F. Maussion, 28.11.2016

Physics of the climate system – WS 2016/2017

Final Projects

40% of the final grade

1. Objectives

Write a report and give a short presentation about the climate of a given region/continent. In groups of three, you will use a global reanalysis dataset to describe the spatio-temporal features of the regional climate. You will discuss your results in relation to selected literature and present them in condensed form to the rest of the class.

2. Informal objectives

Learn about the methods and tools used in climate research. Getting familiar with the specificities of the climate in several regions of the world. Do your own exploratory research in order to gain insights about the drivers of climate variability at regional and local scales.

3. Regions

Africa
Antarctica & Southern Ocean
Australia & Indonesia & New Zealand
South-America
North-America
South-Asia + neighbors

4. Organisation

Four groups of three students, two groups of two (one group per region)
Please give me your preferences before Monday 05.12.2016 evening (see google-sheet and e-mail)
Preparation: independent team work + sessions with me (Tuesdays)
Presentations: Tuesday 24.01.2017, 13:30-15:00. Each group: 12 min pres. + 3 min discussion
Final report submission deadline: 24.01.2017

5. Formal requirements

To pass the exam, the following minimum requirements must be fulfilled:
- final report (a jupyter notebook) submitted in time
- each group member must contribute to the report and presentation, the personal contributions should be stated in the introduction of the final report
- the notebook should be self-contained and must be structured around well defined sections / analyses / plots / descriptions
- scientific rigor: the plots must be as understandable as possible (title, units, x and y axis

labels, appropriate colors and levels...). The text must be clear. Findings or assumptions must be supported by appropriate references if they are not derived from the figures.
- literature: at least three publications must be cited in the report
- reproducible science: I must be able to run the code and understand it (i.e. if you use new data or new python packages you must submit it together with your report)

6. Scientific requirements

At minimum, the following analyses must be presented:
- Description of the basic features of climate: temperature, precipitation and surface wind. Averages, seasonality, description of the regional patterns and description of sub-regions according to their climate
- Description of the atmospheric drivers of the regional climate: at least one circulation plot in the lower, mid- and upper troposphere and one atmospheric cross-section.
- Variability: standard deviation and coefficient of variation of temperature and precipitation. At least one time series of regionally averaged temperature and precipitation. Name and discuss the drivers of regional variability according to the literature (e.g. ENSO, NAO, SOI...).

Other possible analyses based on your personal interest or motivation:
- climate anomalies: pick up as specific period (e.g. El Niño 1998, negative NAO winter 2010...) and describe the climate anomalies for that period
- atmospheric circulation anomalies (advanced): same as above but for the atmospheric circulation (this requires more data – available on demand)
- choose a sub-region (e.g. Sahel Zone in Africa, Altiplano in South America, Peninsula in Antarctica) or a specific location and describe its climate in more detail
- drivers of variability (advanced): correlation analyses with climate indexes (ENSO, NAO, SOI)

7. Grades

If you follow the minimum formal and scientific requirements (points 5 and 6 above) you can be ensured to get a good grade. A nice presentation and/or optional analyses can be seen as a bonus.

8. Available data

- ERA-Interim surface data, monthly averages, 1979-2014:
2 m temperature, *precipitation*, *evaporation*, *U10*, *V10*, *SLP*
- ERA-Interim upper-level data (1000 to 50hPa), monthly climatology 1979-2014:
U, *V*, *W*, *Geopotential height*
+ anything else on demand:
(e.g. shortwave radiation, *monthly time series of gph at a specific pressure level*, *etc.)*

9. Literature

To help you get started, I uploaded a PDF for each region on OLAT (chapter taken from the Encyclopedia of World Climatology). You could (and should) search additional literature by yourselves (I can help you if you need a specific journal article).