USER GUIDE

DECEMBER 2024

VERSION 3.4

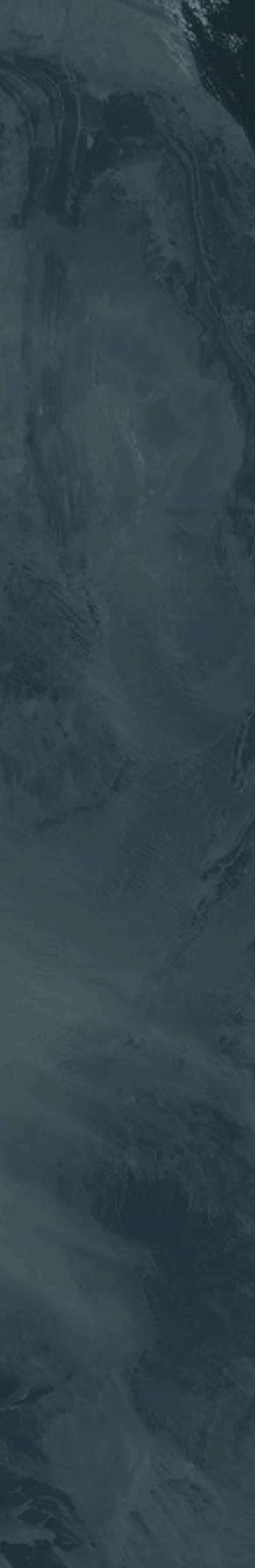
Barcelona Dust Regional Center

WMO SDS-WAS Regional Center for Northern Africa, Middle East and Europe, conducting research and providing operational products

AEMet Agencia Estatal de Meteorología

BSC Barcelona Supercomputing Center Centro Nacional de Supercomputación

WORLD METEOROLOGICAL ORGANIZATION



ABOUT

The **WMO Barcelona Dust Regional Center** coordinates the research activities and operations of the World Meteorological Organization Sand and Dust Storms Warning Advisory and Assessment System (**WMO SDS-WAS**) in **Northern Africa, the Middle East, and Europe**.

The main objective of **the Center** is to enhance the ability of the countries to deliver timely and high-quality sand and dust storm forecasts, observations and knowledge to the users. Providing access to such information is fundamental to support the development of early warning systems and mitigation plans. Additionally, it responds to the growing interest of stakeholders from different sectors, enforcing the international partnership between research, operational services and user communities.

This **User Guide** explains how to access and explore the available dust products through **the Center's** website and describes the key features that allow users to customize their experience and the analysis of the provided information.

DOCUMENT VERSIONS

Version number	Date of publish	Version description
1.0	20/01/2022	Includes descriptions for: daily dust products, dust catalogue, numerical data download service and citation.
2.0	26/05/2022	Includes updates on the following products: Models, Warning Advisory System, Observations.
2.1	12/12/2022	Minor editions and revision of the NASA/MODIS product used for the Evaluation of the daily dust forecasts.
2.2	23/06/2023	Includes updates to the dashboard including: URL Search Queries, Fullscreen Mode, Updated Map Controls and Date Picker, and Synchronised Zoom and Pan.
3.1	15/02/2023	Includes mobile visualisation interface, “select all” checkbox for multiple option checkbox, and improvements in RGB observations browsing.
3.2	24/02/2024	Includes technical requirements for models participating in the multimodel products.
3.3	23/10/2024	Includes new map layers (airports, country borders, ACTRIS stations), Vertical Profiles, and Visibility Active Stations

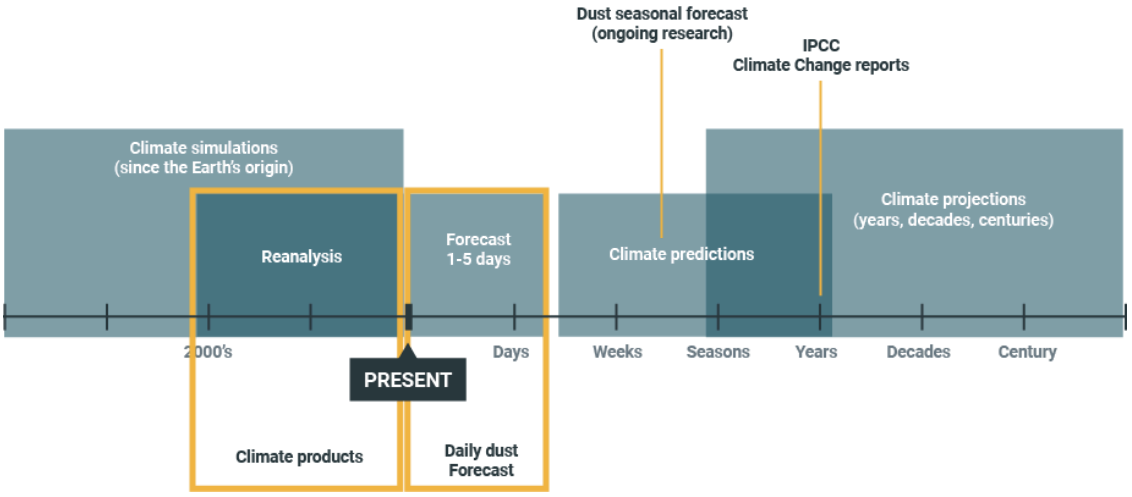
3.4	20/12/2024	Includes new GAW station map layer, and “unknown” category added to Visibility Active Stations

CONTENTS

1 From research to products

Numerical modelling is one of the most important sources of dust information. Models of dust emission, transport and deposition are used as a tool to complement dust observations and to deepen our understanding of the aspects that control the distribution of dust particles and the impacts they provoke. While global models of the dust cycle are used to investigate dust at large scales and its long-term changes, regional dust models are an ideal tool to study in detail the processes that influence dust distribution, as well as individual dust events.

The dust research can be associated with and conducted considering different time scales. Therefore, **dust model simulations can result in either short-term forecasts for up to 5 days ahead, seasonal forecasts for several weeks ahead or dust projections that consider future scenarios about the concentration of desert dust** and are important for climate research. Additionally, the historical record of information on desert dust can be completed with climate simulations and reanalysis datasets.

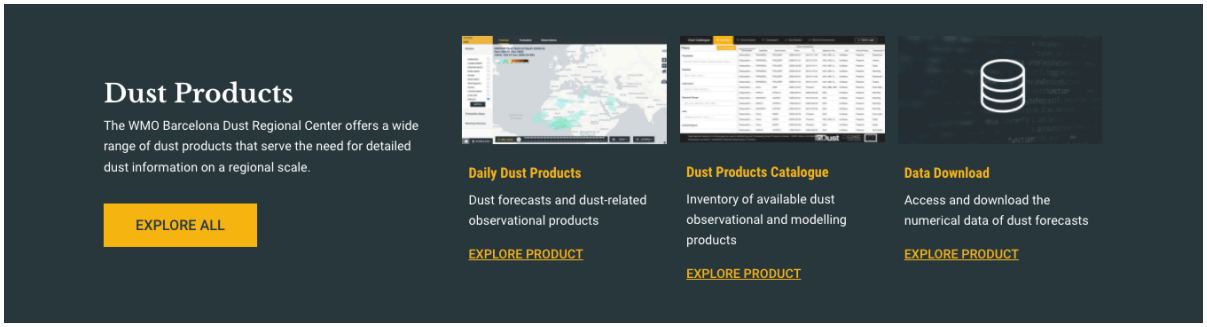


At the moment, the dust products available through the **WMO Barcelona Dust Regional Center** are mainly short-term dust forecasts which are useful to support the development of early warning systems.

2 Dust products

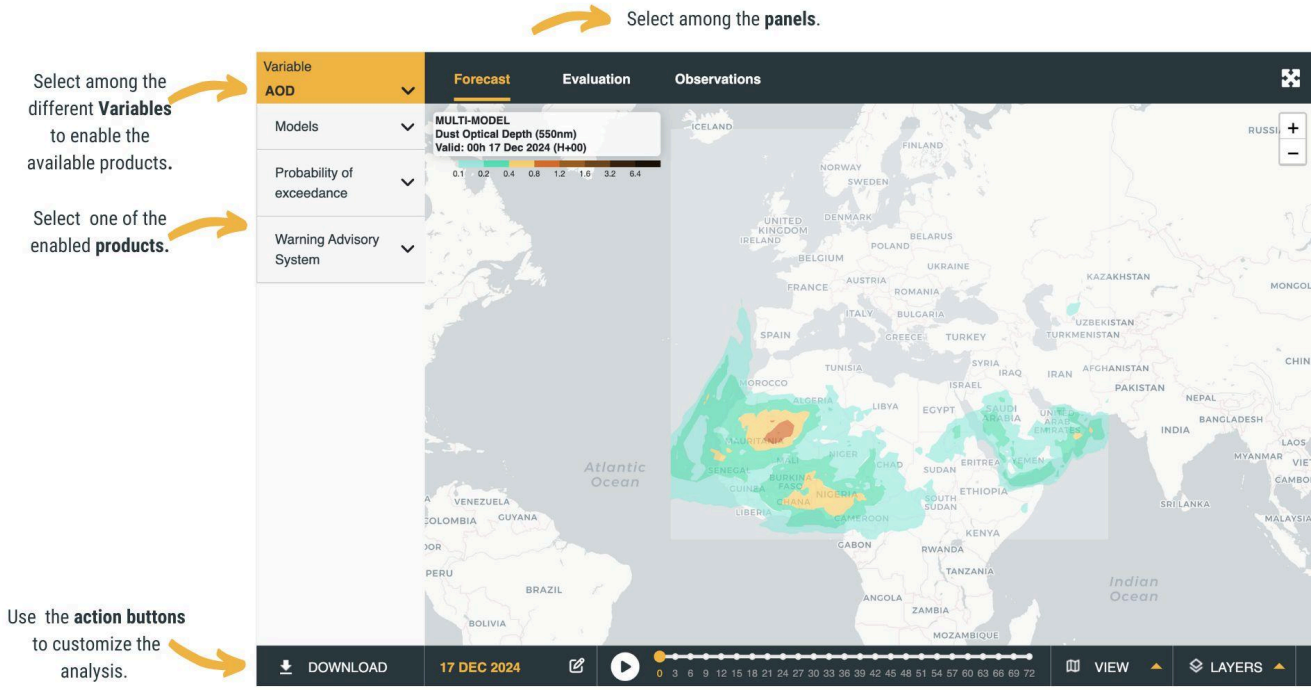
The WMO Barcelona Dust Regional Center coordinates a network of collaborators (researchers, data providers and user communities) in Northern Africa, the Middle East and Europe and provides access to available dust products via the Center's official webpage (https://dust.aemet.es/). The products are available for visualisation and analysis on the fly through the interactive dashboard, as well as for download through the numerical data download service (THREDDS).

On the Products page, users can select whether they want to explore the Daily Dust Products for short-term issued forecasts, the Dust Products Catalogue for a detailed inventory of dust observational products and models or the Data download system for numerical data.



2.1 Daily Dust Products

This section includes daily dust forecasts, their comparison with observations, and dust-related observations. The products are displayed in an **interactive dashboard** that consists of three panels: **i) Forecast, ii) Evaluation** and **iii) Observations**. Users need to select one of the panels from the top menu and a variable from the side menu to see the products that are available for visualisation.



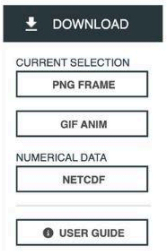
Dashboard action buttons

The dashboard includes several action buttons to customize and facilitate the analysis of the products. Users can change the base map (VIEW button), add extra layers of information (LAYERS button), change the spatial zoom of the displayed map, click on a specific location to obtain more detailed information about this point, access useful documents and download images, animations and numerical data (DOWNLOAD button).

Full screen mode

Zoom **in**

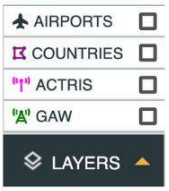
Zoom **out**



Download the currently displayed data in
image
animation or
numerical format

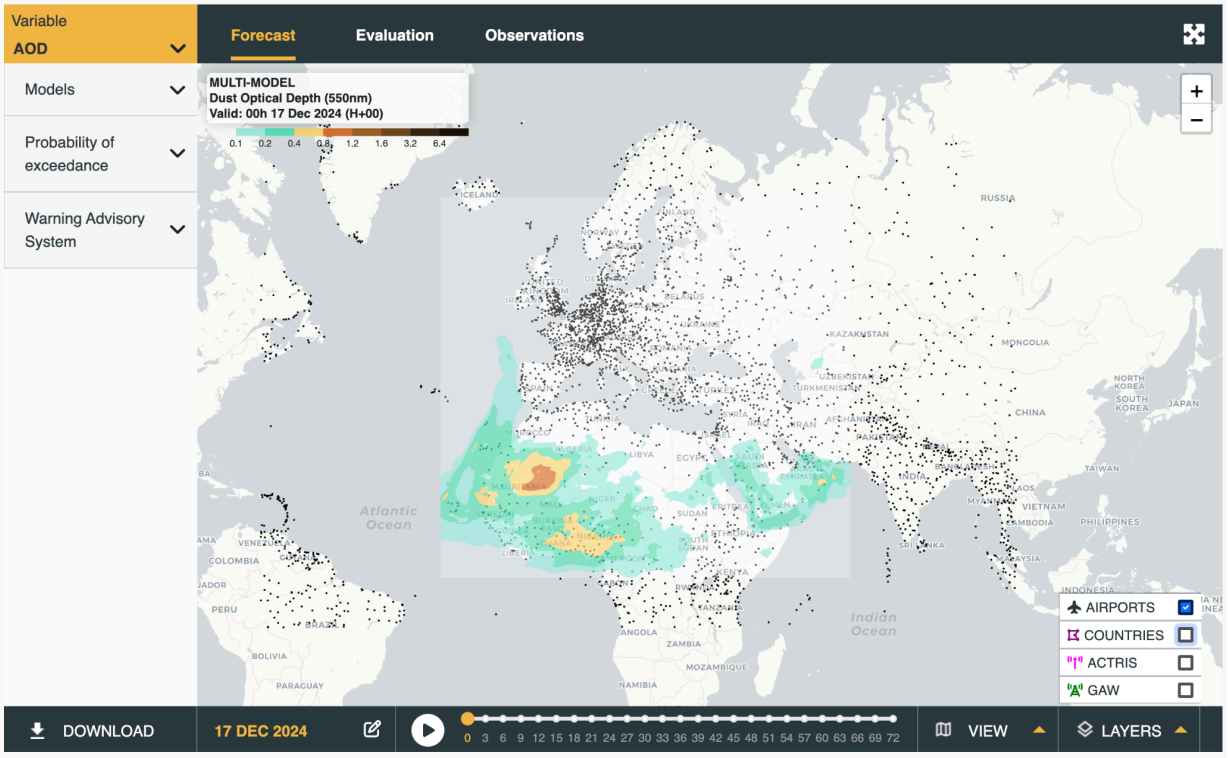
Access to **information** and documents (User Guide)

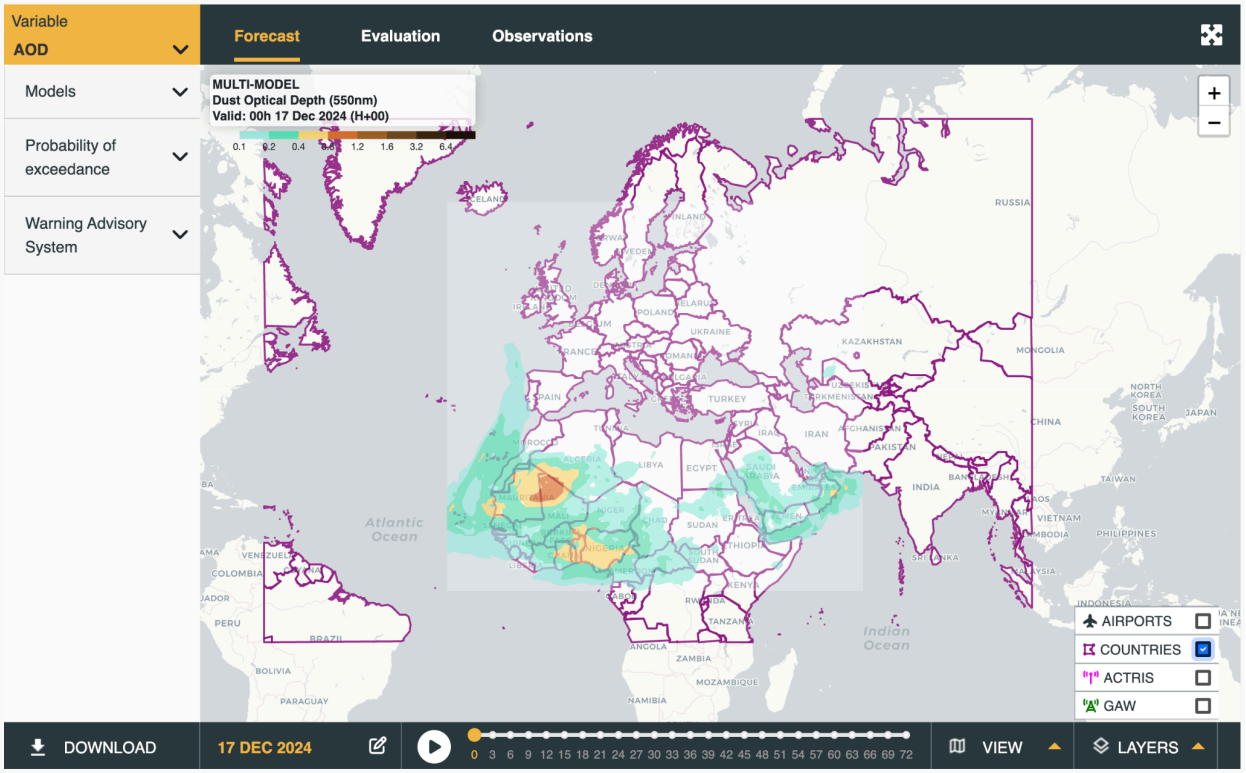
Change the base map displayed, selecting among **Light, Open Street, or ESRI** map

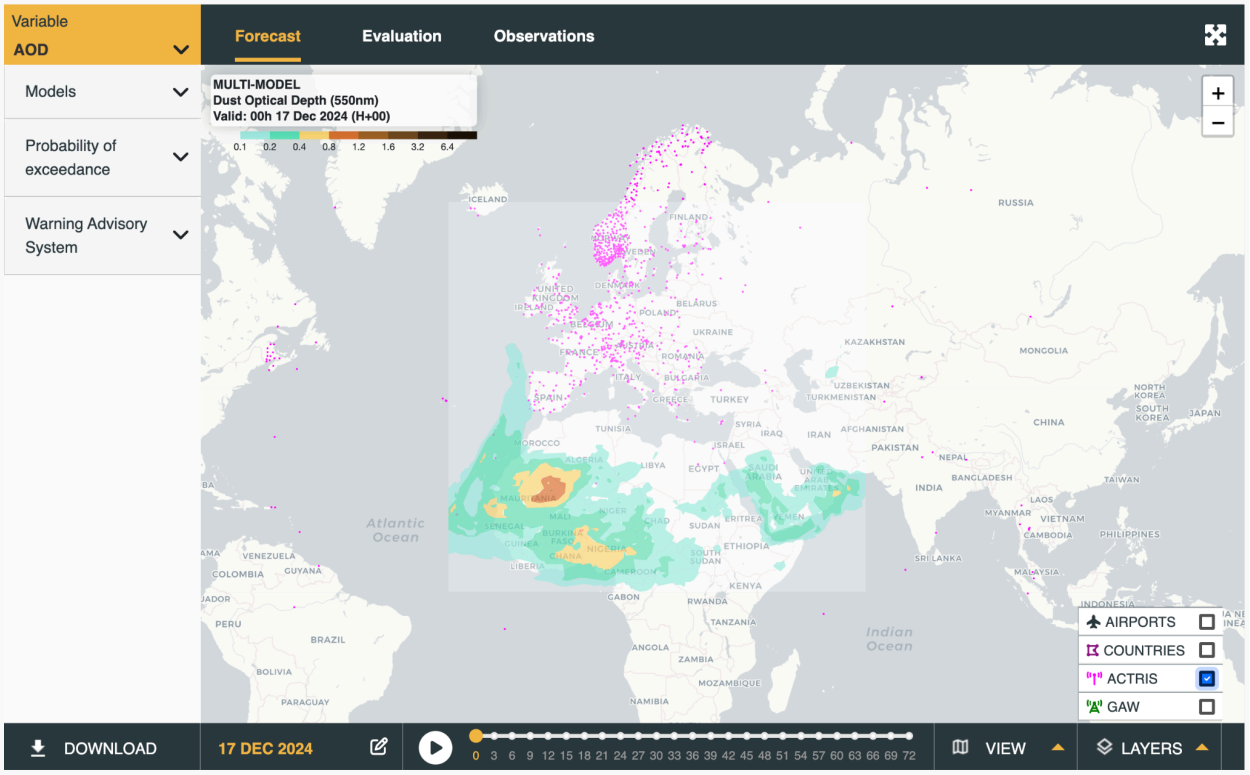


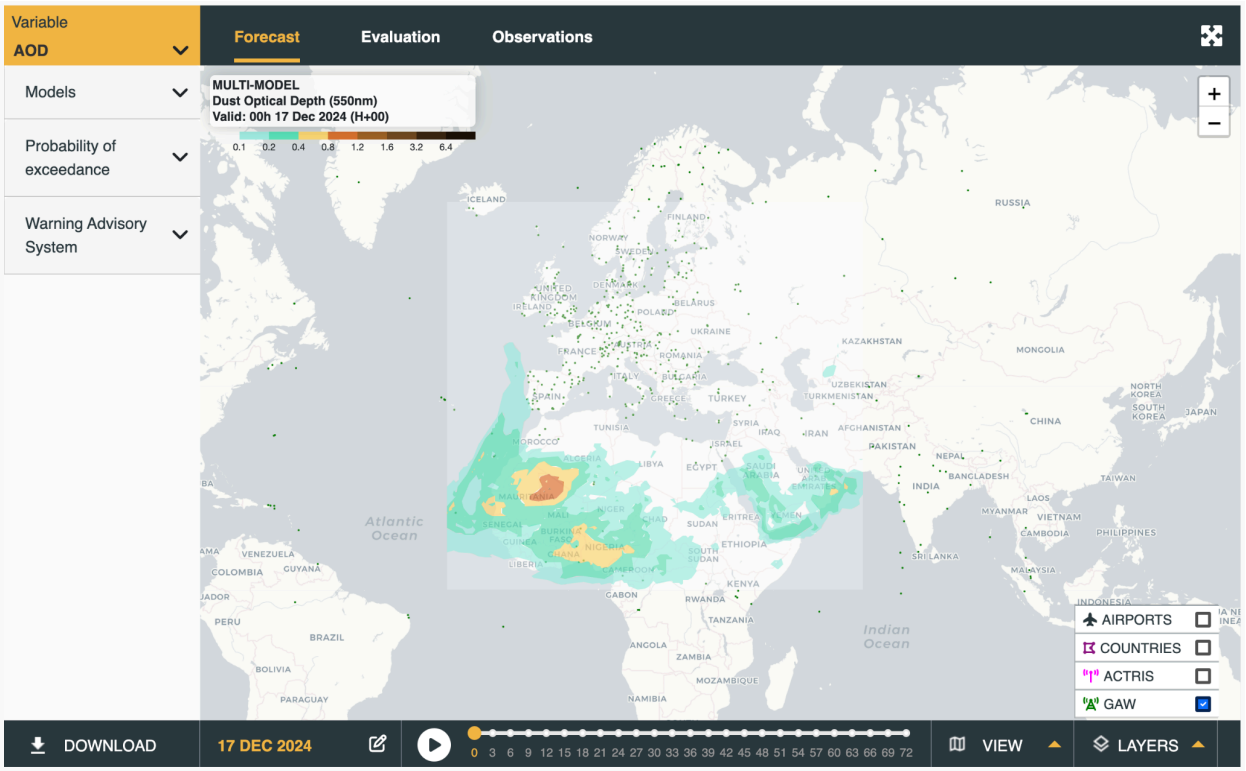
Add extra layers of information in the base map: **location of airports, country borders, ACTRIS stations, GAW stations**

Map Layers. The Maps interface features a layer functionality that displays geographical data through interactive overlays. Users can access the location of Airports, ACTRIS stations, and GAW stations through interactive popups, enabling exploration and analysis of these geographical data points. We have a total **4 layers:**






Variable
AOD
Forecast
Evaluation
Observations
Models
Probability of exceedance
Warning Advisory System
MULTI-MODEL
Dust Optical Depth (550nm)
Valid: 00h 17 Dec 2024 (H+00)
0.1 0.2 0.4 0.8 1.2 1.6 3.2 6.4
AIRPORTS
COUNTRIES
ACTRIS
GAW
DOWNLOAD
17 DEC 2024
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72
VIEW
LAYERS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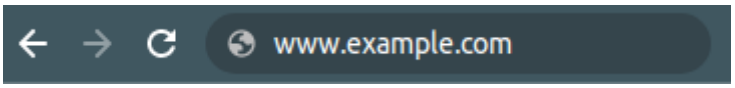
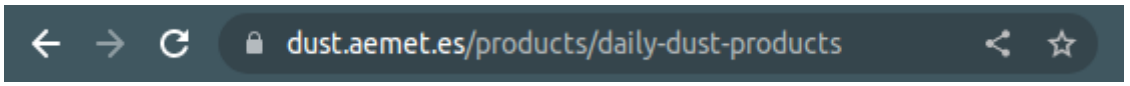
DOWNLOAD
17 DEC 2024
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72
VIEW
LAYERS

2.1.1 Navigating the Dashboard with your URL

Now, users can **navigate to various locations** on the dashboard with **URL queries**. The URL is the address that you type into your the address bar of your browser, which looks like this:



This new functionality will allow users to **quickly get to information** they are looking for on the dashboard, or share specific information with others through URL links. In practice, queries can be added to the base URL of the dashboard to get to the desired information.
For example, the dashboard is located at:



If you want to navigate directly to the Statistics section of the Evaluation tab, you can modify the URL to include the desired tab and section, which would look like the following:

Queries are **not position dependent**, so they can be added in any order. The format for adding a query is to **add a "?" after the base URL**, and then the **queries separated by ampersands (i.e. &)**. After the question mark, the search **queries come in Key/Value pairs, separated by an "="**. So, in the above query, we have "tab=evaluation" and "section=statistics". Each Key/Value pair is separated by an "&".
So, to review, here are **some of the basics**:

- Queries are added by adding a "?" and then the Key/Value pairs after the base URL
- Key/Value pairs are separated by an "&"
- Queries do not need to be in a specific order
- All **queries should be** entered in **lower case**

- **Spaces are accounted for with underscores** (“dry deposition” becomes “dry_deposition”)

As you navigate through the dashboard, you’ll notice that the **URL now updates when certain buttons or tabs are clicked**. Reviewing these changes is a great way to get hints at the proper formatting of the URL queries. Further, you might navigate to the area of the application that you will want to return to later, or send as a link, and then just copy the link out of the search bar.

There are **a total of 5 query keys** with each key having its own possible values.

The available keys are:

- tab
- var (abbreviated from variable)
- section
- model
- date

Values for “tab” are:

- forecast
- evaluation
- observations

Values for “var” are:

- aod
- concentration
- dry_deposition
- wet_deposition
- load
- extinction

Values for “section”:

- prob (abbreviated from “Probability of Exceedance”)
- was (abbreviated from “Warning Advisory System”)
- visual_comparison
- statistics
- eumetsat-rgb
- visibility
- Note: “models” is not needed as it is the default when landing on the “forecast” tab

Values for “model”:

- median (multi-model)
- monarch
- cams (CAMS-IFS)
- dream8-cams

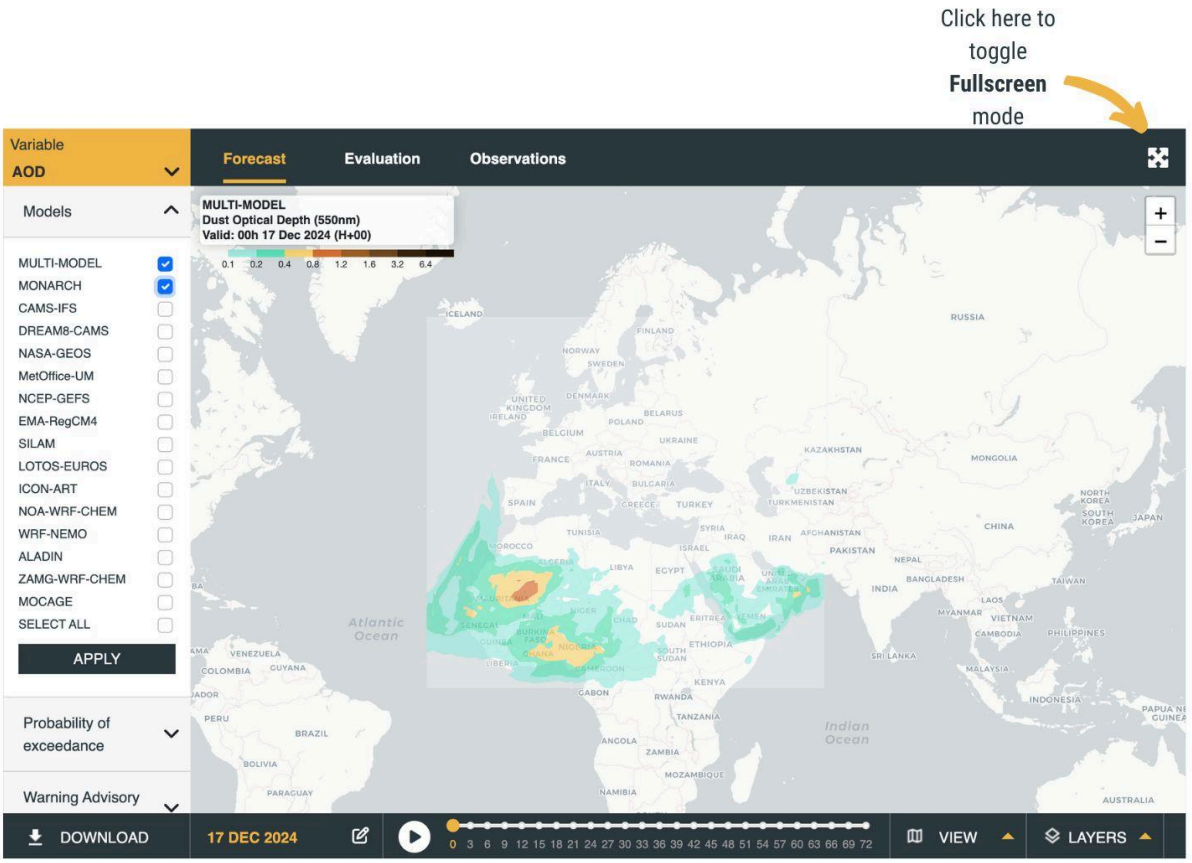
- nasa-geos
- metoffice (MetOffice-UM)
- ncep-gefs
- ema-regcm4
- silam
- lotos-euros
- icon-art
- noa (NOA-WRF-CHEM)
- wrf-nemo
- aladin
- zamg (ZAMG-WRF-CHEM)
- mocage

Values for “date”:

- Date is entered in YYYYMMDD format
- For example, September 25, 2022 is entered as 20220925

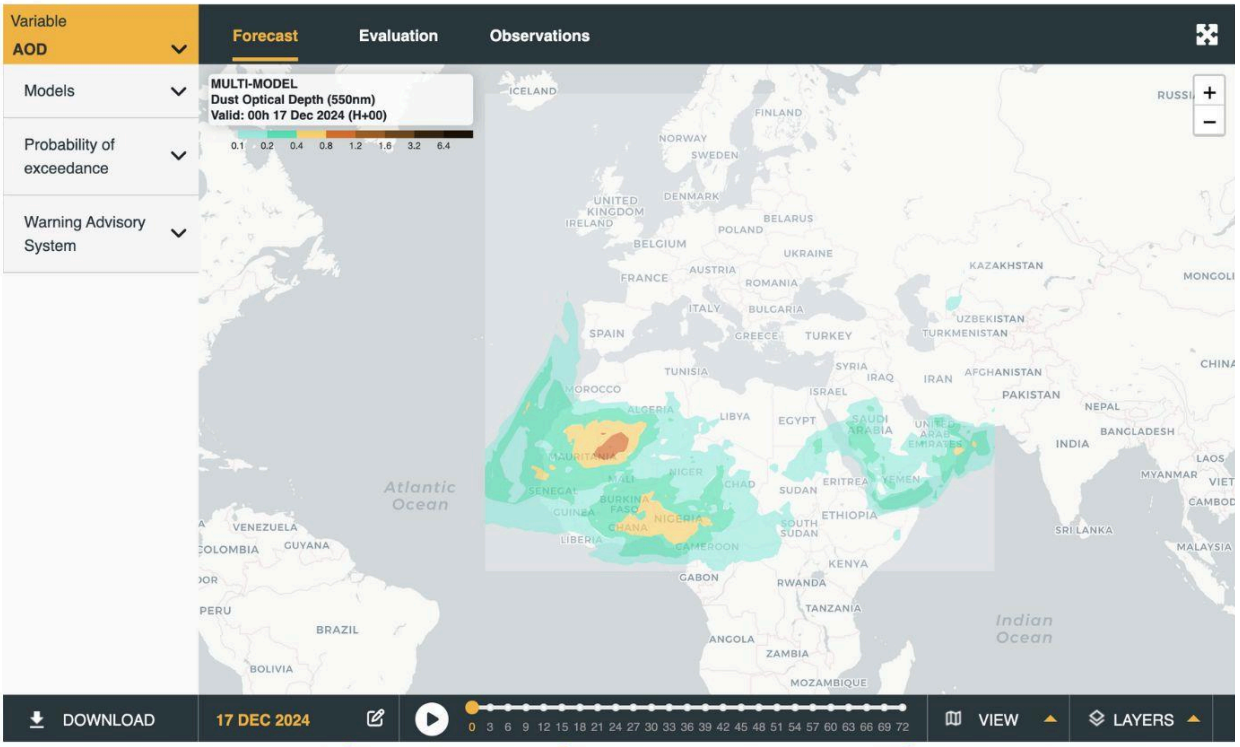
2.1.2 Fullscreen Functionality

You can now take the dashboard into **fullscreen mode** in your browser. Look for the **square box in the top navbar on the right side**. Click this box and you will take the dashboard fullscreen. To put the dashboard back to its original size, click the button again or use your **Esc** button on the top left of your keyboard.



2.1.3 Map Controls

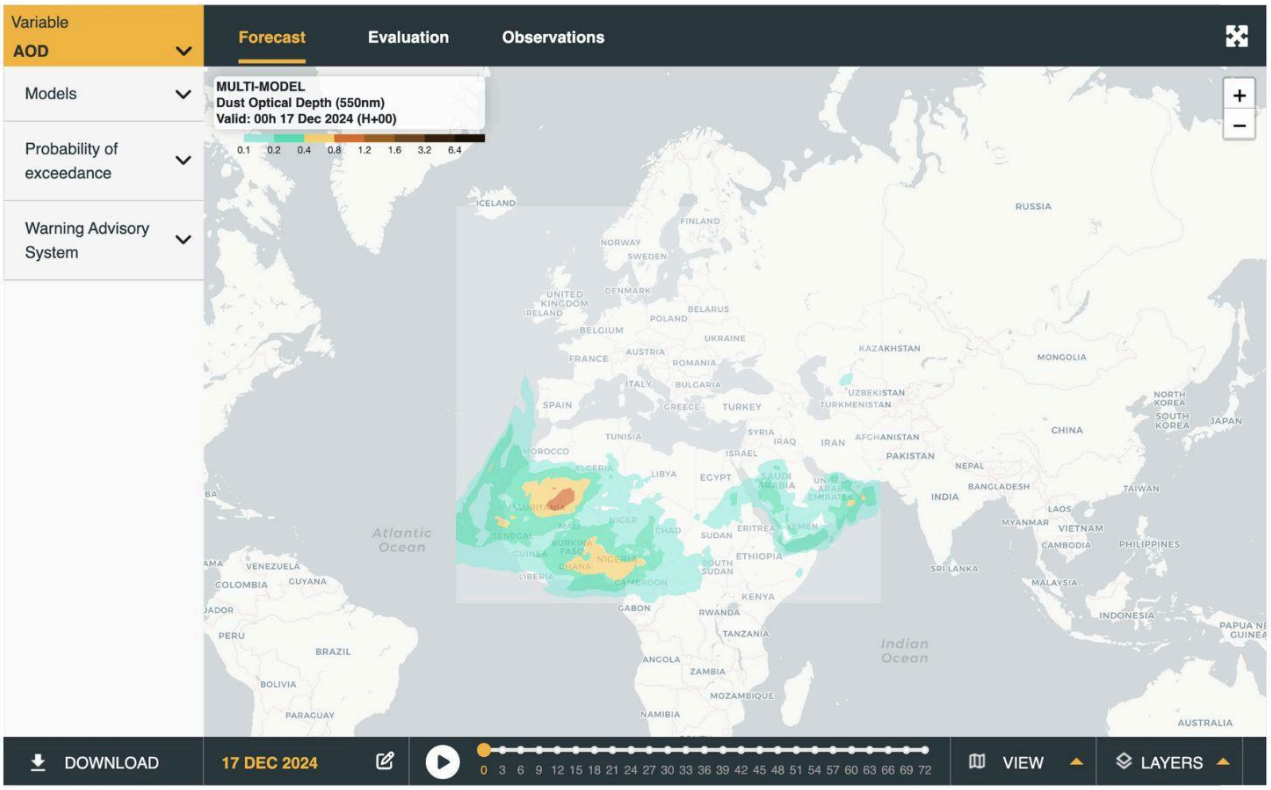
We have updated the controls(**date picker, timeseries, and views menu**) for better functionality, and moved them out of the map space to afford a better field of vision. You will notice that **the pause button** from the time series bar **has been removed**.



The map controls have now been moved below the map space and updated for better functionality

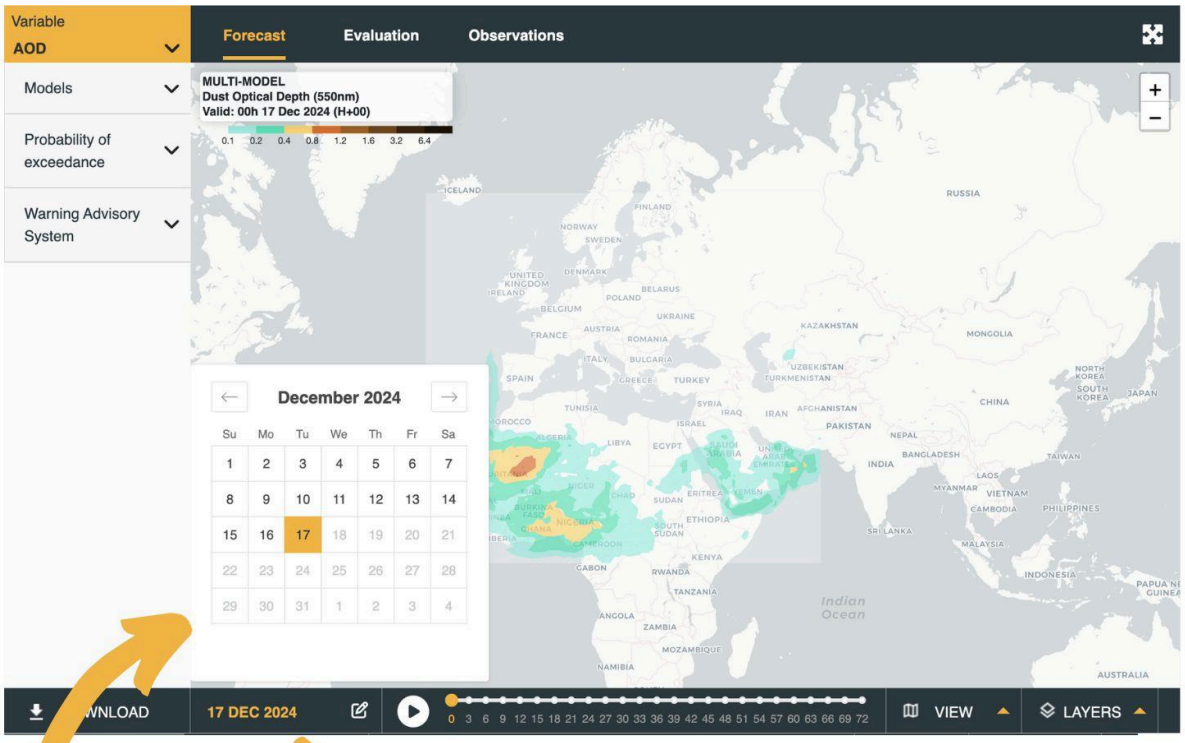
2.1.4 Using the Date Picker

When choosing a date to interact with the various map products that we offer, you can use the date pickers in various ways to **choose which date to view**. You can **click on the date picker or the clear button** which appears as an icon of a pencil on a small piece of paper to get started.



To **clear** the date or **pull up the calendar**, click this icon

If you click the **clear button**, you will be able to **access the calendar popup**, **or the manual entry box**. To enter a date manually, **use the format noted shown in grey** in the box. To use the calendar, **simply click the day** which you want to see. You can also **flip through the months with the left and right arrows** at the top of the calendar popup.

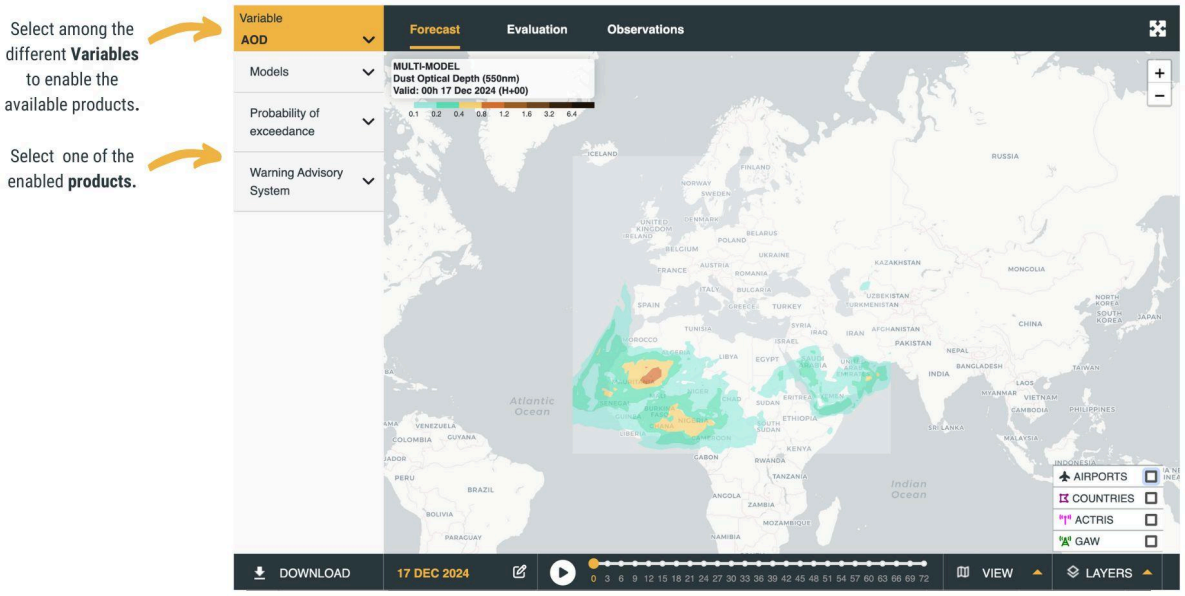


You can also **select a date** by using the **calendar** popup

Dates can be **manually entered** following the format in gray

2.1.5 Exploring the forecast

The **"Forecast"** panel contains a map displaying the daily dust forecast, according to the **variable and product parameters selected** by the users on the left sidebar.



Forecast variables

The full definition of the variables, as well as the enabled products for each one, can be found in the following table:

Variable name	Description	Units	Full name	Enabled products
AOD	Effective depth of the dust-aerosol column from the viewpoint of radiation propagation. It corresponds to the integrated extinction coefficient over a vertical column.	Dimensionless	Dust aerosol optical depth at 550 nm	Models, Probability of exceedance
Concentration	Mass concentration of dust particles in the atmosphere. By default, the dust concentration at surface level is shown.	$\mu g/m^3$	Dust surface concentration	Models, Probability of exceedance, Warning Advisory System
Dry deposition	Accumulated dry dust deposition over the previous 3 hours. Dry deposition processes consider the removal of dust (and sand) by sedimentation and turbulent diffusion.	mg/m^2	Dust dry deposition	Models (only available for MONARCH)
Wet deposition	Accumulated wet dust deposition over the previous 3 hours. Wet deposition processes consider the removal of dust (and sand) by in-cloud and below-cloud scavenging.	mg/m^2	Dust wet deposition	Models (only available for MONARCH)
Load	Accumulated mass concentration of dust (and sand) in the vertical column of the atmosphere.	g/m^2	Dust load	Models (only available for MONARCH)

Extinction	The sum of scattering and absorption of solar and infrared radiation by dust (and sand) at surface level. It is associated with visibility.	Mm^{-1}	Dust surface extinction at 550 nm	Models (only available for MONARCH)

Based on the **"Variable"** selection (in the upper-left corner), the available dust products for the selected variable are enabled. These may include:

- Models *(intercomparison)*: Access to 72h dust forecasts of individual models and the MULTI-MODEL result (median of all individual models). This product (MULTI-MODEL and all individual models) is available for the variables: AOD, and Concentration. In the case of the MONARCH model, the product is available for the following variables: AOD, Concentration, Dry deposition, Wet deposition, Load, and Extinction.

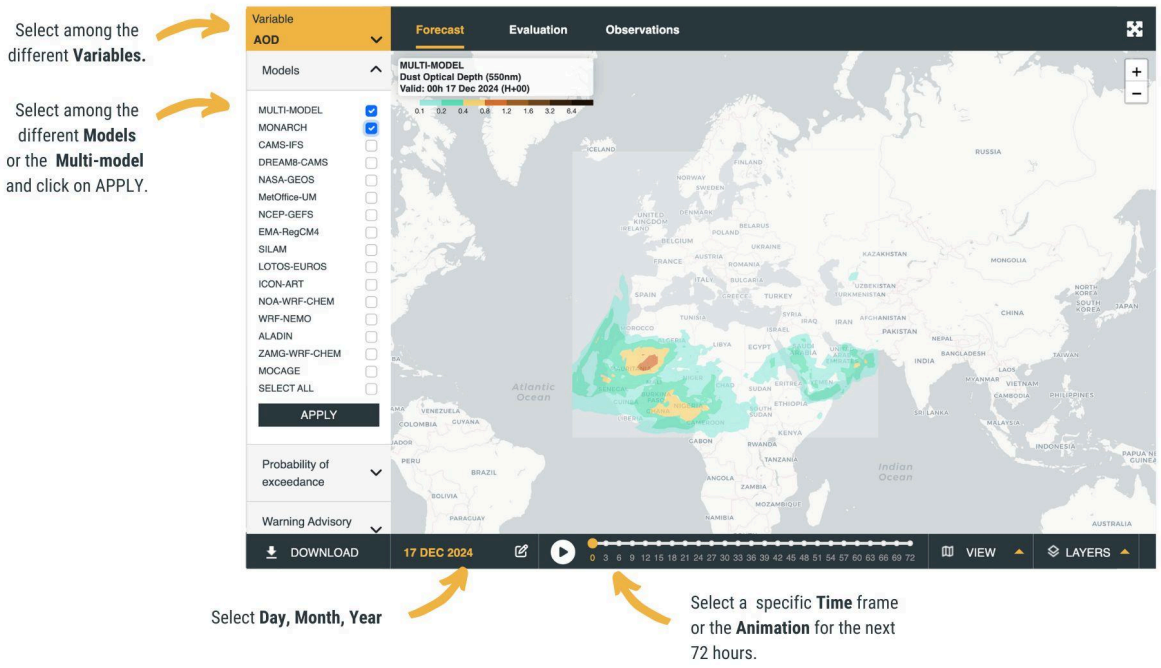
- Probability of exceedance: Percentage of models that predict the exceedance of a given threshold for a particular variable. This product is available only for the variables: AOD, and Concentration.

- Warning Advisory System: Information about the warning levels of dust and sand concentration (from Normal to Extremely High) for the next 2 days (before April 1st, 2023) at province level for particular countries. This product is available only for the variable: Concentration. (3 days available after April 1st, 2023)

Product: Models

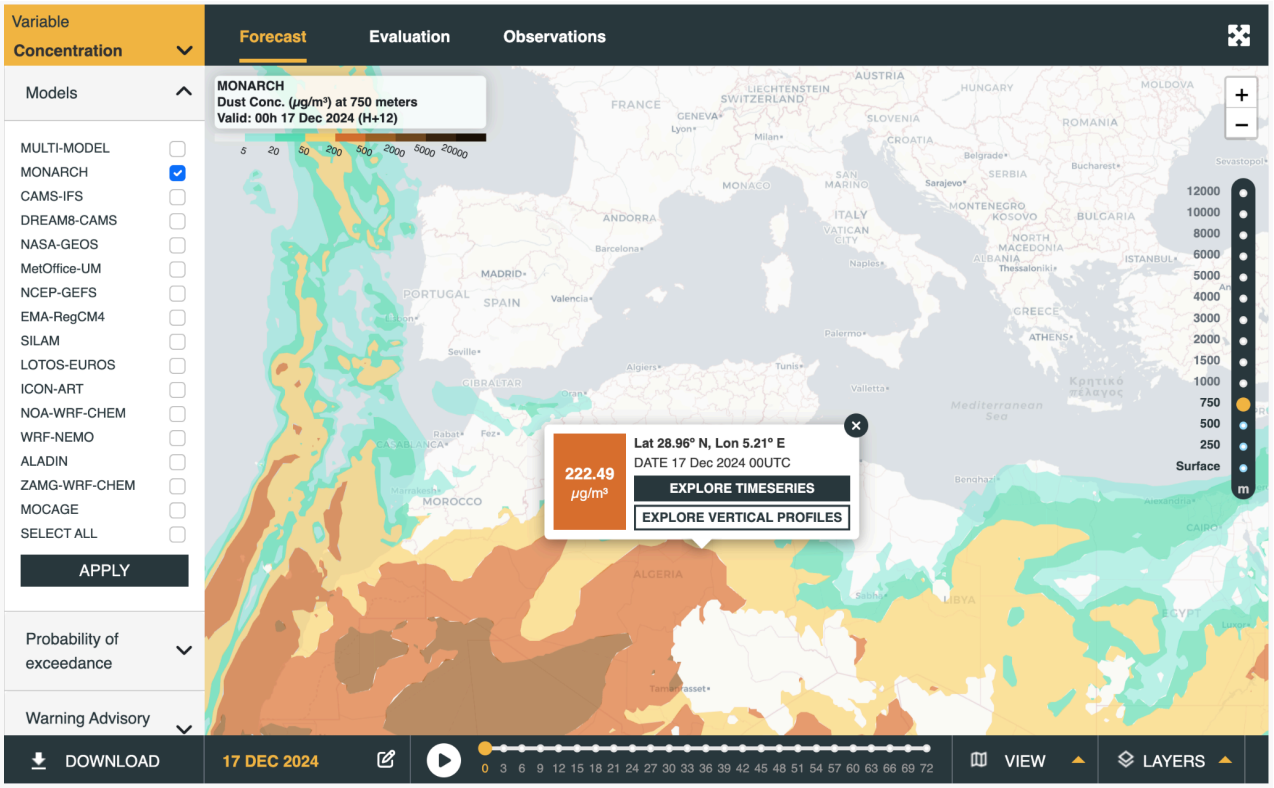
This menu includes all the individual models that currently contribute to the daily dust forecasts provided by the Center. The individual models are used to produce the MULTI-MODEL forecast, which is the median of all the available dust forecasts for a particular day, after bi-linear interpolation to a common grid mesh of 0.5º x 0.5º. At present, the MULTI-MODEL forecast is calculated only for Concentration and AOD. In general, the MULTI-MODEL forecast shows better verification scores than any of the contributing models in most regions and time periods, and is therefore considered a valuable tool to issue trust-worthy predictions of mineral dust in the domain served by the Center.

Based on their selection of models, users can analyse and compare forecasts from various models simultaneously. Lead times range from 0 to 72 h, and predictions are available for every 3 hours.



After clicking on a specific location on the map, the time series of the selected variable is plotted.

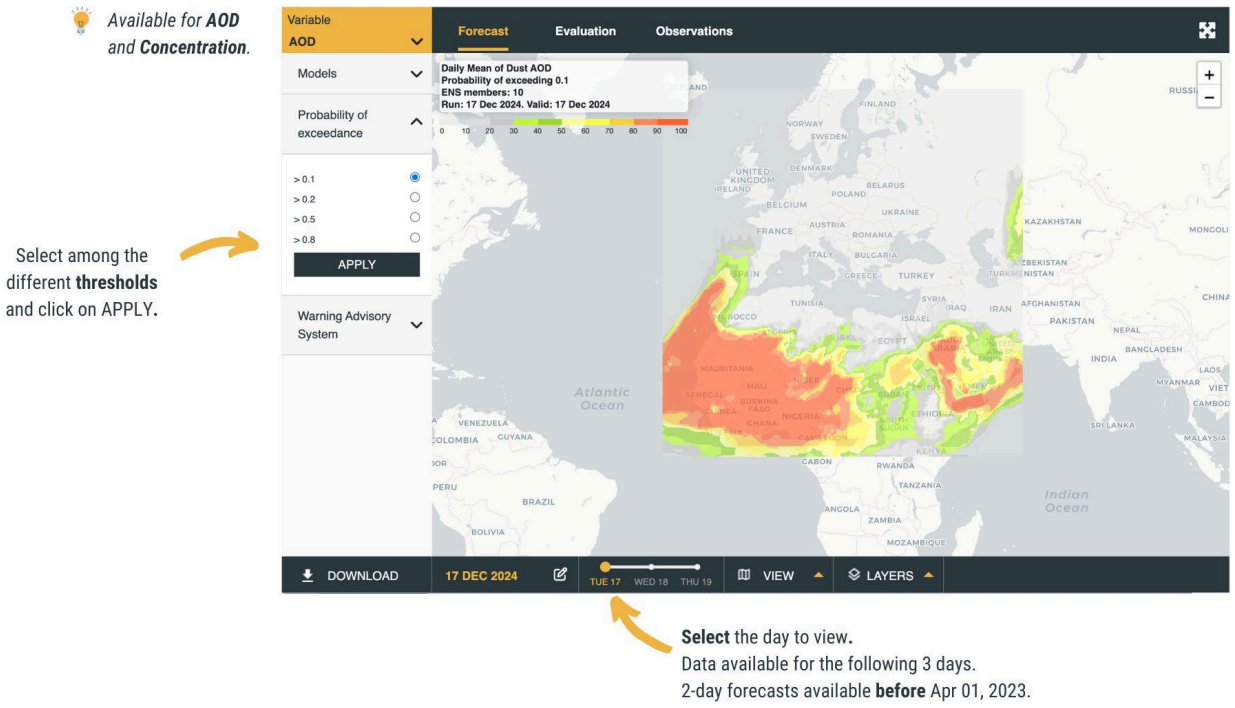
Vertical Profiles have been added to the Models section for the Concentration variable. These are accessible from the popups that appear after clicking the Models maps (only available for the MONARCH model).



More information on the participating models and the generation of the MULTI-MODEL forecast can be found in Terradellas et al. (2020), while more details about MONARCH, the reference model of the Center, is available in Basart et al. (2020). Moreover, detailed information about the individual models that contribute to the Center, their technical features and the contact details of the modelling groups can also be found in the Dust Products Catalogue and here.

Product: Probability of exceedance

Users can refer to this product to check the **"Probability of exceedance",** a given threshold of the daily mean value of both dust surface Concentration and AOD. It is calculated taking into account all the individual models that contribute to the Center and is generated for the 3 days with spatial resolution of 0.5ºx0.5º.



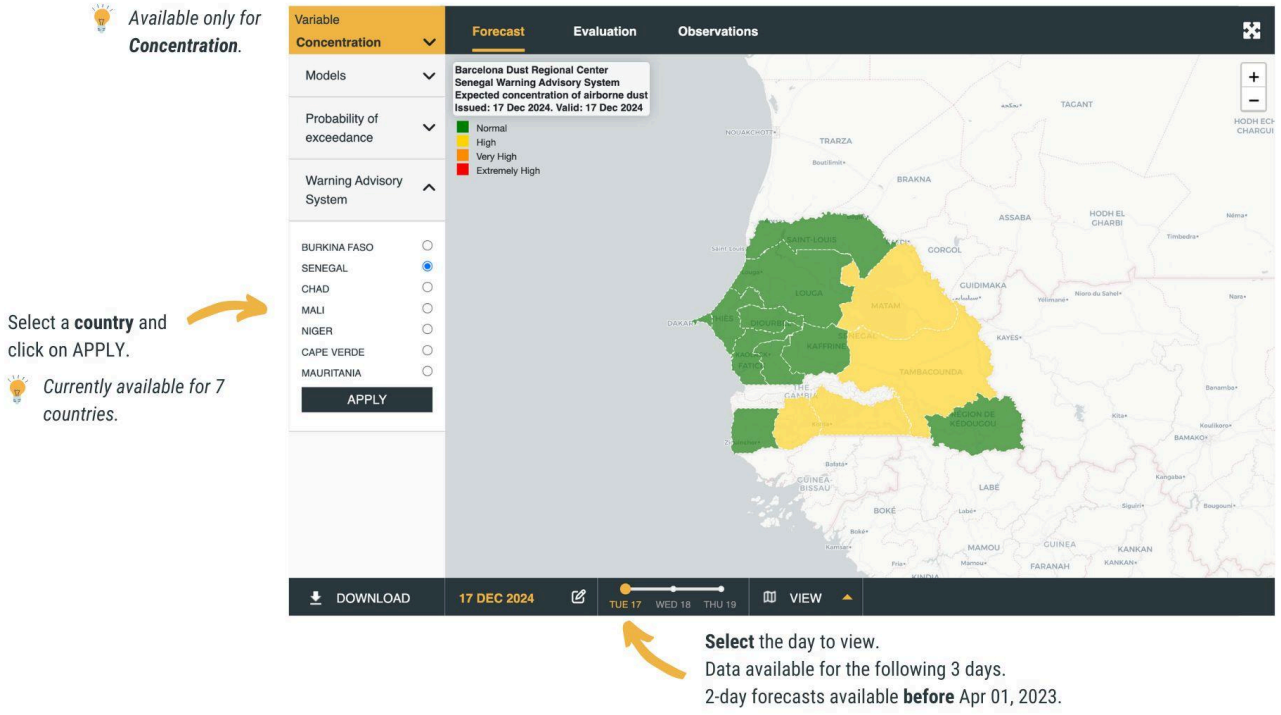
These probability maps are particularly useful for air quality stakeholders and for planning and managing any activity that can be affected due to the presence of airborne dust. More information about this product can be found in Werner et al. (2020).

Product: Warning Advisory System

Users can consult the color-coded maps of the “Warning Advisory System” product for categorical (qualitative) information about the warning levels of sand and dust concentration (from Normal to Extremely High) for 3 days for some of the most vulnerable countries in the Sahel region.

The warning levels are based on the MULTI-MODEL Concentration forecast and are established for each region according to the highest concentration value expected for the day, at any model grid-point within the province. The warning advisory thresholds have been set based on a percentile-based approach using the daily maximum concentration of the historical MULTI-MODEL time series.

This product has been developed under the Climate Risk and Early Warning Systems (CREWS) initiative.



This product could be taken into account to help the planification of any activity that is potentially affected by airborne dust, or the activation of services and procedures aimed at the mitigation of damages caused in vulnerable sectors. More information about this product can be found in Terradellas et al. (2018).

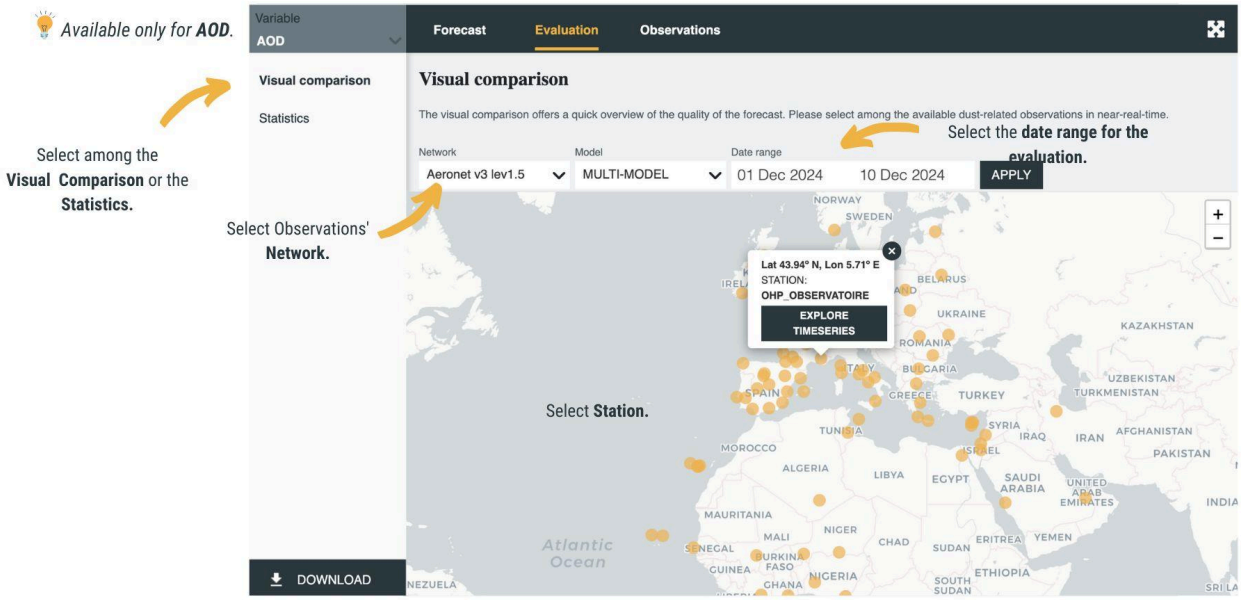
2.1.6 Exploring the evaluation

The “Evaluation” panel presents the comparison of the dust forecasts against dust-filtered observations. Here, the forecasts are compared to:

- AERONET AOD photometric measurements; The global-international AERONET network provides AOD at different wavelengths. In this comparison the direct-sun cloud-screened (Level 1.5) AOD is used. A dust filter that corresponds to Ångström Exponent at 440-870 nm lower than 0.6, is applied to the AOD observations prior to the comparison (Basart et al., 2017).
- NASA/MODIS Aqua and Terra NRT AOD combined product; MODIS AOD retrieval (in particular the Deep Blue product) is available over areas not easily covered by other observational data sets, e.g. very bright reflective surfaces such as deserts, and is therefore particularly relevant for dust applications.

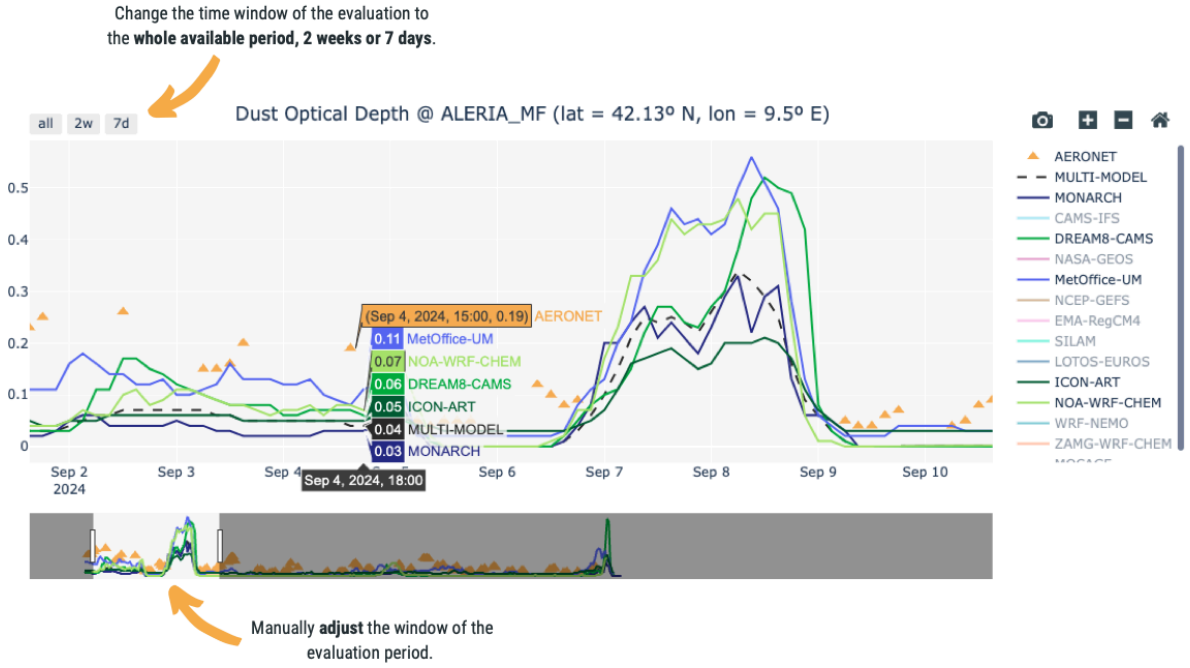
The time period of the comparison, as well as the forecasts to be compared can be defined by the users. The evaluation results are presented in the form of visual comparison and statistics (skill scores).

The visual comparison of dust AOD (MULTI-MODEL and individual models) against dust-filtered AOD observations is available for AERONET stations located in Northern Africa, the Middle East and Southern Europe for the selected date range selected. The comparison is made on a 3-hourly basis.



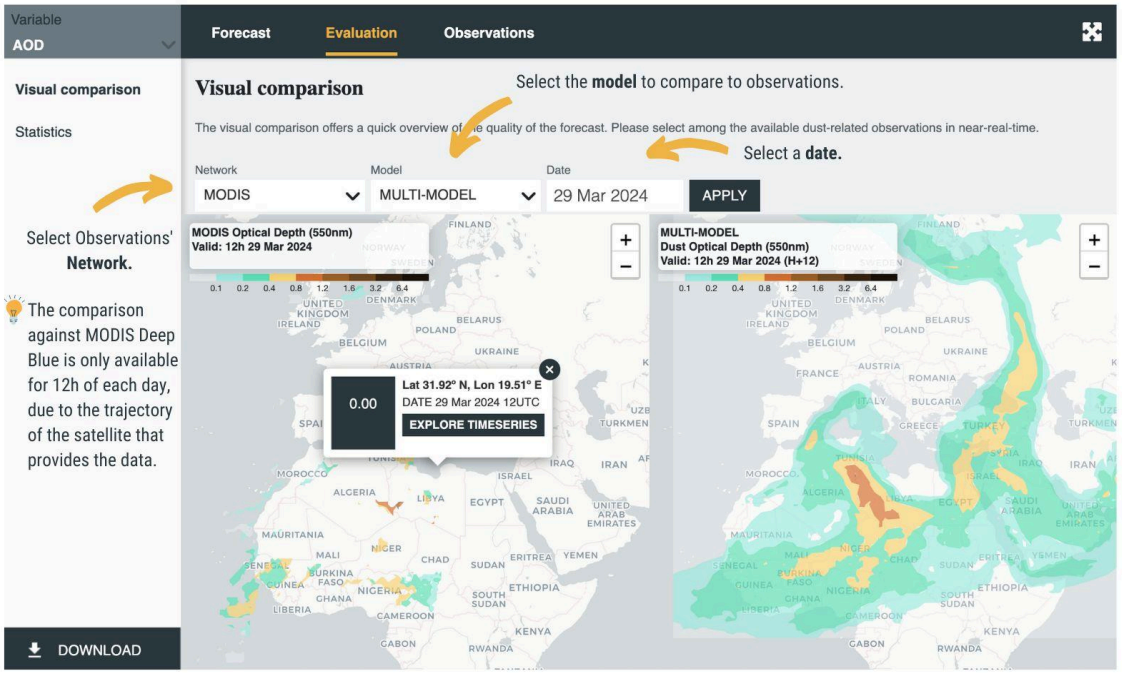
Visual comparison: AERONET

After selecting a specific AERONET station on the map, the comparison between the dust AOD forecasts and observations is plotted as time-series.



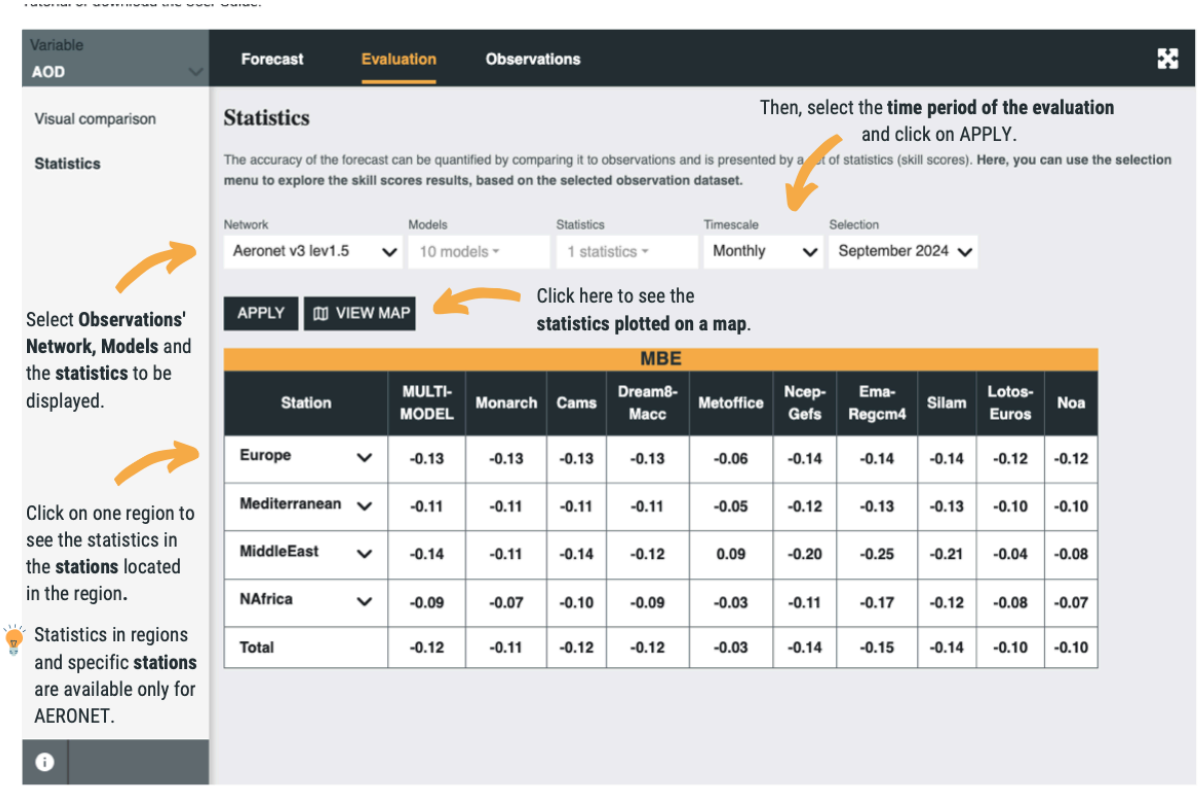
Visual comparison: MODIS

The visual comparison of the dust AOD forecast (MULTI-MODEL and individual models) against MODIS/Aqua NRT AOD product is available in the form of maps plotted side-by-side for a particular day (at 12UTC), and also in the form of time series upon click to a specific location on the map.



Statistics

The corresponding skill scores of the evaluation against AERONET and MODIS observations are available for the whole domain. In the case of the AERONET network, they are also available per region (Northern Africa, the Middle East and the Mediterranean) and stations. They can be displayed in a list or map format, according to the user´s selection. The metrics used to quantify the mean departure between modelled and observed quantities are the mean bias error (BIAS), the root mean square error (RMSE), the correlation coefficient (r), the fractional gross error (FGE) and the number of total cases (TOTAL CASES). Their definition is given in Terradellas et al. (2020).



2.1.7 Exploring the observations

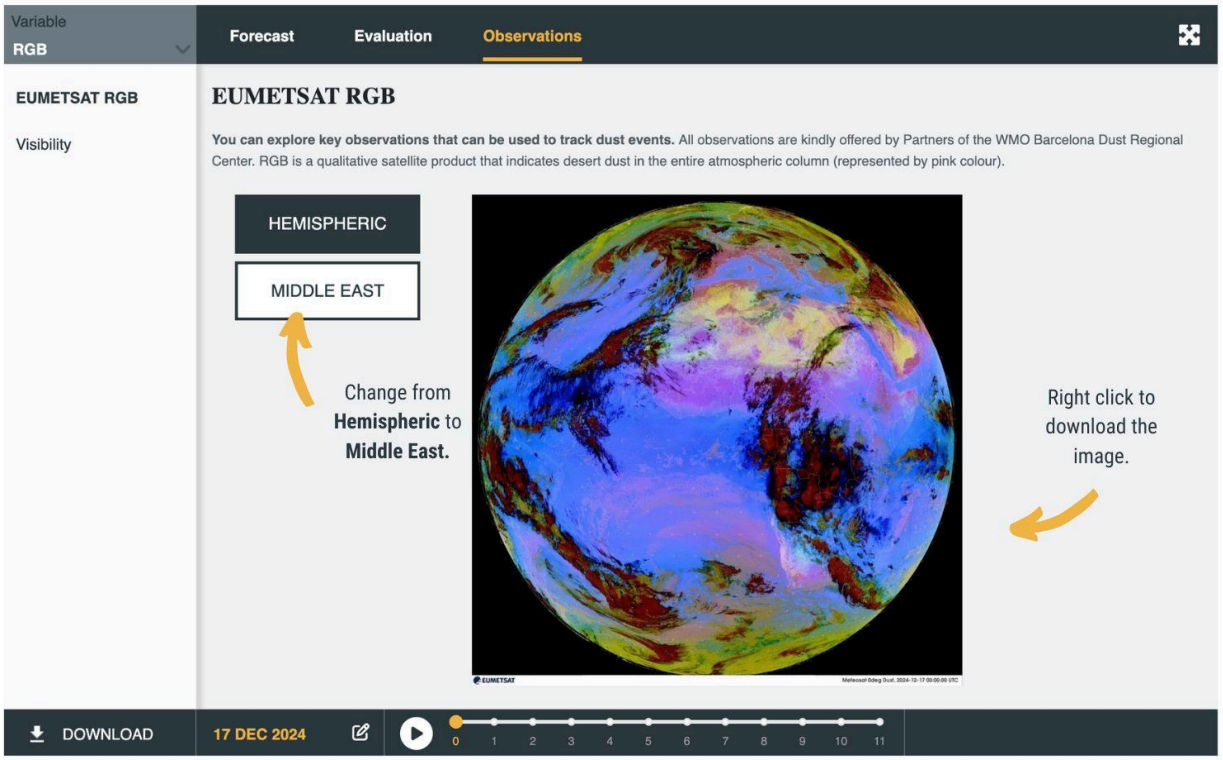
Product: EUMETSAT RGB

The "**Observations**" panel offers a visualisation of key observations that can be used to track sand and dust storms. **The datasets presented here** are different from those used for model evaluation (see 2.1.2 Exploring the evaluation). All observations are kindly offered by Partners of the WMO Barcelona Dust Regional Center.

This product is an **RGB** (Red, Green, Blue) composite based on three infrared channels of the EUMETSAT SEVIRI, which provides images every 15-minutes. This RGB combination is designed to monitor the evolution of dust storms during both day and night (the presence of dust is associated with pink/magenta colour).

*__RGB Image Availability__: RGB timeseries loop will now only show timesteps for available images (Previously 24 timesteps were shown, even when not all the images were available.)

This product is kindly offered by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT).



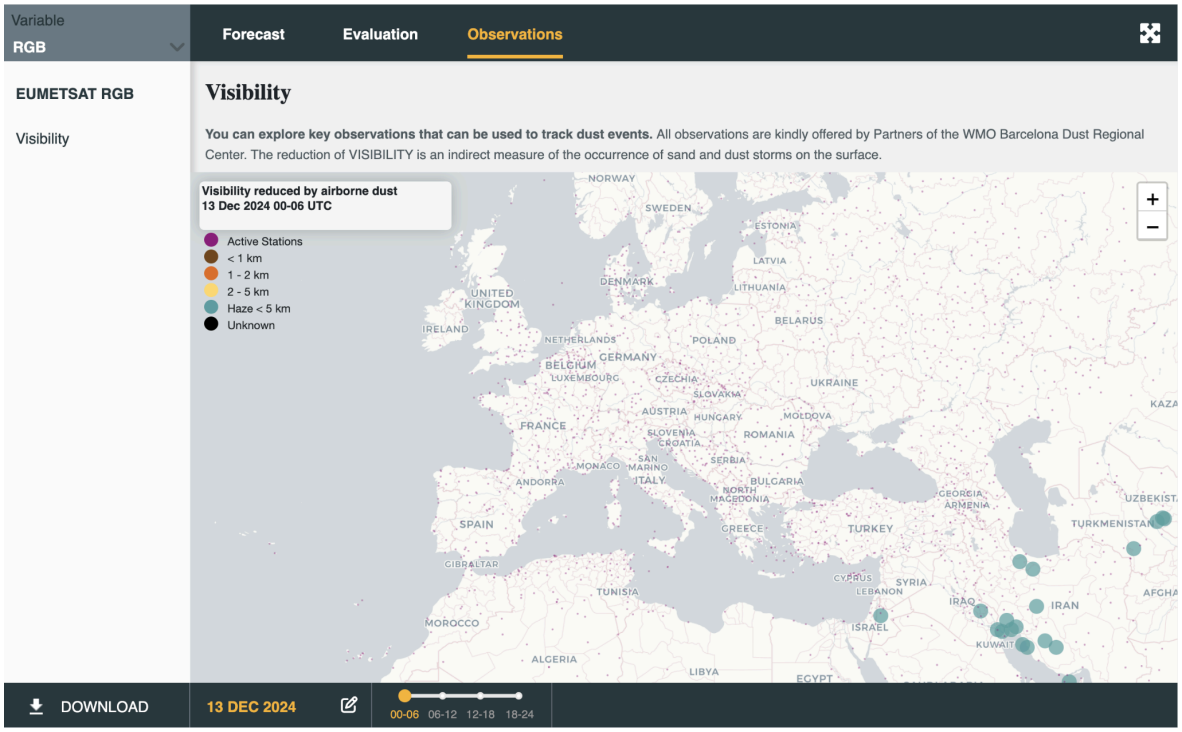
Product: Visibility

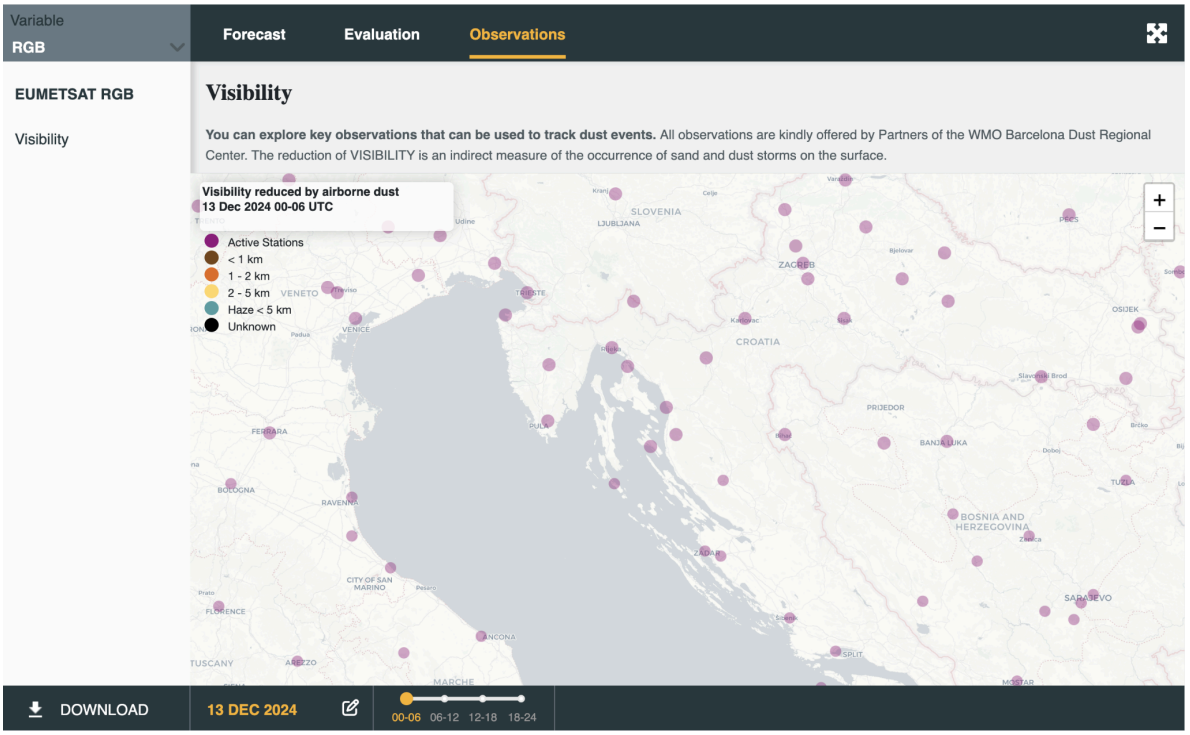
Visibility can be used as an indirect measure of the presence of airborne sand and dust at surface level. This product shows cases of 6-hourly visibility reduction less than 5 km associated with airborne sand or dust reported in METAR (METeorological Aerodrome Reports), SPECI (a special METAR when conditions change significantly at a staffed location) and SYNOP (surface synoptic observations) bulletins.

We have added several categories to improve this product:

- **Haze:** For stations reporting haze (HZ) with visibility reduction of less than 5 km and humidity less than 80%. In these cases, please note that haze could be caused by aerosols other than dust, such as smoke, volcanic ash, etc.
- **Unknown:** Refers to stations where the cause of the visibility reduction cannot be determined. For example, stations without Present Weather information. Additionally, stations with a humidity value higher than 80% are shown as Unknown because visibility reduction can be influenced by humidity.
- **Active stations:** All other stations that provide data.

This product is kindly offered by the AEMET meteorological database.


Variable
RGB
Forecast
Evaluation
Observations
EUMETSAT RGB
Visibility
Visibility
You can explore key observations that can be used to track dust events. All observations are kindly offered by Partners of the WMO Barcelona Dust Regional Center. The reduction of VISIBILITY is an indirect measure of the occurrence of sand and dust storms on the surface.
Visibility reduced by airborne dust
13 Dec 2024 00-06 UTC
Active Stations
< 1 km
1 - 2 km
2 - 5 km
Haze < 5 km
Unknown
NORWAY
SWEDEN
ESTONIA
LATVIA
LITHUANIA
DENMARK
UNITED KINGDOM
IRELAND
BELARUS
NETHERLANDS
POLAND
BELGIUM
GERMANY
LUXEMBOURG
CZECHIA
UKRAINE
SLOVAKIA
AUSTRIA
HUNGARY
MOLDOVA
FRANCE
SLOVENIA
CROATIA
ROMANIA
SERBIA
MONACO
SAN MARINO
ITALY
ANDORRA
BULGARIA
NORTH MACEDONIA
GEORGIA
ARMENIA
SPAIN
GREECE
TURKEY
TURKMENISTAN
GIBRALTAR
CYPRUS
SYRIA
LEBANON
TUNISIA
IRAQ
IRAN
MOROCCO
ISRAEL
KUWAIT
ALGERIA
LIBYA
EGYPT
DOWNLOAD
13 DEC 2024
00-06 06-12 12-18 18-24


Variable
RGB
Forecast
Evaluation
Observations
EUMETSAT RGB
Visibility
Visibility
You can explore key observations that can be used to track dust events. All observations are kindly offered by Partners of the WMO Barcelona Dust Regional Center. The reduction of VISIBILITY is an indirect measure of the occurrence of sand and dust storms on the surface.
Visibility reduced by airborne dust
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Active Stations
< 1 km
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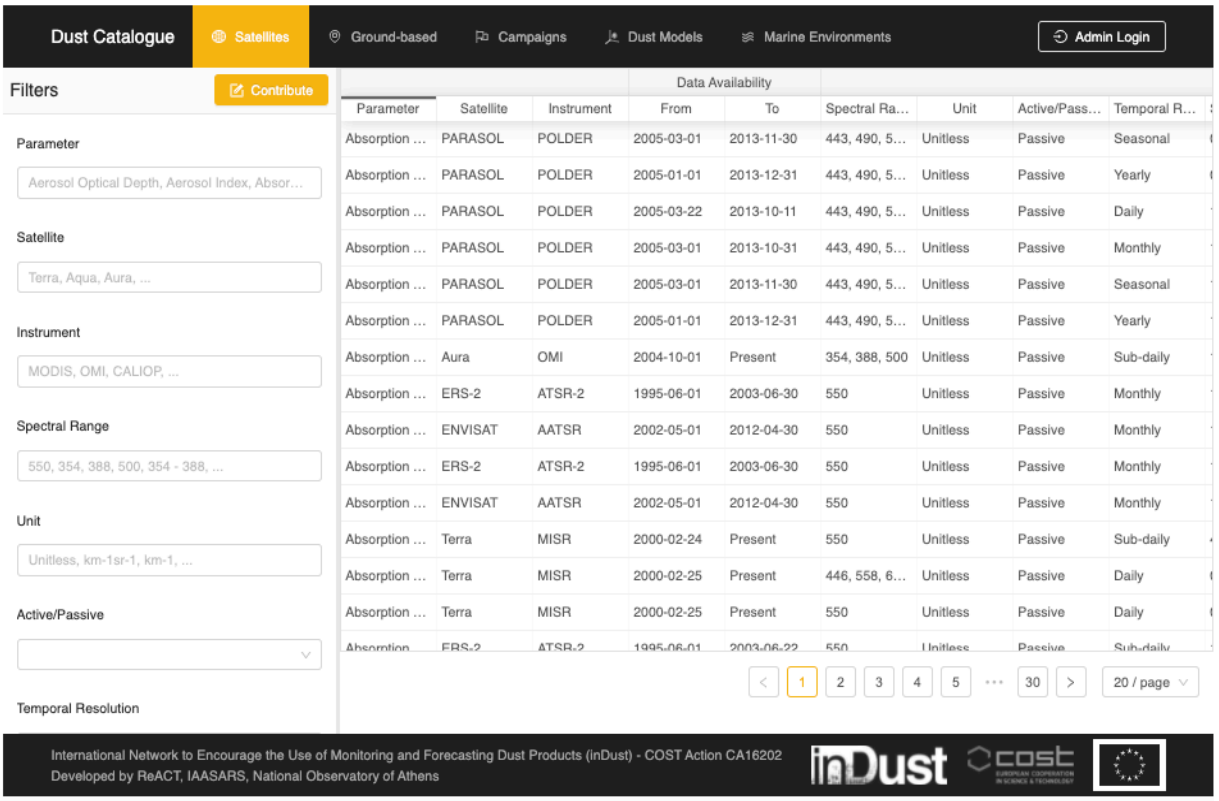
Unknown
SLOVENIA
LJUBLJANA
ZAGREB
CROATIA
PRIJEDOR
BANJA LUKA
BOSNIA AND HERZEGOVINA
SARAJEVO
OSIJEK
FERRARA
RAVENNA
BOLOGNA
CITY OF SAN MARINO
FLORENCE
ANCONA
SPLIT
TUSCANY
MARCHE
DOWNLOAD
13 DEC 2024
00-06 06-12 12-18 18-24

2.2 Dust Products Catalogue-

A detailed inventory of the available dust observational and modelling products is compiled in the **"Dust Products Catalogue", developed in the framework of the** COST Action inDust.

Users can **find centralised dust information from different sources (satellites, ground-based networks, experimental campaigns, marine ecosystems and models), as well as** the contact details of the person/group in charge of **each source**. A wide range of filtering options based on parameters, type of measurement/instruments, and region among others, is available t**o facilitate the search.**

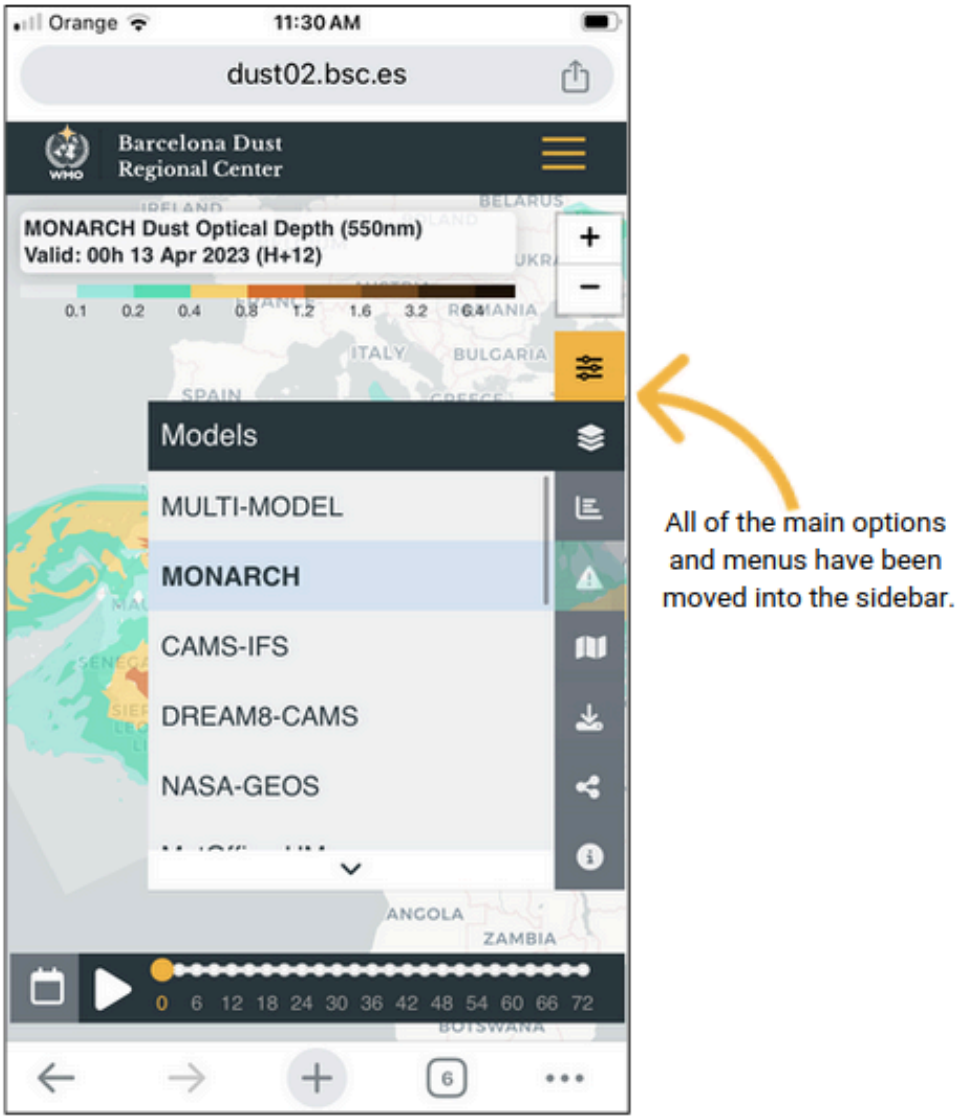
The database was developed by the National Observatory of Athens (NOA) and it is hosted by the WMO Barcelona Dust Regional Center.

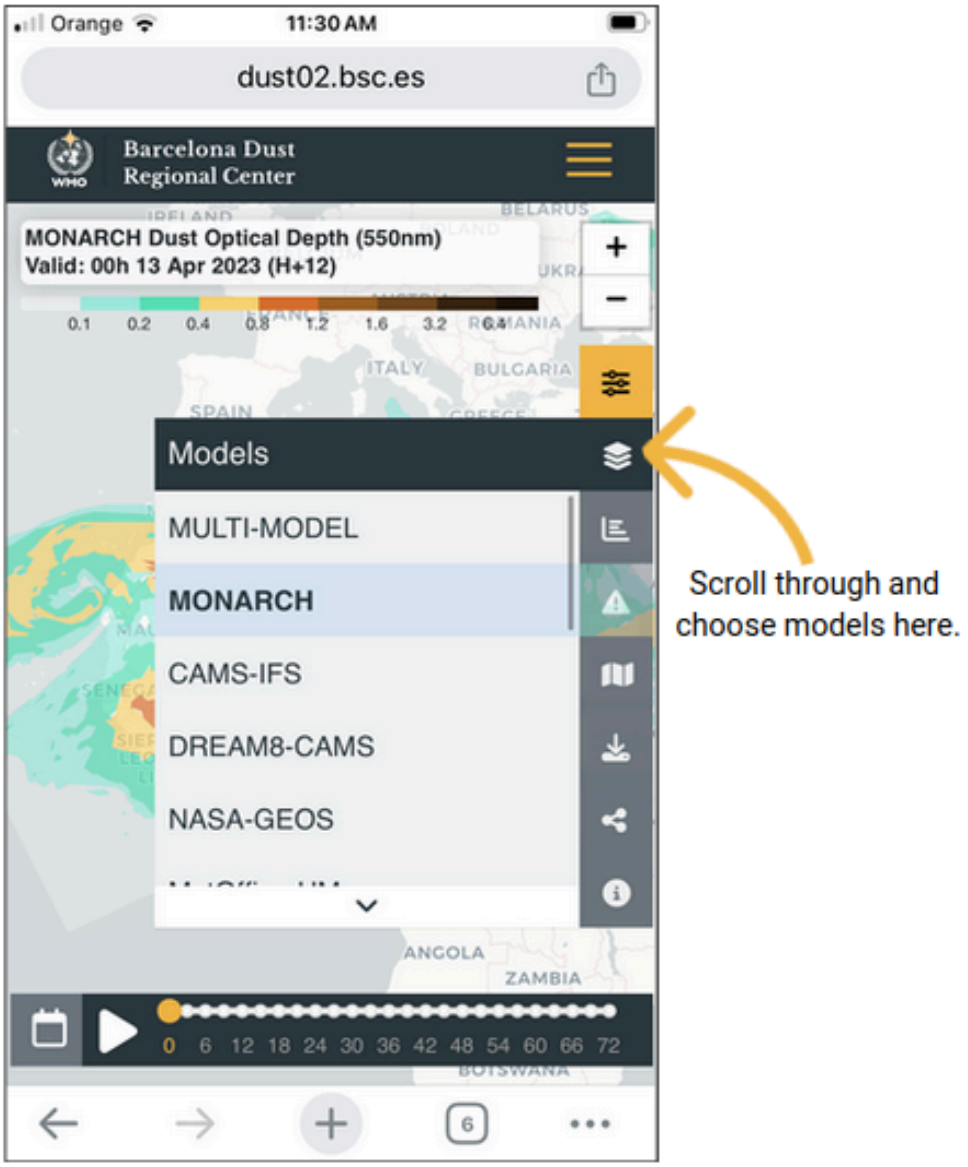


2.3 Dashboard for Mobile Phones

The **Dashboard is accessible through mobile browsers** (optimised for Chrome and Safari) and works in portrait mode (landscape mode not yet supported). The Mobile Dashboard provides **access to the Forecast products** (Models, Probability of Exceedance, and Warning Advisory System). Currently the time series graphs are not yet supported.

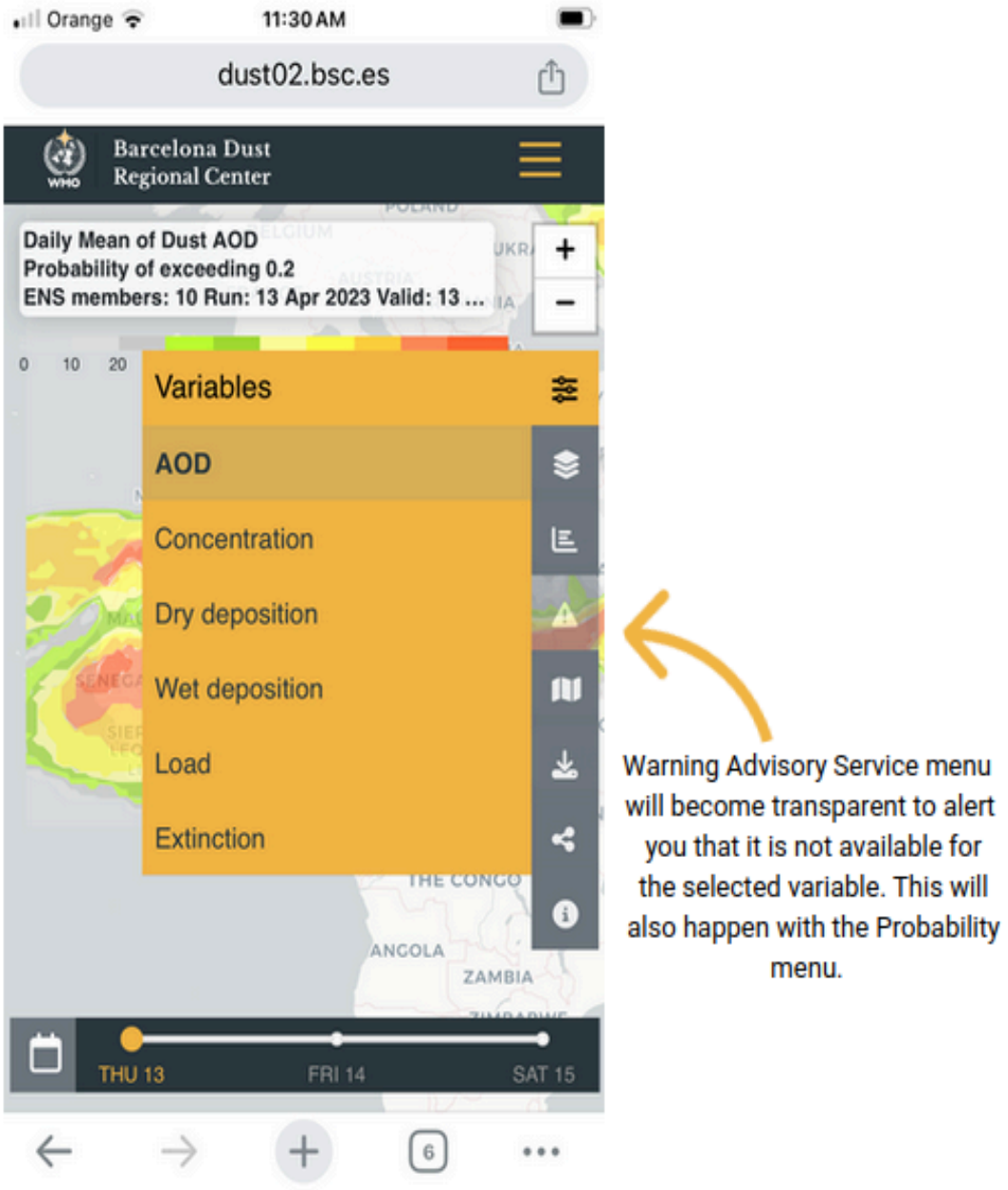
Functionalities for the Dashboard are moved to the **right sidebar** to allow for easy access.



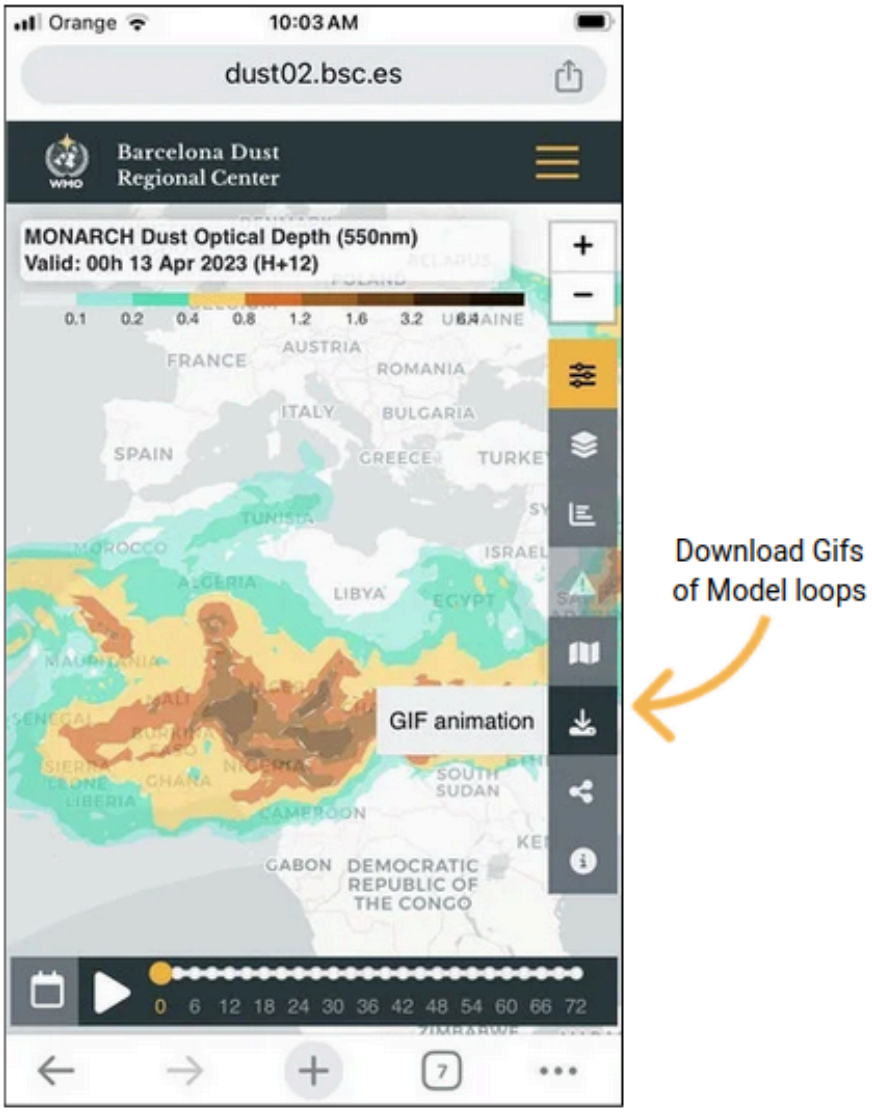


You'll see that all of the sections have titles to allow you to understand which menu you are currently viewing. The **Probability of Exceedance and Warning Advisory System buttons will become transparent and inaccessible** if you change to a Variable that is

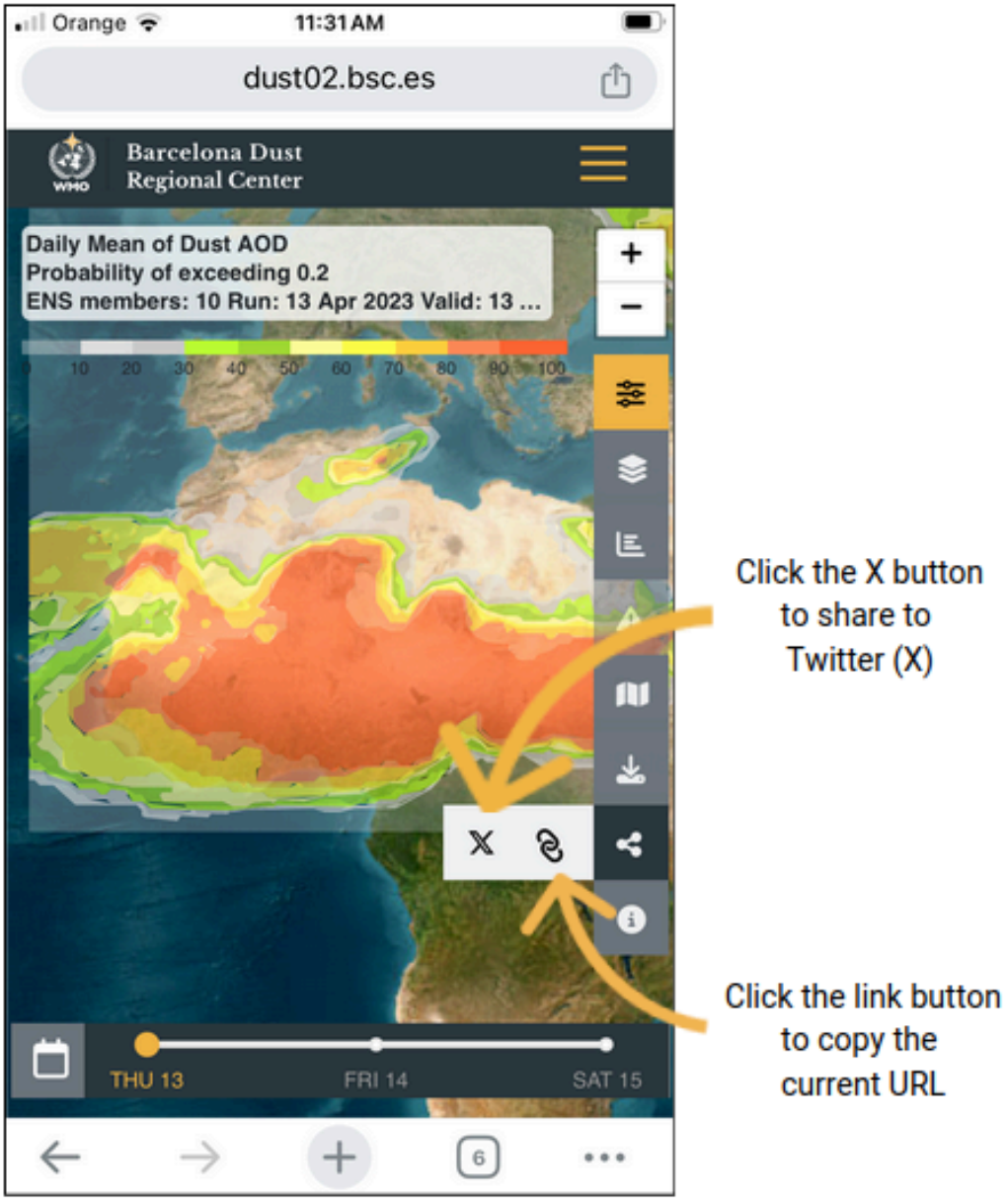
not compatible. An alert will also show to let you know that these products have become inaccessible. **If you click the close button on these alerts, they will not appear again**. If you do not close these alerts, they will automatically disappear after a few seconds, but they will reappear when you change variables again.



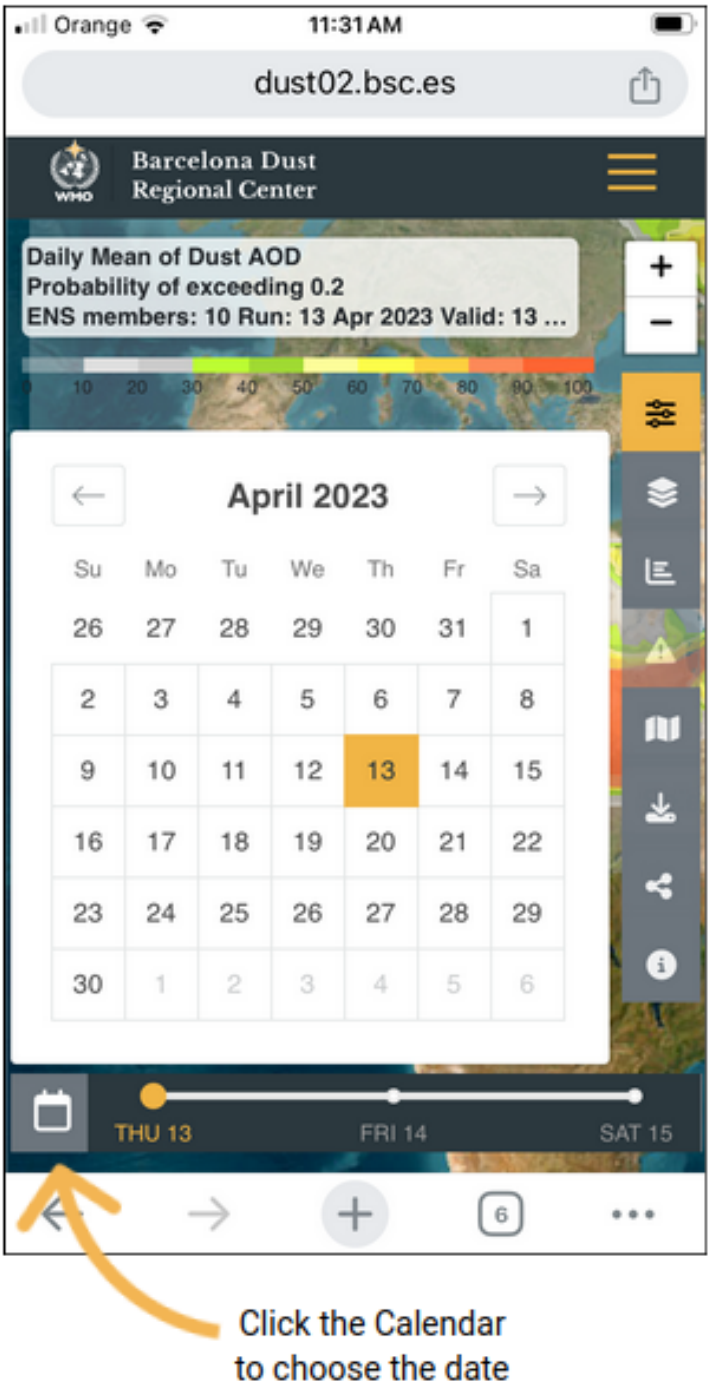
You can **download the animated gifs** of the model loops by tapping the download icon on the sidebar, and then selecting “Gif animation”.



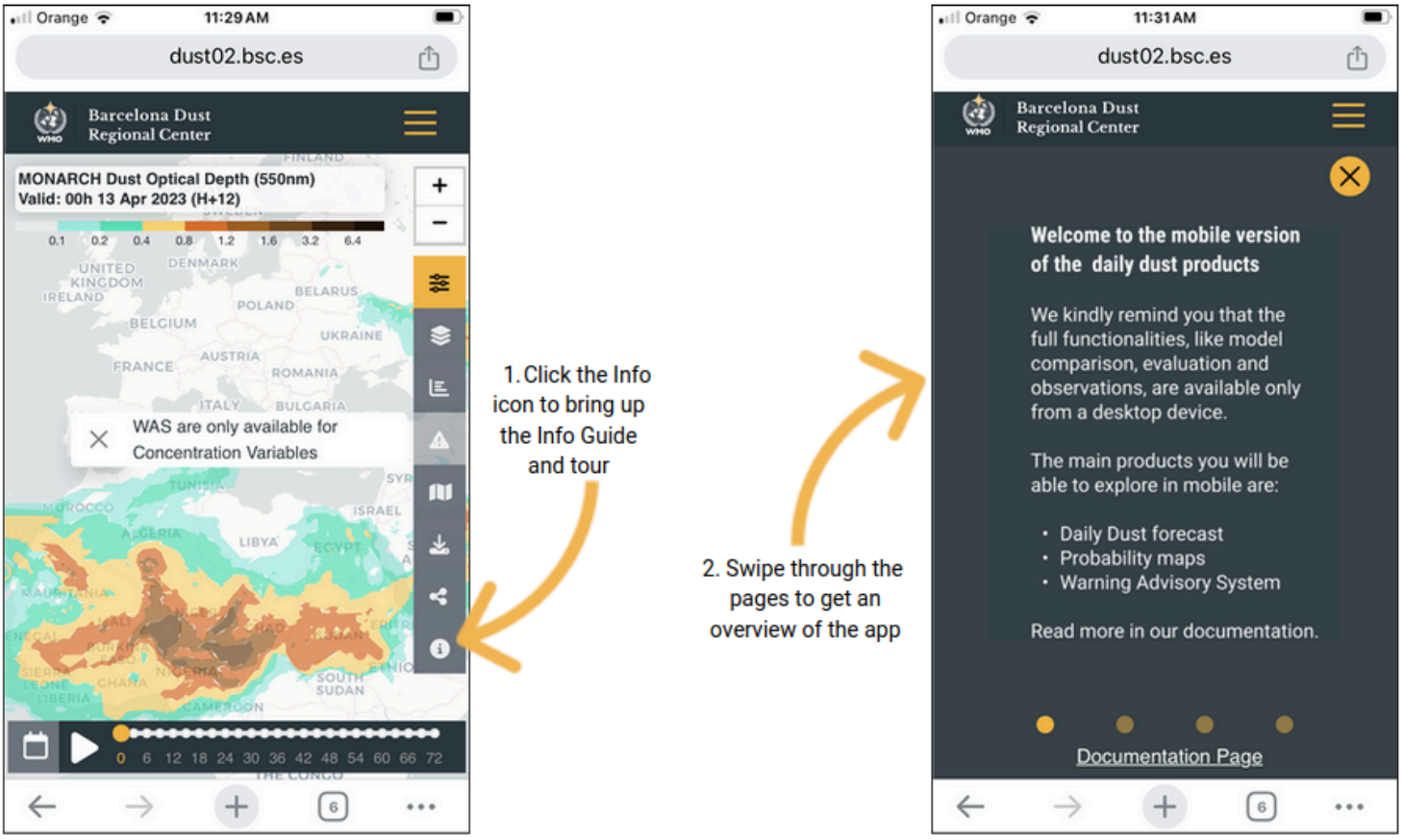
You can now **copy the URL** directly to your system clipboard to paste or share by selecting the share icon in the sidebar menu. **Sharing to X (Twitter)** is also available in this menu.



The **calendar** can be brought up by selecting the calendar icon on the bottom floating navbar. You can also switch through the available timesteps or days by tapping a step on the navbar.



A quick **tour of the mobile Dashboard** is available by tapping the information icon located at the bottom of the sidebar. This will allow you to swipe through cards that detail some of the important aspects and functionalities of the mobile Dashboard.



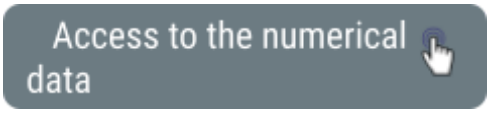
3 Numerical Data Download Service

The WMO Barcelona Dust Regional Center provides easy access to the numerical data of the products available in the website through a THREDDS Data Server (TDS). TDS is a web server that provides metadata and data access for scientific datasets, using remote data access protocols. THREDDS is developed and supported by Unidata, a division of the University Corporation for Atmospheric Research (UCAR), and is sponsored by the National Science Foundation. The download can be completed using a variety of services (OPeNDAP, HTTPServer, NetcdfSubset).

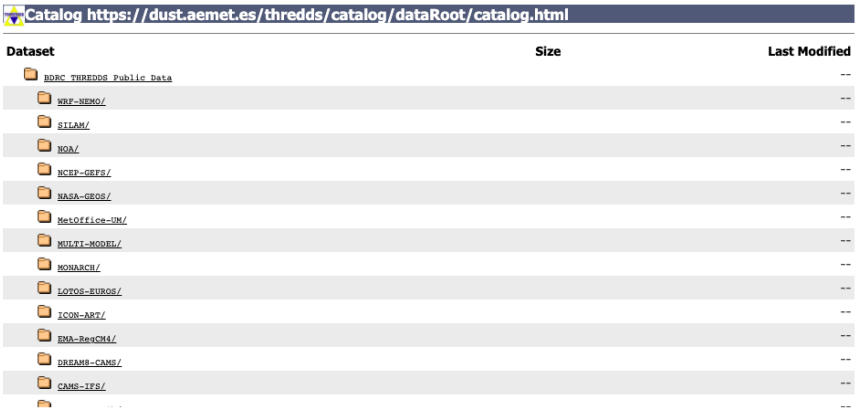
In order to access and download the numerical data of the daily dust forecasts, registration is needed. User access can be requested via email. Two types of access to the daily dust forecasts are implemented:

- Public, providing access to numerical predictions issued more than 2 days ago.
- Restricted, providing access to all the numerical predictions available for re-distribution, including those issued less than 2 days ago. Access is normally limited to National Meteorological and Hydrological Services and other institutions contributing actively to the WMO Barcelona Dust Regional Center and the SDS-WAS programme. Public administrations, research and educational institutions are eligible to access these services in support of specific activities. Applications will be evaluated and answered within 30 days of the date of the petition.

Once registration is completed, users can access the archive of the numerical data of the daily dust forecasts, according to the type of access that has been granted to them (Public or Restricted).



The repository is divided into two folders (BDRC THREDDS Public Data and BDRC THREDDS Restricted Data). These are divided into various subfolders; one for every model that provides data to the Center.



Each of the models´ folders contain the published dust daily forecasts ordered per year and month (including those models decommissioned, e.g. BSC-DREAM8b). After selecting a specific month, users can access the list of files that can be downloaded. When users select a specific file, the available download links appear.

Alternatively, the download of files can be done through the command line, by using the following commands:

Download a file

wget --user="USER" --password="PASSWORD" "https://dust.aemet.es/thredds/fileServer/dataRoot/MODEL/YEAR/MONTH/FILE"

example:
wget --user="USER" --password="PASSWORD" "https://dust.aemet.es/thredds/fileServer/dataRoot/MONARCH/2020/12/2020123112_3H_SDSWAS_NMMB-BSC-v2_OPER.nc"

Subsetting time, latitude, longitude and variable

wget --user="USER" --password="PASSWORD" "https://dust.aemet.es/thredds/ncss/dataRoot/MODEL/YEAR/MONTH/FILE.nc?var=OD550_DUST&var=SCONC_DUST&north=NORTH&west=WEST&east=EAST&south=SOUTH&horizStride=1&time_start=TIME_START&time_end=TIME_END&timeStride=1&addLatLon=true&accept=netcdf4"

example:
wget --user="USER" --password=”PASSWORD" -O 20201231_3H_MEDIAN_test.nc "https://dust.aemet.es/thredds/ncss/dataRoot/MULTI-MODEL/2020/12/20201231_3H_MEDIAN.nc?var=OD550_DUST&var=SCONC_DUST&north=50.0000&west=-20.0000&east=50.0000&south=0.0000&horizStride=1&time_start=2020-12-31T12%3A00%3A00Z&time_end=2021-01-01T12%3A00%3A00Z&timeStride=1&addLatLon=true&accept=netcdf4"

4 How to cite

The WMO Barcelona Dust Regional Center must be acknowledged as the source of information in any materials (graphs, articles, papers, written scientific works, etc.) derived from the numerical data, visualisations or products available in the Center’s official webpage.

A citation example is shown below, which should be adapted accordingly:

"Dust data and/or images were provided by the WMO Barcelona Dust Regional Center and the partners of the Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) for Northern Africa, the Middle East and Europe."

In addition, it is strongly recommended to include the reference article per model(s) in the Bibliography. A more detailed explanation of how to appropriately acknowledge the Center can be found in the Data Policy.

User support (contact)

Users can get in touch with the WMO Barcelona Dust Regional Center for additional information through the Contact page.

Additionally, for issues concerning the models that contribute to the Center, users can consult the contact details of the modelling groups.

To stay informed about the latest activity of the Center, users can subscribe to the newsletter.