Parametrisation of the power harvesting characteristics of Airborne Wind Energy devices

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I hereby declare that this thesis was formulated by myself and that no sources or tools other than those cited were used.

Bonn, ...
Date Signature

1. Gutachter: Priv. Doz. Philip Bechtle
2. Gutachter: Prof. Dr. Wer weiss ich nicht?

Acknowledgements

I would like to thank ...

You should probably use `\chapter*` for acknowledgements at the beginning of a thesis and `\chapter` for the end.

Contents

CHAPTER 1

Introduction

The introduction usually gives a few pages of introduction to the whole subject, maybe even starting with the Greeks.

For more information on LaTeX and the packages that are available see for example the books of Kopka [1] and Goossens et al [2].

A lot of useful information on particle physics can be found in the "Particle Data Book" [3].

I have resisted the temptation to put a lot of definitions into the file `thesis_defs.sty`, as everyone has their own taste as to what scheme they want to use for names. However, a few examples are included to help you get started:

- cross-sections are measured in pb and integrated luminosity in pb^{-1};
- the K_S^0 is an interesting particle;
- the missing transverse momentum, $p_{\mathrm{T}}^{\mathrm{miss}}$, is often called missing transverse energy, even though it is calculated using a vector sum.

Note that the examples of units assume that you are using the siunitx package.

It also is probably a good idea to include a few well formatted references in the thesis skeleton. More detailed suggestions on what citation types to use can be found in the "Thesis Guide" [4]:

- articles in refereed journals [3, 5];
- a book [6];
- a PhD thesis [7] and a Diplom thesis [8];
- a collection of articles [9];
- a conference note [10];
- a preprint [11] (you can also use `@online` or `@booklet` for such things);
- something that is only available online [4].

At the end of the introduction it is normal to say briefly what comes in the following chapters.

The line at the beginning of this file is used by TeXstudio etc. to specify which is the master LaTeX file, so that you can compile your thesis directly from this file. The lines at the end of this file are used by AUCTeX directly within `emacs` to do the same thing. If your thesis is called something other than `mythesis`, adjust them as appropriate.

CHAPTER 2

ERA5 Wind Speed Data Analysis

2.1 ERA5 Data

This section introduces the ERA5 dataset (parameters, model levels)
introduction similar to Fiona - ref ERA5 documentation
What are the errors on wind speeds to be expected from ERA5 data?
include locations inspected in detail: location map

2.1.1 Model Level Height Calculation

Explain principle of height calculation - ref Fiona & website: https://confluence.ecmwf.int/display/CKB/ERA5%3A+compute+geopotential+on+model+levels
What are the errors on wind speeds and other params - height calc errors?
impact:
sea no change
land more change - less than paper (see height pdfs?)

height/diff pdfs: shapes strongly impacted by local parameters
diff pdfs:
in total - consistent with model level and surface elevation calculation single location diffs -

2.1.2 ERA5 Latitude-Longitude Grid Resolution

This shows via basic parameters the differences between the previously used rough grid and the now used fine grid (ALPES)
mention gaussian grid, interpolation - different meaning of 1x1 and .25x.25 same point
Chosen fine grid
need for parallelisation (larger/more data) - ref to repo?

2.1.3 Yearly Differences

show average wind speed pdfs for all years at one point for reference (same scales?)
Yearly wind speed 100m for full map in appendix?

roughly quantify variation: max, min and overall mean wind speeds plus variance?
Fiona cyclons / Cologne research reference?
Year by year differences observed → chosen range of 11 years

2.2 ERA5 Wind Speed Potential Reanalysis

what is processed? how does the processing work? explain meaning of percentiles:

- 5: 95% of time at least these wind speeds
- 32:
- 50: median

compare results w/ paper: map for 2011 to 2017 and 2010 to 2020 - changes?
find update to paper conclusion?

CHAPTER 3

Wind Profile Clustering

3.1 Clustering Principle

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[11] ATLAS Collaboration, *Expected Performance of the ATLAS Experiment – Detector, Trigger and Physics*, 2009, arXiv: 0901.0512 (cit. on p. 1).

APPENDIX A

Useful information

In the appendix you usually include extra information that should be documented in your thesis, but not interrupt the flow.

List of Figures

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