

## Seminário-Projecto de Geografia Física 2022/23

Marcelo Fragoso – 27 fevereiro 2023

### sumário: Fontes de informação em Geografia Física (Climatologia)

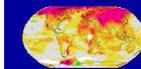
1. Informação climática: diversidade de fontes e de bases de dados.
2. Recolha e manipulação de ficheiros de dados climáticos na ferramenta web KNMI Climate Explorer.

## Informação climática: diversidade de fontes e de bases de dados

### • PORTAIS DE DIVULGAÇÃO DE INFORMAÇÃO CLIMÁTICA

#### • KNMI Climate Explorer

- <https://climexp.knmi.nl/>



KNMI Climate Explorer

“uma ferramenta de pesquisa para investigar o clima. Este site proporciona acesso a muitos dados climáticos e ferramentas de análise.” **Ver documento tutorial no moodle**

#### • COPERNICUS – CLIMATE DATA STORE (CDS)

<https://cds.climate.copernicus.eu/#!/home>



“(CDS) é a infraestrutura fundamental que suporta a implementação do Copernicus Climate Change Service (C3S). Permite o fornecimento de variáveis climáticas essenciais, análises climáticas, reanálises, projeções e indicadores em escalas temporais e espaciais relevantes para estratégias de adaptação e mitigação para várias áreas de benefício setorial e social.”

## Informação climática: diversidade de fontes e de bases de dados

### • PORTAIS DE DIVULGAÇÃO DE INFORMAÇÃO CLIMÁTICA

- **NCAR Climate data guide** <https://climatedataguide.ucar.edu/climate-data>
  - <https://climatedataguide.ucar.edu/>
- **EARTH SYSTEM RESEARCH LABORATORY (NOAA)**
  - <https://www.esrl.noaa.gov/psd/data/>

NCAR UCAR | ClimateDataGuide



## Informação climática: diversidade de fontes e de bases de dados

### • PORTAIS DE DIVULGAÇÃO DE INFORMAÇÃO CLIMÁTICA

- **CRU** <https://www.uea.ac.uk/web/groups-and-centres/climatic-research-unit/data>



## Informação climática: diversidade de fontes e de bases de dados

### 1. Observações

#### Pontuais

- superfície (estações met.)
- altitude

#### Interpoladas

- áreas nacionais, regionais
- globais



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<https://www.ncei.noaa.gov/>

<https://www.ncei.noaa.gov/access/monitoring/products/#datasets>

<https://www.ncei.noaa.gov/access/search/index>

*National Centers for Environmental Information* (ex NCDC): organismo da NOAA que é responsável por centralizar e providenciar o acesso público de bases de dados oceânicos, atmosféricos e geofísicos.

#### Global Historical Climatology Network - Daily (GHCN-Daily), Version 3

The Global Historical Climatology Network - Daily (GHCN-Daily) dataset integrates daily climate observations from approximately 30 different data sources. Version 3 was released in September 2012 with the addition of data from two additional station networks. Changes to the processing system associated with the version 3 release also allowed for updates to occur 7 days a week rather than only on most weekdays. Version 3 contains station-based measurements from well over 90,000 land-based...

[View Details](#)

[Search Data](#)

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<https://www.ncdc.noaa.gov/cdo-web/>

**NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Home Climate Information Data Access Customer Support Contact About

Home > Climate Data Online

## Climate Data Online

Climate Data Online (CDO) provides free access to NCEP's archive of global historical weather and climate data in addition to station history information. These data include quality controlled daily, monthly, seasonal, and yearly measurements of temperature, precipitation, wind, and degree days as well as radar data and 30-year Climate Normals. Customers can also order most of these data as certified hard copies for legal use.

- Browse Datasets**  
Browse documentation, samples, and links
- Certify Orders**  
Get orders certified for legal use (requires payment)
- Check Status**  
Check the status of an order that has been placed
- Find Help**  
Find answers to questions about data and ordering

DISCOVER DATA BY

- SEARCH TOOL**  
Search for and access past weather and climate data by station name or identifier, ZIP code, city, county, state, or country.  
Search Tool >
- MAPPING TOOL**  
Find and view past weather and climate data by station name or identifier, ZIP code, city, county, state, or country.  
Mapping Tool >
- DATA TOOLS**  
Access past weather and climate data using a collection of specialized tools.  
Data Tools >

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# ECA & D European Climate Assessment & Dataset

<https://www.ecad.eu//dailydata/index.php>

Project Services

**Goal**  
ECA&D offers science-based operational services for assessing observed changes in climate extremes in Europe. These services rely on high-quality observational datasets provided by the participants.

**Participants**  
66 National Meteorological and Hydrological Services, observatories and universities from Europe and the Mediterranean.

**Coordination**  
Royal Netherlands Meteorological Institute (KNMI).

**Drivers**  
ECA&D was initiated by the European Climate Support Network of GIE-EUMETNET and has been designated as Regional Climate Centre on climate data for WMO Region VI (Europe). ECA&D has been further developed in the EU-projects ENSEMBLES, MILLENNIUM, EUROAM, UERRA and EUPORIAS.

**Global Embedding**  
ECA&D is part of the International Climate Assessment & Dataset (ICA&D) which is part of a pilot project of the Global Framework for Climate Services (GFCS). As such, it is linked with its Southeast Asian counterpart SACA&D (sacadatabase.bmkg.go.id), Latin American counterpart LACA&D (lacad.ciiien.org) and West African counterpart WACA&D.

**ECA&D services comprise:**

- data gathering (long-term high quality daily observational series from meteorological stations)
- archiving and storage in a centralized relational database
- quality control and homogeneity checks
- analysis (calculation of indices (station-based and gridded) particularly related to climate extremes)

**ECA&D products include:**

- daily dataset built up from 41600 quality controlled series of 12 essential climate variables (including temperature and precipitation) observed at 10388 meteorological stations in 62 countries (77% publicly available)
- meta information on station and time series homogeneity
- maps and plots for changes in extremes in the form of trends, anomalies, climatologies and return values for 75 indices
- E-OBS version 12.0 daily gridded observational dataset (1950-2015) of precipitation, temperature and sea level pressure,
- monthly updates of stations and gridded datasets

ECA&D Station Network

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## DADOS CLIMÁTICOS DE ESTAÇÕES NO FORMATO EPW

- O EnergyPlus (<https://energyplus.net/>) é um programa *open-source*, desenvolvido pelo Departamento de Energia dos Estados Unidos, que permite simular o comportamento térmico e energético de edifícios.
- Os dados meteorológicos para 3.034 locais **estão agora disponíveis** em formato EnergyPlus (**EPW**) - 1.494 locais nos EUA, 80 locais no Canadá, e mais de 1.450 locais em 98 outros países em todo o mundo. Os dados meteorológicos estão organizados por região e país da Organização Meteorológica Mundial e podem ser descarregados em <https://energyplus.net/weather>.
- Um **repositório de acesso aberto** ainda mais vasto de dados climáticos pode ser acessado em <https://climate.onebuilding.org/>
- Informação detalhada deste repositório pode ser consultada em: <https://climate.onebuilding.org/sources/default.html>
- Os dados meteorológicos de input nos ficheiros EPW são horários.
- Entretanto, muitas **aplicações online** têm sido desenvolvidas para visualizar e processar a informação dos ficheiros EPW. Alguns exemplos:

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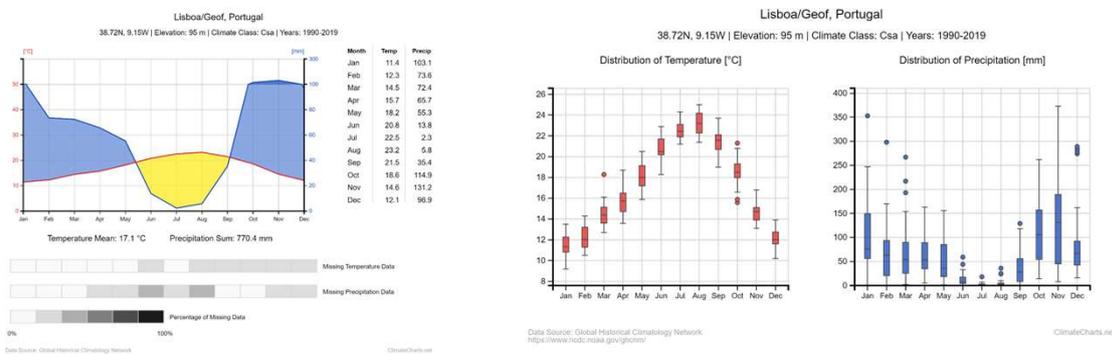

**ClimateCharts.net**
An application to create meteorological charts for places worldwide

[Home](#)
[User Guide](#)
[Datasets & Software](#)
[License & Citation](#)
[About](#)


**TECHNISCHE UNIVERSITÄT DRESDEN**

ClimateCharts.net\* – uma aplicação para criar diagramas climatológicos como gráficos de Walther-Leith. Technische Universität Dresden <https://climatecharts.net/>

Acesso a dados de estações da **Global Historical Climatology Network (GHCN)**  
 Acesso também dados interpolados de várias bases de dados em grelha



\* Laura Zepner, Pierre Karrasch, Felix Wiemann & Lars Bernard (2021) ClimateCharts.net – an interactive climate analysis web platform, *International Journal of Digital Earth*, 14:3, 338-356, DOI: 10.1080/17538947.2020.1829112

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**EPWMap**

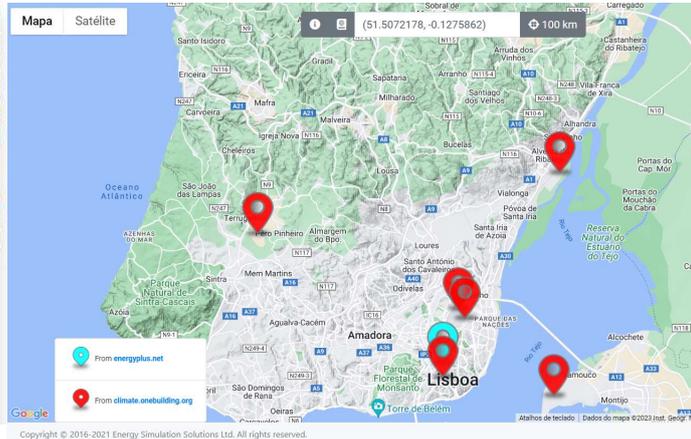
<https://app.ensims.com/epw/>

Visualização de dados no formato EPW disponibilizados pelos EnergyPlus.net e OneBuilding.org

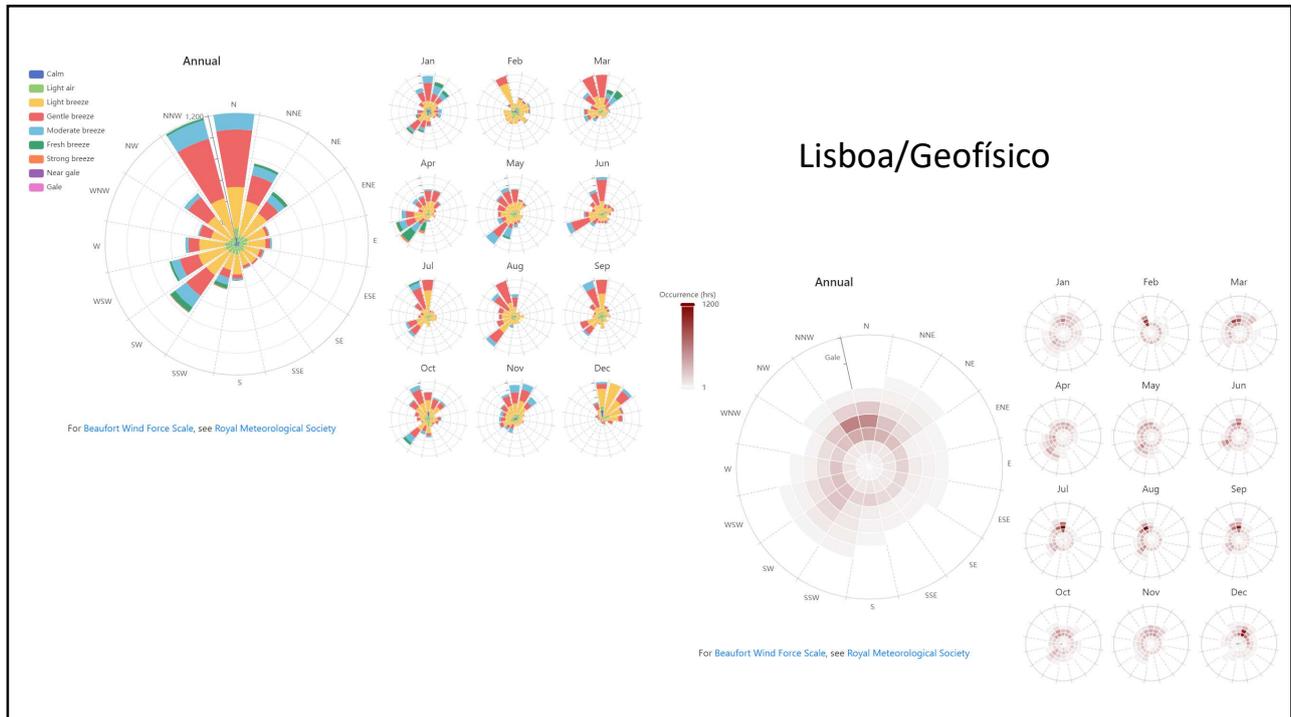


**EPW Map**

Find and download EPW weather files on a map by searching a place and inspecting the available data sets.



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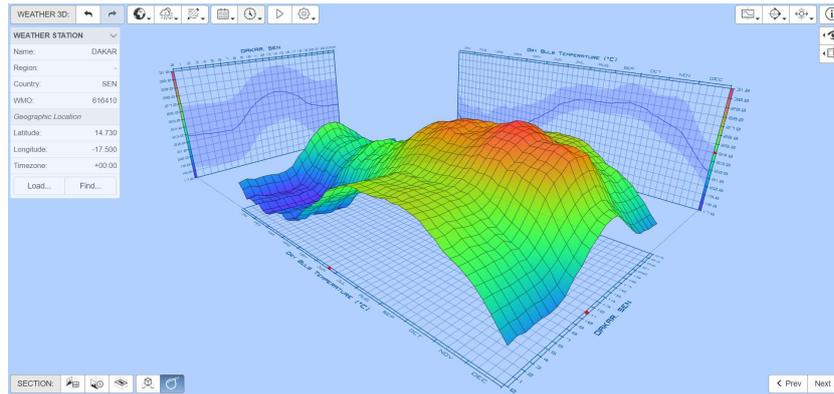


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Aplicações disponíveis na página pessoal de Andrew Marsh:

Weather Data

<http://andrewmarsh.com/software/weather-data-web/>



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## Portal Europeu Copernicus

<https://www.copernicus.eu/pt-pt>

#EUSpace

Mídia Eventos Notícias Contacto | Iniciar sessão

Pesquisar

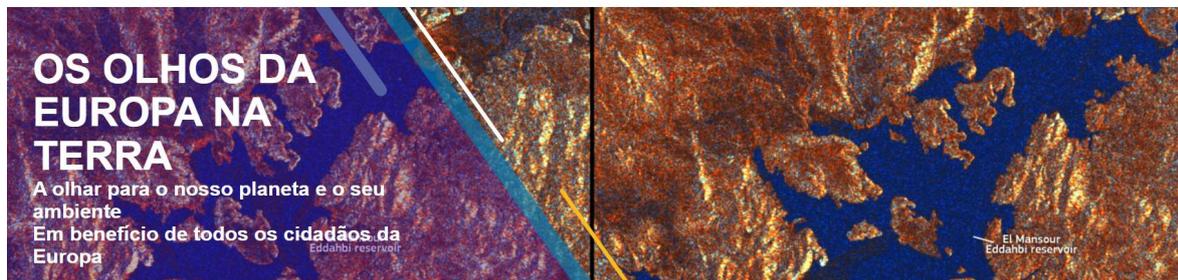
Portuguese, Portugal



PROGRAMME OF THE  
EUROPEAN UNION



Acerca do Copernicus Serviços Oportunidades Acesso aos Dados Biblioteca Casos de utilização



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<https://climate.copernicus.eu/>

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<https://cds.climate.copernicus.eu/#/home>

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<https://cds.climate.copernicus.eu/cdsapp#!/dataset/in-situ-gridded-observations-europe?tab=overview>

### E-OBS daily gridded meteorological data for Europe from 1950 to present derived from in-situ observations

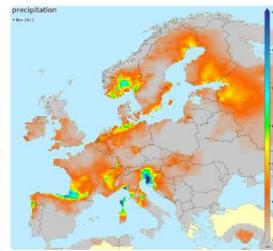
Overview Download data Documentation

E-OBS is a daily gridded land-only observational dataset over Europe. The blended time series from the station network of the European Climate Assessment & Dataset (ECA&D) project form the basis for the E-OBS gridded dataset. All station data are sourced directly from the European National Meteorological and Hydrological Services (NMHSs) or other data holding institutions. For a considerable number of countries the number of stations used is the complete national network and therefore much more dense than the station network that is routinely shared among NMHSs (which is the basis of other gridded datasets). The density of stations gradually increases through collaborations with NMHSs within European research contracts.

Initially, in 2008, this gridded dataset was developed to provide validation for the suite of Europe-wide climate model simulations produced as part of the European Union ENSEMBLES project. While E-OBS remains an important dataset for model validation, it is also used more generally for monitoring the climate across Europe, particularly with regard to the assessment of the magnitude and frequency of daily extremes.

The position of E-OBS is unique in Europe because of the relatively high spatial horizontal grid spacing, the daily resolution of the dataset, the provision of multiple variables and the length of the dataset. Finally, the station data on which E-OBS is based are available through the ECA&D webpages (where the owner of the data has given permission to do so). In these respects it contrasts with other datasets.

The dataset is daily, meaning the observations cover 24 hours per time step. The exact 24-hour period can be different per region. The reason for this is that some data providers measure between midnight to midnight while others might measure from morning to morning. Since E-OBS is an observational dataset, no attempts have been made to adjust time series for this 24-hour offset. It is made sure, where known, that the largest part of the measured 24-hour period corresponds to the day attached to the time step in E-OBS (and ECA&D).



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## Bases de dados EOBS

- Contêm dados em grelha regular para 5 elementos (temperatura média diária TG, temperatura mínima diária TN, temperatura máxima diária TX, precipitação diária RR e pressão média diária do nível do mar PP). Eles cobrem a área: 25N-75N x 40W-75E. Os ficheiros de dados estão no formato NetCDF compactado e variam em tamanho de 88Mb a 1,2Gb. Os dados são disponibilizados em grelhas de 0,1, 0,25 e 0,5 graus regulares lat-lon, bem como numa grelha polar rodada de 0,22 e 0,44 graus, com o pólo norte em 39,25N, 162W.



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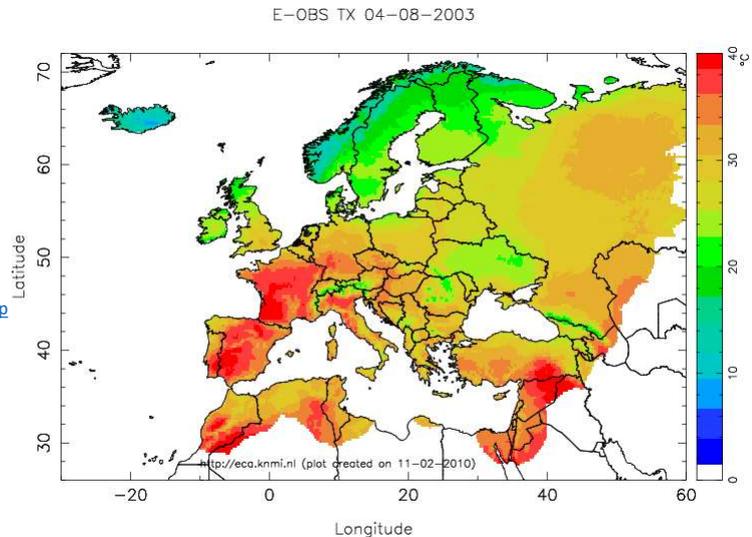
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## Dados interpolados em grelha regular (gridded data)

### E-OBS

<https://www.ecad.eu/download/ensembles/download.php>

- Per: 1950-2019
- Res: 0.1° - 0.25° - 0.50°



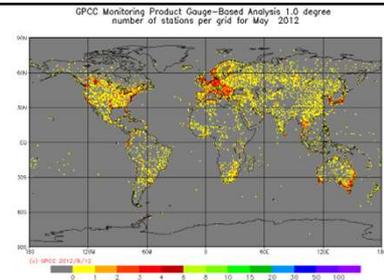
Referência:

"Haylock, M.R., N. Hofstra, A.M.G. Klein Tank, E.J. Klok, P.D. Jones, M. New. 2008: A European daily high-resolution gridded dataset of surface temperature and precipitation. *J. Geophys. Res (Atmospheres)*, **113**

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## Dados interpolados em grelha regular (gridded data)

### Global Precipitation Climatology Project (GPCP)



Conjunto de bases de dados de precipitação em grelha regular – **mensal e diária** – integrando observações de estações meteorológicas de superfície, estimações por satélite e por sondagens. Cobertura global (excepto áreas polares), com uma resolução espacial de 2,5° de lat e lon (entre outras). Na escala mensal, o período abrange 432 meses desde Janeiro de 1979 até Fevereiro de 2015.

- Portais de visualização e de descarga dos dados do *Deutscher Wetterdienst*
  - <https://kunden.dwd.de/GPCC/Visualizer>
  - [ftp://ftp-anon.dwd.de/pub/data/gpcc/html/download\\_gate.html](ftp://ftp-anon.dwd.de/pub/data/gpcc/html/download_gate.html)

Referência: Adler, R.F., G.J. Huffman, A. Chang, R. Ferraro, P. Xie, J. Janowiak, B. Rudolf, U. Schneider, S. Curtis, D. Bolvin, A. Gruber, J. Susskind, and P. Arkin, 2003: The Version 2 Global Precipitation Climatology Project (GPCP) Monthly Precipitation Analysis (1979-Present). *J. Hydrometeorol.*, **4**,1147-1167.

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## GPCC VISUALIZER

### Visualize and Download GPCC Products

GPCC Product	Spatial Resolution	Time Coverage	Possible Application
First Guess Monthly	1.0°	2004 - present	drought monitoring
First Guess Daily	1.0°	2009 - present	analysis of extremes
Monthly Monitoring Version 5	1.0°, 2.5°	1982 - present	calibration of satellite data
Full Data Monthly Version 7	0.5°, 1.0°, 2.5°	1901 - 2013	hydrological studies
Full Data Daily Version 1	1.0°	1988 - 2013	analysis of extremes
HOMPRA Europe Version 1 (coming soon)	1.0°	1951 - 2005	trend analysis
VASClimo Dataset	0.5°, 1.0°, 2.5°	1951 - 2000	trend analysis
Precipitation Climatology Version 2015	0.25°, 0.5°, 1.0°, 2.5°	1951/2000	for application as a reference, and for utilization of the anomaly interpolation method
Interpolation Test Dataset	1.0°	1988	comparison of interpolation schemes
Drought Index Version 1	1.0°	2013 - present	drought monitoring
GPCC Visualizer			access to the GPCC Visualizer, where you can create maps with your own coordinates and parameters
GPCC Home			detailed information about GPCC

The Global Precipitation Climatology Centre (GPCC) is a specialized Centre supporting climate monitoring and research. It is operated by DWD under the auspices of WMO. Product users are kindly asked to refer to GPCC.

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# RDA Research Data Archive NCAR

<http://rda.ucar.edu/>

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<http://www.ogimet.com/>

"Este es el Servicio de Información Meteorológica de **www.ogimet.com** que utiliza datos disponibles en la red de forma pública, fundamentalmente de la [NOAA](#), y software libre para su tratamiento."

SYNOP: código alfanumérico definido pela organização meteorológica mundial, utilizado para reportar observações meteorológicas. A sua frequência habitual de emissão é de 6 horas (00, 06, 12 y 18 UTC), podendo ser de 3 horas ou horária, nalgumas estações.

METAR ("**M**eteorological **A**irport **R**eport") - Mensagens codificadas de observações meteorológicas à superfície de interesse aeronáutico. A sua frequência de emissão é muito maior que as mensagens SYNOP, na maior parte dos locais é horária ou a cada 30 minutos.



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meteoanlz.com/index?cou=1008&ind=0000&ty=mr&d1=15&m1=02&y1=2021&d2=15&m2=02&y2=2021

Meteomanz.com English version

Meteomanz.com proporciona datos meteorológicos observados de lugares de todo el mundo obtenidos de los mensajes SYNOP y BUFR emitidos por estaciones meteorológicas oficiales, así como datos meteorológicos previstos basados en los modelos de predicción globales GFS y ECMWF. Más información en [como usar la página](#) y [preguntas frecuentes](#).

**Búsqueda rápida de los últimos datos**

Introduzca un **indicativo OMM**. También puede introducir una región, estado/zona o nombres de estaciones meteorológicas recogidas por la OMM ([más información](#)).

**Búsqueda detallada de datos de SYNOPS/BUFR**

Seleccione lugar, fechas y tipos de salida.

Región/estado/zona: CABO VERDE

Estación: Todas las estaciones de CABO VERDE

Tipo de salida: Resumen mensual

Mes y año: Febrero 2021

**Búsqueda detallada de datos GFS/ECMWF**

Utilice cualquiera de los tres formularios para indicar la ubicación.

1. Introduzca indicativo WMO

2. Seleccione la estación:

Estado/zona: [Seleccione estado/zona]

3. Introduzca coordenadas:

Latitud (Sur <0)

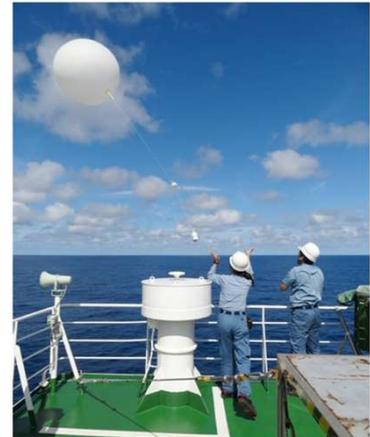
Longitud (Oeste <0)

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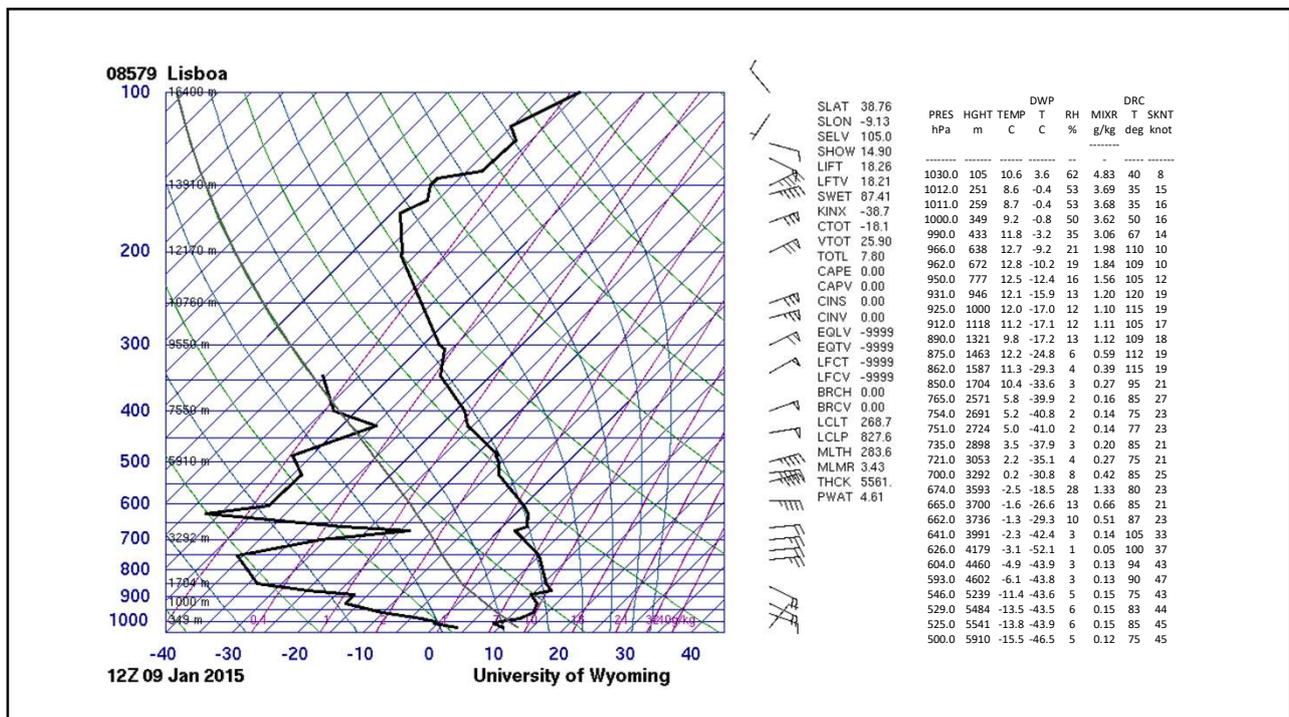
# Observações meteorológicas de altitude

- Integrated Global Radiosonde Archive (IGRA) (NOAA)  
<http://www.ncdc.noaa.gov/data-access/weather-balloon/integrated-global-radiosonde-archive>  
 (1500 estações; formato txt; 1970 - presente)

- Arquivo da Universidade do Wyoming  
<http://weather.uwyo.edu/upperair/sounding.html>  
 (representações gráficas/pdf ou formato txt; 1973- presente)



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## Informação climática: diversidade de fontes e de bases de dados

1.  
Observações

2.  
Reanálises

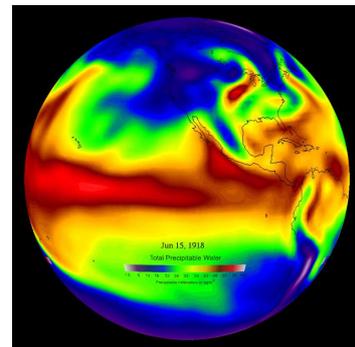


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### • REANÁLISES

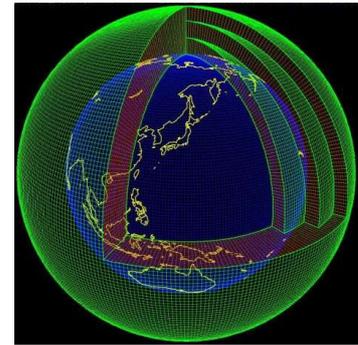
- Bancos de dados produzidos de forma sistemática para a monitorização e investigação do Clima.
- Uma reanálise constitui um sistema de dados, temporalmente tão homogéneo quanto possível, disponível numa grelha regular global.
- As bases de dados de reanálises incluem muitos campos derivados (fluxos de calor e humidade no solo, por exemplo) relativamente aos quais as observações diretas são praticamente inexistentes.
- As reanálises são produzidas através de um esquema de **assimilação de dados** e um **modelo de previsão numérica**.



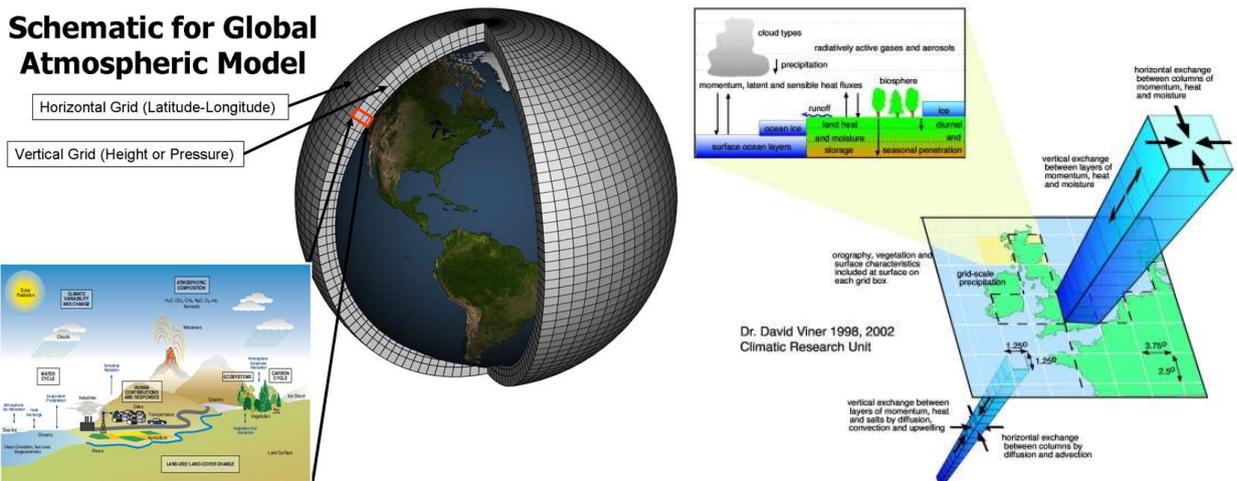
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• **MODELOS DE PREVISÃO NUMÉRICA**

Modelos físico-matemáticos que representam de forma numérica a evolução do estado da atmosfera, descrita pelas leis da Física. Estes modelos são integrados em supercomputadores, em vários centros de previsão e disseminados para todo o mundo.



**Schematic for Global Atmospheric Model**



<http://manunicast.seaes.manchester.ac.uk/how/history.html>

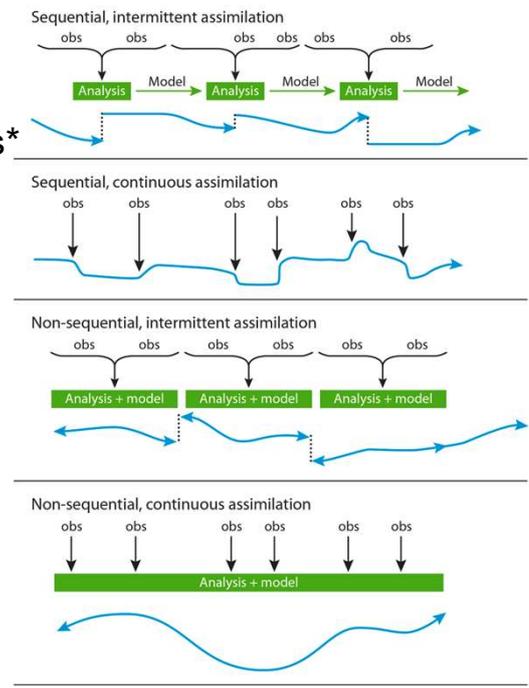


- ASSIMILAÇÃO (esquema)

Processo de combinação de observações\* de uma grande variedade de fontes com *outputs* de um modelo de previsão numérica. A análise resultante é considerada a melhor “estimação” do estado da atmosfera, num determinado instante.

\*Em cada passo temporal (6-12 horas) são incorporadas entre 7 a 9 milhões de observações de redes de superfície, de radiosondagens, de satélites, de bóias, de aviões e de navios.

<https://climatedataguide.ucar.edu/climate-data/simplistic-overview-reanalysis-data-assimilation-methods>



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Excelente síntese sobre os dados de **Reanálises** e as características dos diferentes datasets:

<https://climatedataguide.ucar.edu/climate-data/atmospheric-reanalysis-overview-comparison-tables>

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## Portal de acesso a reanálises:

- reanalysis.org
- <https://reanalyses.org/atmosphere/overview-current-atmospheric-reanalyses>

**Additional Links**

**Recent Updates**

- Atmospheric Reanalyses Comparison Table 3 hours 2 minutes ago
- era5-references 3 hours 8 minutes ago
- Overview of current atmospheric reanalyses 3 hours ago
- Surface 3 days ago
- Add a page 1 month ago

**Recent comments**

- SST in JRA55 1 hour 37 minutes ago
- Alternative download links to 20CR data set 3 weeks 4 days ago
- RE: MERRA-2 precipitation rate in WRIT time series plotter 1 month ago
- Hi Louwrens.
- Gil forwarded... 1 month ago
- precipitation cera20 c reanalysis 1 month 1 week ago

### Overview of current atmospheric reanalyses

Submitted by Cathy.Smith@noaa.gov on Thu, 10/07/2010 - 12:47

**Ask a Question**

**Current / State-of-the-art:**

ASR | COSMO-REA | CERA-20C | ERA5 | ERA-20C | ERA-20CM | ERA-Interim | JRA-55, JRA-55C, JRA-55AMIP | MERRA-2 | NCEP CFSR | NOAA-CIRES 20CRv2c

Possible issues: Consider other datasets for use in new research projects: NCEP/DOE II | NCEP/NCAR | NCEP NARR

Superseded / Caution use for new research projects: ERA-40 | ERA-15 | JRA-25

Model Change: NCEP CFSR (2011 and after)

**Updated in real-time for public use (days behind):** NCEP/DOE II | NCEP/NCAR | NCEP NARR | NCEP CFSR? | JRA-55 (2 days behind from JMA suite) |

**Updated in near real-time for public use (months behind):** ERA5 | ERA-Interim | JRA-55 | MERRA-2

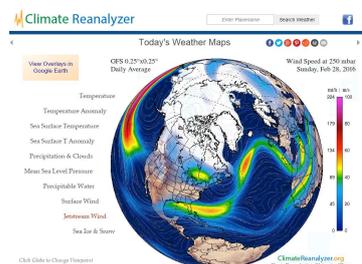
**Updated irregularly for public use (years behind):** CERA-20C | ERA-20C | ERA-20CM | NOAA-CIRES 20CR | NOAA-CIRES 20CRv2c | NASA MERRA

Overview Comparison Table (Reanalyses.org)  
Overview Comparison Table (ClimateDataGuide)  
Overview Comparison Table (as of 2016, S-RIP)  
Notes questions: and discussion by dataset

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## Portais de visualização (e descarga de dados) de reanálises

- <http://cci-reanalyzer.org/>



- <http://www.esrl.noaa.gov/psd/data/gridded/reanalysis/>

U.S. Department of Commerce | National Oceanic & Atmospheric Administration | NOAA Research

**Earth System Research Laboratory**  
Physical Sciences Division

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Climate Datasets by Category

All

- Sub-daily
- Daily
- Monthly
- Surface
- Temperature

**Reanalysis Datasets at PSD**

PSD maintains a collection of reanalysis datasets for use in climate diagnostics and attribution. Reanalysis datasets to reduce the effects of modeling changes on climate statistics. Observations are from many different sources including standard netCDF format.

For more information and discussion of various atmospheric and oceanic reanalyses, see the "Reanalysis Interact"

- <http://iridl.ldeo.columbia.edu/>

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## Formatos dos ficheiros de reanálises

- **netCDF** (Programa Unidata/NCAR). Suportado por muitos softwares de acesso livre
  - Formato netCDF:
  - Formato de arquivo desenvolvido pela UNIDATA
  - Trata-se de um ficheiro multidimensional, sob a forma de matriz
- **GRIB** (WMO, usado pelas agências nacionais de meteorologia)
- **HDF** (National Center for Supercomputing Applications, EUA)



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## Programas para leitura, visualização e análise de ficheiros netCDF

Software	Entidade	Licença	Download
MATLAB	Mathworks	Comercial	-----
GrADS	Center for Ocean-Land-Atmosphere Studies, Institute of Global Environment and Society	Free	<a href="https://sourceforge.net/projects/opengrads/files/">https://sourceforge.net/projects/opengrads/files/</a>
IDV	Unidata Program Center (UPC), University Corporation for Atmospheric Research (UCAR), Boulder, Colorado	Free	<a href="http://www.unidata.ucar.edu/software/idv/index.html">http://www.unidata.ucar.edu/software/idv/index.html</a>
Panoply	Robert B. Schmunk <a href="http://www.giss.nasa.gov/tools/panoply/download.html">NASA Goddard Institute for Space Studies</a>	Free	<a href="http://www.giss.nasa.gov/tools/panoply/download.html">http://www.giss.nasa.gov/tools/panoply/download.html</a>
NCL	<a href="http://www.ncl.ucar.edu/Download/">Computational &amp; Information Systems Laboratory</a> at the National Center for Atmospheric Research (NCAR)	Free	<a href="http://www.ncl.ucar.edu/Download/">http://www.ncl.ucar.edu/Download/</a>
CDO Climate Data Operators	Max-Planck Institute für Meteorologie	Free	<a href="https://code.mpimet.mpg.de/projects/cdo/files">https://code.mpimet.mpg.de/projects/cdo/files</a>



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## Informação climática: diversidade de fontes e de bases de dados

1.  
Observações

2.  
Reanálises

3.  
Deteção  
Remota

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## Dados de satélite

- Exemplo: reanálises MERRA
- Modern-Era Retrospective analysis for Research and Applications (MERRA)
- <https://disc.gsfc.nasa.gov/datasets?page=1&keywords=merra>
- Interface da NASA para análise de dados de superfície:
  - <http://giovanni.gsfc.nasa.gov/giovanni/>



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## Informação climática: diversidade de fontes e de bases de dados

1.  
Observações

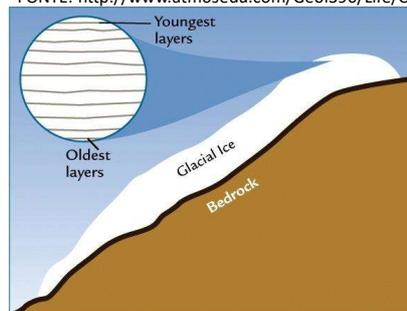
2.  
Reanálises

3.  
Deteção  
Remota

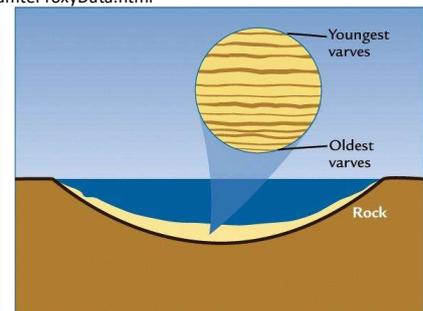
4.  
Registos proxy

## 4. Registos proxy

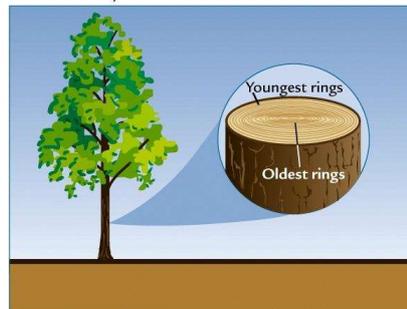
Fonte: <http://www.atmosedu.com/Geol390/Life/CliamteProxyData.html>



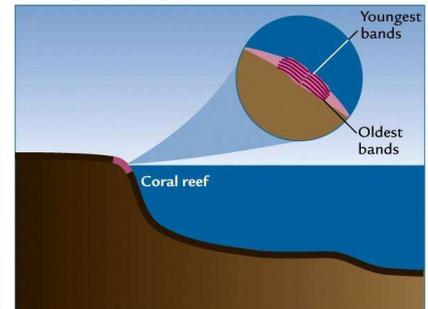
A Annual ice layers



B Annual sediment varves



C Annual tree rings



D Annual coral bands

<https://www.ncdc.noaa.gov/data-access/paleoclimatology-data/datasets>

## Paleoclimatology Datasets



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## Climatologia Histórica

<http://www.historicalclimatology.com/databases.html>

HOME BLOG INTERVIEWS PROJECTS RESOURCES NETWORK

### Historical Databases

Many of the historical sources available to climate historians mention weather in some way, but these references are often nested within a huge volume of information that is difficult, if not impossible, to decipher. Fortunately for scholars of climates past, in recent years well-funded initiatives have transcribed, quantified, and digitalized some of these sources. Some of the most important databases are listed below, with descriptions largely taken from the linked websites. If you have any suggestions for links to additional resources don't hesitate to contact [Dr. Degroot](#).



### Atmospheric Circulation Reconstructions over the Earth



The international Atmospheric Circulation Reconstructions over the Earth (ACRE) initiative both undertakes and facilitates the recovery of historical instrumental surface terrestrial and marine global weather observations to underpin 4D weather reconstructions (reanalyses) spanning the last 200-250 years for climate applications and impacts needs worldwide.

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www.tambora.org/index.php/site/page?view=about

The screenshot shows the 'About' page of the tambora.org website. The page describes the collaborative research environment for climate and environmental history, focusing on Historical Climatology. It lists several partner institutions and their associated researchers:

- University of Freiburg** (Department of Physical Geography): Prof. Dr. Rüdiger Glaser \*, Michael Kahle, Dr. Dirk Riemann, Dr. Steffen Vogt, Rafael Hologa
- universitätsbibliothek freiburg**: Dr. Antje Kellersohn \*, Franck Borel, Wael Sidawi
- Leibniz-Institut für Länderkunde (ifl)**: Prof. Dr. Sebastian Lentz \*, Christian Hanewinkel, Sebastian Koslitz, Sebastian Specht, Heike Steller
- Hochschule Esslingen** (University of Applied Sciences): Prof. Astrid Beck \*
- UNA Universität Augsburg University**: Prof. Dr. Jucundus Jacobett \*

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## Informação climática: diversidade de fontes e de bases de dados

1.  
Observações

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3.  
Deteção Remota

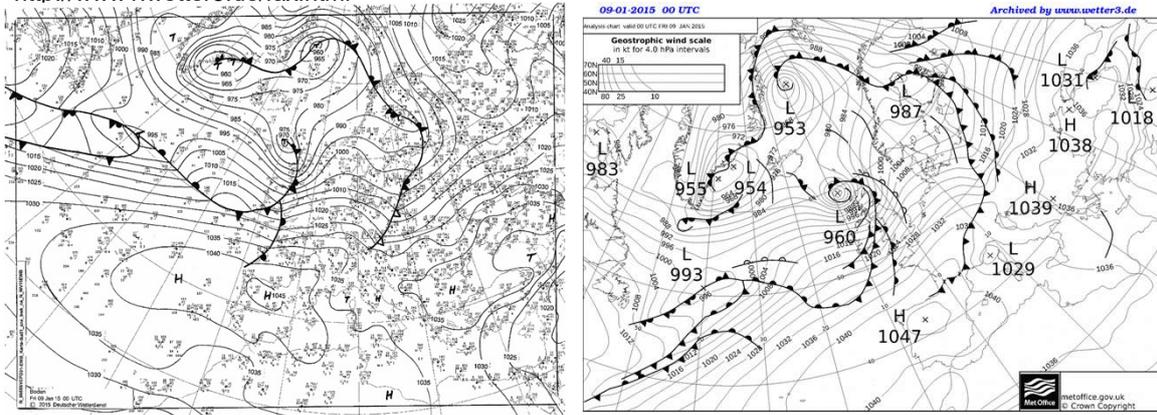
4.  
Registos proxy

5.  
Inventários e catálogos

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## Inventários - catálogos

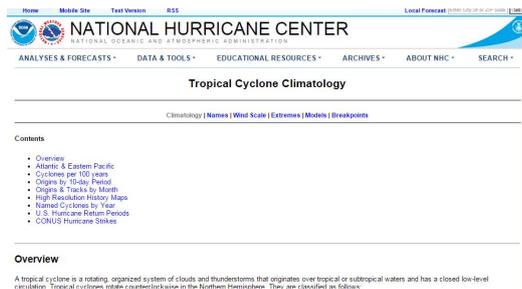
Arquivo de cartas sinópticas editadas por institutos nacionais de meteorologia:  
<http://www1.wetter3.de/fax.html>



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## Inventários - catálogos

- Ciclones tropicais
- <http://www.nhc.noaa.gov/climo/>
  - Pontos de origem das trajectórias



- Ficheiros em ArcGIS das trajectórias:
  - <http://www.nhc.noaa.gov/gis/>



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## Inventários - catálogos

- Inventário de tempestades / depressões extratropicais
  - (Universidade de Berlin) <http://www.met.fu-berlin.de/adopt-a-vortex/archiv/>

- Tempo Severo

- <http://www.eswd.eu/>



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