

O2A specification for GeoTIFF (.sdi.tif)

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The O2A GeoTIFF is a specification of the metadata tags nomenclature inside a GeoTIFF used in the O2A dataflow. It extends the public [GeoTIFF](#) format with defined metadata tags which are used in the O2A dataflow.

Version 1.2

GeoTIFF with [WKT representation of the coordinate reference system](#) (it needs to be a CRS existing in the [EPSG library](#)) and additional metadata tags holding dataset-specific information.

A O2A GeoTIFF needs to contain all the following metadata tags. **If a value is not known, the key can be omitted or the value can be filled in with the word "void".**

Metadata	Value is mandatory	Description, Examples	Example Values
Coordinate System	yes	The Coordinate System (SRS, CRS) must be written in the WKT format and must be valid against the EPSG code representation. If not, it won't be accepted.	WKT of EPSG:4326: https://epsg.io/4326.wkt
DATE_TIME or DATE_TIME_START DATE_TIME_END	no	Date/Time of the data, in the ISO 8601 format. Either one timestamp (DATE_TIME) or two timestamps for time series (DATE_TIME_START , DATE_TIME_END). Note: Folder Naming Specifications and File Naming!	YYYY-MM-DDThh:mm:ss (pattern, not an example!) 2000-01-01T00:00:00
PARAMETER_NAME	no	Name of measured or calculated parameter.	sea ice concentration elevation
PARAMETER_URN	no	A parameter urn of the dataset as defined in sensor.awi.de or built from a PANGAEA DOI .	satellite:gcomw1:amsr2:l2:sic pangaea:893351:M132_bathy_data-products:M132_soundings_WGS84:multibeam
PARAMETER_UNIT	no	The unit (or unit symbol) of the given parameter.	% m meter
METHOD	no	Name of method used for measurement (observation, ...) data.	
DEVICE	no	Name or ID of device used for measurement (observation, ...) data.	
SOURCE	yes	URL of data source.	https://doi.pangaea.de/10.1594/PANGAEA.893351?format=textfile
DOI	yes (if the data set is published in PANGAEA !)	URL to DOI.	https://doi.org/10.1594/PANGAEA.893351
SENSOR_URN	yes (if the data set is registered in sensor.awi.de !)	URL of an sensor.awi.de handle (handle!!).	https://hdl.handle.net/10013/sensor.3a51c0c1-4822-476d-be31-9f80a9ef36e4
LICENSE	yes	License of the dataset.	MIT, CC BY-NC 3.0

PLATFORM	no	Name of platform.	Polarstern
EXPEDITION_NAME	yes (if the data set is registered in PANGAEA!)	Name of expedition (campaign, cruise, ...) where measurement (observation, ...) was taken.	PS001/1
EXPEDITION_ALIAS	no	Alias of expedition (campaign, cruise, ...) where measurement (observation, ...) was taken.	ARK-I/1
EVENT_NAME	yes (only if the data set is registered in PANGAEA!)	Name of expedition event where measurement (observation, ...) is taken. Mostly as dataset its registered in PANGAEA.	PS001/1-0001
EVENT_ALIAS	no	Alias of expedition event where measurement (observation, ...) is taken. Mostly as dataset its registered in PANGAEA.	ARK-I/1-1

Examples

Metadata like in the following examples could be retrieved by using the gdalinfo command.

e.g.: gdalinfo ./path/to/file.sdi.tif

--	--

Data registered in sensor.awi.de

Driver: GTiff/GeoTIFF

Files: ../platforms/satellite/gcomw1/amsr2/l2/sic/data/2019/05/21/asi-AMSR2-n3125-20190521_EPSG4326.tif

Size is 4268, 4268

Coordinate System is:

PROJCS["WGS 84 / Arctic Polar Stereographic",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,298.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0,
AUTHORITY["EPSG","8901"]],
UNIT["degree",0.0174532925199433,
AUTHORITY["EPSG","9122"]],
AUTHORITY["EPSG","4326"]],
PROJECTION["Polar_Stereographic"],
PARAMETER["latitude_of_origin",71],
PARAMETER["central_meridian",0],
PARAMETER["scale_factor",1],
PARAMETER["false_easting",0],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","9001"]],
AXIS["X",EAST],
AXIS["Y",NORTH],
AUTHORITY["EPSG","3995"]]

Origin = (-6527893.000000000000000,6882500.000000000000000)

Pixel Size = (3125.000000000000000,-3125.000000000000000)

Metadata:

AREA_OR_POINT=Area

grid_information=longitude-latitude grid for these data to be
found at: https://seaice.uni-bremen.de/data/grid_coordinates/n3125/

long_name=ASI Ice Concentration, Version: 5.4, 20190521, res:
3.12500, AMSR2, Region: Arctic3125
valid_range=0, 100

DATE_TIME=2019-05-21T00:00:00

DEVICE=Advanced Microwave Scanning Radiometer 2 (AMSR2)

METHOD=Advance Microwave

SOURCE=https://seaice.uni-bremen.de/data/grid_coordinates/n3125/

/n3125/

LICENSE=unknown

PARAMETER_NAME=sea_ice_concentration

PARAMETER_UNIT=%

PARAMETER_URN=satellite:gcomw1:amsr2:l2:sic

Image Structure Metadata:

INTERLEAVE=BAND

Corner Coordinates:

Upper Left (-6527893.000, 6882500.000) (136d30'52.93"W, 15d
7'10.61"N)

Lower Left (-6527893.000,-6455000.000) (45d19'18.07"W,
16d55'59.58"N)

Upper Right (6809607.000, 6882500.000) (135d18'18.09"E,
13d58'41.21"N)

Lower Right (6809607.000,-6455000.000) (46d31'52.83"E,
15d43'36.08"N)

Center (140857.000, 213750.000) (146d36'57.28"E, 87d38'39.46"N)

Band 1 Block=512x512 Type=Float32, ColorInterp=Gray

Min=0.000 Max=100.000

Minimum=0.000, Maximum=100.000, Mean=89.065, StdDev=23.340

NoData Value=0

Overviews: 2134x2134, 1067x1067, 534x534, 267x267, 134x134,
67x67

Metadata:

STATISTICS_MAXIMUM=100

STATISTICS_MEAN=89.065134675115

STATISTICS_MINIMUM=0.0002532234066166

STATISTICS_STDDEV=23.340079762818

Data published in www.pangaea.de

Driver: GTiff/GeoTIFF

Files: ../pangaea/893351/M132_bathy_data-products
/M132_soundings_WGS84/M132_soundings_EPSG4326_2016-
11-15.tif

Size is 4268, 4268

Coordinate System is:

PROJCS["WGS 84 / Arctic Polar Stereographic",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,298.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0,
AUTHORITY["EPSG","8901"]],
UNIT["degree",0.0174532925199433,
AUTHORITY["EPSG","9122"]],
AUTHORITY["EPSG","4326"]],
PROJECTION["Polar_Stereographic"],
PARAMETER["latitude_of_origin",71],
PARAMETER["central_meridian",0],
PARAMETER["scale_factor",1],
PARAMETER["false_easting",0],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","9001"]],
AXIS["X",EAST],
AXIS["Y",NORTH],
AUTHORITY["EPSG","3995"]]

Origin =

(-6527893.000000000000000,6882500.000000000000000)

Pixel Size = (3125.000000000000000,-3125.000000000000000)

Metadata:

AREA_OR_POINT=Area

DATE_TIME=2007-06-01T00:00:00

EXPEDITION_NAME=M132

EVENT_NAME=M132-track

DEVICE=Atlas Hydrographic Hydrosweep DS 2 multibeam
echo sounder

METHOD=multi-beam echosounders

SOURCE=[https://doi.pangaea.de/10.1594/PANGAEA.893351?](https://doi.pangaea.de/10.1594/PANGAEA.893351?format=textfile)

DOI=<https://doi.org/10.1594/PANGAEA.893351>

LICENSE=Creative Commons Attribution-NonCommercial
3.0 Unported (CC-BY-NC-3.0)

PARAMETER_NAME=Elevation

PARAMETER_UNIT=m

PLATFORM=Meteor

Image Structure Metadata:

INTERLEAVE=BAND

Corner Coordinates:

Upper Left (-6527893.000, 6882500.000) (136d30'52.93"W, 15d
7'10.61"N)

Lower Left (-6527893.000,-6455000.000) (45d19'18.07"W,
16d55'59.58"N)

Upper Right (6809607.000, 6882500.000) (135d18'18.09"E,
13d58'41.21"N)

Lower Right (6809607.000,-6455000.000) (46d31'52.83"E,
15d43'36.08"N)

Center (140857.000, 213750.000) (146d36'57.28"E,
87d38'39.46"N)

Band 1 Block=512x512 Type=Float32, ColorInterp=Gray

Min=0.000 Max=100.000

Minimum=0.000, Maximum=100.000, Mean=89.065,

StdDev=23.340

NoData Value=0

Overviews: 2134x2134, 1067x1067, 534x534, 267x267,

134x134, 67x67

Metadata:

STATISTICS_MAXIMUM=100

STATISTICS_MEAN=89.065134675115

STATISTICS_MINIMUM=0.0002532234066166

STATISTICS_STDDEV=23.340079762818

Dataset Homogeneity

A homogeneous data structure is essential for smooth processing and clean rendering of the dataset. A dataset must therefore have the following properties:

- [File naming](#) must be consistent.
- [Metadata keys and values](#) must be consistent.
- Pixel value range must be consistent (e.g. int8, float32, ...).
- *NoData* value must be proper set and consistent (in both pixel values and metadata entries).



Dataset

- A dataset can be of a single image or multiple images.
- A dataset can show a topographic expansion of a parameter at a specific time period.
- A dataset can show a topographic expansion of a parameter over a period of time (time series).

File Naming

Data files follow the naming pattern `<basename>_<timestamp>_EPSG<code>.sdi.tif` and the [Exchange Folder Specifications](#).

Naming Patterns explained:

- `<basename>` can be everything not conflicting with `EPSG<code>` and/or `<timestamp>`.
- `<timestamp>` is used to read the date on which the data was observed or recorded, or for which the data was modelled.
 - Right now only date (and not time) is supported.
 - Needs to be identical with date of `DATE_TIME/DATE_TIME_START`.
 - One of the following date formats are supported (for all files in one dataset):
 - `YYYYMMDD`
 - `YYYY-MM-DD`
 - `YYYY_MM_DD`
- `EPSG<code>` is **mandatory** to allow multiple projections in one folder.

Examples

two valid examples

```
./path/to/data
|-- your_dataset_1_EPSG4326_2021-01-01.tif
|-- your_dataset_1_EPSG3995_2021-01-01.tif
|-- your_dataset_1_EPSG3031_2021-01-01.tif
|-- your_dataset_2_EPSG4326_2021-01-01.tif
|-- your_dataset_2_EPSG3995_2021-01-01.tif
`-- your_dataset_2_EPSG3031_2021-01-01.tif

./path/to/data
|-- world/
|   |-- your_dataset_1_EPSG4326_20210101.tif
|   |-- your_dataset_2_EPSG4326_20210101.tif
|-- north/
|   |-- your_dataset_1_EPSG3995_20210101.tif
|   |-- your_dataset_2_EPSG3995_20210101.tif
`-- south/
    |-- your_dataset_1_EPSG3031_20210101.tif
    |-- your_dataset_2_EPSG3031_20210101.tif
```

~~Version 1.1 (deprecated)~~

*The O2A GeoTIFF specification version 1.1 is in progress and not yet **fully** proofed. It will replace the the O2A GeoTIFF specification version 1.*

GeoTIFF with [WKT representation of the coordinate reference system](#) (it needs to be a CRS existing in the [EPSG library](#)) and additional metadata tags holding dataset specific information.

A O2A GeoTIFF needs to contain all the following metadata tags. If any values are unknown, they should be left empty.

Metadata	Description, Examples	Value
Coordinate System	The Coordinate System (SRS, CRS) must be written in the WKT format and must be valid against the EPSG code representation. If not, it won't be accepted. e.g. WKT of EPSG:4326: https://epsg.io/4326.wkt	mandatory
PARAMETER_NAME	(Natural language) name of measured or calculated parameter. e.g.: cic , multibeam	can be empty
PARAMETER_URN	The parameter urn of the dataset as defined in sensor.awi.de or build from a pangaea DOI. It will be used for decisions in the o2a dataflow. e.g.: satellite-geomw1-amsr2-l2-cic — pangaea:803351.M132_bathy_data products:M132_soundings_WGS84.multibeam	
PARAMETER_UNIT	The unit of the given parameter e.g. %	can be empty
DATE_TIME or DATE_TIME_START DATE_TIME_END	Date/Time of the data, in the ISO 8601 format, e.g. YYYY-MM-DDThh:mm:ss . Either one timestamp (DATE_TIME) or two timestamps for time series (DATE_TIME_START , DATE_TIME_END).	mandatory
LICENSE	License of the dataset. e.g. MIT , CC BY NC 3.0	can be empty

Examples

Metadata like in the following examples could be retrieved by using the `gdalinfo` command.

e.g.: `gdalinfo ./path/to/file.sdi.tif`

Data from [sensor.awi.de](#)

```

Driver: GTiff/GeoTIFF
Files: ../platforms/satellite/gecomw1/amsr2/l2/sic/data/2019/05/21/asi_AMSR2_n3125_20190521_EPSG4326.tif
Size is 4268, 4268
Coordinate System is:
PROJCS["WGS 84 / Arctic Polar Stereographic",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,200.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0,
AUTHORITY["EPSG","3001"]],
UNIT["degree",0.0174532925199433,
AUTHORITY["EPSG","9122"]],
AUTHORITY["EPSG","4326"]],
PROJECTION["Polar Stereographic"],
PARAMETER["latitude_of_origin",71],
PARAMETER["central_meridian",0],
PARAMETER["scale_factor",1],
PARAMETER["false_easting",0],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","3001"]],
AXIS["X",EAST],
AXIS["Y",NORTH],
AUTHORITY["EPSG","3005"]]
Origin = ( 6527893.0000000000000000,6882500.0000000000000000)
Pixel Size = (3125.0000000000000000, 3125.0000000000000000)
Metadata:
AREA_OR_POINT=Area
grid information=longitude latitude grid for these data to be found at: https://seaice.uni-bremen.de/data/grid\_coordinates/n3125/
long_name=ASI Ice Concentration, Version: 5.4, 20190521, res: 3.12500, AMSR2, Region: Arctic3125
valid_range=0, 100
PARAMETER_NAME=sic
PARAMETER_URN=satellite:gecomw1:amsr2:l2:sic
PARAMETER_UNIT=%
LICENSE=
DATE_TIME=2019-05-21T00:00:00
Image Structure Metadata:
INTERLEAVE=BAND
Corner Coordinates:
Upper Left ( 6527893.000, 6882500.000) (136d30'52.93"W, 15d 7'10.61"N)
Lower Left ( 6527893.000, 6455000.000) ( 45d19'18.07"W, 16d55'59.58"N)
Upper Right ( 6809607.000, 6882500.000) (135d18'18.09"E, 13d58'41.21"N)
Lower Right ( 6809607.000, 6455000.000) ( 46d31'52.83"E, 15d43'36.08"N)
Center ( 140857.000, 213750.000) (146d36'57.28"E, 87d38'39.46"N)
Band 1 Block=512x512 Type=Float32, ColorInterp=Gray
Min=0.000 Max=100.000
Minimum=0.000, Maximum=100.000, Mean=89.065, StdDev=23.340
NoData Value=0
Overviews: 2134x2134, 1067x1067, 534x534, 267x267, 134x134, 67x67
Metadata:
STATISTICS_MAXIMUM=100
STATISTICS_MEAN=89.065134675115
STATISTICS_MINIMUM=0.0002532234066166
STATISTICS_STDDEV=23.340079762818

```

Data from www.pangaea.de

```
Driver: GTiff/GeoTIFF
Files: ../pangaea/893351/M132_bathy_data_products/M132_soundings_WGS84/M132_soundings_EPSG4326_2016_11_15.tif
Size is 4268, 4268
Coordinate System is:
-- PROJCS["WGS 84 / Arctic Polar Stereographic",
-- GEOGCS["WGS 84",
-- DATUM["WGS 1984",
-- SPHEROID["WGS 84", 6378137, 208.257223563,
-- AUTHORITY["EPSG", "7030"]],
-- AUTHORITY["EPSG", "6326"]],
-- PRIMEM["Greenwich", 0,
-- AUTHORITY["EPSG", "3001"]],
-- UNIT["degree", 0.0174532925199433,
-- AUTHORITY["EPSG", "9122"]],
-- AUTHORITY["EPSG", "4326"]],
-- PROJECTION["Polar Stereographic"],
-- PARAMETER["latitude_of_origin", 71],
-- PARAMETER["central_meridian", 0],
-- PARAMETER["scale_factor", 1],
-- PARAMETER["false_easting", 0],
-- PARAMETER["false_northing", 0],
-- UNIT["metre", 1,
-- AUTHORITY["EPSG", "3001"]],
-- AXIS["X", EAST],
-- AXIS["Y", NORTH],
-- AUTHORITY["EPSG", "3005"]]
Origin = ( 6527893.0000000000000000, 6882500.0000000000000000)
Pixel Size = (3125.0000000000000000, 3125.0000000000000000)
Metadata:
-- AREA_OR_POINT=Area
-- PARAMETER_NAME=multibeam
-- PARAMETER_URN=pangaea:893351:M132_bathy_data_products:M132_soundings_WGS84:multibeam
-- PARAMETER_UNIT=
-- LICENSE=Creative Commons Attribution NonCommercial 3.0 Unported (CC BY NC 3.0)
-- DATE_TIME_START=2016_11_15T00:00:00
-- DATE_TIME_END=2016_12_11T00:00:00
Image Structure Metadata:
-- INTERLEAVE=BAND
Corner Coordinates:
Upper Left ( 6527893.000, 6882500.000) (136d30'52.93"W, 15d 7'10.61"N)
Lower Left ( 6527893.000, 6455000.000) ( 45d19'18.07"W, 16d55'59.58"N)
Upper Right ( 6809607.000, 6882500.000) (135d18'18.09"E, 13d58'41.21"N)
Lower Right ( 6809607.000, 6455000.000) ( 46d31'52.83"E, 15d43'36.08"N)
Center ( 140857.000, 213750.000) (146d36'57.28"E, 87d38'39.46"N)
Band 1 Block=512x512 Type=Float32, ColorInterp=Gray
-- Min=0.000 Max=100.000
-- Minimum=0.000, Maximum=100.000, Mean=89.065, StdDev=23.340
-- NoData Value=0
-- Overviews: 2134x2134, 1067x1067, 534x534, 267x267, 134x134, 67x67
Metadata:
-- STATISTICS_MAXIMUM=100
-- STATISTICS_MEAN=89.065134675115
-- STATISTICS_MINIMUM=0.0002532234066166
-- STATISTICS_STDDEV=23.340079762818
```

Version 1 (deprecated)

Definition for Format version 1 is in progress and is not yet proofed.

An GeoTiff with defined metadata tags. The advantage is to store the SensorURN and/or DOI and/or additional metadata tags in the file.

GeoTiff with well formed WKT description of the coordinate system and additional defined metadata tags holding dataset specific information. Attribute names (orange) are case sensitive.

Coordinate System	The Coordinate System (SRS, CRS) must be written in the WKT format and must be valid against it. If not, it won't be accepted. e.g. WKT of EPSG:4326: https://epsg.io/4326.wkt

PARAMETER_URN	The sensor or parameter urn of the dataset as defined in sensor.awi.de . It will be used for decisions in the o2a dataflow. e.g. <code>'satellite:geomw1:amcr2:l2:cie'</code>
PARAMETER_UNIT	The unit of the given parameter. e.g. <code>'%</code>

Example: [sensor.awi.de](#)

```
Driver: GTiff/GeoTIFF
Files: ../Downloads/SealceRgb.tiff
Size is 1170, 385
Coordinate System is:
GEOGCS["WGS 84",
  DATUM["WGS_1984",
    SPHEROID["WGS 84",6378137,298.257223563,
      AUTHORITY["EPSG","7030"]],
    AUTHORITY["EPSG","6326"]],
    PRIMEM["Greenwich",0],
    UNIT["degree",0.0174532925199433],
    AUTHORITY["EPSG","4326"]]]
Origin = (55.375000000188301,87.2916666666664497)
Pixel Size = (0.04166666666666700,0.04166666666666700)
Metadata:
  AREA_OR_POINT=Area
  PARAMETER_URN=satellite:geomw1:amcr2:l2:cie
  PARAMETER_UNIT=%
  DOI=PANGAEA.123456
Image Structure Metadata:
  INTERLEAVE=PIXEL
Corner Coordinates:
  Upper Left ( 55.3750000, 87.2916667) ( 55d22'30.00"E, 87d17'30.00"N)
  Lower Left ( 55.3750000, 71.2500000) ( 55d22'30.00"E, 71d15' 0.00"N)
  Upper Right (104.1250000, 87.2916667) (104d 7'30.00"E, 87d17'30.00"N)
  Lower Right (104.1250000, 71.2500000) (104d 7'30.00"E, 71d15' 0.00"N)
  Center ( 79.7500000, 79.2708333) ( 79d45' 0.00"E, 79d16'15.00"N)
Band 1 Block=1170x2 Type=Byte, ColorInterp=Red
Band 2 Block=1170x2 Type=Byte, ColorInterp=Green
Band 3 Block=1170x2 Type=Byte, ColorInterp=Blue
```