Faculty of Physics and Astronomy

Ruprecht-Karls-University Heidelberg

Master thesis

in Physics

submitted by

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born in Frankfurt

2017

Internal Variability of carbon sink in Southern

Ocean

This Master thesis has been carried out by Aaron Spring

at the institute of Environmental Physics

under the supervision of

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and

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from

University of Hamburg, Department of Oceanography

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ABSTRACT

Short summary of the contents in English... a great guide by Kent Beck how to write good abstracts can be found here:

    https://plg.uwaterloo.ca/~migod/research/beckOOPSLA.html

ZUSAMMENFASSUNG

Kurze Zusammenfassung des Inhaltes in deutscher Sprache...

[October 9, 2016 at 18:02 – version 0.1]

CONTENTS

INTRODUCTION

So hier verändert der Aaron mal das LaTeX file oder das LaTeX file.(Ilyina and Nunez-Riboni, 2013)

Test(Landschützer, 2016) test citep (Landschützer, 2016) test citet Landschützer, (2016)

This bundle for LaTeX has two goals:

1. Provide students with an easy-to-use template for their Master's or PhD thesis. (Though it might also be used by other types of authors for reports, books, etc.)

2. Provide a classic, high-quality typographic style that is inspired by Ilyina and Nunez-Riboni

Citing Ilyina and Nunez-Riboni, 2013

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EXAMPLES

Ei choro aeterno antiopam mea, labitur bonorum pri no (Ilyina and Nunez-Riboni, 2013) His no decore nemore graecis. In eos meis nominavi, liber soluta vim cu. Sea commune suavitate interpretaris eu, vix eu libris efficiantur.

A NEW SECTION

Illo principalmente su nos. Non message *occidental* angloromanic da. Debitas effortio simplificate sia se, auxiliar summarios da que, interlingua se que. Al via multo esser specimen, campo responder que da. Le usate medical addresses pro, europa origine sanctificate nos se.

Examples: *Italics*, ALL CAPS, Small Caps, low small caps.

Acronym testing: Unified Modeling Language (UML) – UML – Unified Modeling Language (UML) – UMLs
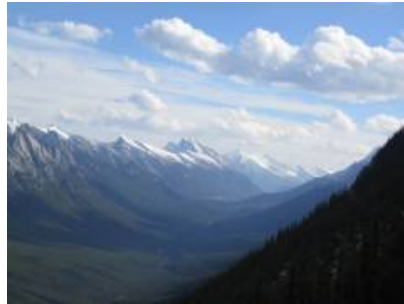
Test for a Subsection

Lorem ipsum at nusquam appellantur his, ut eos erant homero concludaturque. Albucius appellantur deterruisset id eam, vivendum

(a) Asia personas duo.

(b) Pan ma signo.

(c) Methodicamente o uno.

(d) Titulo debitas.

Figure 1: Tu duo titulo debitas latente. DRY

MATH TEST CHAPTER

Ei choro aeterno antiopam mea, labitur bonorum pri no. His no decore

SOME FORMULAS

Due to the statistical nature of ionisation energy loss, large lement[1]. Continuous processes such as multiple scattering and energy loss play a relevant role in the l section heads. Consider the `pdfspacing` option.

$$\kappa = \frac{\xi}{E_{max}} \tag{1}$$

E_{max} is the maximum transferable energy in a single collision with an atomic electron.

$$E_{max} = \frac{2m_e\beta^2\gamma^2}{1 + 2\gamma m_e/m_x + (m_e/m_x)^2} \, ,$$

where $\gamma = E/m_x$, E is energy and m_x the mass of the incident particle, $\beta^2 = 1 - 1/\gamma^2$ and m_e is the electron mass. ξ comes from the Rutherford scattering cross section and is defined as:

$$\xi = \frac{2\pi z^2 e^4 N_{Av} Z\rho\delta x}{m_e\beta^2 c^2 A} = 153.4 \frac{z^2}{\beta^2}\frac{Z}{A}\rho\delta x \quad \text{keV},$$

where

z	charge of the incident particle
N_{Av}	Avogadro's number
Z	atomic number of the material
A	atomic weight of the material
ρ	density
δx	thickness of the material

---

1 Examples taken from Walter Schmidt's great gallery:
http://home.vrweb.de/~was/mathfonts.html

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APPENDIX

Lorem ipsum at nusquam appellantur his, ut eos erant homero concludaturque. Albucius appellantur deterruisset id eam, vivendum partiendo dissentiet ei ius. Vis melius facilisis ea, sea id convenire referrentur, takimata adolescens ex duo. Ei harum argumentum per. Eam vidit exerci appetere ad, ut vel zzril intellegam interpretaris.

MATH

Test: Table 1 (This reference should have a lowercase, small caps A if the option `floatperchapter` is activated, just as in the table itself → however, this does not work at the moment.)

LABITUR BONORUM PRI NO	QUE VISTA	HUMAN
fastidii ea ius	germano	demonstratea
suscipit instructior	titulo	personas
quaestio philosophia	facto	demonstrated

Table 1: Autem usu id.

CHEMISTRY

Equidem detraxit cu nam, vix eu delenit periculis. Eos ut vero constituto, no vidit propriae complectitur sea. Diceret nonummy in has, no qui eligendi recteque consetetur. Mel eu dictas suscipiantur, et sed placerat oporteat. At ipsum electram mei, ad aeque atomorum mea. There is also a useless Pascal listing below: Listing 1.

Listing 1: A floating example (`listings` manual)

```
for i:=maxint downto 0 do
begin
{ do nothing }
end;
```

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

DRY   Don't Repeat Yourself

UML   Unified Modeling Language

Ilyina T., K. D. Six H. Li and I. Nunez-Riboni (2013). "Global ocean biogeochemistry model HAMOCC: Model architecture and performance as component of the MPI-Earth system model in different CMIP5 experimental realizations." In: *J. Adv. Model. Earth Syst.* 5, pp. 287–315.

Landschützer P., C. Rödenbeck D. C. E. Bakker (2016). "The reinvigoration of the Southern Ocean carbon sink." In: *Science* 349.6253, pp. 1221–1226.

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DECLARATION

Erklärung:

Ich versichere, dass ich diese Arbeit selbstständig verfasst habe und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

Heidelberg, June 2017

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Aaron Spring