

O2A specification for GeoCSV (.sdi.csv)

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This specification extends the commonly known [GeoCSV](#) specification with

- special requirements enabling it to be used in automated O2A SDI dataflows (see [SOPs](#))
- advanced features to support basic relational structure

Its main purpose are single-source layers where data is coming in a harmonized table structure and vocabulary.

Version 1.1

This specification comprises three different file types. The two **Layer Definition Files** play a role when using O2A GeoCSV files inside a standardised [O2A SDI SOP](#) dataflow. They define the target structure of the database table fueling a WMS/WFS. **Data Files** and **Join Files** contain the actual data that should be provided as WMS/WFS. Join Files are an optional feature to reduce data redundancy during data exchange. Data Files can be chunked to organise your data. See the subsections, especially the examples for further understanding.

Basics

- [File Naming](#)
 - [Layer Definition Files](#)
 - [_layer_def.csv](#)
 - [_layer_def.csvt](#)
 - [Data Files](#)
 - [<basename>.sdi.csv](#) (Base Usage)
 - [<basename>@<chunk>.sdi.csv](#) (Chunked Usage)
 - [Join Files](#)
 - [<basename>.sdi.join.csv](#)
- [Constraints](#)
 - [delimiter](#): tab
 - [decimal separator](#): dot (.)
 - [encoding](#): UTF-8
 - [file name restrictions](#)
 - [<basename>](#) and [<chunk>](#): alphanumeric, no special characters except underscore (_), dash (-), dot (.), hash symbol (#)
 - [column name restrictions](#)
 - [adherence to column name conventions for basic metadata](#) (see section below)
 - [allowed characters](#): alphanumeric ('a' - 'zA' - 'Z0' - '9'), underscore, dot
 - [recommendation](#): lower case alphanumeric and underscores, only
 - [needs to be compliant with Postgres identifier naming constraints](#)

Layer Definition Files

To define the desired (layer) table structure, including column types, two specific files need to be provided.

_layer_def.csv

An empty CSV file, consisting of *exactly one* line with *exactly all* column headers the target layer should contain, separated by tabs.

_layer_def.csvt

A CSVt file, consisting of *exactly one* line with column types for *exactly all* columns specified in the `_layer_def.csv` file, separated by commas (,). Supported column types are the following

Column Type	Explanation	Comment
Integer (Boolean)	boolean	Values need to be 0 (meaning false) or 1 (meaning true).
Integer	natural number	
Real	decimal numeral	
String	string/text	Could contain lists/dictionaries formatted as strings (see examples)
DateTime	timestamp	
WKT	geometry in WKT format	

Basic Data Files

Not every O2A GeoCSV file needs to contain all columns (except for those mandatory) of the target layer (as described in the Layer Definition Files). All unmentioned columns will hold null values for all rows of O2A GeoCSV data files not containing them.

Column Name Conventions

column type/group	column header	column data type	column+value mandatory?	description	example values
space/time metadata	date_time_start	DateTime	yes	Date and time of data point in ISO 8601 format notation or start of time range. Since version 1.1: time zone specification (e.g. +00 for UTC) is mandatory but could be different from UTC.	valid: 2019-02-28T15:50:00+00:00 valid: 2019-02-28T15:50:00.000+00 invalid: 2019-02-28T15:50:00 invalid: 2019-02-28 15:50:00
	date_time_end	DateTime		End of time range of measurement(s) in ISO 8601 format notation, using UTC time zone.	see above
	elevation	Real		Elevation in meter. A negative value means below sea level, while positive value means above sea level. See Pangaea Geocode definition . Note: This is not the height/depth of the measurement/observation (unless it's taken on earth's surface) but the topographical elevation at the lon/lat position.	valid: 200.1 valid: -200 invalid: -200m
	z_value	Real		Vertical position of the measurement, in meter (third spatial dimension).	
	z_type	String	yes, if z_value is given	Pangaea Geocode to describe the type of z_value.	valid: "DEPTH, water" valid: "DEPTH, sediment/rock" valid: "HEIGHT above ground" invalid: "HEIGHT above aeroplane"
	geometry	WKT	yes	Geometry in WKT notation without third/vertical spatial dimension. The reference system needs to be EPSG:4326 and the unit decimal degrees. Longitude first, latitude second. The geometry type can be chosen freely. However, a simple POINT is usually the best choice.	valid: POINT (123.45678 -20.12345) valid: MULTILINESTRING ((8.58 53.55, 8.58 53.56, 8.57 53.55), (8.0 53.0, 9.0 54.0, 8.0 54.0)) invalid: POINT (-20.12345 123.45678)
data, other metadata	*	*		Arbitrary amount of data and/or metadata columns. For some metadata columns specific vocabulary needs to be used (see section).	valid: "pressure" valid: "pressure_unit" valid: "license" valid: "sample_type" valid: "exposure_time"
join functionality	csv_join	none		Used to hold join keys for the use of join files. Must not appear in layer definition files!	

Metadata Vocabulary

This is a list of compulsory and encouraged vocabulary to use for column headers (if columns with corresponding meaning are used). Compulsory vocabulary does not mean that the column itself is compulsory. Some vocabulary is encouraged to foster consistency among AWI-hosted OWS. but may be deviated from (e.g. basis instead of platform).

metadata category	column vocabulary	vocabulary compulsory?	comment
space/time metadata	date_time_start	compulsory	
	date_time_end	compulsory	
	elevation	compulsory	
	z_value	compulsory	
	z_type	compulsory	
	geometry	compulsory	
acquisition/parameter metadata	expedition	encouraged (aka "Richtlinie")	see https://wiki.pangaea.de/wiki/Campaign
	event	encouraged	see https://wiki.pangaea.de/wiki/Event
	platform	encouraged	see https://wiki.pangaea.de/wiki/Basis
	method	encouraged	Method used for measuring (see https://wiki.pangaea.de/wiki/Method#2._Methods)
	device	encouraged	Instrument used for measuring (see https://wiki.pangaea.de/wiki/Method#1._Instruments)
	registry_uri	compulsory	Was "sensor_uri" before. Handles, not URNs! yes: https://hdl.handle.net/10013/sensor.d3360ba2-df00-44c3-a4b5-6af6ee2bb301 no: vessel:polarstern:gyrocompass
abstract metadata	citation	compulsory	citation string
	license	compulsory	license name (not license text)
	data_url	compulsory	URL, pointing to original data source
	metadata_url	compulsory	URL, pointing to (standard-compliant) metadata
	sop_url	compulsory	URL, pointing to documented Standard Operating Procedures
	doi_url	compulsory	URL, pointing to according DOI
join functionality	csv_join	compulsory	not exactly data or metadata, more of a helper column to add data from a join file to the data file.

Join Files (optional)

Basic relations between files are supported. For each data file (*.sdi.csv) a second CSV (*.sdi.join.csv) file can be joined using the column csv_join to prevent redundancy in data exchange to a certain level. Both files will be joined during database ingest using the following statement. Join Files can hold arbitrary data and metadata columns (but not the geometry column). For details, see the example section.

```
# pseudo SQL
select *
from <datafile>
left join <joinfile>
on <datafile>.csv_join = <joinfile>.csv_join;
```

- File Naming
 - base file: <identifier>.sdi.csv
 - join file: <identifier>.sdi.join.csv
- Constraints
 - see "Basics" section
 - see "Metadata Vocabulary" subsection

Chunked Data Files (optional)

When multiple basic data files should share one join file, they can be chunked. The data files can have different table structures as long as they adhere to the specifications of basic data files. Join files cannot get chunked.

- File Naming
 - data files: <basename>@<chunk>.sdi.csv
 - join file: <basename>.sdi.join.csv (see "Join Files" section)

File Examples

Beware that copy&paste won't work properly as there might be issues with tabs/spaces in Confluence (this website's software) and/or your text editor.

Minimal Example #1

Input Files

layer definition files				
<pre># _layer_def.csv date_time_start geometry temperature # _layer_def.csvt DateTime,WKT,Real</pre>				
data files				
<pre># data-0.sdi.csv date_time_start geometry temperature 2023-06-28T00:00:00+00 POINT(8.5 53.5) 28.76 2023-06-28T01:00:00+00 POINT(8.5 53.5) 27.65 # data-1.sdi.csv date_time_start geometry temperature 2023-06-28T02:00:00+00 POINT(8.5 53.5) 26.54 2023-06-28T03:00:00+00 POINT(8.5 53.5) 25.43</pre>				

Resulting Layer Table

date_time_start	geometry	temperature
2023-06-28T00:00:00+00	POINT(8.5 53.5)	28.76
2023-06-28T01:00:00+00	POINT(8.5 53.5)	27.65
2023-06-28T02:00:00+00	POINT(8.5 53.5)	26.54
2023-06-28T03:00:00+00	POINT(8.5 53.5)	25.43

Minimal Example #2

Input Files

layer definition files				
<pre># _layer_def.csv date_time_start geometry temperature salinity platform # _layer_def.csvt DateTime,WKT,Real,Real,String</pre>				

data files

```
# data-0.sdi.csv
date_time_start      geometry      platform      temperature
2023-06-28T00:00:00+00 POINT(8.5 53.5) 28.76
2023-06-28T01:00:00+00 POINT(8.5 53.5) Black Pearl 27.65

# data-1.sdi.csv
date_time_start      geometry      salinity      platform
2023-06-28T02:00:00+00 POINT(8.5 53.5) 26.54 Flying Dutchman
2023-06-28T03:00:00+00 POINT(8.5 53.5) 25.43
```

Resulting Layer Table

date_time_start	geometry	temperature	salinity	platform
2023-06-28T00:00:00+00	POINT(8.5 53.5)	28.76		
2023-06-28T01:00:00+00	POINT(8.5 53.5)	27.65		Black Pearl
2023-06-28T02:00:00+00	POINT(8.5 53.5)		26.54	Flying Dutchman
2023-06-28T03:00:00+00	POINT(8.5 53.5)		25.43	

List/Dictionary Example

Input Files

layer definition files

```
# _layer_def.csv
date_time_start      geometry      people_dict      people_list

# _layer_def.csvt
DateTime,WKT,String,String
```

data files

```
# data-0.sdi.csv
date_time_start      geometry      people_dict      people_list
2023-06-28T00:00:00+00 POINT(8.5 53.5) {"Alice": {"age": 18, "favorite_colour": "blue"}, "Bob": {"age": 19, "favorite_colour": "pink"}}
2023-06-28T01:00:00+00 POINT(8.5 53.5) ["Alice", "Bob", "Charlie"]
```

Resulting Layer Table

date_time_start	geometry	people_dict	people_list
2023-06-28T00:00:00+00	POINT(8.5 53.5)	{"Alice": {"age": 18, "favorite_colour": "blue"}, "Bob": {"age": 19, "favorite_colour": "pink"}}	
2023-06-28T01:00:00+00	POINT(8.5 53.5)		["Alice", "Bob", "Charlie"]

Join File Example

Input Files

layer definition files

```
# _layer_def.csv
date_time_start      geometry      name      institute      department      division
group      phone

# _layer_def.csvt
DateTime,WKT,String,String,String,String,String,String
```

data files

```
# people.sdi.csv
date_time_start      geometry      name      phone      csv_join
2015-01-01T01:00:00+00      POINT(8.5 53.5)      Andreas      -1744      awi-se
2019-08-01T01:00:00+00      POINT(8.5 53.5)      Robin      awi-rz-se
2019-11-01T00:00:00+00      POINT(8.5 53.5)      Kono      -2362      awi-se
2020-01-01T00:00:00+00      POINT(8.5 53.5)      Christopher      awi-se
2020-01-01T00:00:00+00      POINT(8.5 53.5)      Max      -2561      awi-dls
2021-01-01T00:00:00+00      POINT(10.12 54.2)      Felix      geomar
2000-01-01T00:00:00+00      POINT(8.5 53.5)      Antje      awi-dir

# people.sdi.join.csv
csv_join      institute      department      division      group
awi-se      AWI      Computing & Data Centre      DATA      Software Engineering
awi-dls      AWI      Computing & Data Centre      DATA      Data Logistics Support
geomar      GEOMAR
awi-dir      AWI      Board of Directors
```

Resulting Layer Table

date_time_start	geometry	name	institute	department	division	group	phone
2015-01-01T01:00:00+00	POINT(8.5 53.5)	Andreas	AWI	Computing & Data Centre	DATA	Software Engineering	-1744
2019-08-01T01:00:00+00	POINT(8.5 53.5)	Robin	AWI	Computing & Data Centre	DATA	Software Engineering	
2019-11-01T00:00:00+00	POINT(8.5 53.5)	Kono	AWI	Computing & Data Centre	DATA	Software Engineering	-2362
2020-01-01T00:00:00+00	POINT(8.5 53.5)	Christopher	AWI	Computing & Data Centre	DATA	Software Engineering	
2020-01-01T00:00:00+00	POINT(8.5 53.5)	Max	AWI	Computing & Data Centre	DATA	Data Logistics Support	-2561
2021-01-01T00:00:00+00	POINT(10.12 54.2)	Felix	GEOMAR				
2020-01-01T00:00:00+00	POINT(8.5 53.5)	Antje	AWI	Board of Directors			

Chunking Example

Beispieldaten von [wetterkontor.de](https://www.wetterkontor.de).

Input Files

layer definition files

```
# _layer_def.csv
date_time_start date_time_end      geometry      precipitation

# _layer_def.csvt
DateTime,DateTime,WKT,Real
```

data files

```
# bremerhaven@2022.sdi.csv
date_time_start date_time_end geometry precipitation
2022-01-01T00:00:00+00 2022-02-01T00:00:00+00 POINT(8.57 53.54) 54.9
2022-02-01T00:00:00+00 2022-03-01T00:00:00+00 POINT(8.57 53.54) 129.5
2022-03-01T00:00:00+00 2022-04-01T00:00:00+00 POINT(8.57 53.54) 24.2
2022-04-01T00:00:00+00 2022-05-01T00:00:00+00 POINT(8.57 53.54) 57.7
2022-05-01T00:00:00+00 2022-06-01T00:00:00+00 POINT(8.57 53.54) 76.1
2022-06-01T00:00:00+00 2022-07-01T00:00:00+00 POINT(8.57 53.54) 78.4
2022-07-01T00:00:00+00 2022-08-01T00:00:00+00 POINT(8.57 53.54) 60.1
2022-08-01T00:00:00+00 2022-09-01T00:00:00+00 POINT(8.57 53.54) 21.0
2022-09-01T00:00:00+00 2022-10-01T00:00:00+00 POINT(8.57 53.54) 170.9
2022-10-01T00:00:00+00 2022-11-01T00:00:00+00 POINT(8.57 53.54) 24.6
2022-11-01T00:00:00+00 2022-12-01T00:00:00+00 POINT(8.57 53.54) 47.8
2022-12-01T00:00:00+00 2023-01-01T00:00:00+00 POINT(8.57 53.54) 67.1

#bremerhaven@2023.sdi.csv
date_time_start date_time_end geometry precipitation
2023-01-01T00:00:00+00 2023-02-01T00:00:00+00 POINT(8.57 53.54) 93.0
2023-02-01T00:00:00+00 2023-03-01T00:00:00+00 POINT(8.57 53.54) 41.9
2023-03-01T00:00:00+00 2023-04-01T00:00:00+00 POINT(8.57 53.54) 96.1
2023-04-01T00:00:00+00 2023-05-01T00:00:00+00 POINT(8.57 53.54) 71.0
2023-05-01T00:00:00+00 2023-06-01T00:00:00+00 POINT(8.57 53.54) 14.8
2023-06-01T00:00:00+00 2023-07-01T00:00:00+00 POINT(8.57 53.54) 48.4
```

Resulting Layer Table

date_time_start	date_time_end	geometry	precipitation
2022-01-01T00:00:00+00	2022-02-01T00:00:00+00	POINT(8.5 53.5)	54.9
2022-02-01T00:00:00+00	2022-03-01T00:00:00+00	POINT(8.5 53.5)	129.5
2022-03-01T00:00:00+00	2022-04-01T00:00:00+00	POINT(8.5 53.5)	24.2
2022-04-01T00:00:00+00	2022-05-01T00:00:00+00	POINT(8.5 53.5)	57.7
2022-05-01T00:00:00+00	2022-06-01T00:00:00+00	POINT(8.5 53.5)	76.1
2022-06-01T00:00:00+00	2022-07-01T00:00:00+00	POINT(8.5 53.5)	78.4
2022-07-01T00:00:00+00	2022-08-01T00:00:00+00	POINT(8.5 53.5)	60.1
2022-08-01T00:00:00+00	2022-09-01T00:00:00+00	POINT(8.5 53.5)	21.0
2022-09-01T00:00:00+00	2022-10-01T00:00:00+00	POINT(8.5 53.5)	170.9
2022-10-01T00:00:00+00	2022-11-01T00:00:00+00	POINT(8.5 53.5)	24.6
2022-11-01T00:00:00+00	2022-12-01T00:00:00+00	POINT(8.5 53.5)	47.8
2022-12-01T00:00:00+00	2023-01-01T00:00:00+00	POINT(8.5 53.5)	67.1
2023-01-01T00:00:00+00	2023-02-01T00:00:00+00	POINT(8.5 53.5)	93.0
2023-02-01T00:00:00+00	2023-03-01T00:00:00+00	POINT(8.5 53.5)	41.9
2023-03-01T00:00:00+00	2023-04-01T00:00:00+00	POINT(8.5 53.5)	96.1
2023-04-01T00:00:00+00	2023-05-01T00:00:00+00	POINT(8.5 53.5)	71.0
2023-05-01T00:00:00+00	2023-06-01T00:00:00+00	POINT(8.5 53.5)	14.8
2023-06-01T00:00:00+00	2023-07-01T00:00:00+00	POINT(8.5 53.5)	48.4

Complex Example

Input Files

layer definition files

```
# _layer_def.csv
date_time_start date_time_end geometry state city area_km² population unemployment_%

# _layer_def.csvt
DateTime,DateTime,WKT,String,String,Real,Real,Real
```

data files

```
# bremerhaven@2000-2004.sdi.csv
date_time_start date_time_end geometry population csv_join
2000-01-01T00:00:00+00 2001-01-01T00:00:00+00 POINT(8.54 53.54) 120822 bhv
2001-01-01T00:00:00+00 2002-01-01T00:00:00+00 POINT(8.54 53.54) 118701 bhv
2002-01-01T00:00:00+00 2003-01-01T00:00:00+00 POINT(8.54 53.54) 119111 bhv
2003-01-01T00:00:00+00 2004-01-01T00:00:00+00 POINT(8.54 53.54) 118276 bhv
2004-01-01T00:00:00+00 2005-01-01T00:00:00+00 POINT(8.54 53.54) 117281 bhv

# bremerhaven@2005-2009.sdi.csv
date_time_start date_time_end geometry unemployment_% csv_join
2005-01-01T00:00:00+00 2006-01-01T00:00:00+00 POINT(8.54 53.54) 23.7 bhv
2006-01-01T00:00:00+00 2007-01-01T00:00:00+00 POINT(8.54 53.54) 20.7 bhv
2007-01-01T00:00:00+00 2008-01-01T00:00:00+00 POINT(8.54 53.54) 18.5 bhv
2008-01-01T00:00:00+00 2009-01-01T00:00:00+00 POINT(8.54 53.54) 16.7 bhv
2009-01-01T00:00:00+00 2010-01-01T00:00:00+00 POINT(8.54 53.54) 15.4 bhv

# bremerhaven.sdi.join.csv
csv_join city state area_km²
bhv Bremerhaven Bremen 93.8

# nrw.sdi.csv
date_time_start date_time_end geometry population unemployment_% csv_join comment
2000-01-01T00:00:00+00 2001-01-01T00:00:00+00 POINT(7.10 51.51) 278695 ge unemployment
data missing
2001-01-01T00:00:00+00 2002-01-01T00:00:00+00 POINT(7.10 51.51) 275835 15.3 ge
2002-01-01T00:00:00+00 2003-01-01T00:00:00+00 POINT(7.10 51.51) 274926 16.0 ge
2003-01-01T00:00:00+00 2004-01-01T00:00:00+00 POINT(7.10 51.51) 273782 17.0 ge
2004-01-01T00:00:00+00 2005-01-01T00:00:00+00 POINT(7.10 51.51) 270109 18.0 ge
2005-01-01T00:00:00+00 2006-01-01T00:00:00+00 POINT(7.10 51.51) 268102 23.4 ge
2006-01-01T00:00:00+00 2007-01-01T00:00:00+00 POINT(7.10 51.51) 266772 20.1 ge
2007-01-01T00:00:00+00 2008-01-01T00:00:00+00 POINT(7.10 51.51) 264765 16.7 ge
2008-01-01T00:00:00+00 2009-01-01T00:00:00+00 POINT(7.10 51.51) 262063 15.2 ge
2009-01-01T00:00:00+00 2010-01-01T00:00:00+00 POINT(7.10 51.51) 259744 15.1 ge
2000-01-01T00:00:00+00 2001-01-01T00:00:00+00 POINT(7.63 51.96) 265609 ms unemployment
data missing
2001-01-01T00:00:00+00 2002-01-01T00:00:00+00 POINT(7.63 51.96) 267197 6.7 ms
2002-01-01T00:00:00+00 2003-01-01T00:00:00+00 POINT(7.63 51.96) 268945 7.3 ms
2003-01-01T00:00:00+00 2004-01-01T00:00:00+00 POINT(7.63 51.96) 269579 7.8 ms
2004-01-01T00:00:00+00 2005-01-01T00:00:00+00 POINT(7.63 51.96) 270038 8.3 ms
2005-01-01T00:00:00+00 2006-01-01T00:00:00+00 POINT(7.63 51.96) 270868 9.1 ms
2006-01-01T00:00:00+00 2007-01-01T00:00:00+00 POINT(7.63 51.96) 272106 8.4 ms
2007-01-01T00:00:00+00 2008-01-01T00:00:00+00 POINT(7.63 51.96) 272951 7.1 ms
2008-01-01T00:00:00+00 2009-01-01T00:00:00+00 POINT(7.63 51.96) 273875 6.4 ms
2009-01-01T00:00:00+00 2010-01-01T00:00:00+00 POINT(7.63 51.96) 275543 6.4 ms

# nrw.sdi.join.csv
csv_join city state area_km²
ge Gelsenkirchen Nordrhein-Westfalen 302.9
ms Münster Nordrhein-Westfalen 104.8
```

Resulting Layer Table

date_time_start	date_time_end	geometry	state	city	area_km²	population	unemployment_%
-----------------	---------------	----------	-------	------	----------	------------	----------------

2000-01-01T00:00:00+00	2001-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8	120822	
2001-01-01T00:00:00+00	2002-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8	118701	
2002-01-01T00:00:00+00	2003-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8	119111	
2003-01-01T00:00:00+00	2004-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8	118276	
2004-01-01T00:00:00+00	2005-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8	117281	
2005-01-01T00:00:00+00	2006-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8		23.7
2006-01-01T00:00:00+00	2007-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8		20.7
2007-01-01T00:00:00+00	2008-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8		18.5
2008-01-01T00:00:00+00	2009-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8		16.7
2009-01-01T00:00:00+00	2010-01-01T00:00:00+00	POINT(8.54 53.54)	Bremen	Bremerhaven	93.8		15.4
2000-01-01T00:00:00+00	2001-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	278695	
2001-01-01T00:00:00+00	2002-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	275835	15.3
2002-01-01T00:00:00+00	2003-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	274926	16.0
2003-01-01T00:00:00+00	2004-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	273782	17.0
2004-01-01T00:00:00+00	2005-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	270109	18.0
2005-01-01T00:00:00+00	2006-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	268102	23.4
2006-01-01T00:00:00+00	2007-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	266772	20.1
2007-01-01T00:00:00+00	2008-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	264765	16.7
2008-01-01T00:00:00+00	2009-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	262063	15.2
2009-01-01T00:00:00+00	2010-01-01T00:00:00+00	POINT(7.1 51.51)	Nordrhein-Westfalen	Gelsenkirchen	302.9	259744	15.1
2000-01-01T00:00:00+00	2001-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	265609	
2001-01-01T00:00:00+00	2002-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	267197	6.7
2002-01-01T00:00:00+00	2003-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	268945	7.3
2003-01-01T00:00:00+00	2004-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	269579	7.8
2004-01-01T00:00:00+00	2005-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	270038	8.3
2005-01-01T00:00:00+00	2006-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	270868	9.1
2006-01-01T00:00:00+00	2007-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	272106	8.4
2007-01-01T00:00:00+00	2008-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	272951	7.1
2008-01-01T00:00:00+00	2009-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	273875	6.4
2009-01-01T00:00:00+00	2010-01-01T00:00:00+00	POINT(7.63 51.96)	Nordrhein-Westfalen	Münster	104.8	275543	6.4

Capacities for Unit Representations

- column naming, e.g.
 - temperature_degC
- additional unit column, e.g.
 - temperature + temperature_unit
- string values, e.g.
 - "28.76 °C" instead of "28.76"
 - will prohibit range filtering
- add unit information to layer abstract (see upcoming O2A Data Product Configuration)