



# Climate science at high latitudes: Modeling and model evaluation

Example for writing your report

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Second Supervisor

A tagline for the report.

Institution1

Institution2

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# 1 General structure

- Project title
- Name, email, course title, date, group assistant
- Abstract (1/2 page max)
- Introduction (1 page)
- Method
  - Packages used
  - Datasets (models and observations)
  - Analysis method
  - ...
- Results
- Discussion and outlook (1 page)
- Conclusions (1/2 page)
- References
- Acknowledgments

## 2 How to generate pdf report

### 2.1 Markdown

- Select Markdown cell instead of code cell
- [Markdown cheatsheet](#)

### 2.2 Add a report title

- Edit --> Edit Notebook Metadata

```
"ipub": {
  "bibliography": "/mnt/data/teachers/annefou/test_report.bib",
  "titlepage": {
    "author": "Anne Fouilloux",
    "email": "authors@email.com",
    "institution": [
      "Institution1",
      "Institution2"
    ],
    "logo": "/mnt/data/teachers/annefou/NEGI2018.png",
    "subtitle": "Example for writing your report",
    "supervisors": [
      "First Supervisor",
      "Second Supervisor"
    ],
    "tagline": "A tagline for the report.",
    "title": "Climate science at high latitudes: Modeling and model evaluation"
  }
},
```

### 2.3 Hide a cell output

View --> Cell Toolbar --> Edit Metadata

And add:

```
"ipub": {
  "ignore": true
}
```

### 2.4 Add Code block

In the Cell metadata:

```
"ipub": {
  "code": {
    "format" : {},
    "asfloat": true,
    "caption": "",
    "label": "code:example_code",
    "widefigure": false,
    "placement": "H"
  }
}
```

```
}  
}
```

## 2.5 Add a latex reference

### 2.5.1 Figures

There are two ways to reference plots:

1. Use latex syntax:

- Save your figure in a code cell:

```
fig.savefig('fig_example.png') ;
```

where fig is a matplotlib figure (fig = plt.figure ( figsize =[12 ,5])).

- Reference your plot in a markdown cell:

In both cases, you can reference your plots using latex syntax `\ref`

### 2.5.2 cite a paper

For all the paper in your bib file (added in the notebook metadata), you can use the following syntax to cite your paper:

- you can add a citation using latex citation `\cite`.

## 2.6 Generate pdf with nbpublish

To convert your jupyter notebook into pdf, you need to use nbpublish. See last cell of this jupyter notebook.

```
!nbpublish -f latex_ipypublish_all -pdf report_example.ipynb
```

### 3 Import python packages

```
1 import xarray as xr
2 import dask . array as da
3 import matplotlib . pyplot as plt
4 import cartopy.crs as ccrs
5 import numpy as np
6 import pandas as pd
7 %matplotlib inline
```

## 4 Data and Methods

### 4.1 Read Data

```
1 dset = xr.open_dataset('/mnt/data/students/evelien/Observations/air
    ↪ .mon.mean.seasonal.arctic.nc')
```

```
1 dset . time
```

```
<xarray.DataArray 'time' (time: 461)>
array(['1900-01-16T12:00:00.000000000', '1900-04-01T00
:00:00.000000000',
      '1900-07-01T00:00:00.000000000', ..., '2014-07-01T00
:00:00.000000000',
      '2014-10-01T00:00:00.000000000', '2014-12-01T00
:00:00.000000000'],
      dtype='datetime64[ns]')
Coordinates:
  * time      (time) datetime64[ns] 1900-01-16T12:00:00 1900-04-01 ...
2014-12-01
Attributes:
  standard_name:  time
  long_name:      Time
  bounds:         time_bnds
  axis:           T
```

#### 4.1.1 Select the nearest date

```
1 x = dset["air"].sel( time = "1989-01-01T00:00:00.000000000", method =
    ↪ 'nearest')
```

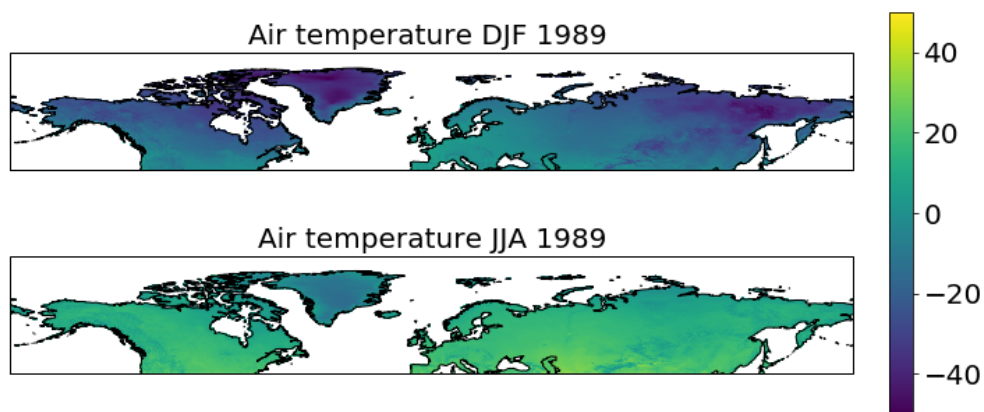


Figure 5.1: A Nice plot.

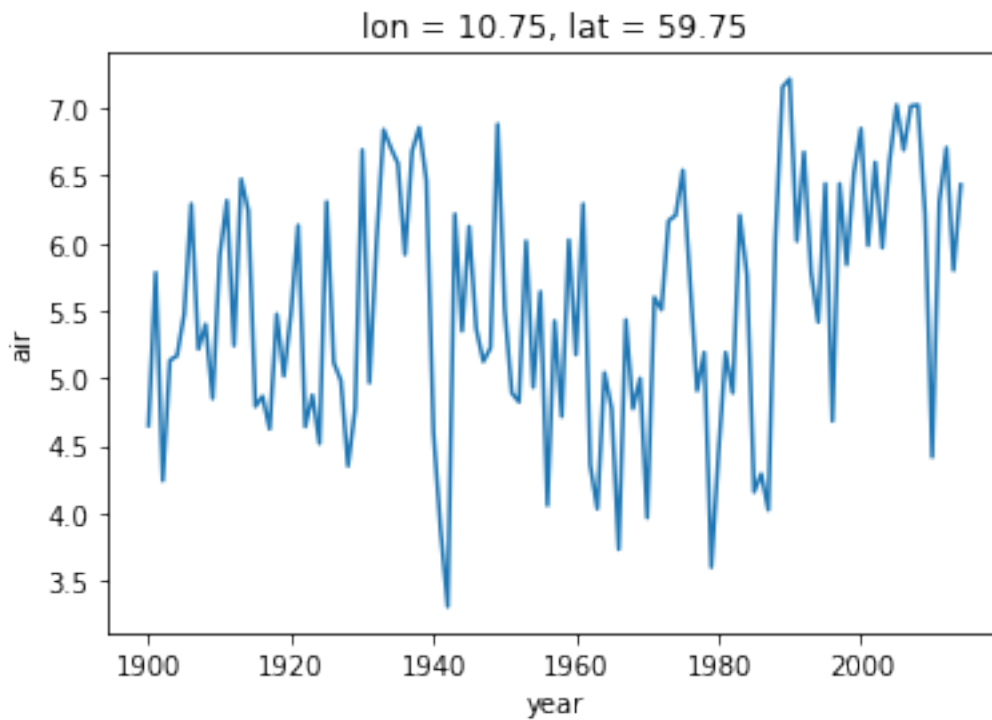
## 5 Results

```

1  # Select one location and group by year to plot
2  # to get your plot in your report (with a label you can reference):
3  # - edit cell metadata
4  # - Add the following (customize label for your own plot)
5  #
6  #
7  # "ipub": {
8  #   "figure": {
9  #     "caption": "Simple time serie over Oslo",
10 #     "label": "fig:oslo_timeserie"
11 #   }
12 # }
13 #
14
15 # Add a semi-column at the end to suppress the output of the
16   ↪ function
dset["air"].sel(lat=59.91,lon=10.74, method="nearest").groupby("
  ↪ time.year").mean(dim="time").plot();

```



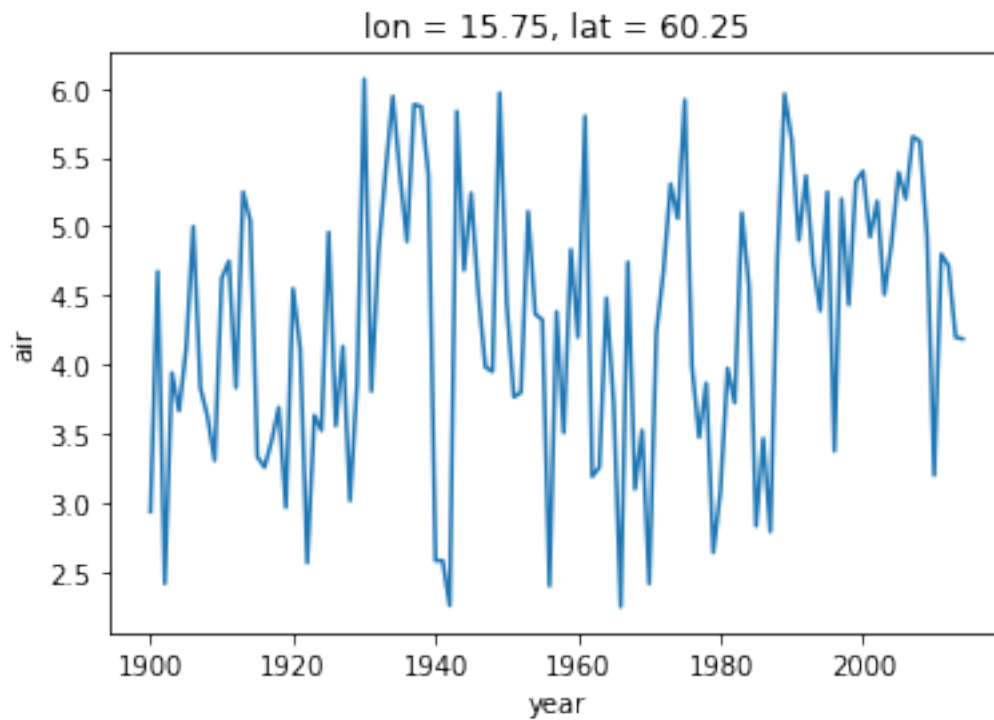


*Figure 5.2:* Simple time serie over Oslo

And then you can reference your previous timeserie [5.2](#)

*Code 5.1:* Code example

```
1 # Add a semi-column at the end to suppress the output of the  
  ↪ function  
2 # Andoya coordinates  
3 dset["air"].sel(lat=60.0, lon=15.71, method="nearest").groupby("time  
  ↪ .year").mean(dim="time").plot();
```



*Figure 5.3:* Another time serie over Andoya

Timeserie over Andoya. See 5.3. The plot has been generated with 5.1.

```
1 df=pd.DataFrame({"col-A": [1, 2, 3], "col-B": [4, 5, 6]})
2 df
```

	col-A	col-B
0	1	4
1	2	5
2	3	6

The table above ?? is an example.

## 6 Discussion

Within a markdown cell, you can add a citation using latex citation<sup>[1]</sup>.

You can also add equations:

$$\frac{\partial p}{\partial z} = -\rho g \quad (6.1)$$

The heat equation

$$\frac{dQ}{dt} \equiv F_T = c_p \frac{dT}{dt} - \frac{\alpha T}{\rho} \frac{dp}{dt} \quad (6.2)$$

The differential form of the heat equation (6.2) without heating can be combined with the hydrostatic equation (6.1) to give the temperature equation for an adiabatic ascent of a parcel.

$$\frac{dT}{dz} = -\Gamma \equiv \frac{g\alpha T}{c_p} \quad (6.3)$$

And you can make a reference to your plots. See Figure 5.1 shows a nice plot.

## 7 Acknowledgments

- model and data owners/providers

And make sure you acknowledge Sigma2:

- *This study was performed using jupyterhub deployed on resources provided by UNINETT Sigma2 - the National Infrastructure for High Performance Computing and Data Storage in Norway as part of NS1000K project. In particular, we would like to thank Thierry Toutain and Gurvinder Singh.*
-

## 8 References

- [1] R. J. Allan. ENSO and Climatic Variability in the Last 150 years. In H. F. Diaz and V. Markgraf, editors, *El Niño and the Southern Oscillation: Multiscale Variability, Global and Regional Impacts*, pages 3–56. Cambridge University Press, Cambridge, UK, 1st edition, 2000.