READY Web API User Guide

April 23, 2025

Change history

Version	Date	Description
0.0.1	Feb 26, 2021	Initial release
0.0.2	Aug 23, 2021	Add additional meteorological datasets beside GFS.
0.1.0	Dec 4, 2024	Include potential temperatures in the sounding profile diagnostics.
0.2.0	Apr 23, 2025	Add endpoints for HYSPLIT trajectory runs.

The READY Web API will provide a set of web accessible endpoints for automated programs to obtain READY products.

Access to the API requires a key issued at the time of registration. A key is unique to each user and it is used for authentication. There is a daily limit on the number of API calls each user can make. The limit is 250 calls per day (Eastern Time) and it may be changed without a prior notice to avoid system overload.

The base URL for a READY Web API is https://apps.arl.noaa.gov/ready2. The base URL is to be prepended to an endpoint described below. If the endpoint you will use is /api/v1/sounding, the full URL for the endpoint is https://apps.arl.noaa.gov/ready2/api/v1/sounding.

1. Sounding

Endpoint	POST /api/v1/sounding	
Authentication	required	Available to registered users.
Request format	json or xml	Use the “Content-Type” header with application/json or application/xml.
Response format	text/plain	Use the “Accept” header with text/plain. No other format is supported at this time.

Input fields:

Name	Data Type	Description
meteorologicalData	string	Name of the meteorological data set. Must be GFS,

		GFS0p25, HRRR, NAM12, NAMHUS, NAMHAK, NAMHHI, or NAMCNEST. See Section A below for the description of these data sets.
latitude	number	Latitude of profile. Must be between -90 and 90 degrees.
longitude	number	Longitude of profile. Must be between -180 and 180 degrees.
elevation	number	Elevation of profile location if known for label. Elevation in meters. Use 0 if unknown.
fullSounding	boolean	Use true for full sounding or false for sounding up to 400 hPa.
startDate	date	Start year, month, and day. Must use the YYYY-MM-DD format.
startHour	integer	Start hour. Must be between 0 and 23.
duration	integer	The number of hours. Use 0 for the default value.
includeDiagnostics	boolean	true or false. If true, potential temperatures are included.

A sample request body file in XML (soundingRequest.xml):

```
<?xml version="1.0" encoding="UTF-8"?>
<soundingRequest>
  <meteorologicalData>GFS</meteorologicalData>
  <latitude>40.12</latitude>
  <longitude>-82.00</longitude>
  <elevation>0</elevation>
  <fullSounding>false</fullSounding>
  <startDate>2020-10-28</startDate>
  <startHour>6</startHour>
  <duration>0</duration>
  <includeDiagnostics>false</includeDiagnostics>
</soundingRequest>
```

The same request body file in JSON (soundingRequest.json):

```
{
  "meteorologicalData": "GFS",
  "latitude": 40.12,
  "longitude": -82.00,
  "elevation": 0,
```

```
  "fullSounding": false,
  "startDate": "2020-10-28",
  "startHour": 6,
  "duration": 0,
  "includeDiagnostics": false
}
```


2. HYSPLIT trajectory

2.1 Requesting a HYSPLIT trajectory calculation

To run a trajectory simulation, use this endpoint. The run result with optional graphics is emailed to an address specified by the reply field.

Endpoint	POST /api/v1/traj	
Authentication	required	Available to registered users.
Request format	json or xml	Use the “Content-Type” header with application/json or application/xml.
Request body	required	Input fields in json or in xml. See examples below after the Input fields table.
Response format	json or xml	Use the “Accept” header with application/json or application/xml.
Response body		Returns the UUID value that can be used for checking the run status and for downloading the results as a zip file. The response includes the number of API calls and the daily limit. An example in JSON is as follows: `{"uuid":"5fd8a9d7-5dc7-4184-a0aa-06f2f517e8c4", "message":"Your request for HYSPLIT trajectory was successfully submitted. Using the UUID provided above, you can monitor the status of your run while it is in progress. Once the run is complete, the results can be downloaded as a zip file. Please refer to the user guide for instructions on how to check the run status or download the results.", "dailyCounts":{"limit":250,"calls":15}}`

Input fields for a HYSPLIT trajectory calculation are shown in the table below.

Name	**Data Type**	**Description**

model (OR meteorologicalData)	string	Name of the meteorological data set. See Section A below for supported options. If the trajectory start location is within Alaska or Hawaii with model NAMS (or NAMHUS), then the NAMSAK or NAMSHI model will be automatically used. If unspecified, GFS is assumed. When FIREWX is employed and the chosen latitude-longitude is out of the FIREWX domain, the user is notified of the center latitude and longitude of the FIREWX domain. Current firewx domain maps at https://www.ready.noaa.gov/ready2-bin/domain_fw.pl
direction	string	Must be forward or backward. If omitted, forward is assumed.
duration	integer	The duration of the calculation in hours is up to 120. It is a positive number for both forward and backward trajectories. If unspecified, a value of 96 is assumed.
motion	string	Vertical motion. options include: actual (uses actual dp/dt fields), isobaric, isosigma, isentropic, or spatial_avg. The spatial_avg may be useful for finer-scale meteorology (e.g. FIREWX). If unspecified, actual is assumed.
latitude	number	The latitude (degrees and fraction) of the trajectory origin. The North is positive. Must be between -90 and 90 degrees. If unspecified, a value of 40.0 degrees is assumed.
longitude	number	The longitude (degrees and fraction) of the trajectory origin. The West is negative. Must be between -180 and 180 degrees. If unspecified, a value of -90.0 degrees is assumed.
levels (OR level)	number(s)	The starting height of the trajectory in meters above ground level (agl). May request one, two, or three trajectory start heights. See request examples below on how to specify multiple heights using a list. Note a list must be used for a single height. If unspecified, a value of 1500 is assumed.
startDate	date	Start year, month, and day in the YYYY-MM-DD format. If unspecified, the start date will be the beginning of the meteorology data file for a forward trajectory and the end of the meteorology data file for a backward trajectory.

startHour	integer	Start hour. If startDate is specified, the start hour must be between 0 and 23. If the startDate is unspecified, the start hour is relative and it ranges from 0 to 72. For example, for a forward trajectory with start hour 12, the trajectory starts 12-hours after the first time period of the first file (archive for NAM and GFS). For a backward trajectory with start hour 12, the trajectory starts 12-hours before the last time period. xi
mode	string	HYSPLIT run mode. Two options are available: std (standard) and ens (ensemble). If unspecified, std is assumed.
endpointInterval	integer	Trajectory endpoint interval in minutes. It must be 1, 2, 3, 4, 5, 10, 15, 30, or 60. If unspecified or not one of the listed values, 60 is used.
graphic	string(s)	Specifies the graphic conversion applied to the model output file. The options are none (no graphics), gif (image file named hysplit.gif), and kmz (Google Earth file named hysplit.kmz). May request one or two graphics. See request examples below on how to specify multiple graphic options using a list. Note a list must be used for one option. If unspecified, none is assumed.
verticalPlot	string	Vertical coordinate. Two options are available: agl and pressure. If unspecified, agl is assumed.
application	string	The options are none and volcano. The volcano option creates 7 trajectories starting at specific heights and it has a volcanic ash disclaimer. Altitude units are in feet. If unspecified, none is assumed.
reply	email	Optional. Email address trajectory along with graphics is sent to.
includeDiagnostics	boolean	true or false.

A sample request body in the JSON format is shown below. The sample specifies three release heights (or levels) using an array. A separate document describing user authentication when calling the web API also illustrates how to submit a JSON request in Python. This document is provided to authorized users when they receive an API key.

```
{
  "meteorologicalData": "NAM12",
  "latitude": 40.12,
```

```
  "longitude": -82.00,
  "levels":[500,1000,1500],
  "startDate": "2025-03-25",
  "startHour": 6,
  "graphic":["gif","kmz"],
  "includeDiagnostics": false
}
```

Alternatively, requests can be in the XML format:

```
<?xml version="1.0" encoding="UTF-8"?>
<soundingRequest>
  <meteorologicalData>NAM12</meteorologicalData>
  <latitude>40.12</latitude>
  <longitude>-82.00</longitude>
  <levels>
    <value>500</value>
    <value>1000</value>
    <value>1500</value>
  </levels>
  <startDate>2025-03-25</startDate>
  <startHour>6</startHour>
  <graphic>
    <value>gif</value>
    <value>kmz</value>
  </graphic>
  <includeDiagnostics>false</includeDiagnostics>
</soundingRequest>
```

2.2 Check the status of a HYSPLIT trajectory calculation

The status of a trajectory simulation can be checked using this endpoint. Note that each API call for checking run status will count toward your daily limit.

Endpoint	GET /api/v1/traj/status/{***UUID***}	
Authentication	required	Available to registered users.
Request		Replace {***UUID***} with the UUID that you received after making an API call for a trajectory calculation.
Request body	not used	
Response format	json or xml	Use the “Accept” header with application/json or application/xml.

Response body		The statuses may be QUEUED, RUNNING, CRASHED, GRAPHICS_RUNNING, GRAPHICS_FAILED, COMPLETED, and EXPIRED. The number of API calls and the daily limit are also included in the response.

An example output after a trajectory calculation is completed is shown below. The run status is COMPLETED.


```
{
  "uuid":"5fd8a9d7-5dc7-4184-a0aa-06f2f517e8c4",
  "jobStatus":"COMPLETED",
  "dailyCounts":{
    "limit":250,
    "calls":17
  }
}
```


2.3 Downloading output files of a HYSPLIT trajectory calculation

Upon successful completion of a trajectory calculation, a zip file is automatically created. It contains tdump (a trajectory dump file), SETUP.CFG and CONTROL (which are HYSPLIT input files), and MESSAGE (a HYSPLIT diagnostics file). If graphics are created for the run, they are added to the zip file as hysplit.gif and/or hysplit.kmz. See the graphic input field in Sec. 2.1. Note that each API call for downloading a zip file will count toward your daily limit.

Endpoint	GET /api/v1/traj/download/{***UUID***}	
Authentication	required	Available to registered users.
Request		Replace {***UUID***} with the UUID that you received after making an API call for a trajectory calculation.
Request body	not used	
Response format	zip	The response format is fixed and it cannot be changed.
Response body		Returns the content of the zip file.

A. Supported meteorology

The following meteorological data files are supported by the API. Note that the names are case-insensitive. For example, GFS, Gfs, and gfs are equivalent.

Name	Description	Update frequency
GFS	1 degree, 384 h, 3 hourly, global, pressure; The long range model is included.	4 times a day
GFS0p25	0.25 degree, 84 h, 3 hourly, global, sigma-pressure hybrid	4 times a day
HRRR	3 km, 18 h, 1 hourly, CONUS, sigma	every hour
NAM12 (aka NAM)	12 km, 84 h, 3 hourly, CONUS, pressure	4 times a day
NAMHUS (aka NAMS)	12 km, 48 h, 1 hourly, CONUS, pressure-sigma hybrid	4 times a day
NAMHAK (aka NAMSAK)	12 km, 48 h, 1 hourly, Alaska, pressure-sigma hybrid	4 times a day
NAMHHI (aka NAMSHI)	2 km, 48 h, 1 hourly, Hawaii, pressure-sigma hybrid	4 times a day
NAMCNEST (aka CONUS)	3 km, 48 h, 1 hourly, CONUS, pressure-sigma hybrid	4 times a day
FIREWX	1 km, 36 h, 1 hourly, Spatial domain may vary from run to run. Current firewx domain maps at https://www.ready.noaa.gov/ready2-bin/domain_fw.pl. Note not available for the sounding API.	4 times a day
GDAS1 (aka ARCH)	1 degree, current week, 3 hourly, global. Note not available for the sounding API.	-