on identifying, imaging and digitizing historical data and associated metadata;
- helps focus new DARE activities to regions where DARE is most urgently needed to address gaps in the historical record;
- helps to converge the contents of new and existing DARE-related websites;
- helps to avoid duplicating DARE activities;
- stimulates donations to support DARE;
- stimulates help by volunteers ('citizen science').

3. Existing DARE-sites

A large number of DARE projects exist worldwide, and many of these projects provide information on a website. The websites of several DARE projects are listed and briefly evaluated in Annex 1. The involvement in I-DARE of major DARE projects, such as ACRE and IEDRO, would be of value.

4. Availability of the data

Although some DARE sites provide metadata, the rescued data themselves are usually not available via the DARE sites. In some cases the rescued data themselves can be made available via websites where the data from different (DARE) sources are combined and stored, such as the Historical Instrumental Climatological Surface Time Series of the Greater Alpine Region (HISTALP), http://www.zamg.ac.at/histalp/, the European Climate Assessment & Dataset (ECA&D), http://www.ecad.eu/, and its extension International Climate Assessment & Dataset (ICA&D), http://eca.knmi.nl/icad.php.

5. Items to be displayed at the I-DARE portal

Items to be displayed at the I-DARE portal are highlighted in Annex 2.

6. Governance

I-DARE has been initiated by CCl, but may benefit from the involvement of other WMO Technical Commissions, particularly the Commission for Basic Systems (CBS), the Commission for Hydrology (CHy), and the Joint WMO-IOC Commission for Oceanography and Marine Meteorology (JCOMM). There is also a link to GFCS and

its Intergovernmental Board on Climate Services and related substructures, as data rescue activities are also important for domains beyond the WMO community.

In executing I-DARE, the I-DARE portal needs an entity for its implementation and sustained operation. The envisaged ET-DARE is recommended to play an active advising role. At the regional level, Regional Climate Centres (RCCs) could play a role on relevant topics, such as co-ordination and capacity building.

7. I-DARE as part of the WMO Information System

I-DARE will be integrated with the WMO Information System (http://www.wmo.int/pages/prog/www/WIS/). WIS is WMO's single coordinated global infrastructure for managing and exchanging weather, climate and water information. Existing centres within WMO Member States that comply with the WIS-requirements might be designated as one of the three types of centres forming the core infrastructure of WIS: Global Information System Centres (GISCs), Data Collection or Production Centres (DCPCs), and National Centres (NCs) (see Figure 2).
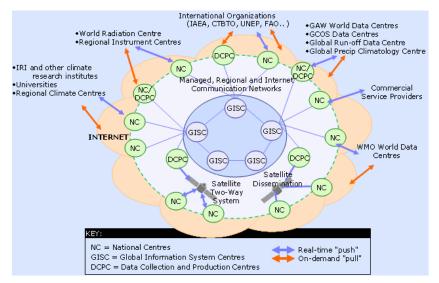

Figure 2 - Diagram showing WIS core components and information exchange

It is proposed that I-DARE will become part of WIS, either as a dedicated Data Collection or Production Centre (DCPC), or attached to existing (and future) DCPCs, such as WMO Regional Climate Centres. Possible models for I-DARE within the WIS framework include:

1) Distributed: I-DARE becomes the central coordinating site for information on date rescue activities worldwide, which is connected to several DCPCs where rescued data are collected, stored and distributed from National Centres (NCs) and international activities.
2) Centralized: I-DARE becomes a DCPC itself.

A third possibility is a gradual transition from 1) to 2). Each structure has its advantages and disadvantages. The distributed structure can probably be realized with less initial efforts and time. A possible disadvantage of a distributed structure is that users might need to visit more than one site to find what they need. The

centralized structure might more easily ensure uniformity and sustainability, although the example of ICA&D, which is hosted by RCCs and potential candidate RCCs in four different regions around the world, shows that uniformity and sustainability can also be realized in a distributed structure.

The existing references for recognizing I-DARE as part of WIS are the WIS Manual (http://library.wmo.int/opac/index.php?lvl=notice_display&id=9254) and the Guide on WIS (http://library.wmo.int/opac/index.php?lvl=notice_display&id=6856). The Commission for Basic Systems (CBS) determines entities to be integrated into WIS, analyses DCPC service offerings, and formulates recommendations in close collaboration with relevant Technical Commissions, where appropriate.

In summary, WIS plays a twofold role regarding I-DARE: facilitating (i) integrating I-DARE within the WIS structure, and (ii) searching for, and accessing, rescued data.

8. Resources

At the global level, the I-DARE portal needs to be designed, developed, implemented, populated and sustained, and necessary resources need to be mobilised. Once implemented, the portal requires -on a voluntary basis- web hosting including manpower for maintenance, and resources for a regular validation of existing content as well as adding new content. An online I-DARE Manual of Operations needs to be developed. At the regional level, there will be capacity development for entities linking to I-DARE, e.g. in the form of workshops. Expert meetings will be needed for the coordination of these and other I-DARE activities. Regional entities, such as WMO Regional Climate Centres (RCC) should play a prominent role in facilitating DARE activities; relevant RCC activities might comprise (i) coordination services, (ii) support for resource mobilization or (iii) the implementation, operation and maintenance of DARE-related platforms, such as ICA&D.

9. Data Policy

WMO promotes the free and unrestricted exchange of data. Accordingly, and considering the outstanding importance of rescued data in extending existing databases, it is expected that rescued data will be registered within, and made accessible through, WIS. It has to be noted, however, that national data policies might place conditions on the use of rescued data. A well-received approach to improve the situation in such cases has been introduced by ICA&D; this Portal allows Members to provide their data to the ICA&D host institute with the condition that the data itself shall not be shared but they can be used to generate products, such as indices, which are subject to a wider distribution.

10. Proposed timeline

- April 2014: Inform CCl TT DARE and CCl OPACE-I co-chairs of I-DARE white paper and request comments and endorsement
- July 2014:   Inform CCl about progress made on I-DARE and request the proposed ET-DARE to coordinate the further evolution of I-DARE based on the white paper
- September 2014: ET-DARE meeting to produce requirements for project implementation (funds, manpower, IT specs, solution central or distributed, WIS requirements, country hosting requirements, others)
- December 2014: A concept to be worked out by ET-DARE or a designated expert appointed by ET-DARE; WMO letter to Members (through may be GFCS Office for trust funds for implementing / hosting I-DARE) informing of the I-DARE concept and inviting offers for I-DARE implementation and hosting
- May 2015: Prototype on a test web page available (tbc)
- June 2015: Side meeting at Congress on DARE / I-DARE
- January 2016: Integration into WIS through CCl and CBS

Acronyms
CBS: *Commission for Basic Systems*
CCl: *Commission for Climatology*
DARE: *Data Rescue*
DCPC: *Data Collection or Production Centre*
ECA&D: *European Climate Assessment & Dataset*
GFCS: *Global Framework for Climate Services*
GISC: *Global Information System Centre*
ET-DRDCR: *Expert Team on Data Rescue and Digitization of Climate Records*
ICA&D: *International Climate Assessment & Dataset*
I-DARE: *International Data Rescue Portal*
NC: *National Centre*
OPACE: *Open Panels of CCl Experts*
RA: *Regional Association*
TT-DARE: *Task Team on Data Rescue*
WIS: *WMO Information System*

Annexes

Annex 1.   *Existing DARE websites*
Annex 2.   *Items proposed to be displayed at the I-DARE portal*
Annex 3.   *Recent developments on data rescue*
Annex 4.   *'Golden rules' for data rescue*
Annex 5.   *Two examples of DARE results*
Annex 6.   *Scientific importance of DARE.*

Annex 1. Existing DARE websites

A large number of DARE-related activities exist worldwide. The websites of some DARE activities are given below. These websites have been assessed briefly in terms of content, functionality and layout. Several aspects of the different sites, which could be applied to new (and existing) DARE websites, are summarized separately below:

1. ACRE, Atmospheric Circulation Reconstructions over the Earth
   http://www.met-acre.org/
   Contact point: Rob Allan
   ACRE considers several aspects of atmospheric circulation reconstructions, of which DARE is only one aspect. ACRE is collaborating with several data rescue projects to obtain data hidden away in NMHS archives, ship's logs, etc. The data are available at various depositories. The DARE-related information is provided on one webpage.

2. CLIMARC, Extending the computerized Australian climate archive
   http://www.bom.gov.au/climate/how/climarc.shtml
   Contact point: Meaghan Flannery
   CLIMARC is concisely described on one webpage, including an informative figure that shows the amount of stations that have been digitized by CLIMARC as well as the amount that are not yet digitized.

3. DiDah, Digitisasi Data Historis
   http://www.didah.org/
   Contact point: Yunus Swarinoto
   The information is given on small pages fitting (nearly) on a screen. A summary of the rescued data is given. A link is given to the website where the data are made available, together with data from other sources,.

4. IEDRO, International Environmental Data Rescue Organization
   http://www.iedro.org/
   Contact point: Richard Crouthamel
   This good-looking website gives extensive information on IEDRO in an organized way. The site includes a motivation for doing DARE, gives information for volunteers and on donations, and provides a clickable map that provides information on projects.

5. ISTI, The International Surface Temperature Initiative
   http://www.surfacetemperatures.org
   Contact point: Peter Thorne
   The data rescue activities under ISTI revolve largely around pulling together existing digitization efforts into a central databank and attempting to ensure against redundancy of effort.

6. MEDARE, Mediterranean Data Rescue Initiative (WMO)
   http://www.omm.urv.cat/MEDARE/
   Contact point: Manola Brunet
   The website gives information on several aspects of MEDARE on separate pages, such as a brief description of the project, the terms of reference, documentation,

and a description of how to join the project. Metadata are available for users, who need to register.

7. NOAA Central Library Foreign Climate Data
    http://www.lib.noaa.gov/collections/imgdocmaps/data_rescue_home.html
    Contact point: NOAA library
    A concise website, with easy access to a large volume of scanned images with meteorological data from different parts of the world.

8. RECLAIM, Recovery of Logbooks and International Marine Data project:
    http://icoads.noaa.gov/reclaim/
    Contact point: Scott D. Woodruff
    A concise, informative website with documentation on marine data rescue. The site provides a large collection of scanned images. Digitized data are merged into the International Comprehensive Ocean-Atmosphere Data Set (ICOADS).

A brief overview of RA-VI DARE activities is provided at http://www.climatol.eu/DARE. In addition an overview of data repositories and information on homogenization packages are provided.

For more DARE activities see the review from 2008 http://www.wmo.int/pages/prog/wcp/wcdmp/wcdmp_series/documents/ET13reportFinal.pdf. A paper describing the scientific importance of data rescue has been written by Brunet and Jones (2011), of which the abstract and a characteristic figure is provided in Annex 6.

Each of the above mentioned DARE websites has its advantages with respect to content, functionality, layout and language. It seems useful for any new (and existing) DARE websites to apply at least the following aspects (references given in parentheses):

Content:
*   Provision of at least some rescued images (7)
*   Short introduction to the project (all)
*   Metadata (e.g., locations, variables, periods) available (6, after registration)
*   Link to website where (meta)data are made available (3, 4)
*   Information on what has been done and on what is to be done (2). This should include also what data are known to exist but need to be digitized, and also what may exist somewhere, but is not currently known. For instance, data from former colonial countries may be held in the former governing country's archives.
*   Information for volunteers (1, 4)
*   Information on donating (4)
*   Link to background documents (2, 6, 8)
*   Description of benefits of DARE (4)
Functionality:
*   A map showing locations of the data rescue activities, with color-codes indicating items such as the status of the rescue (4, 6)
Layout
*   Use of small pages, fitting (almost) on a screen (3, 6, 7, 8)
*   Links to various topics provided at the top (preferred) or side of all pages (3, 4)

- Some pictures/figures on the homepage (2, 3, 4, 7, 8)

Language
- The text on the website should be efficient, pertinent, compelling, concise, with no jargon; an English version of the website is highly recommended.

Annex 2. Items proposed to be displayed at the I-DARE portal

The I-DARE portal should consider the following items in particular:

- General
    - Information should be concise and relevant.
    - The language should be efficient, pertinent, compelling and concise with no jargon.
    - The portal should preferably be available in the six official languages of WMO (Arabic, Chinese, English, French, Russian and Spanish).
    - A search facility would be useful.

- Layout
    - Provide links to various items at the top (preferred) or side of all pages, cf. http://www.iedro.org/.
    - Web pages should preferably fit on one screen.
    - Show some relevant and informative photos or figures, possibly in form of a slide show.

- Items to be considered
    - The idea and benefits of I-DARE
      Based on benefits as mentioned in section 2 above.
    - Reasons to do data rescue
      Like the tab on this item on http://www.iedro.org/
    - Global overview of DARE-activities
      A global clickable map of DARE-activities, with (color)codes giving initial information on various aspects, e.g. the status (to be rescued, ongoing, finished), the extent of the project (number of stations, amount of data), the (meteorological) variables that are considered, their time period, and information on the original data source. These aspects are likely not to be captured by one single symbol, but might be made visible after clicking on the global map at a DARE-location. The map should also provide links to the sites of the DARE-activities.
      In realizing this, I-DARE should take the lead; the information should be obtained from the DARE projects, and should be checked and put on the map by I-DARE. An appropriate online DARE registry for information upload and download should be considered in this respect.
    - DARE success stories
      A short description of several of the DARE websites mentioned in Annex 1 needs to be given, including for ACRE, IEDRO and MEDARE. Websites where rescued data are made available (e.g. ECA&D) should be explicitly mentioned too. Existing DARE websites should provide graphical information on meteorological time series or patterns that have been extended or improved thanks to data rescue. Two examples are given in Annex 5. In addition, information can be given on the amount of data that has already been or still needs to be rescued.
    - Easy access to the (meta)data
      I-DARE should provide access to as many rescued data and metadata as possible. The data should be easily accessible via a distributed or centralized approach as described in section 6 above.
    - Data waiting to be rescued
      Starting new DARE activities should be made as easy as possible. Potential

starters should be provided with information about data to be rescued (worldwide) including prioritization.
- o Guidelines on data rescue
  The WMO Guidelines on Data Rescue from 2004 are still valid, see http://www.wmo.int/pages/prog/wcp/wcdmp/documents/WCDMP-55.pdf Some recent developments are mentioned in Annex 3. 'Golden rules' on data rescue are provided in Annex 4.
- o Information for new and existing DARE websites
  The information provided through DARE websites can be a subset of the information given through the I-DARE website. The I-DARE website might provide direct access to the data as well as some concise (graphical) results from data rescue activities. Also, (some of) the positive aspects of existing DARE websites could be applied (cf. Annex 1).
- o Tools
  New DARE activities should be provided with easy access to guidance on e.g., setting up a DARE activity, scanning images, digitization software, storing the data, and implementing a website according to the I-DARE recommendations. Examples of tools are the automatic curve extraction and strip chart digitization programs, described in Annex 3.
- o Staff engaged with DARE
  A list of contact points for DARE projects and their email addresses.
- o I-DARE contact point
  The name of a contact point should be provided, including a means to provide feedback to this contact point.
- o Web forum
  People working on DARE should be enabled to exchange information on all aspects of DARE.
- o Donations
  The benefits of data rescue should be promoted to potential donors (via concise, attractive text, images and videos). The IEDRO website is a good example. Donors might be grouped into different categories, depending on the extent of their contribution, and might be mentioned on the website.
- o Citizen volunteers
  Contributions by volunteers can be stimulated by making reference to existing citizens science projects, such as http://www.oldweather.org, https://sites.google.com/site/historicalclimatedata/canadian-historical-data-typing-project, and http://www.data-rescue-at-home.org/, and by enabling volunteers to join a specific DARE project, via the site of that project, such as http://iedro.org/form/volunteer_form.php.
  The names and efforts of volunteers could, if appreciated, be mentioned on the website.
- o References
  A list of relevant scientific and technical papers, guidelines, and other relevant documents should be given (cf. links and information sources identified in this I-DARE white paper).
- o Upload possibility
  It is envisaged to facilitate easy upload on DARE activities onto the I-DARE site by responsible persons from DARE projects.

Annex 3. Recent developments on data rescue

New topics and tools relevant for data rescue have emerged since the publication of WMO's Guidelines on Climate Data Rescue in 2004 (http://www.wmo.int/pages/prog/wcp/wcdmp/documents/WCDMP-55.pdf), some of which are mentioned below:

Automatic curve extraction
Van Piggelen et al. (J. Atmos. Oceanic Technol., 28, 891–906, 2011) developed a method that largely automates the labor-intensive extraction work for large amounts of rainfall strip charts and paper rolls. The charts and rolls are scanned to digital images, and automatic curve extraction software is applied to determine the coordinates of cumulative rainfall lines on the images.

Citizen science
The widespread access to Internet can strongly enhance the progress of data rescue via Citizen science projects. Examples are http://www.data-rescue-at-home.org/ and http://www.oldweather.org/. Another possibility to involve the public is via playing computer games, such as http://scienceathome.org/.

MEDARE
MEDARE's Working Group 2 is involved in DARE techniques and procedures. For a list of its members see
http://www.omm.urv.cat/MEDARE/working-group-2.html

Strip Chart Digitizer Program
IEDRO's Strip Chart Digitizer program
(http://www.iedro.org/en/datarescue/stripchartdigitizer.html) retrieves data from scanned strip chart images and converts them into an accurate computer-readable format.
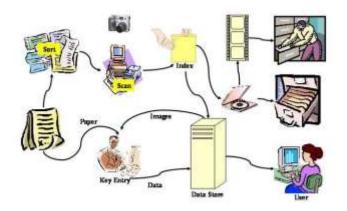
Text recognition programs
Optical Character Recognition (OCR) allows typewritten or printed text to be digitized. Intelligent Character Recognition (ICR) is an advanced OCR that allows (handwritten) fonts to be digitized. Still more advanced is Intelligent Word Recognition (IWR), which allows handwritten text to be digitized. For data rescue ICR and IWR are potentially very useful. However, the accuracy of ICR, and even more that of IWR, is still limited, although the technology keeps improving. A relevant aspect is that some software uses neural network techniques to improve its performance, which means that accuracy increases the more often the software is applied.

MCH
The MCH Climate Database Management System includes a module to automate the digitisation of analog records on strip charts

Annex 4. 'Golden rules' for data rescue

Some 'golden rules' for data rescue are given below. More information can be found in http://www.wmo.int/pages/prog/wcp/wcdmp/documents/WCDMP-55.pdf
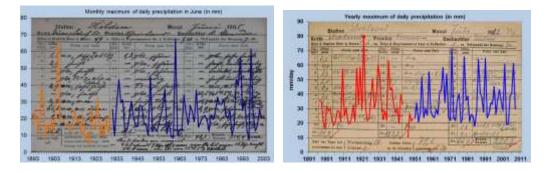

1. Data rescue is a large task, but a small beginning can be started almost immediately. Prioritization is necessary right from the beginning in accordance with scientific needs and available resources.
2. Search and locate the data, know where they are.
3. Assess the situation facing the survival of the collection of documents and assign priorities.
4. As a priority, securing hard copy records in safe locations, as digitization may not always be practicable.
5. Construction of inventories of data holdings, including undigitised data
6. Check and document which data have been rescued already – avoid duplication.
7. Make electronic images. A digital camera has many advantages compared to a scanner, such as speed, price and available software for the automated generation of file names.
8. Make spreadsheets with information of each image, including its filename.
9. Imaged files must be viewed and checked before being written to the final storage medium.
10. Apply quality control. Have all data been imaged? Are all images sharp? Have all images been stored? Is the spreadsheet complete?
11. The next step is digitizing the imaged data. Be aware that this is probably the most tedious and difficult part of data rescue.
12. Digitizing often means keying, i.e. typing on a keyboard; optical pattern recognition programs might be helpful, but cannot deal with many handwritings, especially those from old times.
13. Prioritization for keying imaged or not yet imaged data (variables, regions and periods) should be based on scientific considerations.
14. As for the images, check the keyed data and apply quality control.
15. Retain original documents and images (or copies of them) after finishing the digitization process.
16. Data series of rescued data should be tested on their meaning, reliability, and homogeneity.

17. Generate standard climate products from quality-controlled rescued data such as tables, climate averages and graphs.
18. The data should be made available to users in a conveniently accessible form.
19. Ensure regular migration of electronic data archives to new storage media and formats in order to maintain readability into the future.
20. Disperse the rescued data by providing copies, particularly to the countries from which the data originate.
21. Ensure an adequate backup strategy.
22. Remember that you are not alone, as many groups around the world are doing data rescue.

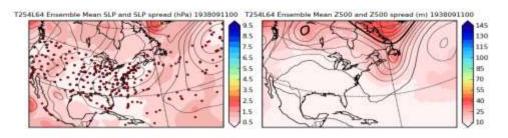## Annex 5. Two examples of DARE results

DARE example 1

The left graph shows the monthly maximum of daily precipitation for June 1893-2002 at station Hilden in Germany. The blue curve shows the already available data since 1931 while the orange curve represents the newly digitized part (1893-1930). The background shows the original paper document with the maximum on 66.5 mm at the 8th of June 1905. The right graph shows the yearly maximum of daily precipitation from 1897-2008 for station Stralsund with newly digitized data for the period 1897-1950. The graphs were kindly provided by Mr. Hermann Mächel of Deutscher Wetterdienst, Germany.

DARE example 2

The two graphs show geographical distributions of sea level pressure and 500 hPa geopotential height over New England on 11 September 1938, 00 GMT. The graphs are part of an animation of high resolution (2° x 2° lat/lon, every 6 hours) historical weather reanalyses, obtained from data rescue results from the ACRE project and the 20th century reanalysis project. For the entire animation see http://clima.meteoam.it/Documenti/presentazioni/Talk_5_Climate_Assessment_and_Emerging_Data_Rescue_Initiativ.ppt#267,10,ACRE_&_the_20th_century_Reanalysis_project: the usefulness of DARE

September 1938 New England

Annex 6. Scientific importance of DARE

An excellent paper describing the scientific importance of data rescue, written by Manola Brunet and Phil Jones, is *Data rescue initiatives: bringing historical climate data into the 21st century*, Climate Research 47, 29-40, 2011, http://www.int-res.com/articles/cr_oa/c047p029.pdf. Its abstract including a characteristic figure is given below:

ABSTRACT: The currently limited availability of long and high-quality surface instrumental climate records continues to hamper our ability to carry out more robust assessments of the climate. Such assessments are needed to better understand, detect, predict and respond to global climate variability and change. Despite the wealthy heritage of past climate data and recent efforts to improve data availability and accessibility, much more surface data could be digitised. Additionally, some long records are not of the quality needed for more confidently supporting any climate assessment, service, or application. The present paper discusses the usefulness of undertaking integrated data rescue (DARE) activities by showing several climate assessments as examples. It describes emerging DARE activities worldwide, with a focus on the World Meteorological Organization Mediterranean Data Rescue (MEDARE) and the Atmospheric Circulation Reconstructions over the Earth (ACRE) initiatives to assess the benefits historical instrumental climate data can bring to studies of climate variability and change that consider the 21st century.

CHARACTERISTIC FIGURE: One of the clearest benefits of DARE is that longer climate records make possible more extensive trend and other assessments, enabling recent climate data and extremes to be placed into a longer instrumental context. Also, recent extremes, such as the unprecedented heat wave that affected Europe in summer 2003 can be put into the context of the longest instrumental records. The figure below (adapted from Trenberth et al. 2007) illustrates area averaged summer (June–August) temperatures over Central Europe for the 1780–2005 period, exemplifying the unusualness of the 2003 summer temperature values in this long record.
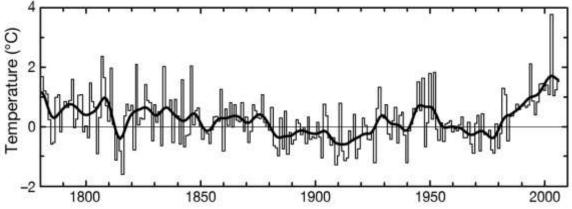

Figure from Brunet and Jones (2011); for its description see the text above.