How to download reanalysis data

Tutorial Summary:

Learn how to download MERRA2 and ERA5 reanalysis data to your PC. If time series met data is imported in Continuum, reanalysis wind speed data may be used in MCP (Measure-Correlate-Predict) to predict long-term wind speeds at each met site. This tutorial covers the steps needed to download ERA5 and MERRA2 data. See the tutorial named "How to Add/Edit Reanalysis data" to learn how to define and extract reference nodes for a Continuum model.

Reanalysis Data in Continuum Overview

Long-term reanalysis data is stored as textfiles and folders containing reanalysis data may be used in multiple Continuum projects. When a Continuum model is created, the user needs to specify where the reference data is downloaded and then when a long-term reference is added, Continuum extracts the reanalysis data at the required nodes and saves it to a local SQL database. This way, the Continuum .cfm file may be used and new models and estimates can be generated without requiring access to the daily textfiles. The folders containing the textfiles may contain a larger geographic area and/or a larger timespan than what is used in the Continuum model. The data stored in the local SQL database (DB) is specific to the long-term references defined in the model. The diagram below (Figure 1) shows how long-term reanalysis datasets are utilized in Continuum. When creating a new model that requires reanalysis data, the user must either specify where the downloaded reanalysis data is located or start/resume a reference data download by clicking 'View/Edit Ref. Data Downloads' on the LT Reference Data tab. Once the reanalysis data is available, the user may then create/edit new long-term reference sites by clicking 'New' or 'Edit' on the LT Reference Data tab.

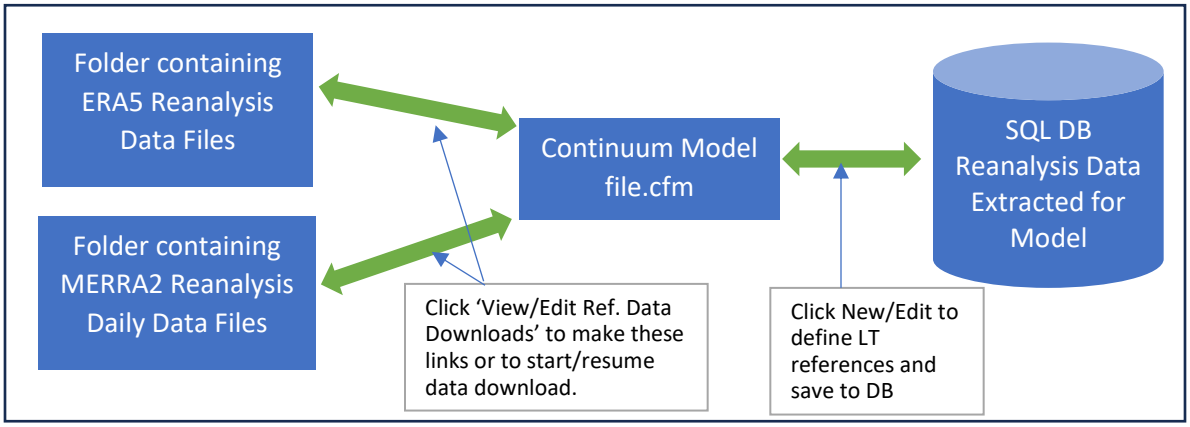


Figure 1. Reanalysis Data Access/Usage in Continuum

Pre-Requisites

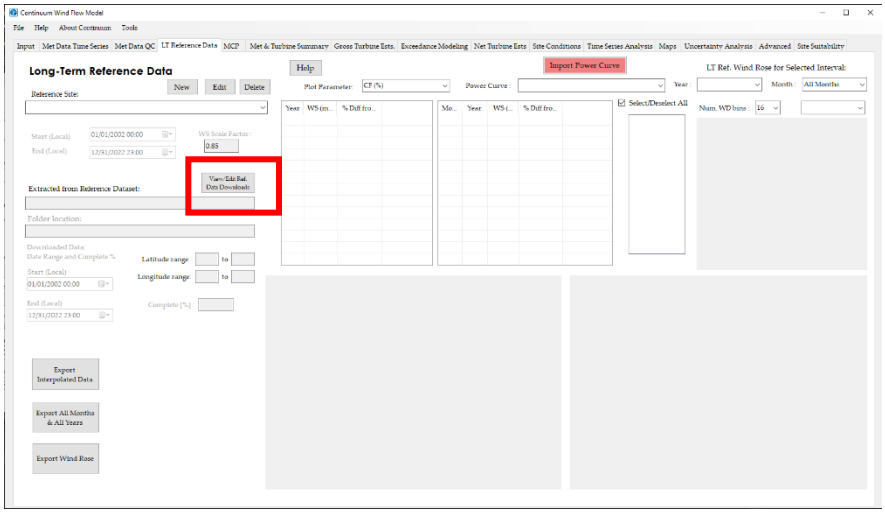
Two types of reanalysis data may be imported into Continuum: MERRA2 and ERA5 data.

To download MERRA2 data, users must create an account with NASA's EarthData (https://urs.earthdata.nasa.gov/). When a MERRA2 data download is initiated, the EarthData credentials will be requested.

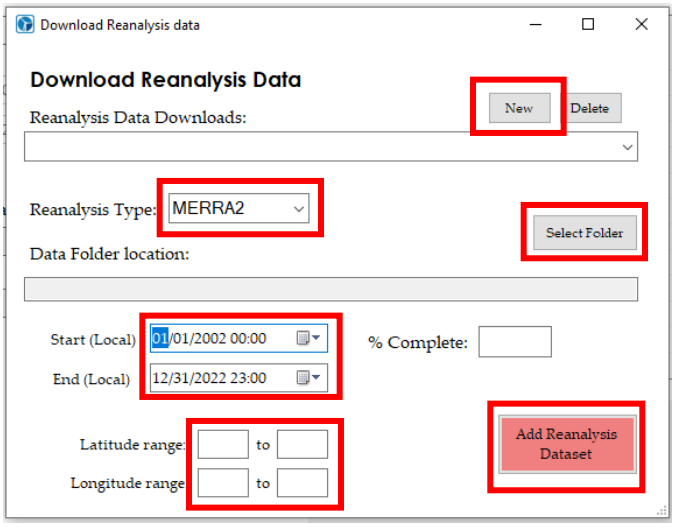
How to download reanalysis data

To download ERA5 data, users must have Python installed (https://www.python.org/downloads/) and users must have Copernicus' CDS API installed (https://cds.climate.copernicus.eu/api-how-to)

1) Go to LT Reference tab and click 'View/Edit Ref. Data Downloads'

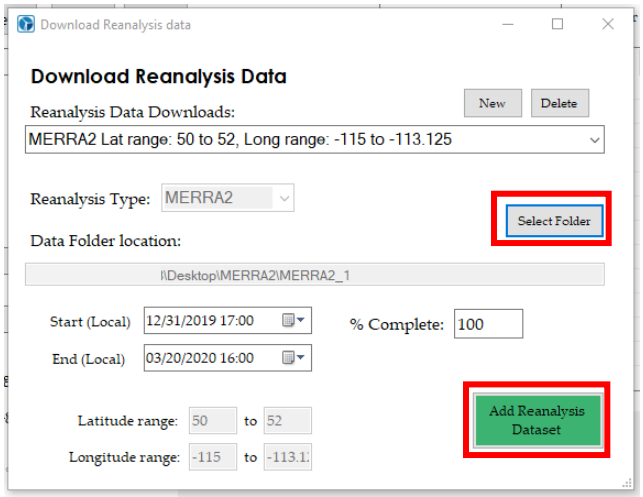


2) To start a new download,
   - Click 'New'
   - Select reanalysis type (MERRA2 or ERA5)
   - Select folder where the data will be downloaded
   - Specify start/end dates for download. (These dates reflect the local time of the project.)
   - Specify the latitude range and longitude range to download.
     i. Note: MERRA2 has a 0.5° x 0.625° (latitude x longitude) grid and ERA5 uses 0.25° x 0. 25°

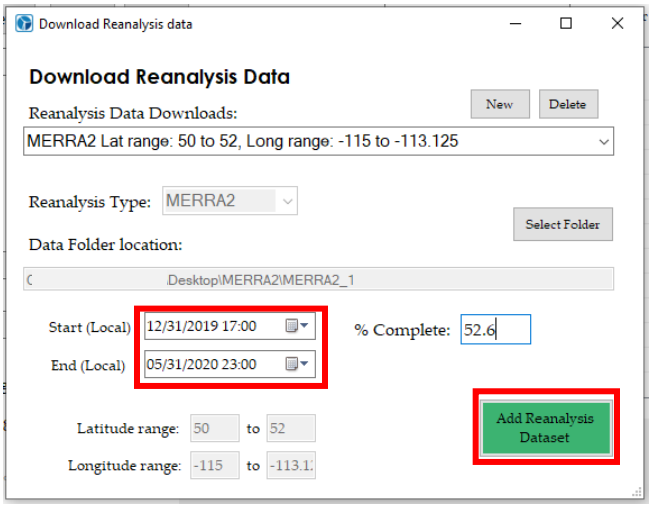


ii. Click 'Add Reanalysis Dataset'

3) To connect to a folder with downloaded or to resume/extend a data download,
   - Click 'Select Folder' and find folder with downloaded data. The form will populate showing the reanalysis data type, the (local) start/end times, the latitude/longitude ranges contained the datafiles.
   - If the textbox labeled '% Complete' is < 100 then the folder is missing some daily datafile so a download should be resumed.
   - If the folder contains all required data for the analysis, click 'Add Reanalysis Dataset'



   - If additional data is needed, update the start and/or end dates and click 'Add Reanalysis Dataset'.



How to add/edit reanalysis sites

Tutorial Summary:

Learn how to add or edit MERRA2 and ERA5 reanalysis dataset to your Continuum. If time series met data is imported in Continuum, reanalysis wind speed data may be used in MCP (Measure-Correlate-Predict) to predict long-term wind speeds at each met site and turbine location. This tutorial covers the steps needed to define and extract reference nodes for a Continuum model. See the tutorial named "How to download Reanalysis data" to learn how to download ERA5 and MERRA2 data and connect the data to your project.

Reanalysis Data in Continuum Overview

Long-term reanalysis data is stored as textfiles and folders containing reanalysis data may be used in multiple Continuum projects. When a Continuum model is created, the user needs to specify where the reference data is downloaded and then when a long-term reference is added, Continuum extracts the reanalysis data at the required nodes and saves it to a local SQL database. This way, the Continuum .cfm file may be used and new models and estimates can be generated without requiring access to the daily textfiles. The folders containing the daily textfiles may contain a larger geographic area and/or a larger timespan than what is used in the Continuum model. The data stored in the local SQL database (DB) is specific to the long-term references defined in the model. The diagram below (Figure 1) shows how long-term reanalysis datasets are utilized in Continuum. When creating a new model that requires reanalysis data, the user must either specify where the downloaded reanalysis data is located or start/resume a reference data download by clicking 'View/Edit Ref. Data Downloads' on the LT Reference Data tab. Once the reanalysis data is available, the user may then create/edit long-term reference sites by clicking 'New' or 'Edit' on the LT Reference Data tab.

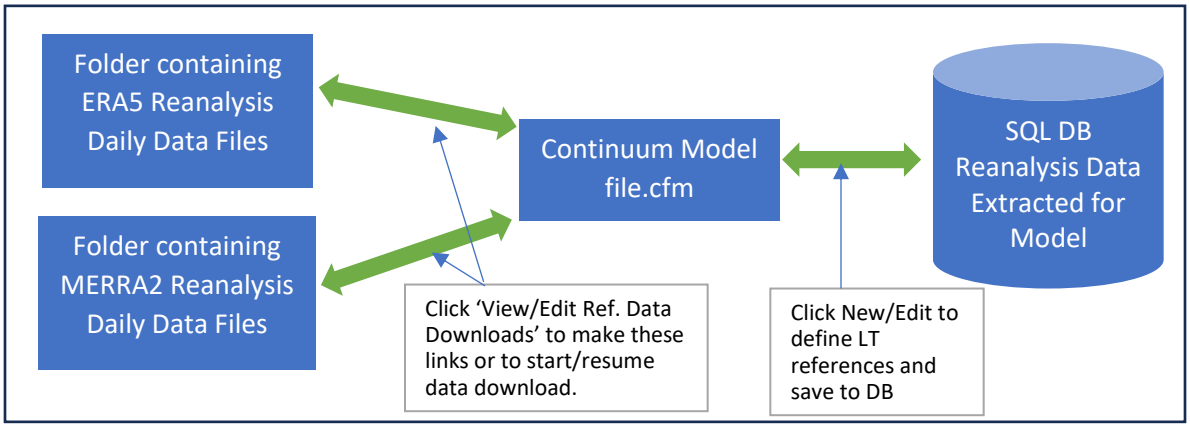


Figure 1. Reanalysis Data Access/Usage in Continuum

Pre-Requisites

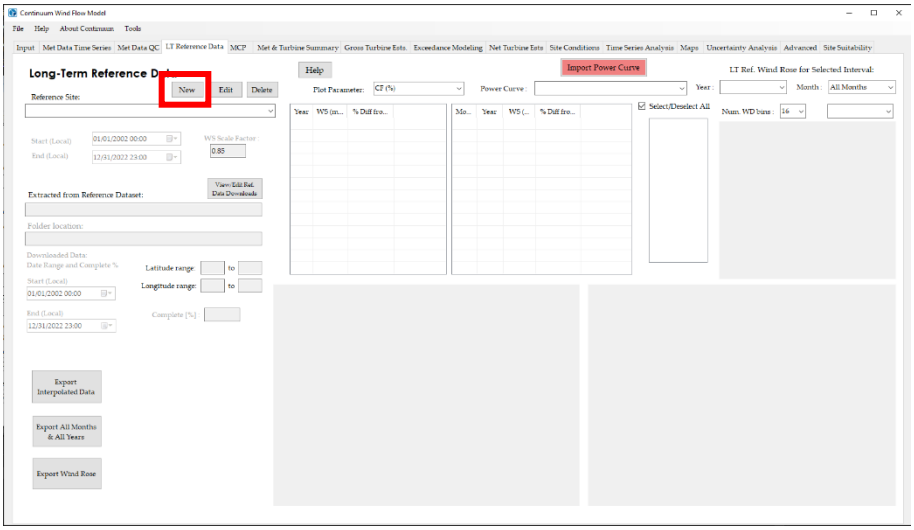
Two types of reanalysis data may be imported into Continuum: MERRA2 and ERA5 data.

To download MERRA2 data, users must create an account with NASA's EarthData (https://urs.earthdata.nasa.gov/). When a MERRA2 data download is initiated, the EarthData credentials will be requested.

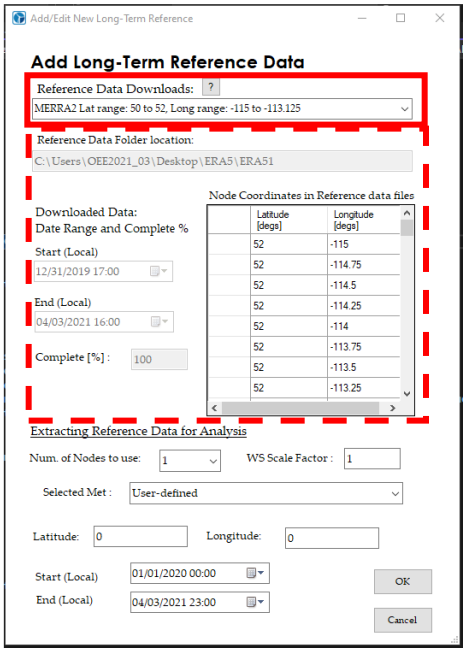
How to add/edit reanalysis sites

To download ERA5 data, users must have Python installed (https://www.python.org/downloads/) and users must have Copernicus' CDS API installed (https://cds.climate.copernicus.eu/api-how-to)

1) Follow tutorial 'How to Download Reanalysis Data' and connect to folder(s) containing downloaded reanalysis data.
2) To create a new long-term reference site, click 'New'



3) The reference data downloads that have been linked to the project are listed in the dropdown menu at the top. When the user selects a reference data download from the dropdown, the textboxes showing the downloaded data start/end dates and the tables showing the node coordinates contained in the downloaded data are displayed.



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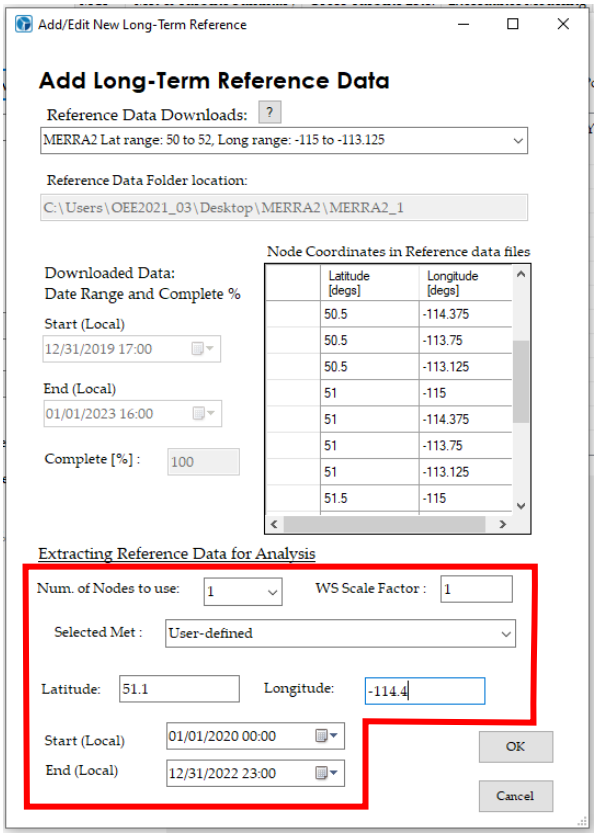
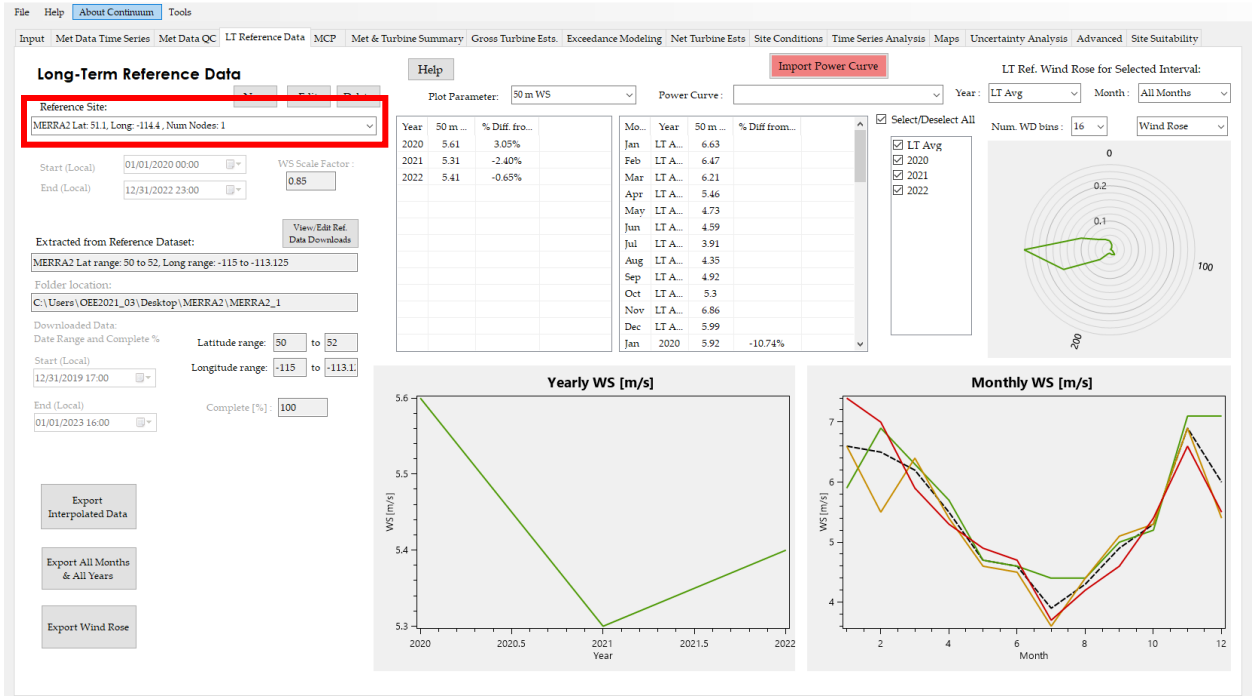
4) Users can add a long-term reference site to the project by either selecting a met site from the 'Selected Met' dropdown or selecting 'User-defined' from the dropdown. If a met is selected, a long-term reference site will be created using the met site coordinates. If the number of nodes to use is set to 1, Continuum will find the closest reanalysis node to the met site and extract the data. If the number of nodes to use is set to 4 or 16, Continuum will find the closest 4 or 16 nodes, extract the data, and interpolate the wind speed and wind direction at the specified coordinates using the grid of nodes. Once the reference node settings have been entered, click 'Ok'.



5) Users may add multiple long-term reference sites and may view/analyze the data by changing the selection in the dropdown menu highlighted below.

How to add/edit reanalysis sites



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Created: 1/3/2024

continuum® Wind Flow Model