Arable API Data Dictionary

Weather and Soil Data Table Definition

Version 1.5
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Overview

The Arable Mark collects meteorological and spectral data at 5-minute intervals. The data is sent to the Arable platform for calibration and aggregation every hour. When the raw data is delivered to the platform, it is calibrated using machine learning models. The calibrated data is aggregated on an hourly and daily basis. The aggregated data is served through the Arable API endpoint at https://api.arable.cloud/api/v2/data/{table}, where "table" can be one of [daily, hourly, local_hourly]. The data table fields, their corresponding measurement units, and aggregation functions are described in the following section.

Daily Weather and Crop Measurement Data Table

* If the Mark device is not equipped with an anemometer, the wind data fields for the API will be null. However, on the web app export and graph, the wind data will be displayed using external remote data.

DAILY TABLE			
API 2.0 endpoint: https://api.arable.cloud/api/v2/data/daily			
Description	**Units**	**Field**	**Aggregation Function**
Arable device ID	String (e.g., C012345)	device	N/A
Location ID	24-digit hex	location	N/A
Latitude	Decimal degree	lat	N/A
Longitude	Decimal degree	long	N/A
Daily maximum air temperature	°C or °F (calculated from °C)	maxt	max
Daily minimum air temperature	°C or °F (calculated from °C)	mint	min
Daily mean air temperature	°C or °F (calculated from °C)	meant	mean
Time in local time when maximum temperature was experienced	YYYY-MM-DD HH:MM:SS	maxt_time	N/A
Time in local time when minimum temperature was experienced	YYYY-MM-DD HH:MM:SS	mint_time	N/A
Mean relative humidity over the day	Between 0 and 1	mean_rh	mean
Minimum relative humidity over the day	Between 0 and 1	min_rh	min
Maximum relative humidity over the day	Between 0 and 1	max_rh	max
Relative humidity when maximum temperature was experienced	Between 0 and 1	rh_at_maxt	N/A
Relative humidity when minimum temperature was experienced	Between 0 and 1	rh_at_mint	N/A
Precipitation total	mm	precip	sum

DAILY TABLE			
API 2.0 endpoint: https://api.arable.cloud/api/v2/data/daily			
Description	**Units**	**Field**	**Aggregation Function**
Number of hours with more than 0.1 mm rain per day	E.g., 3.0	precip_hours	N/A
Precipitation rate	mm/day	prate (deprecated)	N/A
Sea level pressure	kPa	slp	N/A
Vapor pressure deficit	kPA	vpd	mean
Hours of downwelling shortwave radiation >120 W/m^2	Hours	sunshine_duration	Sum of swdw above 120/12
Shortwave downwelling radiation, daily total	MJ/m2	swdw	Sum (total seconds * swdw)/1e6
Daily light integral	mJ/m2 /d	dli	sum (total seconds * swdw)/1e6
Wind direction*	N, NNE, NE, etc.	wind_direction	mean
Wind heading*	Degrees from North	wind_heading	N/A
Wind speed*	m/s	wind_speed	mean
Max wind speed*	m/s	wind_speed_max	max
Min wind speed*	m/s	wind_speed_min	min
Actual water vapor pressure	kPa	ea	mean
Evapotranspiration (ETo)	mm/day	et	sum
Crop evapotranspiration (ETc)	mm/day	etc	sum
Crop coefficient (Kc)	Unitless	kc	N/A
Normalized difference vegetation index (NDVI)	unitless index between -1 and 1	ndvi	Value of NDVI +/- 1 hour of solar noon
Chlorophyll index	Unitless index	cl	Value of CI +/- 1 hour of solar noon
Leaf wetness	Hours	lfw	N/A
Dew temperature	°C or °F (calculated from °C)	tdew	mean
Maximum dew point temperature over the day	°C or °F (calculated from °C)	max_tdew	max
Dew temperature when minimum temperature was experienced	°C or °F (calculated from °C)	tdew_at_mint	N/A
Daily mean leaf/ground temperature	°C or °F (calculated from °C)	mean_tbelow	mean

DAILY TABLE			
API 2.0 endpoint: https://api.arable.cloud/api/v2/data/daily			
Description	**Units**	**Field**	**Aggregation Function**
Growing degree days for the day (GDD)	°C-days	gdd	sum
Cumulative growing degree days, accumulated from time of device deployment	°C-days	gdd_cumulative	sum
Leaf-to-air temperature difference	°C or °F (calculated from °C)	lfairdelta	Mean difference between air temperature and below temperature around solar noon
Crop water demand	mm/day	crop_water_demand	
Local date	YYYY-MM-DD HH:MM:SS	time	N/A
Aggregation sample percent (number of datapoints aggregated for that day)	Between 0 and 1	sample_pct	N/A
True for low data quality (Deprecated)	True or False	low_quality	N/A

Local Hourly & Hourly Weather and Crop Measurement Data Table

* Wind data fields will be null if the Mark 2 device is not equipped with an anemometer.
 # Spectral Bands are supported only in Mark 2 data api endpoints.

LOCAL HOURLY & HOURLY TABLE			
API 2.0 endpoint: https://api.arable.cloud/api/v2/data/hourly			
Description	**Units**	**Field**	**Aggregation Function**
Device ID	String (e.g., C012345)	device	N/A
Location ID	24-digit hex	location	N/A
Latitude	Decimal degree	lat	N/A
Longitude	Decimal degree	long	N/A
Air temperature	°C or °F (calculated from °C)	tair	mean
The maximum air temperature experienced during this hour	°C or °F (calculated from °C)	maxt	max
The minimum air temperature experienced during this hour	°C or °F (calculated from °C)	mint	min
Relative humidity	Between 0 and 1	rh	mean
Minimum relative humidity in the hour	Between 0 and 1	min_rh	min
Maximum relative humidity in the hour	Between 0 and 1	max_rh	max
Relative humidity when a maximum temperature was experienced	Between 0 and 1	rh_at_maxt	N/A
Relative humidity when a minimum temperature was experienced	Between 0 and 1	rh_at_mint	N/A
Pressure	kPa or mBar (calculated from kPa)	p	mean
Sea level pressure	kPa	slp	mean
Vapor pressure deficit	kPA	vpd	mean
Precipitation total	mm	precip	sum
Precipitation rate	mm/h	prate (deprecated)	N/A
Wind direction*	N, NNE, NE, etc.	wind_direction	mean

LOCAL HOURLY & HOURLY TABLE			
API 2.0 endpoint: https://api.arable.cloud/api/v2/data/hourly			
Description	**Units**	**Field**	**Aggregation Function**
Wind heading*	degrees	wind_heading	N/A
Wind speed*	m/s	wind_speed	mean
Max wind speed*	m/s	wind_speed_max	max
Min wind speed*	m/s	wind_speed_min	min
Actual water vapor pressure	kPa	ea	mean
Evapotranspiration (ETo)	mm	et	sum
Crop evapotranspiration	mm/hour	etc	sum
Short wave downwelling	W/m2	swdw	mean
Short wave upwelling	W/m2	swuw	mean
Longwave upwelling	W/m2	lwuw	mean
Longwave downwelling	W/m2	lwdw	mean
Dew point temperature	°C or °F (calculated from °C)	tdew	mean
Maximum dew point temperature in the hour	°C or °F (calculated from °C)	max_tdew	max
Temperature above sky temperature	°C or °F (calculated from °C)	tabove	mean
Temperature below leaf/ground temperature	°C or °F (calculated from °C)	tbelow	mean
Leaf wetness	min	lfw	N/A
Spectral value[#]	W/m2	b1dw - b7dw b1uw - b7uw	N/A
Photosynthetically active radiation downwelling	uE/m2/s	pardw	N/A
Photosynthetically active radiation upwelling	uE/m2/s	paruw	N/A
UTC time	YYYY-MM-DD HH:MM:SS	time	N/A
Aggregation sample percent (number of datapoints aggregated for that day)	Between 0 and 1	sample_pct	N/A
True for low data quality	True or False	low_quality	N/A

Connected Sentek Soil Moisture Hourly/Daily Data Table and Measurement Range

The Sentek sensor is capable of measuring up to three sets of measurements for each of the parameters (moisture, temperature, and salinity) at depths ranging from 10 cm to 150 cm. These measurements are captured in the field named "moisture_0 to moisture_14", "temp_0" to "temp_14", and "salinity_0" to salinity_14" in the data table.

However, when using the SDI-12 interface, the measurement depth is capped at 120 cm. Therefore, depending on the probe model/size, the Mark can measure up to 12 measurements.

For example:

- If a 10 cm (4 inch) probe is used, the API will return three sets of measurements (minimum, maximum, and mean) for moisture, temp, and salinity**. The fields "moisture_0_min*" , "temp_0_min*" and "[salinity_0_min*]" will have a value, while the field "moisture_1" to moisture_14", "temp_1" to "temp_14", and "salinity_1" to salinity_14" will be "null."

- If a 30 cm (12 inch) probe is used, the API will return three sets of measurements for each of the parameters (moisture, temperature, and salinity) at depths of 10 cm, 20 cm, and 30 cm.

- If a 120 cm (48 inch) probe is used, the API will return three sets of measurements for each of the parameters (moisture, temperature, and salinity) at depths of 10 cm, 20 cm, and so on, up to a maximum depth of 120 cm.

"Sentek Drill and Drop probe sizes: *The Drill & Drop probe is available in lengths from 30 cm (12 inch) through to 120 cm (48 inch) with sensors every 10 cm or four inches. It is also offered as a Single Point Sensor measuring 10. 5cm or 4 inch for SDI-12 loggers."*

* - min, max, mean
** salinity is optional based on the sensor probe capability.

SENTEK HOURLY/DAILY		
API 2.0 endpoint: https://api.arable.cloud/api/v2//data/sentek_daily or /data/sentek_hourly		
Description	**Metric**	**Field**
Time stamp	timestamp with time zone	create_time
Device name: e.g. A000001	character varying	device
Location ID	character varying	location
Maximum moisture @ 10 cm, volumetric water content	%	moisture_0_max
Mean moisture @ 10 cm, volumetric water content	%	moisture_0_mean
Minimum moisture @ 10 cm, volumetric water content	%	moisture_0_min

SENTEK HOURLY/DAILY		
API 2.0 endpoint: https://api.arable.cloud/api/v2//data/sentek_daily or /data/sentek_hourly		
Description	**Metric**	**Field**
Minimum moisture @ 150 cm, volumetric water content	%	moisture_14_max
Maximum moisture @ 150 cm, volumetric water content	%	moisture_14_mean
Mean moisture @ 150 cm, volumetric water content	%	moisture_14_min
Number of sensors E.g., 1, 3, 6, 9, 12 depends on the probe type	integer	num_of_sensors
Maximum salinity @ 10 cm, volumetric ion content	real	salinity_0_max
Mean salinity @ 10 cm, volumetric ion content	real	salinity_0_mean
Minimum salinity @ 10 cm, volumetric ion content	real	salinity_0_min
Maximum salinity @ 150 cm, volumetric ion content	real	salinity_14_max
Mean salinity @ 150 cm, volumetric ion content	real	salinity_14_mean
Minimum salinity @ 150 cm, volumetric ion content	real	salinity_14_min
Sensor connector input version	character varying	sdi12_version
Sentek sensor model	character varying	sentek_model
Sentek sensor version	character varying	sentek_version
Maximum temperature @ 10 cm	°C or °F (calculated from °C)	temp_0_max
Mean temperature @ 10 cm	°C or °F (calculated from °C)	temp_0_mean
Minimum temperature @ 10 cm	°C or °F (calculated from °C)	temp_0_min
Maximum temperature @ 150 cm	°C or °F (calculated from °C)	temp_14_max
Mean temperature @ 150 cm	°C or °F (calculated from °C)	temp_14_mean
Minimum temperature @ 150 cm	°C or °F (calculated from °C)	temp_14_min
Update time stamp	timestamp with time zone	time