

Network Common Data Form (NetCDF)

- ‘Array-orientated’ scientific data (can be multidimensional)
- Self-describing
- Open standard
- Software-independent
- Earlier versions supported by future versions

Timeline



Timeline



unidata



1988

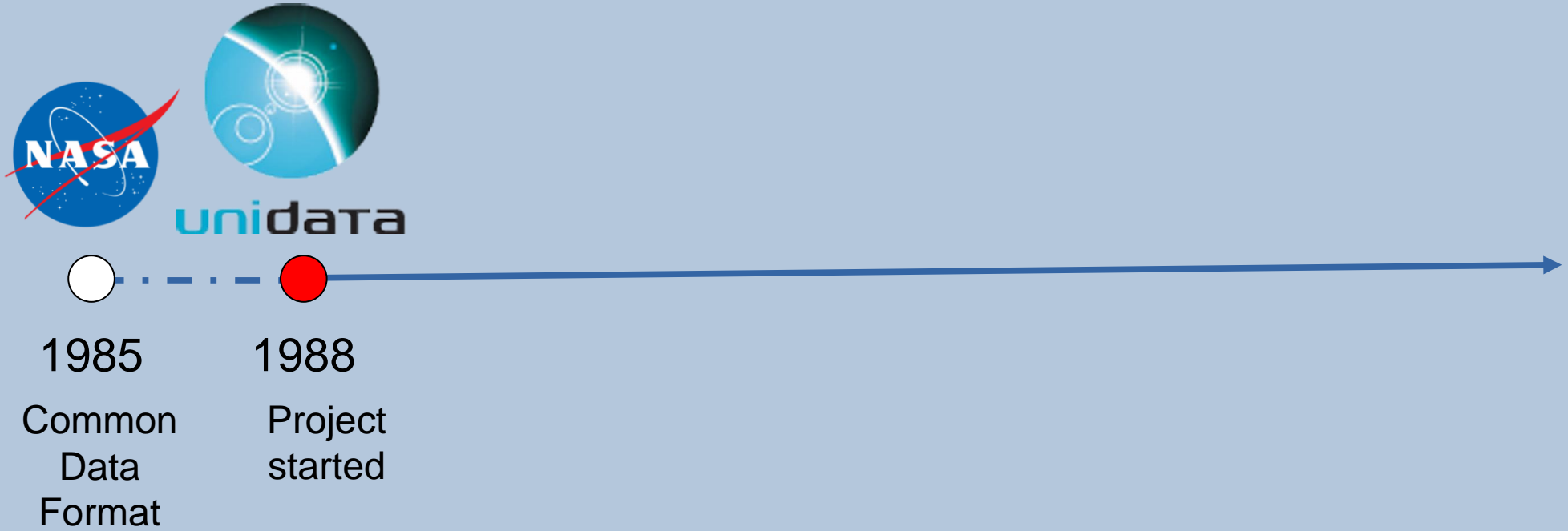
Project
started



UCAR

UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

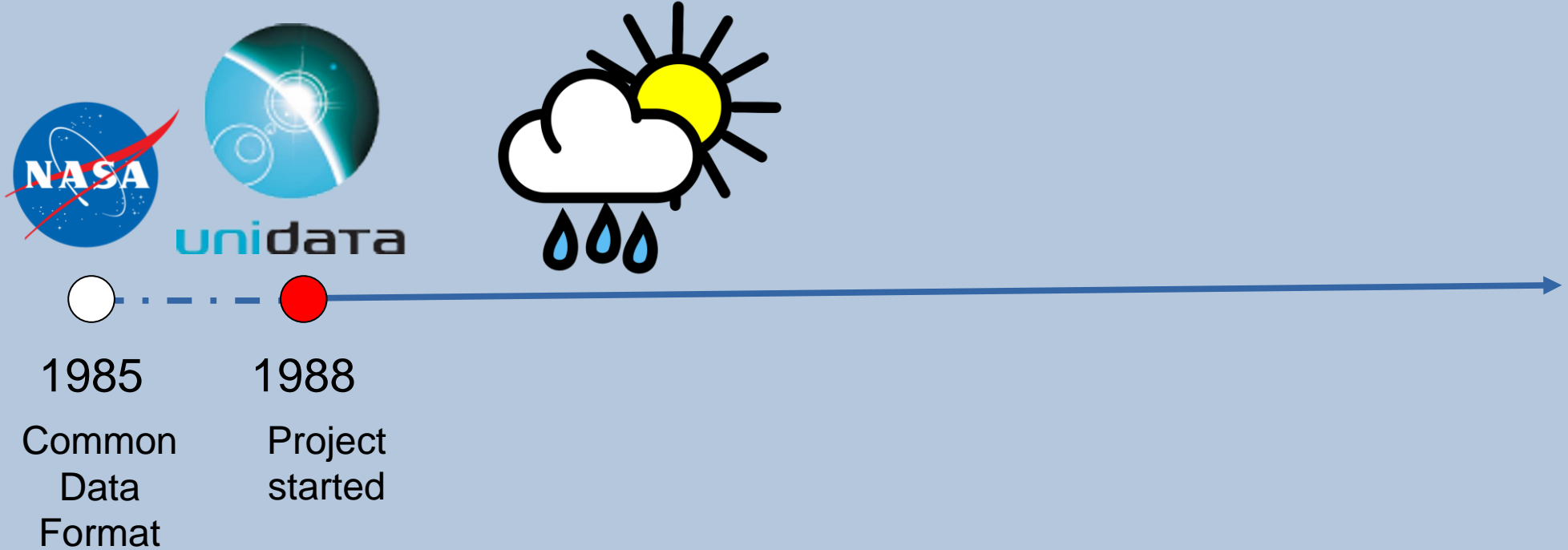
Timeline



1985
Common
Data
Format

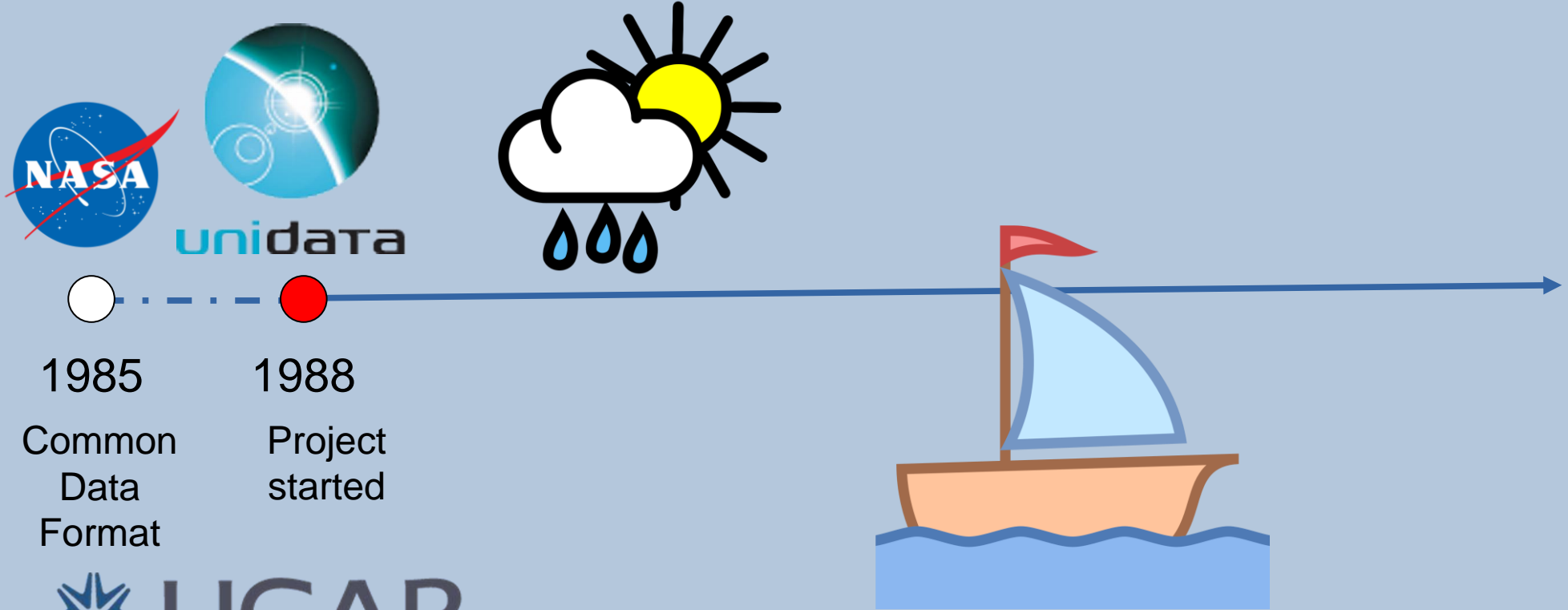
1988
Project
started

Timeline



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Timeline



1985
Common
Data
Format

1988
Project
started



UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

Timeline



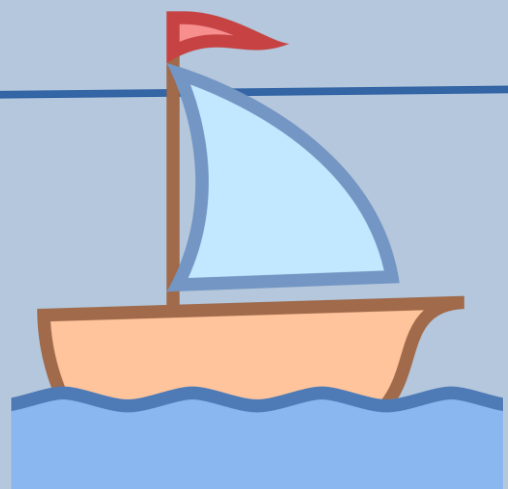
1985

Common
Data
Format

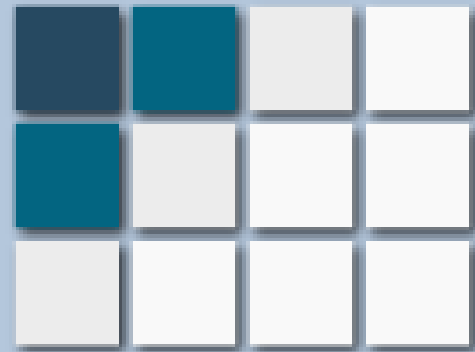


1988

Project
started

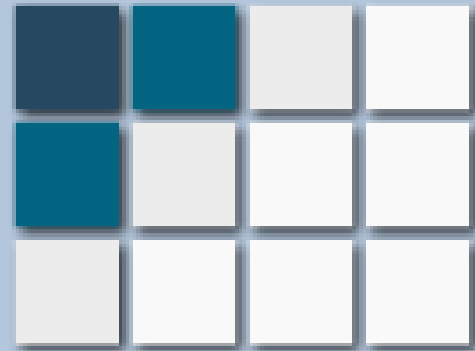


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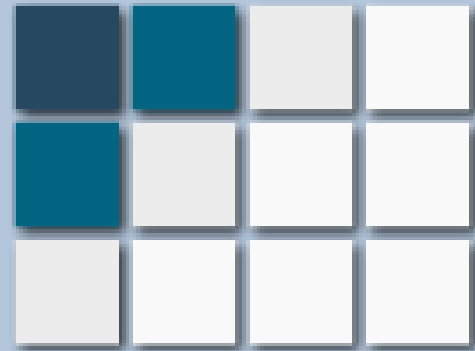
netCDF

Dimensions



netCDF

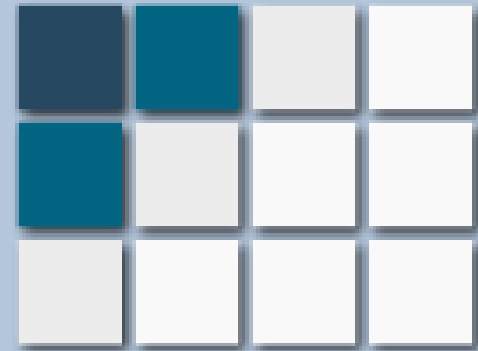
Dimensions



netCDF

Variables

Dimensions



netCDF

Variables

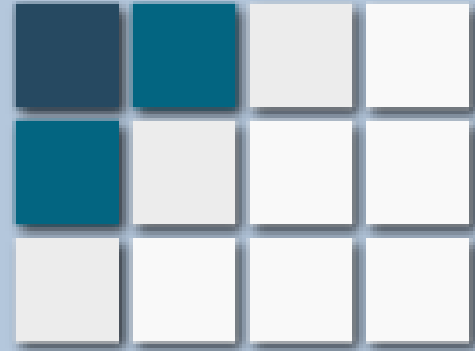
Attributes

Dimensions

⋮
|
⋮
|

coordinate variables

Variables



netCDF

Attributes

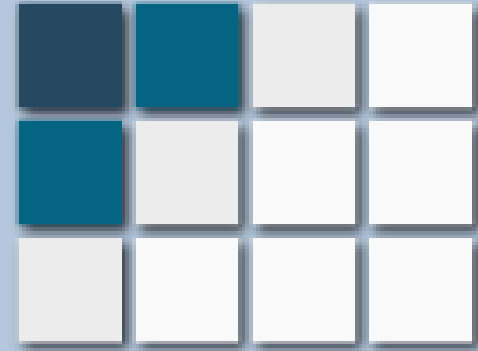
Dimensions



coordinate variables

Variables

data variables



netCDF

Attributes

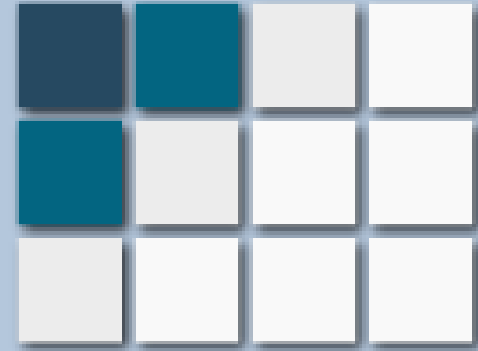
Dimensions

⋮
|
⋮
|

coordinate variables

Variables

data variables



netCDF

;

global attributes

Attributes

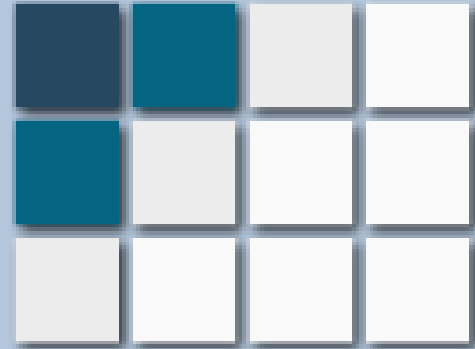
Dimensions



coordinate variables

Variables

data variables



netCDF



global attributes

Attributes

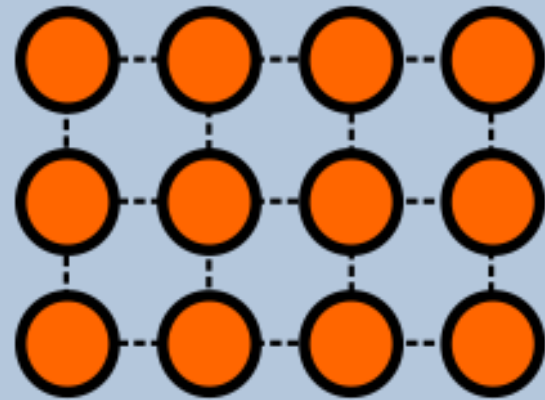
variable attributes



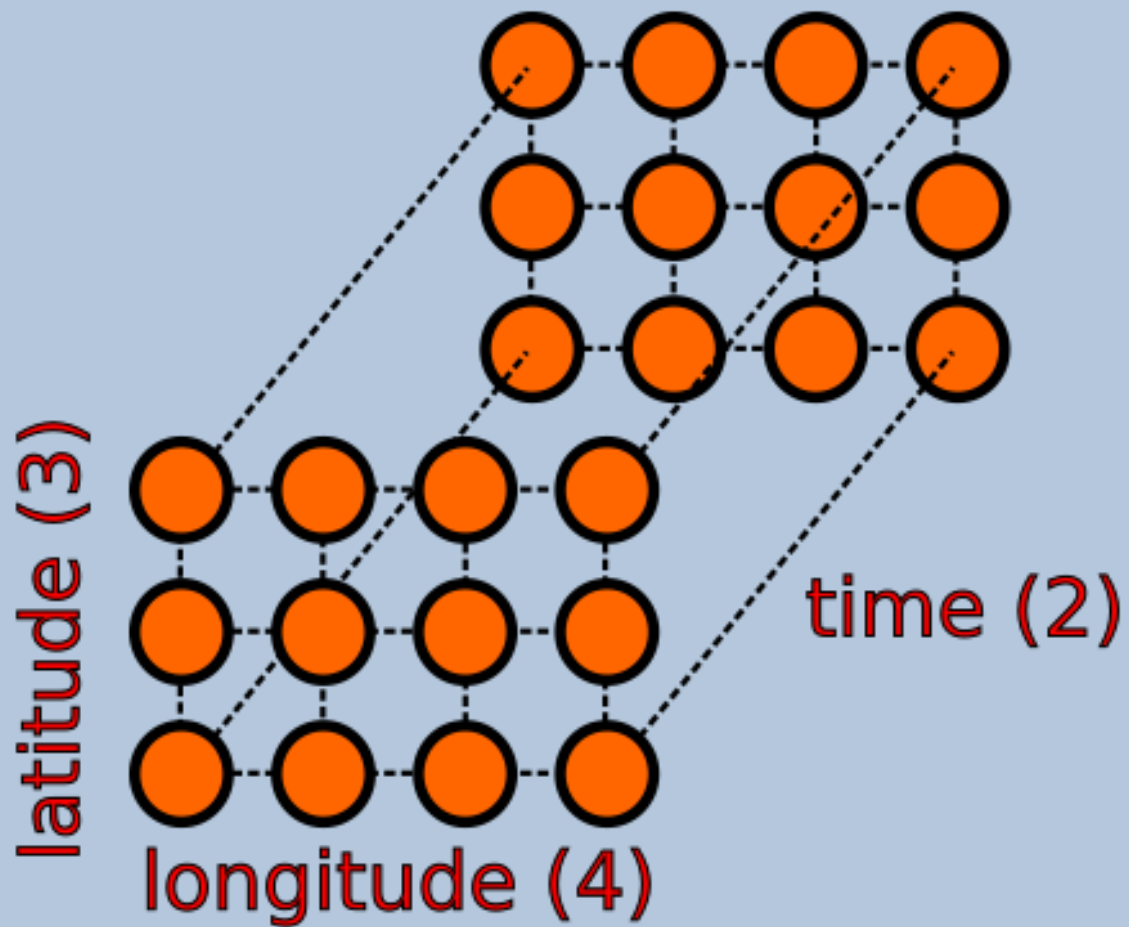


longitude (4)

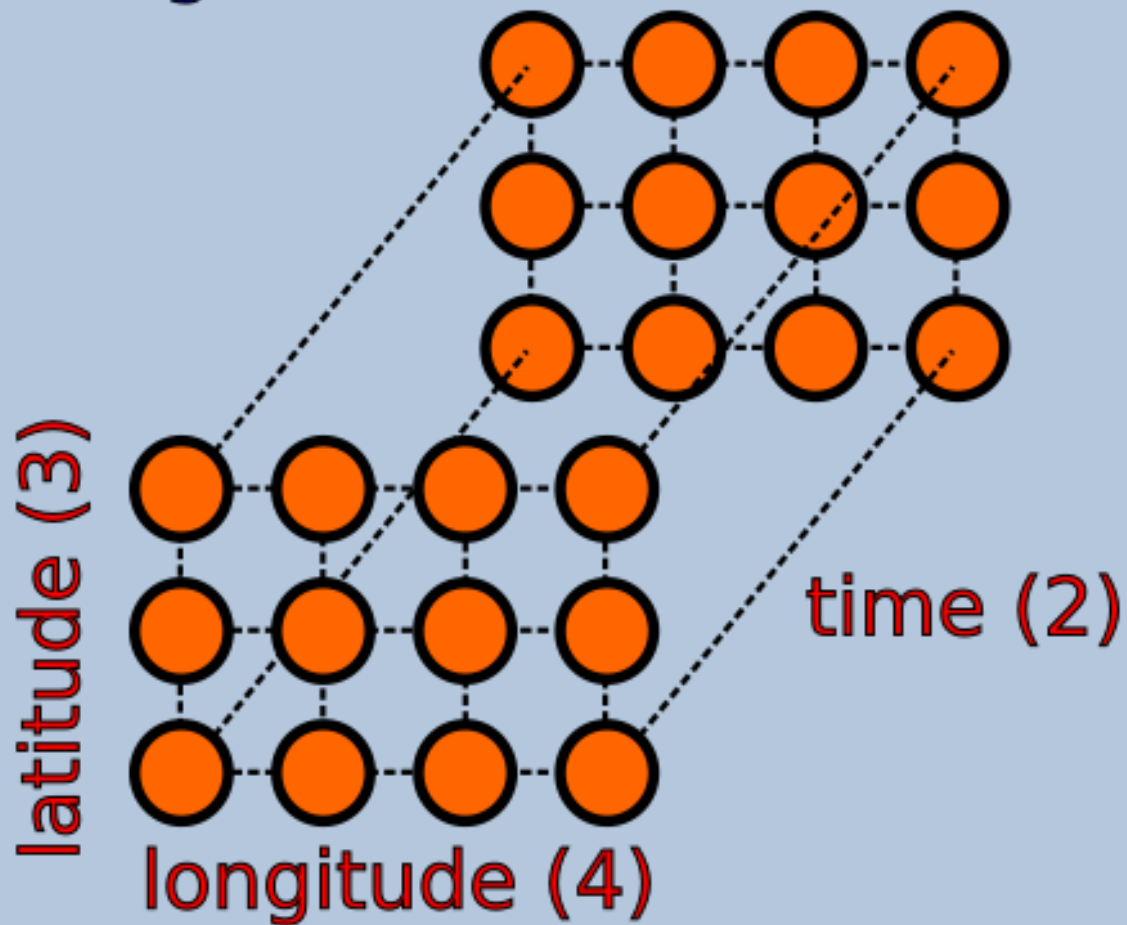
latitude (3)



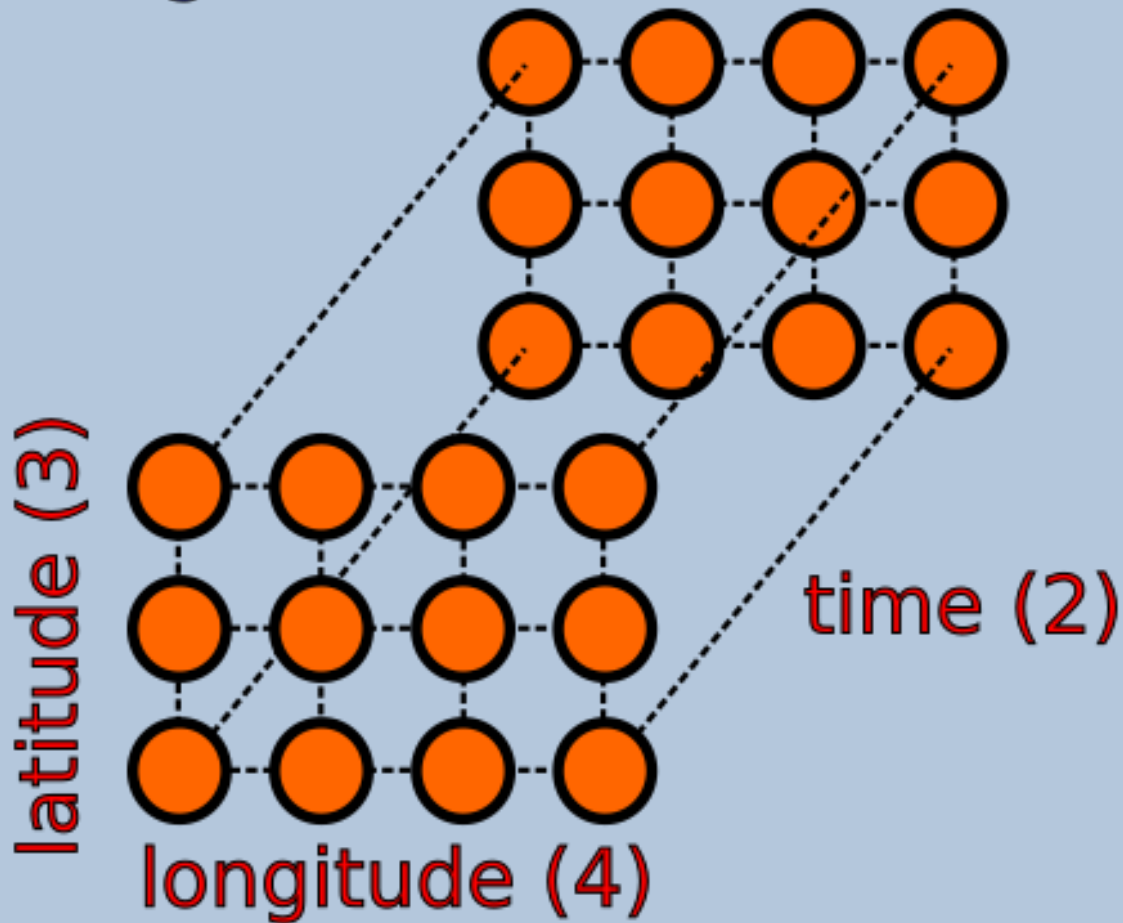
longitude (4)

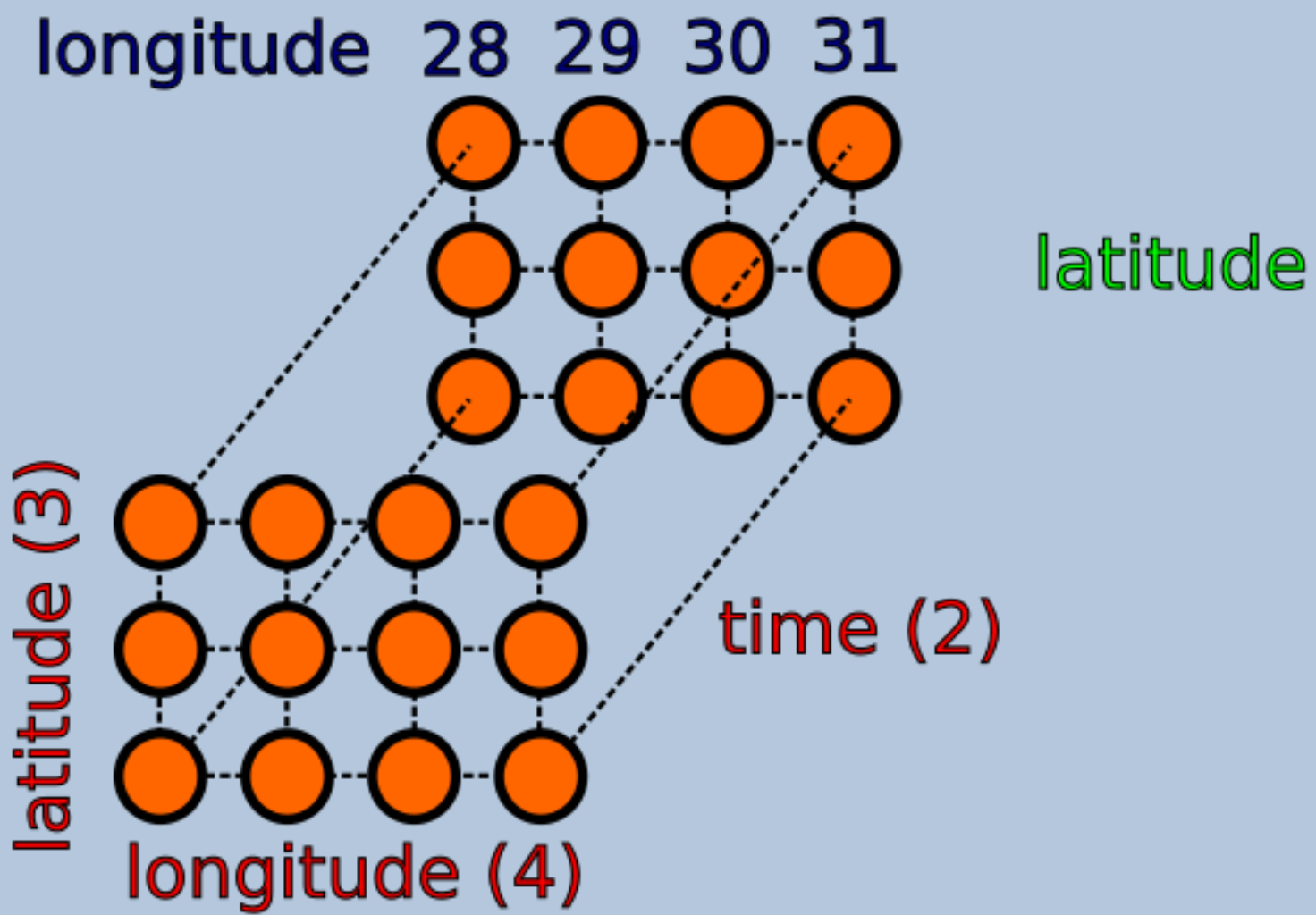


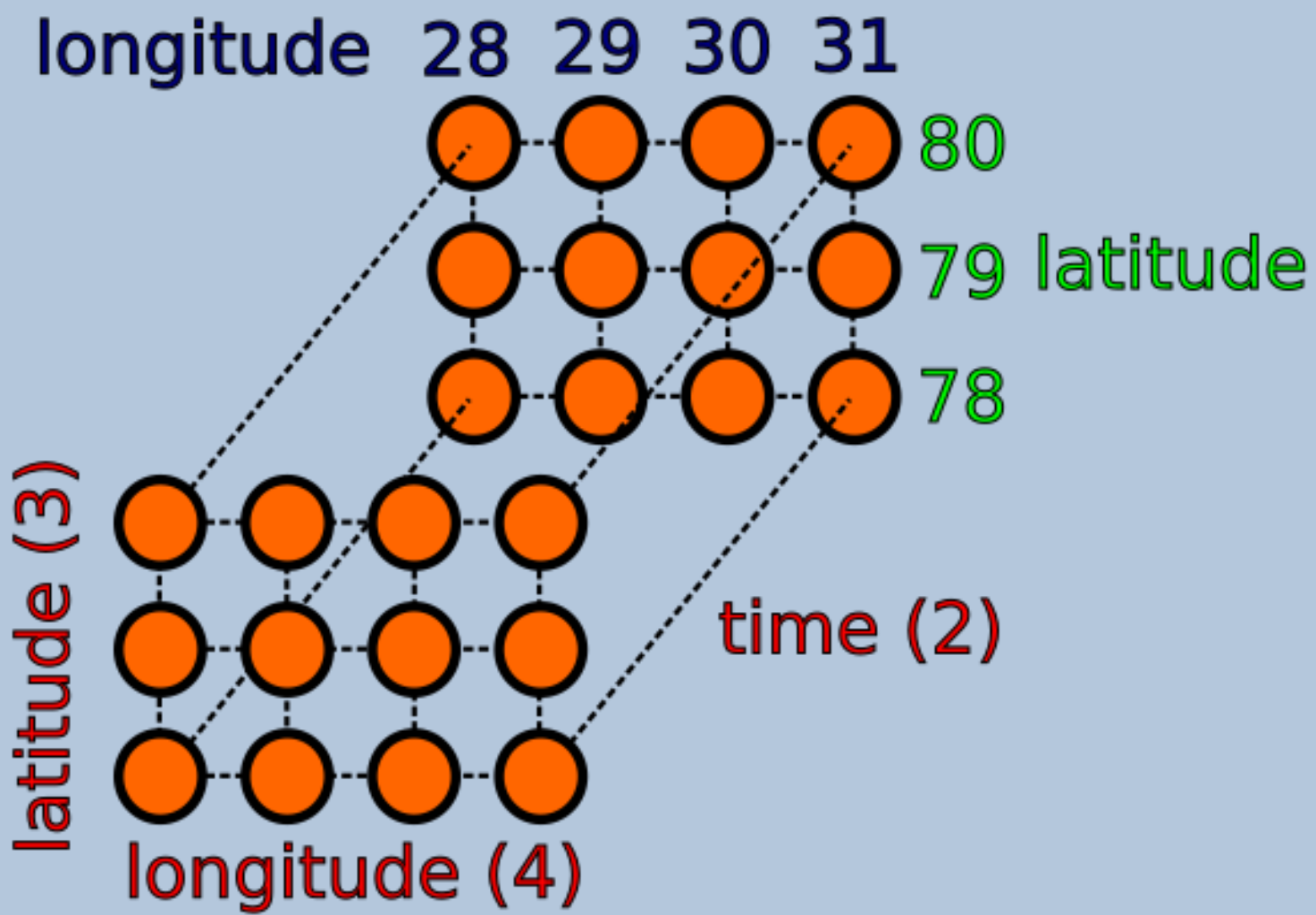
longitude

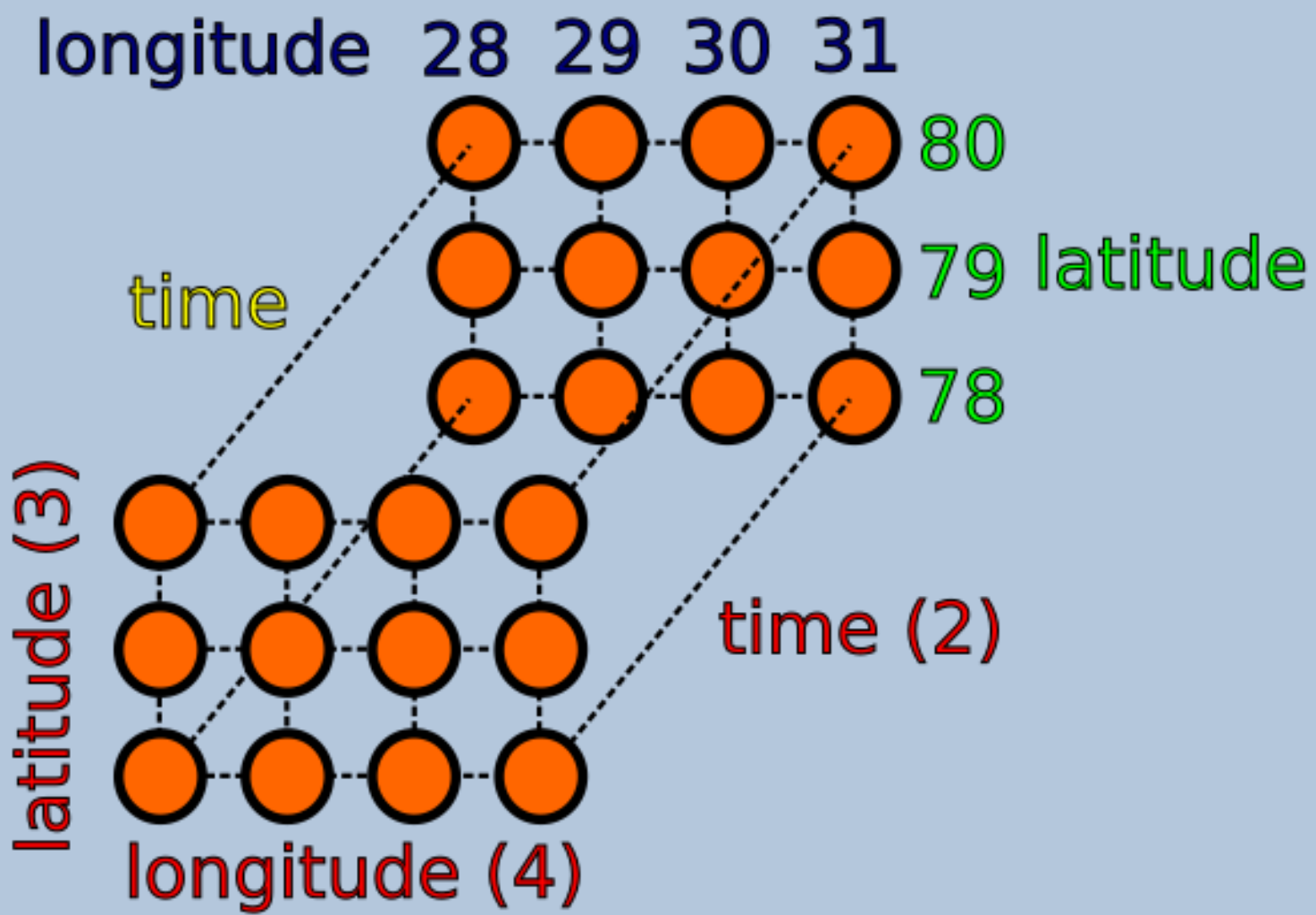


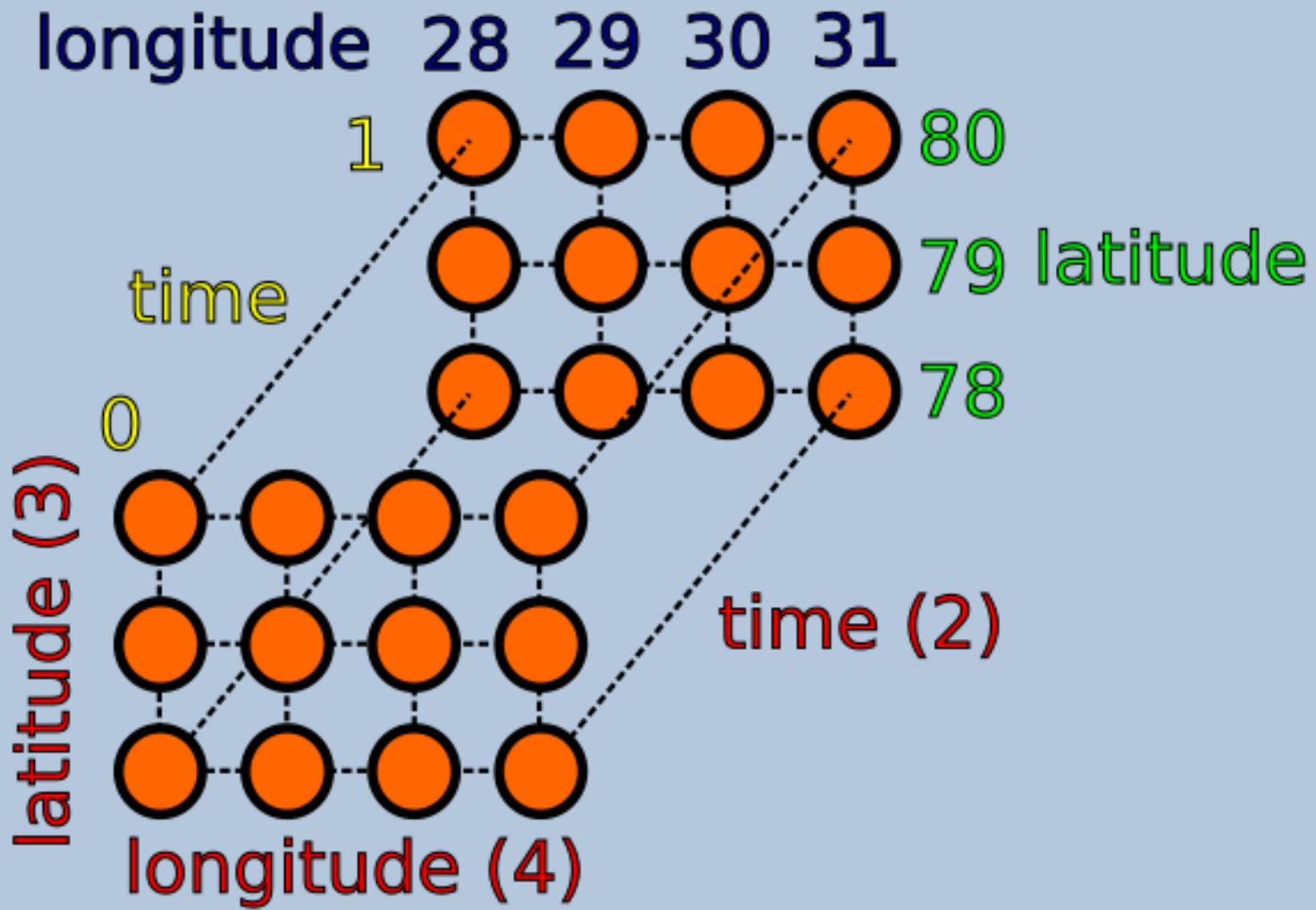
longitude 28 29 30 31

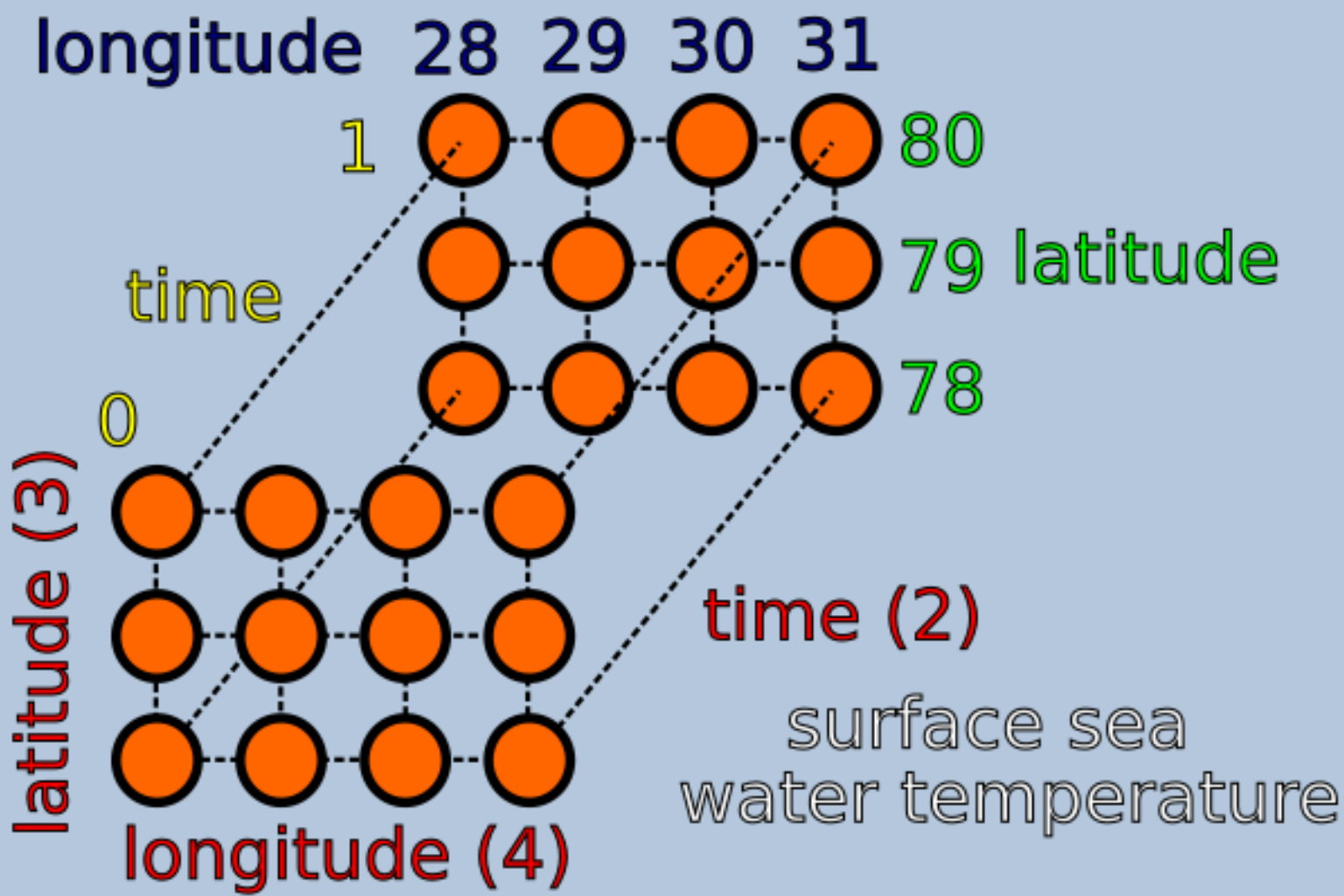


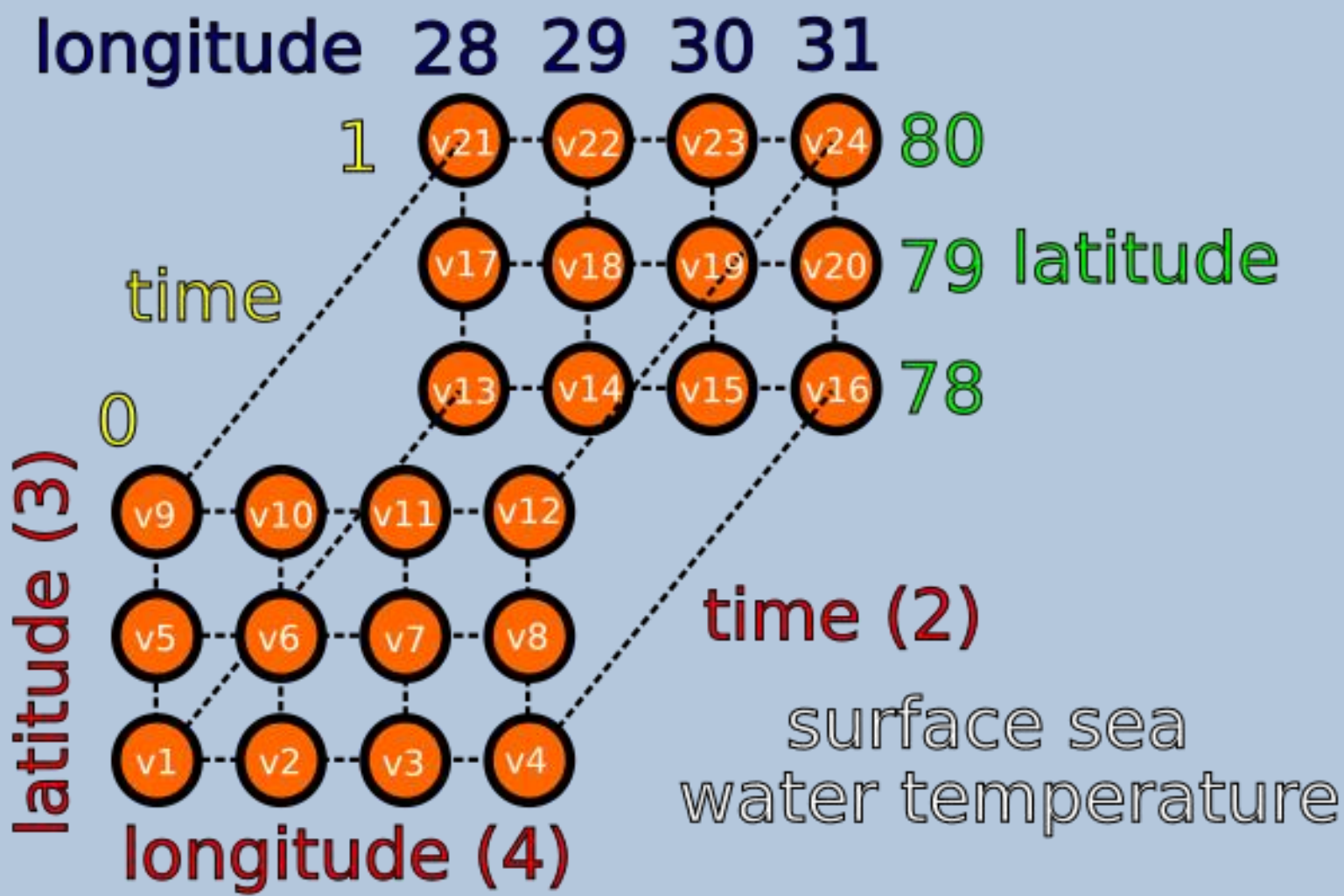


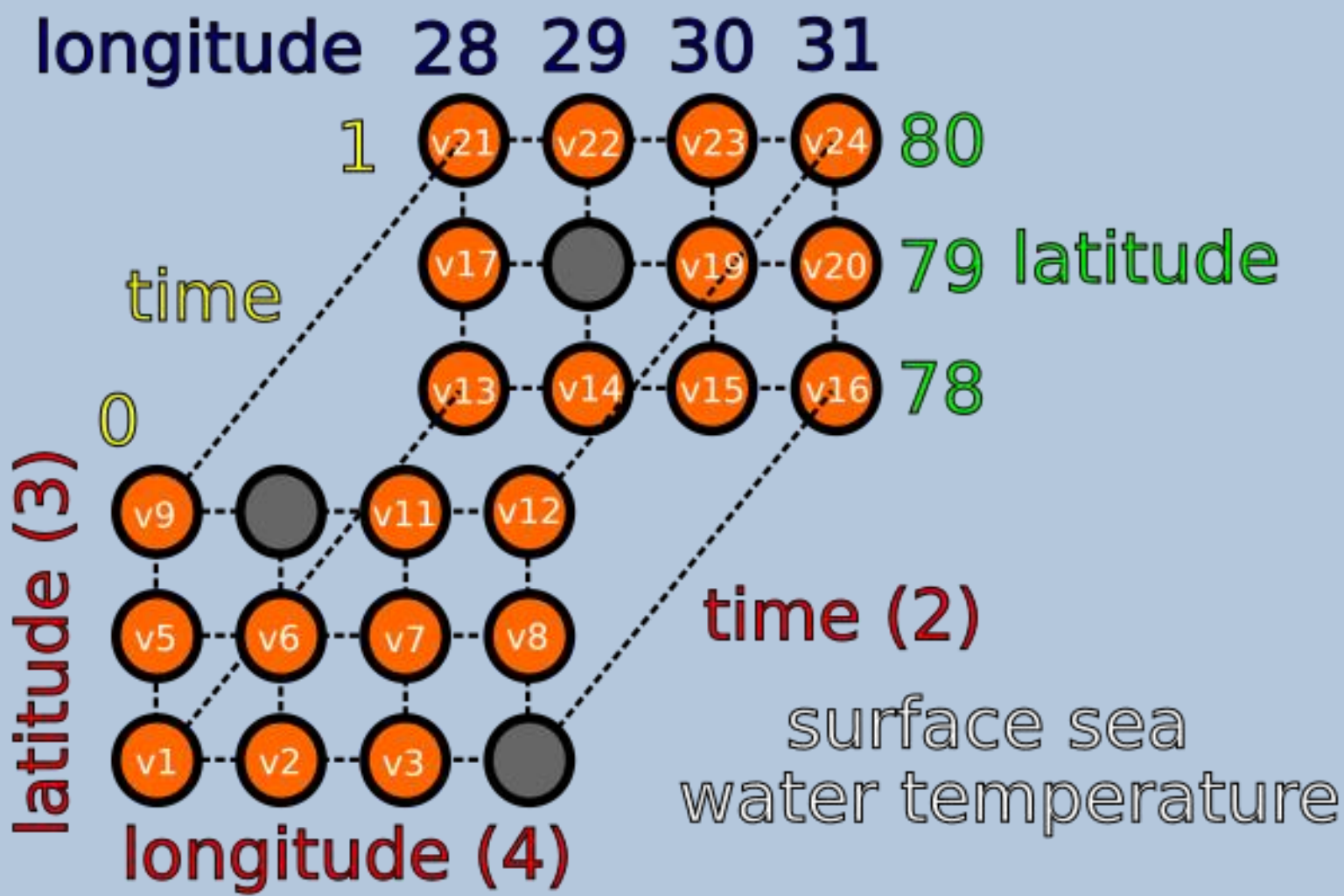


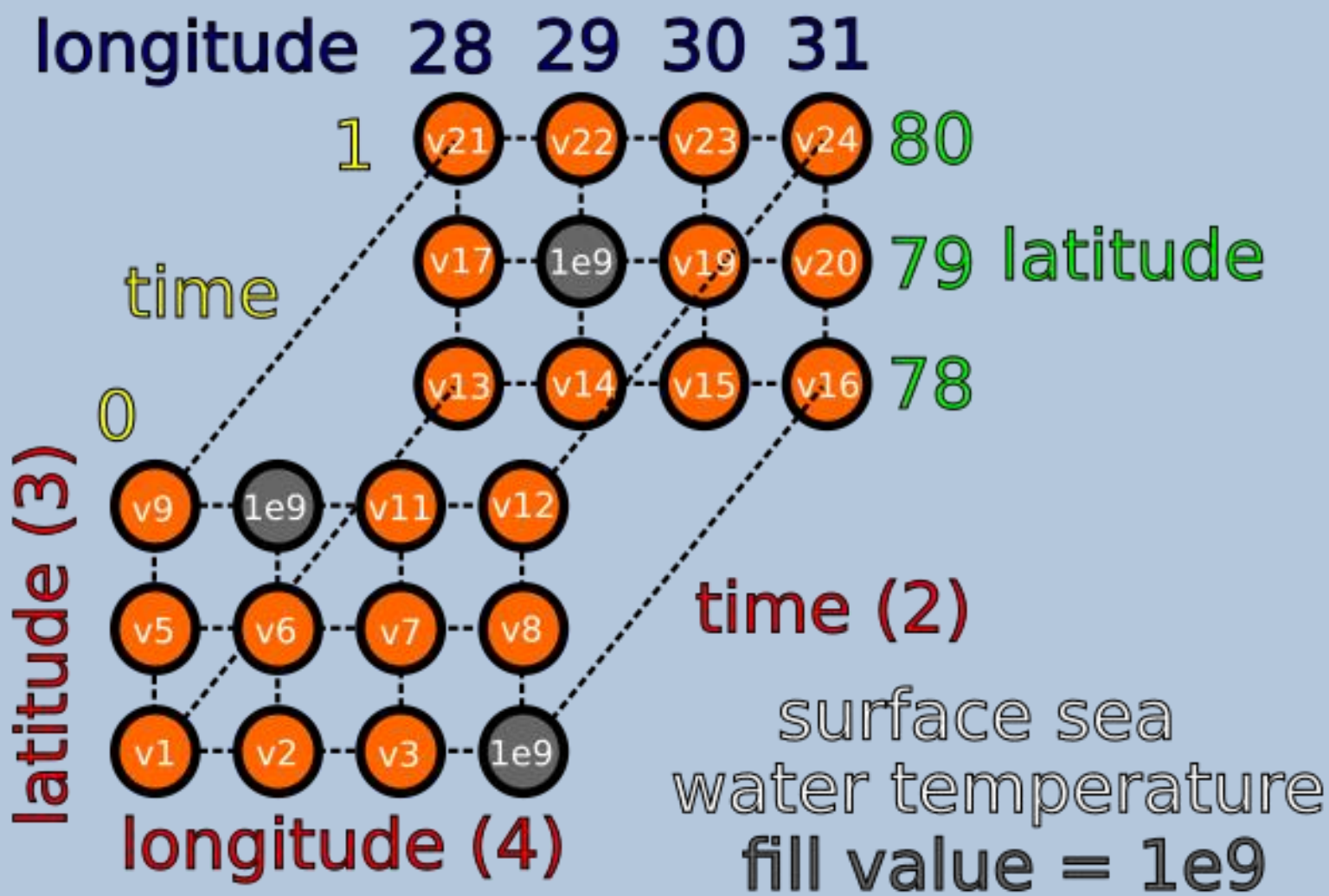












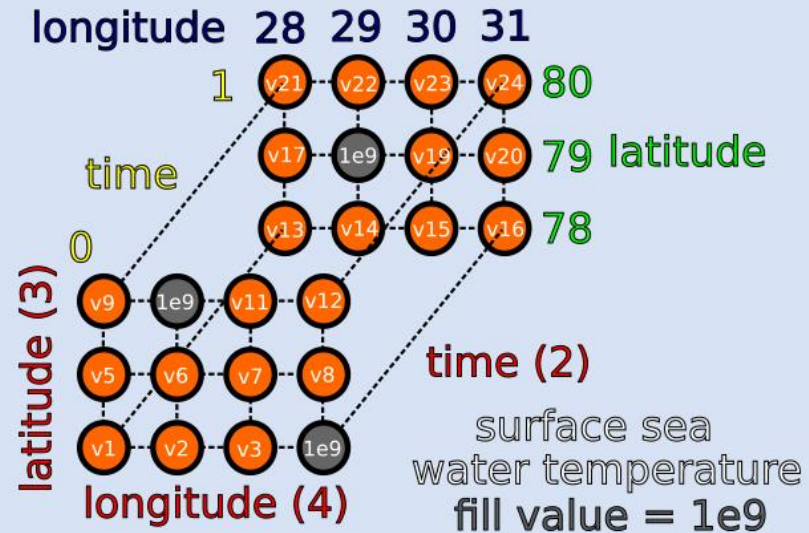
```

{
dimensions:
  time = 2 ;
  latitude = 3 ;
  longitude = 4 ;

variables:
  double sea_surface_skin_temperature(time, latitude, longitude) ;
    sea_surface_skin_temperature: FillValue = -999. ;
    sea_surface_skin_temperature: standard_name =
      "sea_surface_skin_temperature" ;
    sea_surface_skin_temperature: long_name = "Temperature of the sea water
      directly below the surface" ;
    sea_surface_skin_temperature: units = "K" ;
    sea_surface_skin_temperature: coverage_content_type =
      "physicalMeasurement" ;
  float longitude(longitude) ;
    longitude: standard_name = "longitude" ;
    longitude: long_name = "decimal longitude in degrees east" ;
    longitude: units = "degrees_east" ;
  float latitude(latitude) ;
    latitude: standard_name = "latitude" ;
    latitude: long_name = "decimal latitude in degrees north" ;
    latitude: units = "degrees_north" ;
  int time(time) ;
    time: standard_name = "time" ;
    time: long_name = "time" ;
    time: units = "days since 2020-07-10T12:00:00Z" ;

// global attributes:
  :id = "554b5b10-8675-500c-9ecd-9b23998c0b74" ;
  :naming_authority = "University Centre in Svalbard (UNIS)" ;
  :title = "Sea surface skin temperature measurements from the Northern
    Barents Sea in July 2020" ;
  :summary = "A long and descriptive abstract, analogous to an abstract in a

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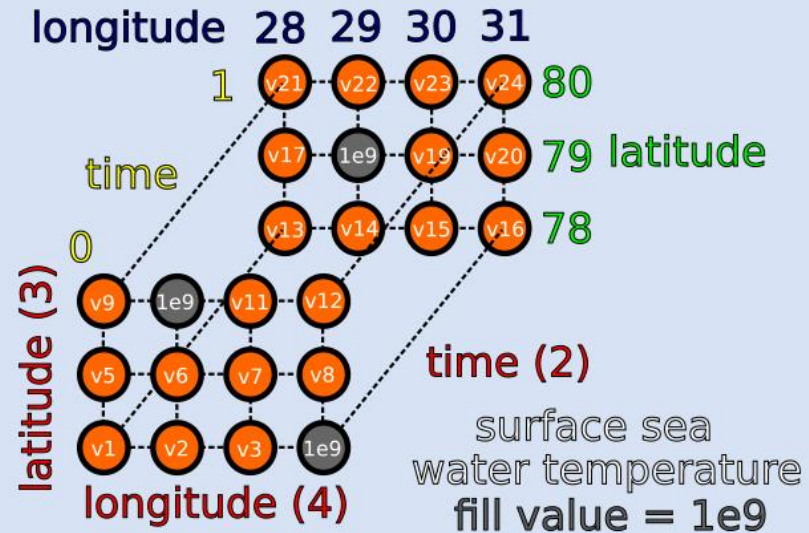

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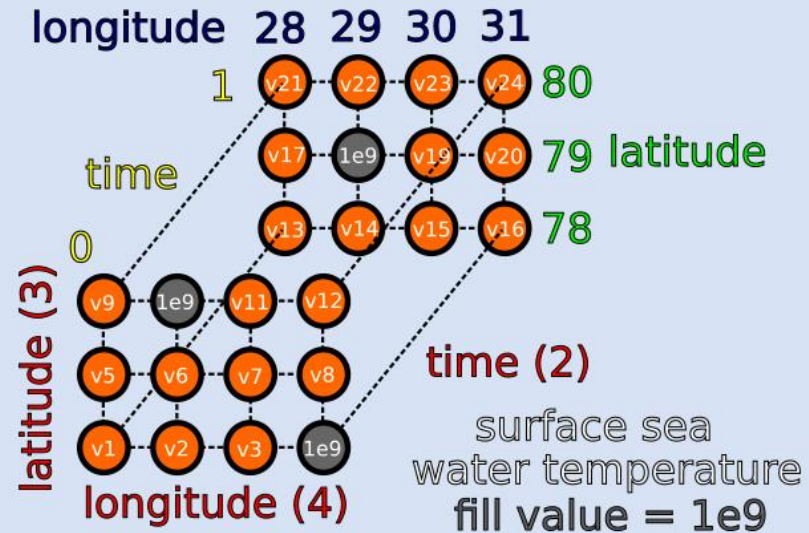
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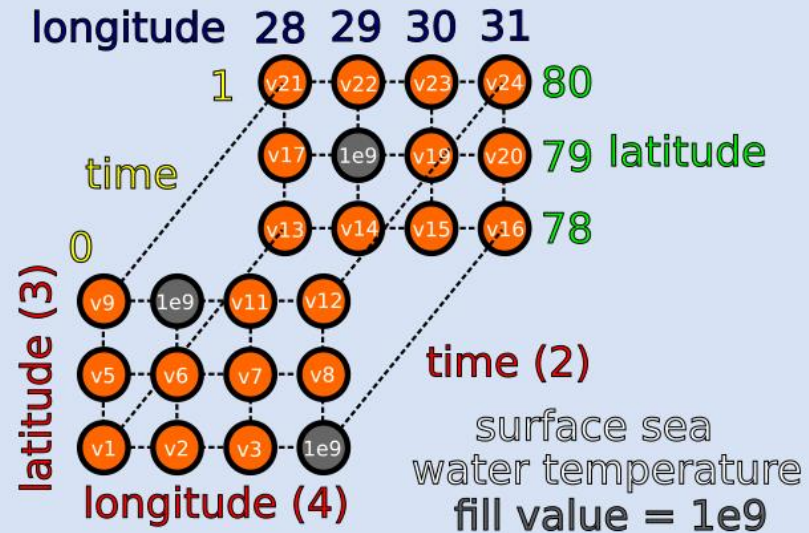
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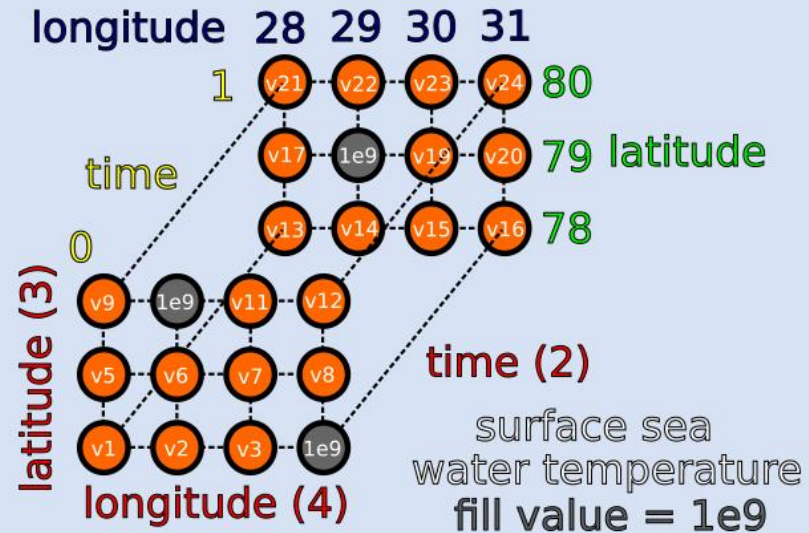
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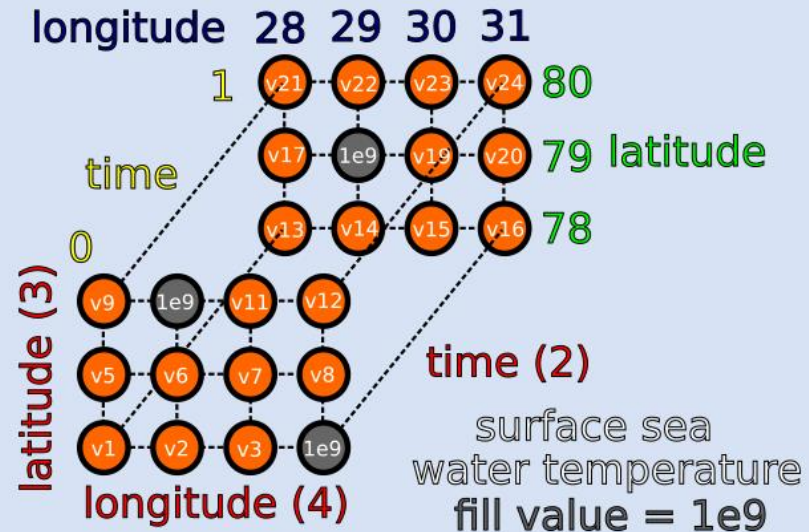
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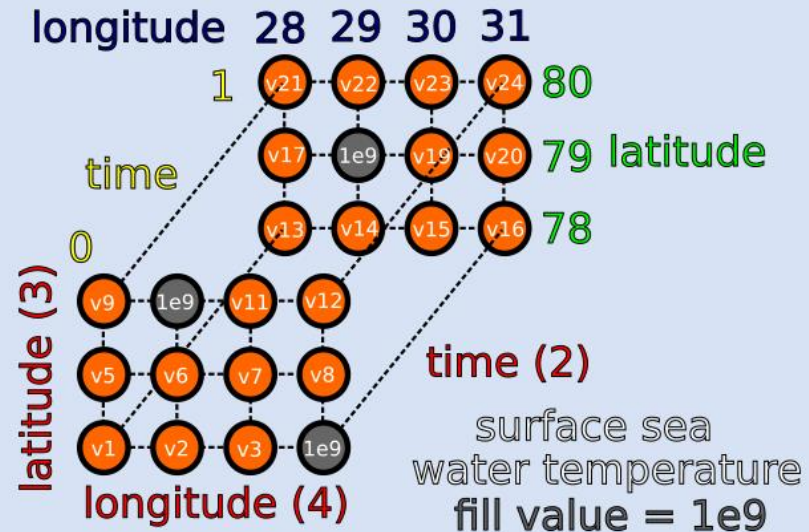
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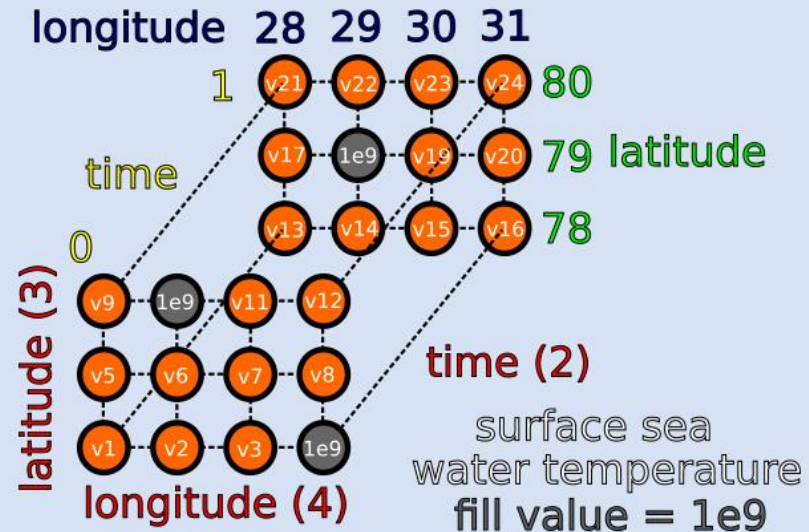
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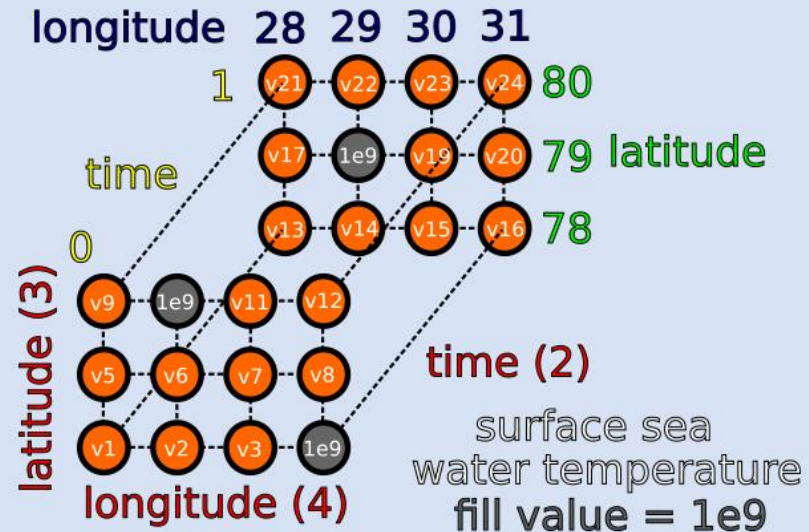
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  latitude: units = "degrees_north" ;
  int time(time) ;
  time: standard_name = "time" ;
  time: long_name = "time" ;
  time: units = "days since 2020-07-10T12:00:00Z" ;

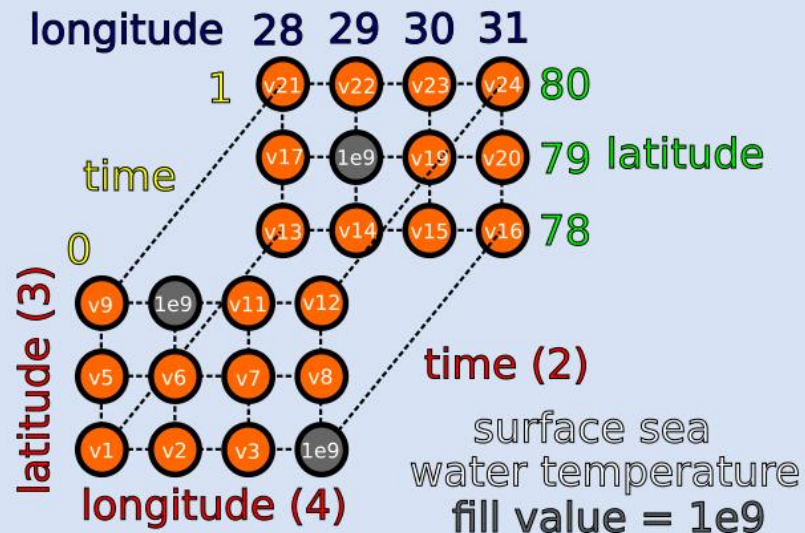
// global attributes:
  :id = "554b5b10-8675-500c-9ecd-9b23998c0b74" ;
  :naming_authority = "University Centre in Svalbard (UNIS)" ;
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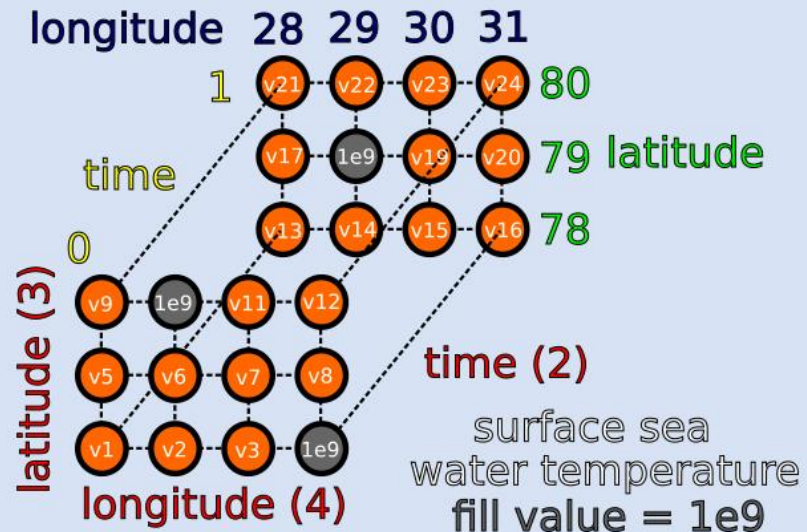
// global attributes:

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:id = "554b5b10-8675-500c-9ecd-9b23998c0b74" ;
:naming_authority = "University Centre in Svalbard (UNIS)" ;
:title = "Sea surface skin temperature measurements from the Northern Barents Sea in July 2020" ;
:summary = "A long and descriptive abstract, analogous to an abstract in a journal article, that describes the data" ;
:keywords = "Earth Science > Oceans > Ocean Temperature > Sea Surface Temperature > Sea Surface Skin Temperature" ;
:keywords_vocabulary = "GCMD" ;
:geospatial_lat_min = 76LL ;
:geospatial_lat_max = 78LL ;
:geospatial_lon_min = 28LL ;
:geospatial_lon_max = 31LL ;
:time_coverage_start = "2020-07-10T12:00:00Z" ;
:time_coverage_end = "2020-07-19T12:00:00Z" ;
:Conventions = "ACDD-1.3, , CF-1.8" ;
:history = "File created at 2022-01-10T14:21:58Z using the xarray library in Python" ;
:source = "Sea surface temperature measurements recorded by...okay, I made them up!" ;
:processing_level = "raw" ;
:date_created = "2022-01-10T14:21:58Z" ;
:creator_type = "person; person" ;
:creator_institution = "The University Centre in Svalbard, Norway; The University Centre in Svalbard, Norway" ;
:creator_name = "Luke Marsden; John Doe" ;
:creator_email = "lukem@unis.no; johndoe@unis.no" ;
:creator_url = "https://www.unis.no/staff/luke-marsden/; https://www.unis.no/staff/john-doe/" ;
:institution = "The University Centre in Svalbard (UNIS)" ;
:publisher_name = "Norwegian Meteorological Institute - Arctic Data Centre" ;
:publisher_email = "adc-support@met.no" ;
:publisher_url = "https://adc.met.no/" ;
:publisher_type = "institution" ;
:project = "The Nansen Legacy (RCN # 276730)" ;
:license = "https://creativecommons.org/licenses/by/4.0/" ;
:metadata_link = "" ;
:metadata_catalogue = "https://sios-svalbard.org/aen/tools, event ID = a5ec89da-f45e-11eb-b6ae-0f3712703d75" ;
:acknowledgements = "Funded by the Research Council of Norway. John Smith was involved in collecting the data" ;
```



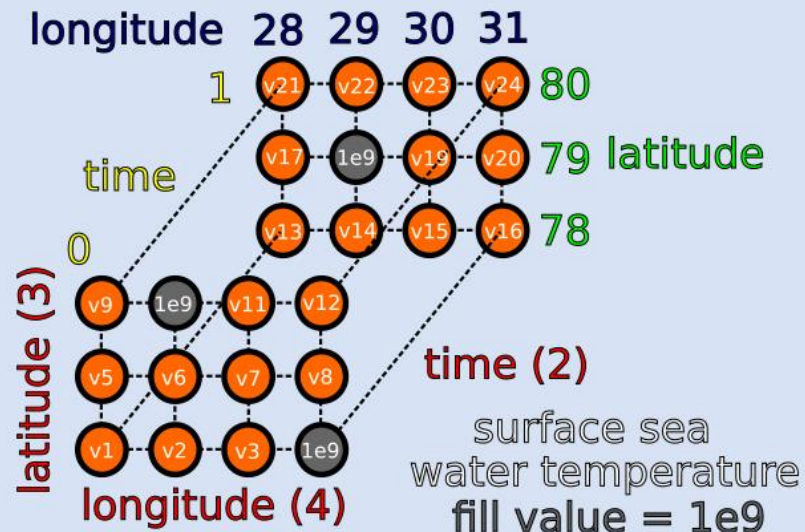
// global attributes:

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:naming_authority = "University Centre in Svalbard (UNIS)" ;
:title = "Sea surface skin temperature measurements from the Northern Barents Sea in July 2020" ;
:summary = "A long and descriptive abstract, analogous to an abstract in a journal article, that describes the data" ;
:keywords = "Earth Science > Oceans > Ocean Temperature > Sea Surface Temperature > Sea Surface Skin Temperature" ;
:keywords_vocabulary = "GCMD" ;
:geospatial_lat_min = 76LL ;
:geospatial_lat_max = 78LL ;
:geospatial_lon_min = 28LL ;
:geospatial_lon_max = 31LL ;
:time_coverage_start = "2020-07-10T12:00:00Z" ;
:time_coverage_end = "2020-07-19T12:00:00Z" ;
:Conventions = "ACDD-1.3, , CF-1.8" ;
:history = "File created at 2022-01-10T14:21:58Z using the xarray library in Python" ;
:source = "Sea surface temperature measurements recorded by...okay, I made them up!" ;
:processing_level = "raw" ;
:date_created = "2022-01-10T14:21:58Z" ;
:creator_type = "person; person" ;
:creator_institution = "The University Centre in Svalbard, Norway; The University Centre in Svalbard, Norway" ;
:creator_name = "Luke Marsden; John Doe" ;
:creator_email = "lukem@unis.no; johndoe@unis.no" ;
:creator_url = "https://www.unis.no/staff/luke-marsden/; https://www.unis.no/staff/john-doe/" ;
:institution = "The University Centre in Svalbard (UNIS)" ;
:publisher_name = "Norwegian Meteorological Institute - Arctic Data Centre" ;
:publisher_email = "adc-support@met.no" ;
:publisher_url = "https://adc.met.no/" ;
:publisher_type = "institution" ;
:project = "The Nansen Legacy (RCN # 276730)" ;
:license = "https://creativecommons.org/licenses/by/4.0/" ;
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:metadata_catalogue = "https://sios-svalbard.org/aen/tools, event ID = a5ec89da-f45e-11eb-b6ae-0f3712703d75" ;
:acknowledgements = "Funded by the Research Council of Norway. John Smith was involved in collecting the data" ;
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:publisher_name = "Norwegian Meteorological Institute - Arctic Data Centre" ;
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```



CF Conventions

Climate and Forecast

<https://cfconventions.org/>

ACDD Conventions

Attribute Conventions for Data Discovery

https://wiki.esipfed.org/Attribute_Convention_for_Data_Discovery_1-3

Some requirements for SIOS:

<https://adc.met.no/node/4>

GCMD Keywords

Global Change Master Directory

Keyword viewer:

<https://gcmd.earthdata.nasa.gov/KeywordViewer/>

Help with NetCDF

Python

https://lhmarsden.github.io/NetCDF_in_Python_from_beginner_to_pro

R

https://lhmarsden.github.io/NetCDF_in_R_from_beginner_to_pro

No coding

https://lhmarsden.github.io/Introduction_to_CF-NetCDF