

---

# helios Documentation

*Release 3.0.1*

**Michael Bayer**

**Sep 27, 2018**



<b>1</b>	<b>Installation</b>	<b>3</b>
1.1	Install from PyPI (recommended) . . . . .	3
1.2	Install from source (bleeding edge) . . . . .	3
<b>2</b>	<b>Authentication</b>	<b>5</b>
2.1	Using Environment Variables . . . . .	5
2.2	Using an Authentication File . . . . .	5
<b>3</b>	<b>Using the Core APIs</b>	<b>7</b>
3.1	Creating Instances . . . . .	7
3.2	Examples . . . . .	7
<b>4</b>	<b>Session Instances</b>	<b>11</b>
4.1	Creating a Session . . . . .	11
4.2	Reusing a Session . . . . .	11
4.3	Using a Custom env . . . . .	12
<b>5</b>	<b>License</b>	<b>13</b>
<b>6</b>	<b>Core APIs</b>	<b>15</b>
6.1	Alerts . . . . .	15
6.2	Cameras . . . . .	17
6.3	Collections . . . . .	20
6.4	Observations . . . . .	23
<b>7</b>	<b>Session</b>	<b>27</b>
<b>8</b>	<b>Structure</b>	<b>29</b>
<b>9</b>	<b>Utilities</b>	<b>31</b>
9.1	json_utils . . . . .	31
9.2	parsing_utils . . . . .	32
9.3	data_utils . . . . .	32
<b>10</b>	<b>Indices and tables</b>	<b>35</b>
	<b>Python Module Index</b>	<b>37</b>



Use the Helios APIs in Python.

Helios® weather analytics from Harris Corporation provide fast and accurate local ground weather intelligence to assist organizations with real-time decision making. Helios analyzes content from thousands of existing public and private video cameras, providing immediate confirmation of ground weather condition changes at a detailed local level. For more details, refer to [helios.earth](https://helios.earth).

The Helios SDK brings the core API functionality along with extensions to Python. Many of the capabilities are thread-enabled allowing for batch jobs. The overall goal is to provide the tools necessary to quickly begin using the Helios product.

For further developer information, refer to [the Helios developer documentation](#).



### 1.1 Install from PyPI (recommended)

```
pip install helios-sdk
```

### 1.2 Install from source (bleeding edge)

Clone the GitHub repository:

```
git clone https://github.com/harris-helios/helios-sdk-python.git
```

Then `cd` to the `helios-sdk-python` directory and run the install command:

```
cd helios-sdk-python  
pip install .
```





All Helios API methods require valid authentication and are protected using the OAuth 2.0 “client credentials” flow. The general process for authenticating requests involves first requesting an access token using the developer API key pair, and then requesting protected data using the access token. [Request access](#) if you would like to obtain an API key.

### 2.1 Using Environment Variables

1. Add **“helios\_client\_id”**: “your ID key”
2. Add **“helios\_client\_secret”**: “your secret key”
3. Add **“helios\_api\_url”**: “API URL associated with your account credentials”
  - **“helios\_api\_url”** is optional.

### 2.2 Using an Authentication File

1. Create a **“.helios”** directory in your home directory.
2. Create a **“credentials.json”** file in your **“.helios”** directory.
3. Copy and paste the following into the **“credentials.json”** file and fill in your authentication values.
  - **“helios\_api\_url”** is optional. If you do not need a custom API URL leave this out of your json file or set to null.

```
{
  "helios_client_id" : "your ID key" ,
  "helios_client_secret" : "your secret key",
  "helios_api_url" : null
}
```

For more information refer to the Helios authentication [documentation](#).



## 3.1 Creating Instances

Instances of the core APIs are easy to create.

```
import helios
alerts = helios.Alerts()
cameras = helios.Cameras()
observations = helios.Observations()
collections = helios.Collections()
```

Each instance will internally initialize a Helios *Session* and call *start\_session*.

## 3.2 Examples

### 3.2.1 Find alerts

```
import helios
alerts = helios.Alerts()

# Retrieve results for New York.
ny_alert_results = alerts.index(state='New York')

# Gather the camera IDs from the results.
ny_alert_ids = ny_alert_results.id
```

- `ny_alert_results` is an instance of *AlertsFeatureCollection*.

### 3.2.2 Find camera times and download images

```
import helios
import numpy as np

cameras = helios.Cameras()

# Find cameras in Maryland.
md_cam_results = cameras.index(state='Maryland')
cam_id = md_cam_results.id[0]

# Find image times for the given camera id.
image_times = cameras.images(cam_id, '2018-01-01')

# Download the images.
show_image_results = cameras.show_image(cam_id,
                                       image_times,
                                       out_dir='/temp/data',
                                       return_image_data=True)

# Get a list of image data. (return_image_data was True)
img_data = show_image_results.image_data
```

- `md_cam_results` is an instance of *CamerasFeatureCollection*.
  - Access the list of individual features by calling `md_cam_results.features`.
- `show_image_results` is an instance of *ImageCollection*.

### 3.2.3 Find observations and work with collections

```
import helios
import requests
from helios.utilities import parsing_utils

observations = helios.Observations()
collections = helios.Collections()

# Find Observations
index_results = observations.index(state='georgia',
                                  sensors='sensors[visibility]=0',
                                  time_min='2018-02-10T18:00Z',
                                  time_max='2018-02-10T18:15Z')

# Get id for each observation feature.
ids = [x.id for x in index_results.features]

# Convenience properties also exist for combining attributes from all features.
ids_1 = index_results.id

# Create new collection.
new_id = collections.create('Temp Collection', 'example collection', ['test', 'temp'])

# Add Observations to collection.
payload = [{'observation_id': x} for x in ids]
add_result = collections.add_image(new_id, payload)
```

(continues on next page)

(continued from previous page)

```
# Check for http failures.
if len(add_result.failed) > 0:
    print('Failures occurred!')

# Simple data analysis - find all unique cameras for the added observation images.
ims = collections.images(new_id)
cams = set([parsing_utils.parse_camera(x) for x in ims])
```

- `index_results` is an instance of *ObservationsFeatureCollection*.
  - Access the list of individual features by calling `index_results.features`.
- `add_result` is an instance of *RecordCollection*.



---

## Session Instances

---

A Helios *Session* depends on properly established authentication procedures. See *Authentication* for more information. It also stores your authentication information and will fetch an API token. This token is required for any API queries.

Once a session has been created, the token will be written to a *.helios\_token* file in your home directory. This token will be reused until it becomes invalid.

### 4.1 Creating a Session

If authentication is stored on your machine starting a session is simple. Create a *Session* instance without any inputs. The authentication information stored on your machine will automatically be applied.

```
import helios
sess = helios.Session()
```

This will automatically make a call to the *start\_session* method to fetch the token.

If successful, the *sess* instance will now have all the authentication information needed to being using the core APIs.

#### 4.1.1 Token Expiration

Restarting Python if your token expires while the SDK is in use is not necessary. Call *start\_session* to perform the token verification process. This will acquire a new token if it has expired.

After the a token has been re-acquired you will need to create new core API instances using the session.

### 4.2 Reusing a Session

Creating a *Session* instance allows you to use a single instance across all Core APIs. This avoids multiple token verifications with the initialization of every Core API instance.

```
import helios
sess = helios.Session()
alerts = helios.Alerts(session=sess)
cameras = helios.Cameras(session=sess)
```

In the above code `sess` is started once and used across *Alerts* and *Cameras*.

## 4.3 Using a Custom env

When creating a *Session* instance an optional input variable, `env`, can be used for dynamic credential usage.

This optional input must consist of a dictionary containing all necessary information for authentication.

```
custom_env = {'helios_client_id': 'your ID key',
              'helios_client_secret': 'your secret key',
              'helios_api_url': 'optional API URL override'}
sess = helios.Session(env=custom_env)
sess.start_session()
```



## CHAPTER 5

---

### License

---

The HeliosSDK is released under terms of [MIT license](#).



## 6.1 Alerts

Helios Alerts API.

Methods are meant to represent the core functionality in the developer documentation. Some may have additional functionality for convenience.

**class** `helios.alerts_api.Alerts` (*session=None*)

Helios alerts provide real-time severe weather alerts.

### National Weather Service:

- Severe weather alerts for the United States are provided by the National Weather Service. These alerts cover events such as Flood Warnings, Severe Thunderstorm Warnings, and Special Weather Statements.

### Helios:

- Alerts generated by Helios are based on the sensor measurements from the Observations API. These alerts represent regional areas with a high detection confidence and currently include: Road Wetness Watch, Poor Visibility Watch, and Heavy Precip Watch.

**index** (*\*\*kwargs*)

Get alerts matching the provided spatial, text, or metadata filters.

The maximum skip value is 4000. If this is reached, truncated results will be returned. You will need to refine your query to avoid this.

**Parameters** *\*\*kwargs* – Any keyword arguments found in the [alerts\\_index\\_documentation](#).

**Returns** `AlertsFeatureCollection`

**show** (*alert\_ids*)

Get attributes for alerts.

**Parameters** `alert_ids` (*str or list of strs*) – Helios alert ID(s).

**Returns** `AlertsFeatureCollection`

**class** `helios.alerts_api.AlertsFeature` (*feature*)

Individual Alert GeoJSON feature.

**area\_description**

*str* – ‘areaDesc’ value for the feature.

**bbox**

*list of floats* – ‘bbox’ value for the feature.

**category**

*str* – ‘category’ value for the feature.

**certainty**

*str* – ‘certainty’ value for the feature.

**country**

*str* – ‘country’ value for the feature.

**description**

*str* – ‘description’ value for the feature.

**effective**

*str* – ‘effective’ value for the feature.

**event**

*str* – ‘event’ value for the feature.

**expires**

*str* – ‘expires’ value for the feature.

**headline**

*str* – ‘headline’ value for the feature.

**id**

*str* – ‘id’ value for the feature.

**json**

*dict* – Raw ‘json’ for the feature.

**origin**

*str* – ‘origin’ value for the feature.

**severity**

*str* – ‘severity’ value for the feature.

**states**

*list of str*s – ‘states’ value for the feature.

**status**

*str* – ‘status’ value for the feature.

**urgency**

*str* – ‘urgency’ value for the feature.

**class** `helios.alerts_api.AlertsFeatureCollection` (*features, records=None*)

Collection of GeoJSON features obtained via the Alerts API.

Convenience properties are available to extract values from every feature.

**features**

*list of AlertsFeature* – All features returned from a query.

**area\_description**

‘areaDesc’ values for every feature.

**bbox**  
 'bbox' values for every feature.

**category**  
 'category' values for every feature.

**certainty**  
 'certainty' values for every feature.

**country**  
 'country' values for every feature.

**description**  
 'description' values for every feature.

**effective**  
 'effective' values for every feature.

**event**  
 'event' values for every feature.

**expires**  
 'expires' values for every feature.

**headline**  
 'headline' values for every feature.

**id**  
 'id' values for every feature.

**json**  
 Raw 'json' for every feature.

**origin**  
 'origin' values for every feature.

**severity**  
 'severity' values for every feature.

**states**  
 'states' values for every feature.

**status**  
 'status' values for every feature.

**urgency**  
 'urgency' values for every feature.

## 6.2 Cameras

Helios Cameras API.

Methods are meant to represent the core functionality in the developer documentation. Some may have additional functionality for convenience.

**class** `helios.cameras_api.Cameras` (*session=None*)  
 The Cameras API provides access to all cameras in the Helios Network.

**images** (*camera\_id, start\_time, end\_time=None, limit=500*)  
 Get the image times available for a given camera in the media cache.

The media cache contains all recent images archived by Helios, either for internal analytics or for end user recording purposes.

**Parameters**

- **camera\_id** (*str*) – Camera ID.
- **start\_time** (*str*) – Starting image timestamp, specified in UTC as an ISO 8601 string (e.g. 2014-08-01 or 2014-08-01T12:34:56.000Z).
- **end\_time** (*str*, *optional*) – Ending image timestamp, specified in UTC as an ISO 8601 string (e.g. 2014-08-01 or 2014-08-01T12:34:56.000Z).
- **limit** (*int*, *optional*) – Number of images to be returned, up to a max of 500. Defaults to 500.

**Returns** Image times.

**Return type** list of strs

**index** (*\*\*kwargs*)

Get cameras matching the provided spatial, text, or metadata filters.

The maximum skip value is 4000. If this is reached, truncated results will be returned. You will need to refine your query to avoid this.

**Parameters** **\*\*kwargs** – Any keyword arguments found in the [cameras\\_index\\_documentation](#).

**Returns** *CamerasFeatureCollection*

**show** (*camera\_ids*)

Get attributes for cameras.

**Parameters** **camera\_ids** (*str* or *list of str*s) – Helios camera ID(s).

**Returns** *CamerasFeatureCollection*

**show\_image** (*camera\_id*, *times*, *out\_dir=None*, *return\_image\_data=False*)

Get images from the media cache.

The media cache contains all recent images archived by Helios, either for internal analytics or for end user recording purposes.

**Parameters**

- **camera\_id** (*str*) – Camera ID.
- **times** (*str* or *list of str*s) – Image times, specified in UTC as an ISO 8601 string (e.g. 2017-08-01 or 2017-08-01T12:34:56.000Z). The image with the closest matching timestamp will be returned.
- **out\_dir** (*optional*, *str*) – Directory to write images to. Defaults to None.
- **return\_image\_data** (*optional*, *bool*) – If True images will be returned as `numpy.ndarrays`. Defaults to False.

**Returns** *ImageCollection*

**class** `helios.cameras_api.CamerasFeature` (*feature*)

Individual Camera GeoJSON feature.

**city**

*str* – ‘city’ value for the feature.

**country***str* – ‘country’ value for the feature.**description***str* – ‘description’ value for the feature.**direction***str* – ‘direction’ value for the feature.**id***str* – ‘id’ value for the feature.**json***dict* – Raw ‘json’ for the feature.**region***str* – ‘region’ value for the feature.**state***str* – ‘state’ value for the feature.**video***bool* – ‘video’ value for the feature.**class** `helios.cameras_api.CamerasFeatureCollection` (*features, records=None*)

Collection of GeoJSON features obtained via the Cameras API.

Convenience properties are available to extract values from every feature.

**features**list of *CamerasFeature* – All features returned from a query.**city**

‘city’ values for every feature.

**coordinates**

‘coordinate’ values for every feature.

**country**

‘country’ values for every feature.

**description**

‘description’ values for every feature.

**direction**

‘direction’ values for every feature.

**id**

‘id’ values for every feature.

**json**

Raw ‘json’ for every feature.

**region**

‘region’ values for every feature.

**state**

‘state’ values for every feature.

**video**

‘video’ values for every feature.

## 6.3 Collections

Helios Collections API.

Methods are meant to represent the core functionality in the developer documentation. Some may have additional functionality for convenience.

**class** `helios.collections_api.Collections` (*session=None*)

The Collections API allows users to group and organize individual image frames.

Collections are intended to be short-lived resources and will be accessible for 90 days from the time the collection was created. After that time period has expired, the collection and all associated imagery will be removed from the system.

**add\_image** (*collection\_id, assets*)

Add images to a collection from Helios assets.

*assets* dictionary templates:

```
# Asset examples that can be included in the `assets` input list.
{'camera_id': ''}
{'camera_id': '', 'time': ''}
{'observation_id': ''}
{'collection_id': '', 'image': ''}
```

Usage example:

```
import helios
collections = helios.Collections()
camera_id = '...'
times = [...] # List of image times.
destination_id = '...'
data = [{'camera_id': camera_id, 'time': x} for x in times]
collections.add_image(destination_id, data)
```

### Parameters

- **collection\_id** (*str*) – Collection ID.
- **assets** (*dict or list of dicts*) – Data containing any of these payloads (`camera_id`), (`camera_id, time`), (`observation_id`), (`collection_id, image`). E.g. `data = [{'camera_id': 'cam_01', 'time': '2017-01-01T00:00:00Z'}]`

**Returns** `RecordCollection`

**copy** (*collection\_id, new\_name*)

Copy a collection and its contents to a new collection.

### Parameters

- **collection\_id** (*str*) – Collection ID.
- **new\_name** (*str*) – New collection name.

**Returns** New collection ID.

**Return type** `str`

**create** (*name, description, tags=None*)

Create a new collection.

### Parameters



- **name** (*str*) – Display name for the collection.
- **description** (*str*) – Description for the collection.
- **tags** (*str or list of strs, optional*) – Optional comma-delimited keyword tags to be added to the collection.

**Returns** New collection ID.

**Return type** str

**destroy** (*collection\_id*)

Delete an empty collection.

If the collection is not empty, delete will fail. Use the *empty* method to remove all imagery before calling this method.

**Parameters** **collection\_id** (*str*) – Collection to delete.

**Returns** {ok: true}

**Return type** dict

**empty** (*collection\_id*)

Bulk remove (up to 1000) images from a collection.

**Parameters** **collection\_id** (*str*) – Collection to empty.

**Returns** {ok: true, total: 1000}

**Return type** dict

**images** (*collection\_id, camera=None, old\_flag=False*)

Get all image names in a given collection.

When using the optional camera input parameter only images from that camera will be returned.

**Parameters**

- **collection\_id** (*str*) – Collection ID.
- **camera** (*str, optional*) – Camera ID to be found.
- **old\_flag** (*bool, optional*) – Flag for finding old format image names. When True images that do not contain md5 hashes at the start of their name will be found.

**Returns** Image names.

**Return type** list of strs

**index** (*\*\*kwargs*)

Get collections matching the provided spatial, text, or metadata filters.

The maximum skip value is 4000. If this is reached, truncated results will be returned. You will need to refine your query to avoid this.

**Parameters** **\*\*kwargs** – Any keyword arguments found in the [collections\\_index\\_documentation](#).

**Returns** *CollectionsFeatureCollection*

**remove\_image** (*collection\_id, names*)

Remove images from a collection.

**Parameters**

- **collection\_id** (*str*) – Collection ID to remove images from.

- **names** (*str or list of strs*) – List of image names to be removed.

Returns *RecordCollection*

**show** (*collection\_id, limit=200, marker=None*)

Get the attributes and image list for collections.

The results will also contain image names available in the collection. These are limited to a maximum of 200 per query.

**Parameters**

- **collection\_id** (*str*) – Collection ID.
- **limit** (*int, optional*) – Number of image names to be returned with each response. Defaults to 200. Max value of 200 is allowed.
- **marker** (*str, optional*) – Pagination marker. If the marker is an exact match to an existing image, the next image after the marker will be the first image returned. Therefore, for normal linked list pagination, specify the last image name from the current response as the marker value in the next request. Partial file names may be specified, in which case the first matching result will be the first image returned.

Returns *CollectionsFeature*

**show\_image** (*collection\_id, image\_names, out\_dir=None, return\_image\_data=False*)

Get images from a collection.

**Parameters**

- **collection\_id** (*str*) – Collection ID to add images into.
- **image\_names** (*str or list of strs*) – Image names.
- **out\_dir** (*optional, str*) – Directory to write images to. Defaults to None.
- **return\_image\_data** (*optional, bool*) – If True images will be returned as `numpy.ndarrays`. Defaults to False.

Returns *ImageCollection*

**update** (*collections\_id, name=None, description=None, tags=None*)

Update a collection.

**Parameters**

- **collections\_id** (*str*) – Collection ID.
- **name** (*str, optional*) – Name to be changed to.
- **description** (*str, optional*) – Description to be changed to.
- **tags** (*str or list of strs, optional*) – Optional comma-delimited keyword tags to be changed to.

**class** `helios.collections_api.CollectionsFeature` (*feature*)

Individual Collection JSON result.

**bucket**

*str* – ‘bucket’ value for the result.

**created\_at**

*str* – ‘city’ value for the result.

**description**

*str* – ‘created\_at’ value for the result.

**id**  
*str* – ‘\_id’ value for the result.

**images**  
*list of strs* – ‘images’ value for the result.

**json**  
*dict* – Raw JSON result.

**name**  
*str* – ‘name’ value for the result.

**tags**  
*list of strs* – ‘tags’ value for the result.

**updated\_at**  
*str* – ‘updated\_at’ value for the result.

**user\_id**  
*str* – ‘user\_id’ value for the result.

**class** `helios.collections_api.CollectionsFeatureCollection` (*features,*  
*records=None*)

Collection of features obtained via the Collections API.

Convenience properties are available to extract values from every feature.

**features**  
*list of `CollectionsFeature`* – All features returned from a query.

**bucket**  
‘bucket’ values for every result.

**created\_at**  
‘city’ values for every result.

**description**  
‘created\_at’ values for every result.

**id**  
‘\_id’ values for every result.

**json**  
Raw ‘json’ for every feature.

**name**  
‘name’ values for every result.

**tags**  
‘tags’ values for every result.

**updated\_at**  
‘updated\_at’ values for every result.

**user\_id**  
‘user\_id’ values for every result.

## 6.4 Observations

Helios Observations API.

Methods are meant to represent the core functionality in the developer documentation. Some may have additional functionality for convenience.

**class** `helios.observations_api.Observations` (*session=None*)

The Observations API provides ground-truth data generated by the Helios analytics.

**index** (*\*\*kwargs*)

Get observations matching the provided spatial, text, or metadata filters.

The maximum skip value is 4000. If this is reached, truncated results will be returned. You will need to refine your query to avoid this.

Usage example:

```
import helios
obs = helios.Observations()
state = 'Maryland'
bbox = [-169.352, 1.137, -1.690, 64.008]
sensors = 'sensors[visibility][min]=0&sensors[visibility][max]=1'
results = obs.index(state=state,
                    bbox=bbox,
                    sensors=sensors)
```

Usage example for transitions:

```
import helios
obs = helios.Observations()
# transition from dry/wet to partial/fully-covered snow roads
sensors = 'sensors[road_weather][data][min]=6&sensors[road_
↩weather][prev][max]=3'
results = obs.index(sensors=sensors_query)
```

**Parameters** *\*\*kwargs* – Any keyword arguments found in the `observations_index_documentation`.

**Returns** `ObservationsFeatureCollection`

**preview** (*observation\_ids, out\_dir=None, return\_image\_data=False*)

Get preview images from observations.

**Parameters**

- **observation\_ids** (*str or list of strs*) – list of observation IDs.
- **out\_dir** (*optional, str*) – Directory to write images to. Defaults to None.
- **return\_image\_data** (*optional, bool*) – If True images will be returned as `numpy.ndarrays`. Defaults to False.

**Returns** `ImageCollection`

**show** (*observation\_ids*)

Get attributes for observations.

**Parameters** **observation\_ids** (*str or list of strs*) – Helios observation ID(s).

**Returns** `ObservationsFeatureCollection`

**class** `helios.observations_api.ObservationsFeature` (*feature*)

Individual Observation GeoJSON feature.

**city**

*str* – ‘city’ value for the feature.

**country**  
*str* – ‘country’ value for the feature.

**description**  
*str* – ‘description’ value for the feature.

**id**  
*str* – ‘id’ value for the feature.

**json**  
*dict* – Raw JSON feature.

**prev\_id**  
*str* – ‘prev\_id’ value for the feature.

**region**  
*str* – ‘region’ value for the feature.

**sensors**  
*dict* – ‘sensors’ value for the feature.

**state**  
*str* – ‘state’ value for the feature.

**time**  
*str* – ‘time’ value for the feature.

**class** `helios.observations_api.ObservationsFeatureCollection` (*features*,  
*records=None*)

Collection of GeoJSON features obtained via the Observations API.

Convenience properties are available to extract values from every feature.

**features**  
list of `ObservationsFeature` – All features returned from a query.

**city**  
‘city’ values for every feature.

**country**  
‘country’ values for every feature.

**description**  
‘description’ values for every feature.

**id**  
‘id’ values for every feature.

**json**  
Raw ‘json’ for every feature.

**observations**  
Observation data from the sensor block of each feature.

Data will be returned as a dictionary with a key for each sensor. Observation data for each sensor is a named tuple ease-of-use.

Each named tuple contains the sensor, time, data, prev, id, and prev\_id.

**prev\_id**  
‘prev\_id’ values for every feature.

**region**  
‘region’ values for every feature.

**sensors**

'sensors' values for every feature.

**state**

'state' values for every feature.

**time**

'time' values for every feature.

Manager for the authorization token required to access the Helios API.

**class** `helios.core.session.Session` (*env=None*)

Manages API tokens for authentication.

Authentication credentials can be specified using the `env` input parameter, environment variables, or a `credentials.json` file in your `~/helios` directory. See the official documentation for more authentication information.

**Required keys:**

- `helios_client_id`: Client ID from API key pair.
- `helios_client_secret`: Client Secret ID from API key pair.

**Optional keys:**

- `helios_api_url`: Optional, URL for API endpoint.

A session can be established and reused for multiple core API instances.

```
import helios
sess = helios.Session()
alerts = helios.Alerts(session=sess)
cameras = helios.Cameras(session=sess)
```

If a session is not specified before hand, one will be initialized automatically. This is less efficient because each core API instance will try to initialize a session.

```
import helios
alerts = helios.Alerts()
cameras = helios.Cameras()
```

**start\_session()**

Begins Helios session.

This will establish and verify a token for the session. If a token file exists the token will be read and verified. If the token file doesn't exist or the token has expired then a new token will be acquired.

**verify\_token()**

Verifies the token.

If the token is bad or if the expiration time is less than the threshold False will be returned.

**Returns** True if current token is valid, False otherwise.

**Return type** bool



Base data structures for the SDK.

**class** `helios.core.structure.ImageCollection` (*image\_data, records*)  
Stores all image content and associated metadata.

**image\_data**  
*list of ndarray* – All image data.

**image\_names**  
Names of all images.

**output\_files**  
Full paths to all saved images.

**class** `helios.core.structure.ImageRecord` (*message=None, query=None, content=None, error=None, name=None, output\_file=None*)

Record class for images.

**Parameters**

- **message** (*tuple*) – Original message. This will be a namedtuple containing all the inputs for an individual call within a batch job.
- **query** (*str*) – API query.
- **content** (*numpy.ndarray*) – Image as a Numpy ndarray.
- **error** (*exception*) – Exception that occurred, if any.
- **name** (*str*) – Name of image.
- **output\_file** (*str*) – Full path to image file that was written.

**ok**

Check if failure occurred.

**Returns** False if error occurred, and True otherwise.

**Return type** bool

**class** `helios.core.structure.Record` (*message=None, query=None, content=None, error=None*)

Individual query record.

**Parameters**

- **message** (*tuple*) – Original message. This will be a namedtuple containing all the inputs for an individual call within a batch job.
- **query** (*str*) – API query.
- **content** – Returned content. To be defined by method.
- **error** (*exception*) – Exception that occurred, if any.

**ok**

Check if failure occurred.

**Returns** False if error occurred, and True otherwise.

**Return type** bool

**class** `helios.core.structure.RecordCollection` (*records=None*)

Class for handling query records.

**records**

list of *Record* – Raw record data for debugging purposes.

**failed**

Records for queries that failed.

**succeeded**

Records for queries that succeeded.

## 9.1 json\_utils

Helper functions for JSON objects.

`helios.utilities.json_utils.merge_json(data, keys)`  
Merge JSON fields into a single list.

Keys can either be a single string or a list of strings signifying a chain of “keys” into the dictionary.

**Parameters**

- **data** (*list*) – Dictionary to merge data from.
- **keys** (*str or sequence of strs*) – A chain of keys into the dictionary to get to the field that will be merged.

**Returns** Merged values.

**Return type** list

`helios.utilities.json_utils.read_json_file(json_file, **kwargs)`  
Read a json file.

**Parameters**

- **json\_file** (*str*) – Full path to JSON file.
- **\*\*kwargs** – Any keyword argument from the `json.load` method.

**Returns** JSON formatted dictionary.

**Return type** dict

`helios.utilities.json_utils.read_json_string(json_string, **kwargs)`  
Convert JSON formatted string to JSON.

**Parameters**

- **json\_string** (*str*) – JSON formatted string.

- **\*\*kwargs** – Any keyword argument from the `json.loads` method.

**Returns** JSON formatted dictionary.

**Return type** dict

`helios.utilities.json_utils.write_json(json_dict, file_name, **kwargs)`

Write JSON dictionary to file.

**Parameters**

- **json\_dict** (*dict*) – JSON formatted dictionary.
- **file\_name** (*str*) – Output file name.
- **\*\*kwargs** – Any keyword argument from the `json.dump` method.

**Returns** None

## 9.2 parsing\_utils

Helper functions for paths and URLs.

`helios.utilities.parsing_utils.parse_camera(data)`

Parse camera name from a URL or image name.

**Parameters** **data** (*str*) – Image URL or name.

**Returns** Camera name.

**Return type** str

`helios.utilities.parsing_utils.parse_image_name(url)`

Parse image name from a URL.

**Parameters** **url** (*str*) – Image URL.

**Returns** Image name.

**Return type** str

`helios.utilities.parsing_utils.parse_time(data)`

Parse time from a URL or image name.

**Parameters** **data** (*str*) – Image URL or name.

**Returns** The parsed time as a datetime object.

**Return type** datetime.datetime

`helios.utilities.parsing_utils.parse_url(url)`

Parse a URL into its components.

**Parameters** **url** (*str*) – Image URL.

**Returns** Parsed URL.

**Return type** urllib.parse.ParseResult

## 9.3 data\_utils

Utilities for working with SDK results.

`helios.utilities.data_utils.concatenate_feature_collections` (*fc\_tuple*)  
Concatenates FeatureCollections.

```
import helios
from helios.utilities.data_utils import concatenate_feature_collections
cams_inst = helios.Cameras()
results1 = cams_inst.index(state='new york')
results2 = cams_inst.index(state='maryland')
combined = concatenate_feature_collections((results1, results2))
```

**Parameters** `fc_tuple` (*tuple*) – (fc0, fc1, fc2, ...) FeatureCollections to be combined. All FeatureCollections must be of the same type.

**Returns** FeatureCollection of the same API type as the input.

**Return type** FeatureCollection



## CHAPTER 10

---

### Indices and tables

---

- `genindex`
- `modindex`





## h

helios.alerts\_api, 15  
helios.cameras\_api, 17  
helios.collections\_api, 20  
helios.core.session, 27  
helios.core.structure, 29  
helios.observations\_api, 23  
helios.utilities.data\_utils, 32  
helios.utilities.json\_utils, 31  
helios.utilities.parsing\_utils, 32



**A**

add\_image() (helios.collections\_api.Collections method), 20

Alerts (class in helios.alerts\_api), 15

AlertsFeature (class in helios.alerts\_api), 15

AlertsFeatureCollection (class in helios.alerts\_api), 16

area\_description (helios.alerts\_api.AlertsFeature attribute), 16

area\_description (helios.alerts\_api.AlertsFeatureCollection attribute), 16

**B**

bbox (helios.alerts\_api.AlertsFeature attribute), 16

bbox (helios.alerts\_api.AlertsFeatureCollection attribute), 16

bucket (helios.collections\_api.CollectionsFeature attribute), 22

bucket (helios.collections\_api.CollectionsFeatureCollection attribute), 23

**C**

Cameras (class in helios.cameras\_api), 17

CamerasFeature (class in helios.cameras\_api), 18

CamerasFeatureCollection (class in helios.cameras\_api), 19

category (helios.alerts\_api.AlertsFeature attribute), 16

category (helios.alerts\_api.AlertsFeatureCollection attribute), 17

certainty (helios.alerts\_api.AlertsFeature attribute), 16

certainty (helios.alerts\_api.AlertsFeatureCollection attribute), 17

city (helios.cameras\_api.CamerasFeature attribute), 18

city (helios.cameras\_api.CamerasFeatureCollection attribute), 19

city (helios.observations\_api.ObservationsFeature attribute), 24

city (helios.observations\_api.ObservationsFeatureCollection attribute), 25

Collections (class in helios.collections\_api), 20

CollectionsFeature (class in helios.collections\_api), 22

CollectionsFeatureCollection (class in helios.collections\_api), 23

concatenate\_feature\_collections() (in module helios.utilities.data\_utils), 32

coordinates (helios.cameras\_api.CamerasFeatureCollection attribute), 19

copy() (helios.collections\_api.Collections method), 20

country (helios.alerts\_api.AlertsFeature attribute), 16

country (helios.alerts\_api.AlertsFeatureCollection attribute), 17

country (helios.cameras\_api.CamerasFeature attribute), 18

country (helios.cameras\_api.CamerasFeatureCollection attribute), 19

country (helios.observations\_api.ObservationsFeature attribute), 25

country (helios.observations\_api.ObservationsFeatureCollection attribute), 25

create() (helios.collections\_api.Collections method), 20

created\_at (helios.collections\_api.CollectionsFeature attribute), 22

created\_at (helios.collections\_api.CollectionsFeatureCollection attribute), 23

**D**

description (helios.alerts\_api.AlertsFeature attribute), 16

description (helios.alerts\_api.AlertsFeatureCollection attribute), 17

description (helios.cameras\_api.CamerasFeature attribute), 19

description (helios.cameras\_api.CamerasFeatureCollection attribute), 19

description (helios.collections\_api.CollectionsFeature attribute), 22

description (helios.collections\_api.CollectionsFeatureCollection attribute), 23

description (helios.observations\_api.ObservationsFeature attribute), 25

description (helios.observations\_api.ObservationsFeatureCollection attribute), 25

destroy() (helios.collections\_api.Collections method), 21

direction (helios.cameras\_api.CamerasFeature attribute), 19

direction (helios.cameras\_api.CamerasFeatureCollection attribute), 19

## E

effective (helios.alerts\_api.AlertsFeature attribute), 16

effective (helios.alerts\_api.AlertsFeatureCollection attribute), 17

empty() (helios.collections\_api.Collections method), 21

event (helios.alerts\_api.AlertsFeature attribute), 16

event (helios.alerts\_api.AlertsFeatureCollection attribute), 17

expires (helios.alerts\_api.AlertsFeature attribute), 16

expires (helios.alerts\_api.AlertsFeatureCollection attribute), 17

## F

failed (helios.core.structure.RecordCollection attribute), 30

features (helios.alerts\_api.AlertsFeatureCollection attribute), 16

features (helios.cameras\_api.CamerasFeatureCollection attribute), 19

features (helios.collections\_api.CollectionsFeatureCollection attribute), 23

features (helios.observations\_api.ObservationsFeatureCollection attribute), 25

## H

headline (helios.alerts\_api.AlertsFeature attribute), 16

headline (helios.alerts\_api.AlertsFeatureCollection attribute), 17

helios.alerts\_api (module), 15

helios.cameras\_api (module), 17

helios.collections\_api (module), 20

helios.core.session (module), 27

helios.core.structure (module), 29

helios.observations\_api (module), 23

helios.utilities.data\_utils (module), 32

helios.utilities.json\_utils (module), 31

helios.utilities.parsing\_utils (module), 32

## I

id (helios.alerts\_api.AlertsFeature attribute), 16

id (helios.alerts\_api.AlertsFeatureCollection attribute), 17

id (helios.cameras\_api.CamerasFeature attribute), 19

id (helios.cameras\_api.CamerasFeatureCollection attribute), 19

id (helios.collections\_api.CollectionsFeature attribute), 22

id (helios.collections\_api.CollectionsFeatureCollection attribute), 23

id (helios.observations\_api.ObservationsFeature attribute), 25

id (helios.observations\_api.ObservationsFeatureCollection attribute), 25

image\_data (helios.core.structure.ImageCollection attribute), 29

image\_names (helios.core.structure.ImageCollection attribute), 29

ImageCollection (class in helios.core.structure), 29

ImageRecord (class in helios.core.structure), 29

images (helios.collections\_api.CollectionsFeature attribute), 23

images() (helios.cameras\_api.Cameras method), 17

images() (helios.collections\_api.Collections method), 21

index() (helios.alerts\_api.Alerts method), 15

index() (helios.cameras\_api.Cameras method), 18

index() (helios.collections\_api.Collections method), 21

index() (helios.observations\_api.Observations method), 24

## J

json (helios.alerts\_api.AlertsFeature attribute), 16

json (helios.alerts\_api.AlertsFeatureCollection attribute), 17

json (helios.cameras\_api.CamerasFeature attribute), 19

json (helios.cameras\_api.CamerasFeatureCollection attribute), 19

json (helios.collections\_api.CollectionsFeature attribute), 23

json (helios.collections\_api.CollectionsFeatureCollection attribute), 23

json (helios.observations\_api.ObservationsFeature attribute), 25

json (helios.observations\_api.ObservationsFeatureCollection attribute), 25

## M

merge\_json() (in module helios.utilities.json\_utils), 31

## N

name (helios.collections\_api.CollectionsFeature attribute), 23

name (helios.collections\_api.CollectionsFeatureCollection attribute), 23

## O

Observations (class in helios.observations\_api), 24

observations (helios.observations\_api.ObservationsFeatureCollection attribute), 25

ObservationsFeature (class in helios.observations\_api), 24

- ObservationsFeatureCollection (class in helios.observations\_api), 25
- ok (helios.core.structure.ImageRecord attribute), 29
- ok (helios.core.structure.Record attribute), 30
- origin (helios.alerts\_api.AlertsFeature attribute), 16
- origin (helios.alerts\_api.AlertsFeatureCollection attribute), 17
- output\_files (helios.core.structure.ImageCollection attribute), 29
- ## P
- parse\_camera() (in module helios.utilities.parsing\_utils), 32
- parse\_image\_name() (in module helios.utilities.parsing\_utils), 32
- parse\_time() (in module helios.utilities.parsing\_utils), 32
- parse\_url() (in module helios.utilities.parsing\_utils), 32
- prev\_id (helios.observations\_api.ObservationsFeature attribute), 25
- prev\_id (helios.observations\_api.ObservationsFeatureCollection attribute), 25
- preview() (helios.observations\_api.Observations method), 24
- ## R
- read\_json\_file() (in module helios.utilities.json\_utils), 31
- read\_json\_string() (in module helios.utilities.json\_utils), 31
- Record (class in helios.core.structure), 29
- RecordCollection (class in helios.core.structure), 30
- records (helios.core.structure.RecordCollection attribute), 30
- region (helios.cameras\_api.CamerasFeature attribute), 19
- region (helios.cameras\_api.CamerasFeatureCollection attribute), 19
- region (helios.observations\_api.ObservationsFeature attribute), 25
- region (helios.observations\_api.ObservationsFeatureCollection attribute), 25
- remove\_image() (helios.collections\_api.Collections method), 21
- ## S
- sensors (helios.observations\_api.ObservationsFeature attribute), 25
- sensors (helios.observations\_api.ObservationsFeatureCollection attribute), 25
- Session (class in helios.core.session), 27
- severity (helios.alerts\_api.AlertsFeature attribute), 16
- severity (helios.alerts\_api.AlertsFeatureCollection attribute), 17
- show() (helios.alerts\_api.Alerts method), 15
- show() (helios.cameras\_api.Cameras method), 18
- show() (helios.collections\_api.Collections method), 22
- show() (helios.observations\_api.Observations method), 24
- show\_image() (helios.cameras\_api.Cameras method), 18
- show\_image() (helios.collections\_api.Collections method), 22
- start\_session() (helios.core.session.Session method), 27
- state (helios.cameras\_api.CamerasFeature attribute), 19
- state (helios.cameras\_api.CamerasFeatureCollection attribute), 19
- state (helios.observations\_api.ObservationsFeature attribute), 25
- state (helios.observations\_api.ObservationsFeatureCollection attribute), 26
- states (helios.alerts\_api.AlertsFeature attribute), 16
- states (helios.alerts\_api.AlertsFeatureCollection attribute), 17
- status (helios.alerts\_api.AlertsFeature attribute), 16
- status (helios.alerts\_api.AlertsFeatureCollection attribute), 17
- succeeded (helios.core.structure.RecordCollection attribute), 30
- ## T
- tags (helios.collections\_api.CollectionsFeature attribute), 23
- tags (helios.collections\_api.CollectionsFeatureCollection attribute), 23
- time (helios.observations\_api.ObservationsFeature attribute), 25
- time (helios.observations\_api.ObservationsFeatureCollection attribute), 26
- ## U
- update() (helios.collections\_api.Collections method), 22
- updated\_at (helios.collections\_api.CollectionsFeature attribute), 23
- updated\_at (helios.collections\_api.CollectionsFeatureCollection attribute), 23
- urgency (helios.alerts\_api.AlertsFeature attribute), 16
- urgency (helios.alerts\_api.AlertsFeatureCollection attribute), 17
- user\_id (helios.collections\_api.CollectionsFeature attribute), 23
- user\_id (helios.collections\_api.CollectionsFeatureCollection attribute), 23
- ## V
- verify\_token() (helios.core.session.Session method), 27
- video (helios.cameras\_api.CamerasFeature attribute), 19
- video (helios.cameras\_api.CamerasFeatureCollection attribute), 19
- ## W
- write\_json() (in module helios.utilities.json\_utils), 32