



Madagascar School
of Reproducible Computational
Geophysics Shanghai 2017



同濟大學
TONGJI UNIVERSITY

Writing a Reproducible Paper using LaTeX and Madagascar

Jiubing Cheng & Yang Liu



Acknowledgement



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Madagascar

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Main Page

Madagascar is an open-source software package for multidimensional data analysis and [reproducible](#) computational experiments. Its mission is to provide

- a convenient and powerful environment
- a convenient technology transfer tool

for researchers working with digital image and data processing in geophysics and related fields. Technology developed using the Madagascar project management system is transferred in the form of recorded processing histories, which become "computational recipes" to be verified, exchanged, and modified by users of the system.

Features

 Madagascar is a [modern](#) package. Started in 2003 and publicly released in 2006, it was developed almost entirely from scratch. Being a relatively new package, it follows modern software engineering practices such as module encapsulation and test-driven development. A rapid development of a project of this scope (more than 1,000 main programs and more than 5,000 tests) would not be possible without standing on the shoulders of giants and learning from the 30 years of previous experience in open packages such as SEPlib and Seismic Unix. We have borrowed and reimplemented functionality and ideas from these other packages.

 Madagascar is a [test-driven](#) package. Test-driven development is not only an agile software programming practice but also a way of bringing scientific foundation to geophysical research that involves numerical experiments. Bringing reproducibility and peer review, the backbone of any real science, to the field of computational geophysics is the main motivation for Madagascar development. The package consists of two levels: low-level main programs (typically developed in the C programming language and working as data filters) and high-level processing flows (described using the Python programming language) that combine main programs and completely document data processing histories for testing and reproducibility. Experience shows that high-level programming is easily mastered even by beginning students who have no previous programming experience.

 Madagascar is an [open-source](#) package. It is distributed under the standard GPL open-source license, which places no restriction on the usage and modification of the code. Moreover, access to modifying the source repository is not controlled by one organization but shared equally among different developers. This enables an open collaboration among different groups spread all over the world, in the true spirit of the open-source movement.

 Madagascar uses a [simple, flexible, and universal](#) data format that can handle very large datasets but is not tied specifically to seismic data or data of any other particular kind. This "regularly sampled" format is borrowed from the traditional SEPlib. A universal data format allows us to share general-purpose data processing tools with scientists from other disciplines such as petroleum engineers working on large-scale reservoir simulations.

Latest News

Upcoming events:

Madagascar School in Shanghai July 10-11, 2017

SEG Working Workshop in Houston, August 9-12, 2017

Acknowledgement

Madagascar School for Advanced Users in Qingdao 2015



Reproducible Paper:

Writing and publishing using $\text{\LaTeX}$ and Madagascar



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Acknowledgement

Journal of
open research software

Fomel, S et al 2013 Madagascar: open-source software project for multidimensional data analysis and reproducible computational experiments. *Journal of Open Research Software* 1:e8, DOI: <http://dx.doi.org/10.5334/jors.ag>

SOFTWARE METAPAPER

Madagascar: open-source software project for multidimensional data analysis and reproducible computational experiments

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² Center for Wave Phenomena, Colorado School of Mines, Golden, Colorado, USA

³ TGS, Houston, Texas, USA

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⁵ BP, Houston, Texas, USA

The Madagascar software package is designed for analysis of large-scale multidimensional data, such as those occurring in exploration geophysics. Madagascar provides a framework for reproducible research. By “reproducible research” we refer to the discipline of attaching software codes and data to computational results reported in publications. The package contains a collection of (a) computational modules, (b) data-processing scripts, and (c) research papers. Madagascar is distributed on SourceForge under a GPL v2 license <https://sourceforge.net/projects/rsf/>. By October 2013, more than 70 people from different organizations around the world have contributed to the project, with increasing year-to-year activity. The Madagascar website is <http://www.ahay.org/>.

Keywords: reproducibility, data analysis, geophysics, seismology, Python



Agenda

- **Background & Motivations**
- **How to use SEGTeX**
 - Requirements
 - Implement steps
 - Rules
 - Some tips
- **An Example in RSFSRC/book/tutorial/authors**



Agenda

- **Background & Motivations**
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The three branches of science

From Euclid's reasoning and Galileo's experiments, it took hundreds of years for the **theoretical** and **experimental** branches of science to develop standards for publication and peer review.

Computational science, rightly regarded as the third branch, can walk the same road much faster.

What is science?

When does computational research become scientific?

“Science is the systematic enterprise of gathering knowledge about the universe and organizing and condensing that knowledge into testable laws and theories. The success and credibility of science are anchored in the willingness of scientists to **independent testing and replication** by other scientists. This requires the **complete** and **open exchange** of data, procedures and materials.” (See www.aps.org/policy/statements/99_6.cfm for more information.)



Reproducible research

GUEST EDITORS'
INTRODUCTION

Reproducible Research



Our generation of computational scientists is living in an exciting time: not only do we get to pioneer important algorithms and computations, we also get to set standards on how computational research should be conducted and published. From Euclid's reasoning and Galileo's experiments, it took hundreds of years for the theoretical and experimental branches of science to develop standards for publication and peer review. Computational science, rightly regarded as the third branch, can walk the same road much faster.

What is science anyway? When does computational research become scientific? According to

the American Physical Society, "Science is the systematic enterprise of gathering knowledge about the universe and organizing and condensing that knowledge into testable laws and theories. The success and credibility of science are anchored in the willingness of scientists to expose their ideas

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SERGEY FOMEL

The University of Texas at Austin

JON F. CLAERBOUT

Stanford University

CiSE: *Computing in Science & Engineering*

The so-called “Claerbout’s principle”

- Reproducible research refers to the discipline of attaching software code and data to scientific publications, in order to enable independent verification and replication of computational experiments.
- The so-called “Claerbout’s principle” states that “An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures.”

Fomel, S and Claerbout, J F 2009 Guest Editors' Introduction: Reproducible Research. *Computing in Science & Engineering* 11(1): 5-7. DOI: <http://dx.doi.org/10.1109/MCSE.2009.14> 2.

References

1. M. Schwab, M. Karrenbach, and J. Claerbout, "Making Scientific Computations Reproducible," *Computing in Science & Eng.*, vol. 2, no. 6, 2000, pp. 61–67.
2. S. Fomel and G. Hennenfent, "Reproducible Computational Experiments Using SCons," *Proc. IEEE Int'l Conf. Acoustics, Speech and Signal Processing*, vol. 4, IEEE CS Press, 2007, pp. 1257–1260.
3. R. Gentleman, "Reproducible Research: A Bioinformatics Case Study," *Statistical Applications in Genetics and Molecular Biology*, vol. 4, no. 1, 2005, pp. 1–23.

Reproducible Research

Links and info about reproducible research

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[BLOG](#)

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[REPRODUCIBLE MATERIAL](#)

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Home

An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures.

—D. Donoho

Welcome on this site about reproducible research. This site is intended to gather a lot of information and useful links about reproducible research. As the authors mainly work in signal/image processing, that is also the main focus of this site. Follow the links in the text or in the menu to navigate through this site.

Overview

This site hosts a [blog](#) with a wide range of posts related to reproducibility. A description of how we make our research reproducible can be found on the [How To](#) page. We try to keep track of a [bibliography](#) of reproducible research-related articles. The [Links](#) page contains a large set of links about RR, tools, etc. And on the [Reproducible Material](#) page, you can find a set of links to code and data for papers in signal and image processing.

Motivation

After a colleague asked something about a paper you wrote, you spend a considerable amount of time finding back the right program files you used in that paper. Not to talk about the time to get back to the set of parameters used to produce that nice result.

Because this type of situations sounded all too familiar to many of us, we are now trying to make our research reproducible. Most of the ideas about reproducible research come from Jon Claerbout and his research group at Stanford University. We believe reproducible research can be helpful in many ways:



Jon Claerbout's Story



- **1987: Sunview experience**
 - Interactive programs are slavery
- **1992: LaTeX + cake**
 - Rebuilding books by a single command
- **Reproducible research at Stanford Exploration Project (SEP)**
 - From CD-ROMs to WWW
 - From cake to GNU make
 - 2001 CiSE paper





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Computational Seismology

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The **Madagascar** Project

at the University of Texas at Austin started by Sergey Fomel and Paul Sava



- Started in 2006
- Open community
- Open source (GPL)
- Multidimensional data analysis

Madagascar: open-source software project for multidimensional data analysis and reproducible computational experiments

Sergey Fomel,¹ Paul Sava,² Ioan Vlad,³ Yang Liu,⁴ Vladimir Bashkardin,⁵

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How does Madagascar help for reproducible research

- Code attached to published results
- Continuous maintenance
- Previous results used for testing
 - Test-driven development
- Lessons from open-source
 - Intellectual property
 - Community



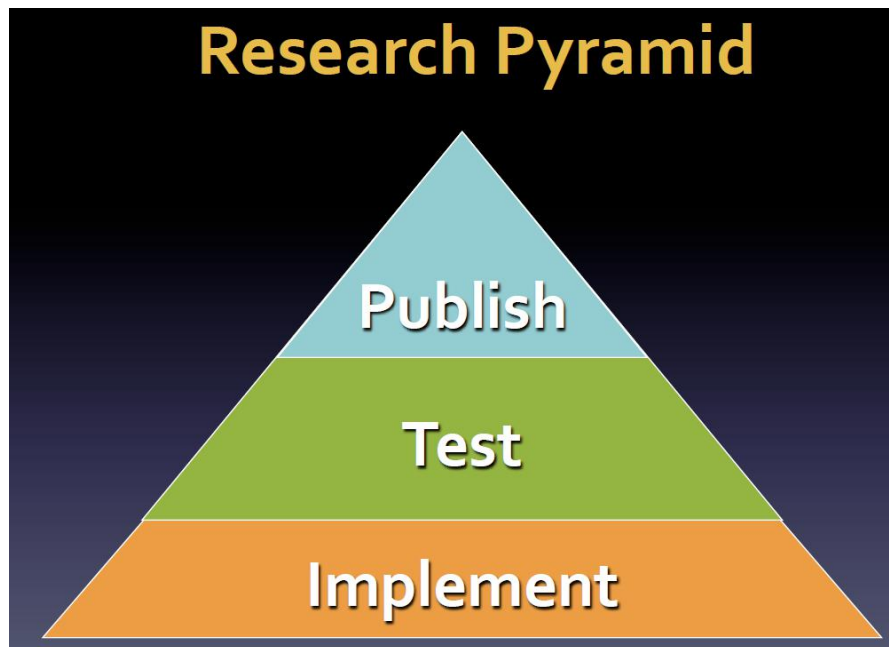
Madagascar supports the research pyramid

Three levels

- Building blocks in C
- Recipes in Python/SCons
- Papers in LaTeX + SCons



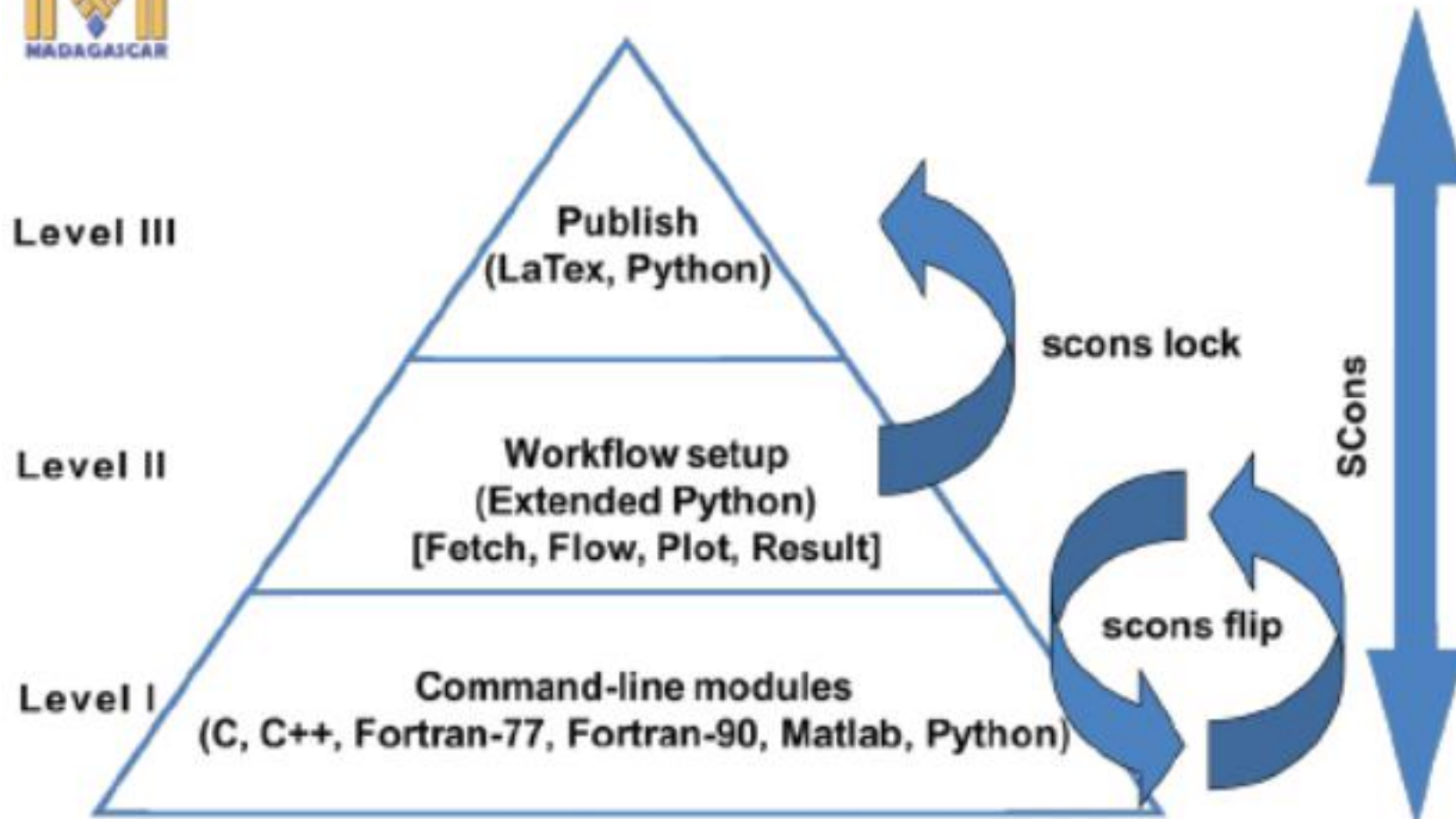
<http://ahay.org>



From Sergey Fomel

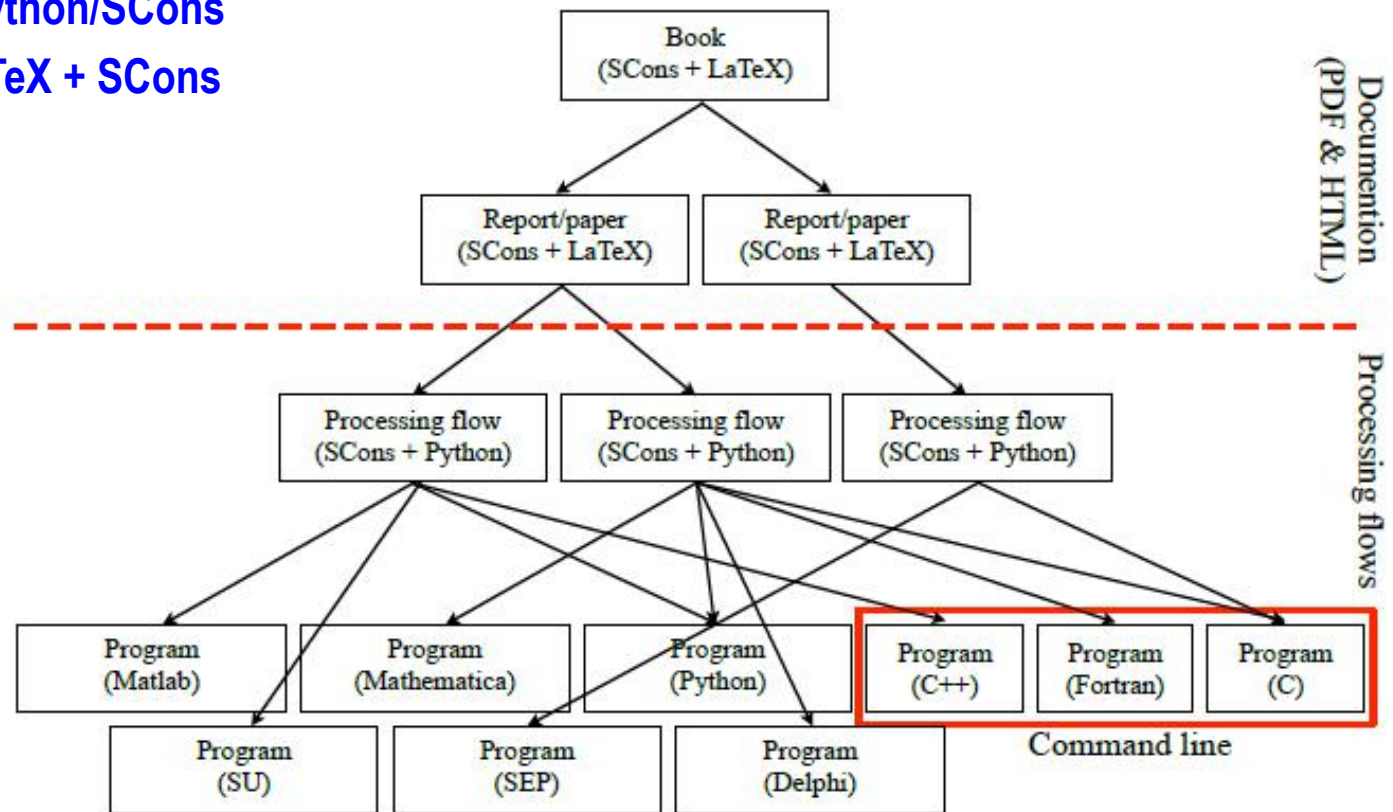


Madagascar software architecture



MADAGASCAR SOFTWARE PACKAGE OVERVIEW

- Building blocks in C
- Recipes in Python/SCons
- Papers in LaTeX + SCons



From Sergey Fomel and Gilles Hennenfent

Why use LaTeX

- **MS-word--> LaTeX**

“I hope to die before I have to use Microsoft Word”

– Donald Ervin Knuth

Reasons:

- 1) Focus on paper structure and content;**
- 2) Better mathematic style;**
- 3) More efficient (easy comments);**
- 4) Better revision for long document;**
- 5) Sole high-quality text software in Linux;**
- 6) Compiling by command line.**



- **However, LaTeX is not perfect, either MS-word or LaTeX is just a tool, choose any of them you need.**



同濟大學
TONGJI UNIVERSITY

博士学位论文

基于弹性波模式解耦的全波形反演方法

姓 名: 王腾飞

学 号: 1110701

所在院系: 海洋与地球科学学院

学科门类: 理学

学科专业: 固体地球物理学

指导教师: 程玖兵教授

二〇一七年五月

Full Wave Modes Seismic Imaging with Multi-component Data in Anisotropic Media

Thesis Defence in Tongji University

Respondent: Chenlong Wang

Advisor: Jiubing Cheng

04, June 2017

Tongji University



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ECONOMIC
GEOLOGY



Texas Consortium for
Computational Seismology

JACKSON
SCHOOL OF GEOSCIENCES

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RESEARCH

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NEWS AND EVENTS

OUTREACH

PRESENTATIONS



May 28, 2013

Software for Reproducible Research



Madagascar: an open-source software package for multidimensional data analysis and reproducible computational experiments. Learn more at the Madagascar home page.



SEGTeX: a LaTeX package for geophysical publications. Learn more at <http://www.reproducibility.org/wiki/SEGTeX>.

For more information, please contact **Sergey Fomel**.
Telephone 512-475-9573. E-mail sergey.fomel@beg.utexas.edu.



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SEGTex: When LaTeX meets Madagascar



The logo for the Society of Exploration Geophysicists (SEG), featuring the letters "SEG" in a stylized font with a globe-like pattern behind them.

SOCIETY OF EXPLORATION
GEOPHYSICISTS

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A yellow square with a black book icon and the word "PUBLICATIONS" in black capital letters.

PUBLICATIONS

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LaTeX package for paper submission to GEOPHYSICS

A typesetting package is available to help authors prepare papers for GEOPHYSICS. The package consists of a set of macros prepared for LaTeX, a popular document preparation system. The SEG has developed several macros designed specifically for GEOPHYSICS and SEG Annual Meeting Expanded Abstracts.

Authors who use the LaTeX typesetting program to prepare their manuscripts can use the SEG macros (called [SEGTex](#)) to format the text, equations, references, and appendices so that they conform to GEOPHYSICS guidelines for submission. If using BibTeX to create references, authors must run BibTeX before submitting the .tex file and read in or paste the resulting contents of the generated .bbl file within the bibliography section of the .tex file. All LaTeX submissions must include only one .tex file and a PDF of that file. You may send questions concerning LaTeX files to the [SEGTex mailing list](#) .

To submit papers to GEOPHYSICS, follow the procedures described in the SEG [Instructions to Authors](#). The manuscript will undergo the standard review process. Once all revisions and changes to the manuscript are made and the manuscript is accepted, LaTeX files will be converted to Microsoft Word documents for production.

A thumbnail image of the cover of the GEOPHYSICS journal, showing a blue background with white text and a small SEG logo in the bottom left corner.

Read the latest issue of
GEOPHYSICS in
the [SEG Digital Library](#)

SEGT_EX

SEGT_EX is a LaTeX package for geophysical publications.

It consists of

- LaTeX2_ε class files for [Geophysics](#) papers, SEG expanded abstracts, etc
- BibTeX style files [seg.bst](#)
- BibTeX cumulative bibliography of geophysical publications [SEG.bib](#)
- [latex2html](#) customizations



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- [latex2html](#) customizations

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Downloading

Access SEGTeX through its SourceForge project [by downloading the latest stable release](#).

Alternatively, access the current working version by either using [Git](#) and running

```
git clone https://github.com/SEGTeX/texmf
```

or using [Subversion](#) and running

```
svn co https://github.com/SEGTeX/texmf/trunk texmf
```

You can also [browse the GitHub repository](#).

Installation

If your LaTeX installation is missing/incomplete, try installing [TeX Live](#) first.

To install, put the contents of the `texmf` folder where LaTeX can find it. Most systems recognize `$HOME/texmf` as one of the default places. On MacOS X, it can be `$HOME/Library/texmf`. You may need to run `texhash` to tell LaTeX about the new files. For more help on `texmf`, see “[Private](#)” [installations of files](#).

Prerequisites

Some of the required additional LaTeX packages are:

- [natbib](#) support for (author,year) bibliography style of natural sciences

Download and Install SEGTEX on Mac

```
cd $HOME/Library
git clone https://github.com/SEGTEX/texmf
sudo port install texlive-latex-extra
```

SEG expanded abstracts

SEGTeX includes **segabs.cls** -- a LaTeX class for generating SEG expanded abstracts. Alternatively, you can [download segabs-2015](#) -- a packaged expanded abstract template.

To generate an expanded abstract without references, as required by SEG, use two LaTeX files: one for the abstract itself, and the other for separating pages without references. Examples are [segabs_example.ltx](#) and [segabs_final.ltx](#)

```
\documentclass{article}
\usepackage{pdfpages}
\begin{document}
\includepdf[pages={1-4}]{segabs_example}
\end{document}
```

This solution only works with **pdflatex**.

Alternatively, you can separate pages using an external program.

- In [Acrobat Pro](#), open the PDF file with references, select Document -> Pages -> Extract, and extract the reference page with the delete option (*thanks to Norm Bleistein for the tip.*)
- Another useful program is [pdftk](#) (PDF toolkit.)

Documentation

The [tex/latex/seg](#) directory contains several example files.

Use the manuscript style to submit papers to **Geophysics**.

- Manuscript style **Geophysics** paper [geophysics_example](#) 
- Manuscript style **Geophysics** paper using `endfloat` [geophysics_endfloat](#) 
- Publication style two-column **Geophysics** paper [geophysics_twocolumn](#) 
- **SEG** expanded abstract (with references) [segabs_example](#) 
- **SEG** expanded abstract (without references) [segabs_final](#) 
- Report style paper [geophysics_paper](#) 



Agenda

- Background & Motivations
- **How to use SEGTeX**
 - Requirements
 - Implement steps
 - Rules
 - Some tips
- An Example in RSFSRC/book/tutorial/authors

Installation Requirements

1) Madagascar package

download from: <http://www.ahay.org/wiki/Download>

2) LaTeX package

download from: <http://www.tug.org/texlive/>

3) Text editor: emacs, gedit, vim, et al.

4) Compiler: pdflatex

5) SEGTeX:

download from: <http://www.ahay.org/wiki/SEGTeX>



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Implement steps

1) Ideas



2) Implement ideas in Madagascar and lock Figures (scons **fig.lock**)

scons lock

3) Write a paper text by SEGTeX rules

4) Insert Figures into paper by SEGTeX rules

SCONS COMMANDS

- **scons:** run an SConstruct
- **scons view:** view the results from an SConstruct, run if necessary
- **scons lock:** lock the results from an SConstruct
- **scons -c:** clean the local directory, delete all files
- **pscons:** parallel execution of an SConstruct

SConstruct $\Leftrightarrow$ scons

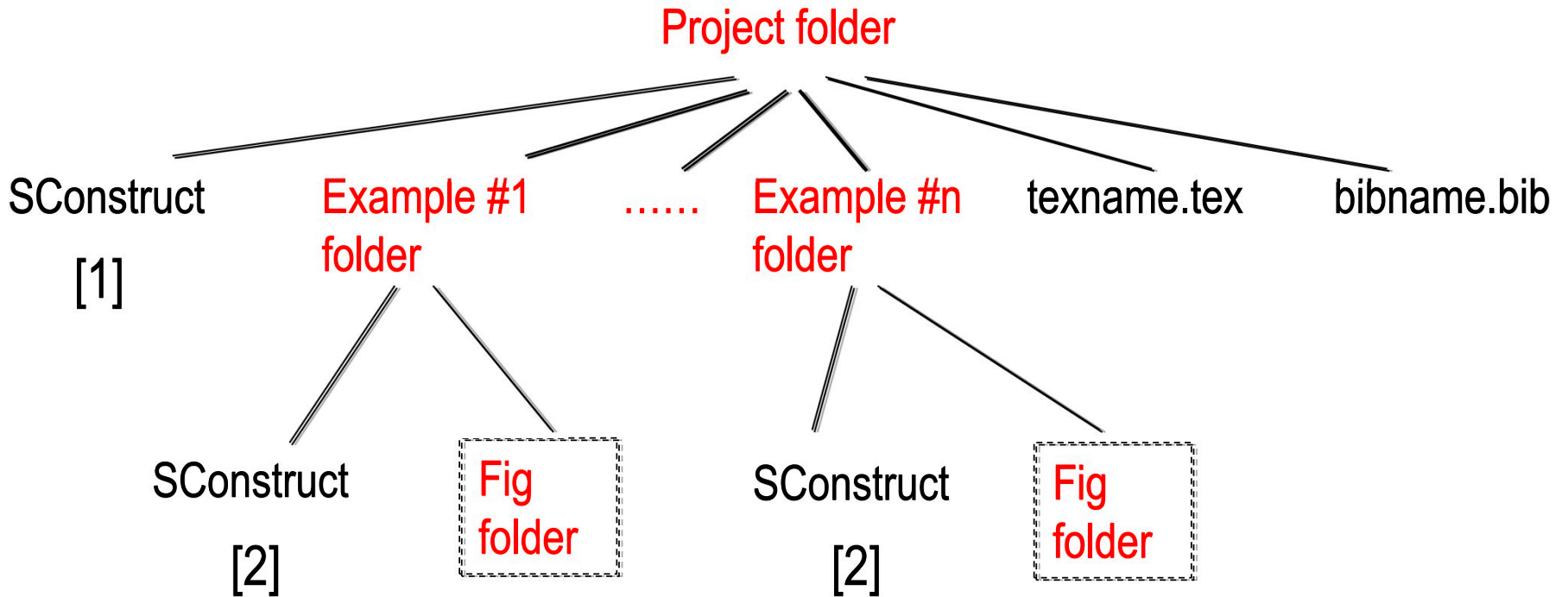
Makefile $\Leftrightarrow$ make



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Some rules



See example: [~/RSFSRC/book/tongji/lrmode](#)

Example in ~/RSFSRC/book/tongji/lrmode

```
[cjb@dell225 lrmode]$ ll
total 112
-rw-rw-r--. 1 cjb cjb 748 Apr 13 2015 abstract.tex
-rw-rw-r--. 1 cjb cjb 443 Apr 13 2015 acknowledge.tex
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007.comparison
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007.smoth
-rw-rw-r--. 1 cjb cjb 1616 Apr 13 2015 conclusions.tex
-rw-rw-r--. 1 cjb cjb 4947 Apr 13 2015 decomposition.tex
-rw-rw-r--. 1 cjb cjb 14006 Apr 13 2015 examples.tex
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 hessvti
-rw-rw-r--. 1 cjb cjb 4572 Apr 13 2015 introduction.tex
-rw-rw-r--. 1 cjb cjb 9755 Apr 13 2015 lowrank.tex
-rw-rw-r--. 1 cjb cjb 729 Apr 13 2015 paper.tex
-rw-rw-r--. 1 cjb cjb 8578 Apr 13 2015 reference.bib
-rw-rw-r--. 1 cjb cjb 490 Apr 13 2015 SConstruct
-rw-rw-r--. 1 cjb cjb 7700 Apr 13 2015 theory.tex
drwxrwxr-x. 3 cjb cjb 4096 Jul 6 15:05 twolayer2dti
drwxrwxr-x. 2 cjb cjb 4096 Aug 25 2016 twolayer3dtti
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 twolayer3dvti
```

```
[cjb@dell225 lrmode]$ ll
```

```
total 112
```

-rw-rw-r--.	1	cjb	cjb	748	Apr	13	2015	abstract.tex
-rw-rw-r--.	1	cjb	cjb	443	Apr	13	2015	acknowledge.tex
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007.comparison
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007.smth
-rw-rw-r--.	1	cjb	cjb	1616	Apr	13	2015	conclusions.tex
-rw-rw-r--.	1	cjb	cjb	4947	Apr	13	2015	decomposition.tex
-rw-rw-r--.	1	cjb	cjb	14006	Apr	13	2015	examples.tex
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	hessvti
-rw-rw-r--.	1	cjb	cjb	4572	Apr	13	2015	introduction.tex
-rw-rw-r--.	1	cjb	cjb	9755	Apr	13	2015	lowrank.tex
-rw-rw-r--.	1	cjb	cjb	729	Apr	13	2015	paper.tex
-rw-rw-r--.	1	cjb	cjb	8578	Apr	13	2015	reference.bib
-rw-rw-r--.	1	cjb	cjb	490	Apr	13	2015	SConstruct
-rw-rw-r--.	1	cjb	cjb	7700	Apr	13	2015	theory.tex
drwxrwxr-x.	3	cjb	cjb	4096	Jul	6	15:05	twolayer2dti
drwxrwxr-x.	2	cjb	cjb	4096	Aug	25	2016	twolayer3dtti
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	twolayer3dvti

```
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```

```
total 112
```

-rw-rw-r--.	1	cjb	cjb	748	Apr	13	2015	abstract.tex
-rw-rw-r--.	1	cjb	cjb	443	Apr	13	2015	acknowledge.tex
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007.comparison
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007.smth
-rw-rw-r--.	1	cjb	cjb	1616	Apr	13	2015	conclusions.tex
-rw-rw-r--.	1	cjb	cjb	4947	Apr	13	2015	decomposition.tex
-rw-rw-r--.	1	cjb	cjb	14006	Apr	13	2015	examples.tex
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	hessvti
-rw-rw-r--.	1	cjb	cjb	4572	Apr	13	2015	introduction.tex
-rw-rw-r--.	1	cjb	cjb	9755	Apr	13	2015	lowrank.tex
-rw-rw-r--.	1	cjb	cjb	729	Apr	13	2015	paper.tex
-rw-rw-r--.	1	cjb	cjb	8578	Apr	13	2015	reference.bib
-rw-rw-r--.	1	cjb	cjb	490	Apr	13	2015	SConstruct
-rw-rw-r--.	1	cjb	cjb	7700	Apr	13	2015	theory.tex
drwxrwxr-x.	3	cjb	cjb	4096	Jul	6	15:05	twolayer2dti
drwxrwxr-x.	2	cjb	cjb	4096	Aug	25	2016	twolayer3dtti
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	twolayer3dvti


```
[cjb@dell225 lrmode]$ ll
```

```
total 112
```

-rw-rw-r--.	1	cjb	cjb	748	Apr	13	2015	abstract.tex
-rw-rw-r--.	1	cjb	cjb	443	Apr	13	2015	acknowledge.tex
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007.comparison
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	bptti2007.smth
-rw-rw-r--.	1	cjb	cjb	1616	Apr	13	2015	conclusions.tex
-rw-rw-r--.	1	cjb	cjb	4947	Apr	13	2015	decomposition.tex
-rw-rw-r--.	1	cjb	cjb	14006	Apr	13	2015	examples.tex
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	hessvti
-rw-rw-r--.	1	cjb	cjb	4572	Apr	13	2015	introduction.tex
-rw-rw-r--.	1	cjb	cjb	9755	Apr	13	2015	lowrank.tex
-rw-rw-r--.	1	cjb	cjb	729	Apr	13	2015	paper.tex
-rw-rw-r--.	1	cjb	cjb	8578	Apr	13	2015	reference.bib
-rw-rw-r--.	1	cjb	cjb	490	Apr	13	2015	SConstruct
-rw-rw-r--.	1	cjb	cjb	7700	Apr	13	2015	theory.tex
drwxrwxr-x.	3	cjb	cjb	4096	Jul	6	15:05	twolayer2dti
drwxrwxr-x.	2	cjb	cjb	4096	Aug	25	2016	twolayer3dtti
drwxrwxr-x.	2	cjb	cjb	4096	Apr	14	2015	twolayer3dvti

```
[cjb@dell225 lrmode]$ ll
total 112
-rw-rw-r--. 1 cjb cjb 748 Apr 13 2015 abstract.tex
-rw-rw-r--. 1 cjb cjb 443 Apr 13 2015 acknowledge.tex
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007.comparison
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007.smth
-rw-rw-r--. 1 cjb cjb 1616 Apr 13 2015 conclusions.tex
-rw-rw-r--. 1 cjb cjb 4947 Apr 13 2015 decomposition.tex
-rw-rw-r--. 1 cjb cjb 14006 Apr 13 2015 examples.tex
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 hessvti
-rw-rw-r--. 1 cjb cjb 4572 Apr 13 2015 introduction.tex
-rw-rw-r--. 1 cjb cjb 9755 Apr 13 2015 lowrank.tex
-rw-rw-r--. 1 cjb cjb 729 Apr 13 2015 paper.tex
-rw-rw-r--. 1 cjb cjb 8578 Apr 13 2015 reference.bib
-rw-rw-r--. 1 cjb cjb 490 Apr 13 2015 SConstruct
-rw-rw-r--. 1 cjb cjb 7700 Apr 13 2015 theory.tex
drwxrwxr-x. 3 cjb cjb 4096 Jul 6 15:05 twolayer2dti
drwxrwxr-x. 2 cjb cjb 4096 Aug 25 2016 twolayer3dtti
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 twolayer3dvti
```

```
\published{Geophysics, 79, no. 4, C97-C110, (2014)}

\newcommand{\rs}[1]{\mathstrut\mbox{\scriptsize\rm #1}}
\newcommand{\rr}[1]{\mbox{\rm #1}}

\title{Fast algorithms for elastic-wave-mode separation and vector
decomposition using low-rank approximation for anisotropic media}

\lefthead{Cheng \& Fomel}
\righthead{Anisotropic wave mode separation}
\footer{TCCS-7}

\renewcommand{\thefootnote}{\fnsymbol{footnote}}

\author{Jiubing Cheng, Tongji University, and Sergey Fomel, Bureau of
Economic Geology, The University of Texas at Austin}

\maketitle

\input{abstract}
\input{introduction}
\input{theory}
\input{lowrank}
\input{examples}
\input{conclusions}
\input{acknowledge}

\blfootrule
\bibliographystyle{seg}
\bibliography{reference}
```

```
[cjb@dell225 lrmode]$ ll
total 112
-rw-rw-r--. 1 cjb cjb   748 Apr 13  2015 abstract.tex
-rw-rw-r--. 1 cjb cjb   443 Apr 13  2015 acknowledge.tex
drwxrwxr-x. 2 cjb cjb  4096 Apr 14  2015 bptti2007
drwxrwxr-x. 2 cjb cjb  4096 Apr 14  2015 bptti2007.comparison
drwxrwxr-x. 2 cjb cjb  4096 Apr 14  2015 bptti2007.smth
-rw-rw-r--. 1 cjb cjb  1616 Apr 13  2015 conclusions.tex
-rw-rw-r--. 1 cjb cjb  4947 Apr 13  2015 decomposition.tex
-rw-rw-r--. 1 cjb cjb 14006 Apr 13  2015 examples.tex
drwxrwxr-x. 2 cjb cjb  4096 Apr 14  2015 hessvti
-rw-rw-r--. 1 cjb cjb  4572 Apr 13  2015 introduction.tex
-rw-rw-r--. 1 cjb cjb  9755 Apr 13  2015 lowrank.tex
-rw-rw-r--. 1 cjb cjb   729 Apr 13  2015 paper.tex
-rw-rw-r--. 1 cjb cjb  8578 Apr 13  2015 reference.bib
-rw-rw-r--. 1 cjb cjb   490 Apr 13  2015 SConstruct
-rw-rw-r--. 1 cjb cjb  7700 Apr 13  2015 theory.tex
drwxrwxr-x. 3 cjb cjb  4096 Jul  6 15:05 twolayer2dti
drwxrwxr-x. 2 cjb cjb  4096 Aug 25  2016 twolayer3dti
drwxrwxr-x. 2 cjb cjb  4096 Apr 14  2015 twolayer3dvti
```

Vim SConstruct

```
from rsf.tex import *

End(use='amsmath,listings',
    color='vp-hess epsilon-hess delta-hess Polxp Polzp Errpolxp
Errpolzp Decompxp Decompzp Decompxzp Errdecxp Errdeczp Errdecxp vp0
epsi del the Errpolxp1 Errpolzp1 Errpolxp2 Errpolzp2 Errdecxp1
Errdeczp1 Errdecxpzp1 Errdecxp2 Errdeczp2 Errdecxp2 Polxp1 Polzp1
Polxp2 Polzp2 Decompxp1 Decompzp1 Decompxzp1 Decompxp2 Decompzp2
Decompxzp2',
    hires='Elasticx Elasticz ElasticSepP ElasticSepSV ElasticPx
ElasticPz ElasticSVx ElasticSVz')
```


(1) SConstruct

Some rules:

If (paper name is “paper.tex”)

```
from rsf.tex import *
```

```
End(use='listings')
```

Default is SEP report, change by lclass

else (“texname.tex”)

```
from rsf.tex import *
```

```
Paper('texname',lclass='geophysics', options='manuscript',use='listings')
```

```
End()
```

Change to Geophysics peer-review mode

Commonly-used paper class

`Paper('texname',lclass='geophysics', options='manuscript',use='listings')`

- | | |
|----------------------------|--|
| 1) SEP report | no need lclass and options |
| 2) Geophysics | <code>lclass='geophysics', options='manuscript'</code> |
| 3) Geophysical Prospecting | <code>lclass='geophysics', options='manuscript,a4paper'</code> |
| 4) SEG abstract | <code>lclass='segabs'</code> |
| 5) EAGE abstract | <code>lclass='name', options='11pt'</code> |

Need edit `name.cls`

See template “`texmf/tex/latex/cwp/adam2009.cls`”

Revised mode:

`options='manuscript, revised'`

(2) texname.tex (for Geophysics paper)

`\title{paper title}`

`\address{\footnotemark[1] address1 \footnotemark[2] address2
\footnotemark[3] address3}`

`\author{Name1\footnotemark[1], Name2\footnotemark[2], and
Name3\footnotemark[3]}`

`\footer{GEO-2015-XXXX}`

`\lefthead{Surname1 etc.}`

`\righthead{short title}`

`\maketitle`

`\begin{abstract}`

Write paper abstract here ...

`\end{abstract}`

(2) texname.tex (for Geophysics paper)

```
\section{section name, e.g., Introduction}
```

The paper starts from old idea \cite[]{\refname1}. \cite{\refname2} also improve it. ...

```
\section{section name, e.g., Theory}
\subsection{subsection name}
```

The theory is shown as follows ...

```
\begin{equation}
\label{eq:eq1}
\mathbf{C} = \frac{\mathbf{A}}{b} \;,
\end{equation}
```

Refer to equation~\ref{eq:eq1}.

(2) texname.tex (for Geophysics paper)

`\section{section name, e.g., Synthetic examples}`

The paper has several synthetic tests...

`\inputdir{example#1 folder name}`

`\multiplot{2}{fig1,fig2}{width=0.5\textwidth}{figure1 name`

(a)

and figure2 name (b).}

One can also refer to different figures, e.g.,

Figure~`\ref{fig:fig1,fig2}`a ...

`\section{section name, e.g., Field data tests}`

The method is also used to deal with field data

(Figure~`\ref{fig:fig3}`).

`\inputdir{example#2 folder name}`

`\plot{fig3}{width=0.75\textwidth}{figure3 name.}`

(2) texname.tex (for Geophysics paper)

`\section{Conclusion}`

Write conclusion here...

`\section{Acknowledgments}`

Should thank anyone for useful help...

`\appendix`

`\section{Appendix: name}`

Write the content of appendix here...

`\bibliographystyle{seg}`

`\bibliography{SEG,bibname}`

Annotated paper

Make revision available:

Use `\new{new contents}` and `\old{old contents}` to indicate “**revised contents**” and “**replaced contents**” corresponding to `SConstruct[1]` “options=**revised**”

Tricks:

Equations, citation commands, etc don't work inside `\old`.

1) Enclose citations in `\mbox`:

Instead of `\old{wrong citation \cite{wrong}}`, use `\old{wrong citation \mbox{\cite{wrong}}}`.

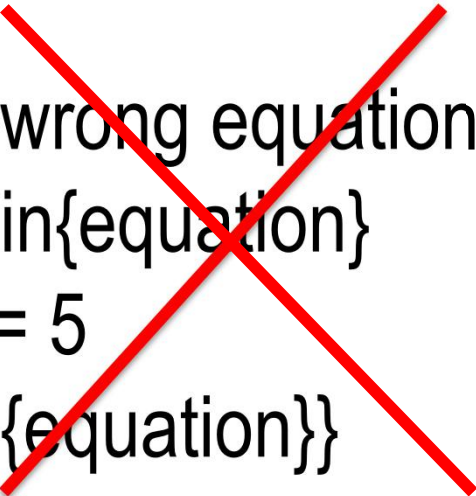
Annotated paper

2) Enclose equations in `\parbox` or `minipage`

```
\old{wrong equation \\  
\begin{minipage}{\textwidth}  
\begin{equation}  
2*2 = 5  
\end{equation}  
\end{minipage}}
```

or

```
\old{wrong equation \\  
\parbox{\textwidth}{  
\begin{equation}  
2*2 = 5  
\end{equation}  
}}
```



```
\old{wrong equation  
\begin{equation}  
2*2 = 5  
\end{equation}}
```

(3) bibname.bib

```
@Article{Abma05,  
  author =      {R[] Abma and N[] Kabir},  
  title =       {Comparisons of interpolation methods},  
  journal =     {The Leading Edge},  
  year =        2005,  
  volume =      24,  
  pages =       {984-989}  
}  
  
@Article{Naghizadeh09,  
  author =      {M[ostafa] Naghizadeh and M[auricio] D[] Sacchi},  
  title =       {f-x adaptive seismic-trace interpolation},  
  journal =     {Geophysics},  
  year =        2009,  
  volume =      74,  
  pages =       {V9-V16}  
}
```

(3) bibname.bib

```
@book{Claerbout92,  
  author =    {J[on] F[] Claerbout},  
  publisher = {Blackwell Scientific Publications},  
  title =     {{Earth Soundings Analysis: Processing Versus Inversion}},  
  year =      {1992}  
}  
  
@inproceedings{Curry04,  
  author =    {W[illiam] Curry},  
  title =     {Interpolation with multi-shifted-scale prediction-error filters},  
  booktitle = {74th Annual International Meeting},  
  year =      {2004},  
  publisher = {SEG, Expanded Abstracts},  
  pages =     {2005-2008}  
}
```

Check “texmf/bibtex/bib/seg/SEG.bib” before you start to type the references.



Agenda

- Motivations
- **How to use SEGTeX**
 - Requirements
 - Implement steps
 - Rules
 - **Some tips**
- An Example in RSFSRC/book/tutorial/authors

Some tips

1) Label parameter:

<http://www.reproducibility.org/rsflog/index.php?/archives/159-How-do-I-change-fonts-in-vplot-graphics.html>

<http://www.reproducibility.org/rsflog/index.php?/archives/177-A-journal-requires-a-particular-font-e.g.-Arial-or-Helvetica-in-figure-labels.-How-do-I-achieve-that.html>

2) Figure color:

<http://www.reproducibility.org/rsflog/index.php?/archives/14-Color-schemes.html>

<http://www.reproducibility.org/rsflog/index.php?/archives/388-Light-Bartlein-color-palette.html>

<http://www.reproducibility.org/rsflog/index.php?/archives/330-Color-palettes.html>

<http://www.reproducibility.org/rsflog/index.php?/archives/355-Cube-helix-color-palette.html>

Some tips

3) Insert hand drawing:

(a) XFig

(b) MS-PowerPoint -> $\left\{ \begin{array}{l} \text{Adobe Illustrator -> EPS/PDF file} \\ \text{Adobe Acrobat Professional -> EPS/PDF file} \end{array} \right.$

4) Control figure color and resolution:

```
Paper('name',lclass='geophysics', options='manuscript',  
      use='listings', hires='fig1 fig2 fig3', color='fig4 fig5 fig6')
```

5) Insert only grey figures in LaTeX (SConstruct [1]):

```
from rsf.tex import *  
import os  
os.environ['PSTEXPENOPTS'] = 'color=n'
```

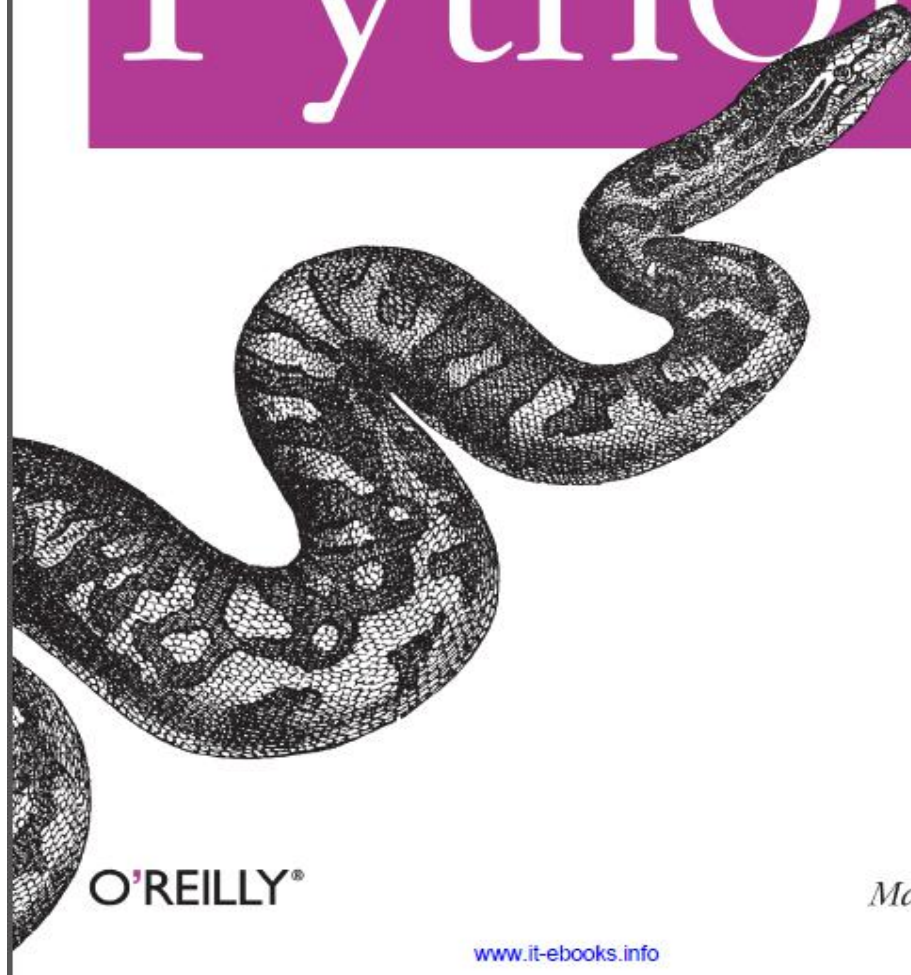
```
End(use='amsmath,hyperref',options='manuscript')
```

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- 6 [Madagascar Datasets](#)
- 7 [ICP-Ecopetrol](#)
- 8 [Jilin University](#)
- 9 [Madagascar Documentation](#)
- 10 [Politecnico di Milano](#)



Madagascar Documentation [↗](#)

- [Madagascar tutorial: Field data processing](#) [↗](#) by *Maurice the Aye-Aye*
- [Seismic Imaging Tutorial: "exploding reflector" modeling/migration](#) [↗](#) by *Paul Sava*
- [A brief introduction to Madagascar](#) [↗](#) by *Jeff Godwin*
- [Madagascar Programming Reference Manual](#) [↗](#) by *Mohammad Akbar Zuberi, Tariq Alkhalifah, and Christos Saragoitis*
- [Madagascar tutorial](#) [↗](#) by *Maurice the Aye-Aye*
- [Guide to Madagascar programs](#) [↗](#) by *Sergey Fomel*
- [Revisiting SEP tour with RSF and SCons](#) [↗](#) by *Sergey Fomel*
- [Guide to RSF API](#) [↗](#) by *Sergey Fomel*
- [Guide to programming using RSF](#) [↗](#) by *Paul Sava*
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- [Seismic Imaging Tutorial: "exploding reflector" modeling/migration](#) by *Paul Sava*
- [A brief introduction to Madagascar](#) by *Jeff Godwin*
- [Madagascar Programming Reference Manual](#) by *Mohammad Akbar Zuberi, Tariq Alkhalifah, and Christos Saragoitis*
- [Madagascar tutorial](#) by *Maurice the Aye-Aye*
- [Guide to Madagascar programs](#) by *Sergey Fomel*
- [Revisiting SEP tour with RSF and SCons](#) by *Sergey Fomel*
- [Guide to RSF API](#) by *Sergey Fomel*
- [Guide to programming using RSF](#) by *Paul Sava*
- [Reproducible computational experiments using SCons](#) by *Sergey Fomel and Gilles Hennenfent*

Texas Consortium for Computational Seismology

- [Diffraction imaging and time-migration velocity analysis using oriented velocity continuation](#) by *Luke Decker, Dmitrii Merzlikin, and Sergey Fomel*, **Geophysics**, 82, U25-U35, (2017)
- [Analytical path-summation imaging of seismic diffractions](#) by *Dmitrii Merzlikin and Sergey Fomel*, **Geophysics**, 82, S51-S59, (2017)
- [3D generalized nonhyperbolic moveout approximation](#) by *Yanadet Sripanich, Sergey Fomel, Alexey Stovas, and Qi Hao*, **Geophysics**, 82, C49-C59, (2017)
- [Elastic wave-vector decomposition in heterogeneous anisotropic media](#) by *Yanadet Sripanich, Sergey Fomel, Junzhe Sun, and Jiubing Cheng*, **Geophysical Prospecting**, doi 10.1111/1365-2478.12482, (2016)
- [Theory of interval traveltimes parameter estimation in layered anisotropic media](#) by *Yanadet Sripanich and Sergey Fomel*, **Geophysics**, 81, C253-C263, (2016)
- [Lowrank one-step wave extrapolation for reverse-time migration](#) by *Junzhe Sun, Sergey Fomel, and Lexing Ying*, **Geophysics**, 81, S39-S54, (2016)
- [Double sparsity dictionary for seismic noise attenuation](#) by *Yangkang Chen, Jianwei Ma, and Sergey Fomel*, **Geophysics**, 81, V17-V30, (2016)
- [Seismic data interpolation using nonlinear shaping regularization](#) by *Yangkang Chen, Lele Zhang, and Le-wei Mo*, **Journal of Seismic Exploration**, 24, 327-342, (2015)
- [Ground-roll noise attenuation using a simple and effective approach based on local band limited orthogonalization](#) by *Yangkang Chen, Shebao Jiao, Jianwei Ma, Hanming Chen, Yatong Zhou, and Shuwei Gan*, **IEEE Geoscience and Earth Engineering Letters**, 12, 2316-2320, (2015)
- [Random noise attenuation by a selective hybrid approach using f-x empirical mode decomposition](#) by *Yangkang Chen, Shuwei Gan, Tingting Liu, Jiang Yuan, Yizhuo Zhang, and Zhaoyu Jin*, **Journal of Geophysics and Engineering**, 12, 2316-2320, (2015)
- [Deblending using a space-varying median filter](#) by *Yangkang Chen*, **Exploration Geophysics**, doi 10.1071/EG14051
- [On anelliptic approximations for qP velocities in TI and orthorhombic media](#) by *Yanadet Sripanich and Sergey Fomel*, **Geophysics**, 80, C89-C105, (2015)
- [Iterative deblending with multiple constraints based on shaping regularization](#) by *Yangkang Chen*, **IEEE Geoscience and Remote Sensing Letters**, doi 10.1109/LGRS.2015.2463815
- [Velocity analysis using similarity-weighted semblance](#) by *Yangkang Chen, Tingting Liu, and Xiaohong Chen*, **Geophysics**, 80, A75-A82, (2015)
- [Structure-constrained relative acoustic impedance using stratigraphic coordinates](#) by *Parvaneh Karimi*, **Geophysics**, 80, A63-A67, (2015)
- [A fast algorithm for 3D azimuthally anisotropic velocity scan](#) by *Jingwei Hu, Sergey Fomel, and Lexing Ying*, **Geophysical Prospecting**, 63, 368-377, (2015)
- [Stratigraphic coordinates, a coordinate system tailored to seismic interpretation](#) by *Parvaneh Karimi and Sergey Fomel*, **Geophysical Prospecting**, v. 63, 1246-1255, (2015)
- [Carbonate reservoir characterization using seismic diffraction imaging](#) by *Luke Decker, Xavier Janson, and Sergey Fomel*, **Interpretation**, 3, SF21-SF30, (2015)
- [Random noise attenuation using local signal-and-noise orthogonalization](#) by *Yangkang Chen and Sergey Fomel*, **Geophysics**, 80, WD1-WD9, (2015)
- [Time-frequency analysis of seismic data using synchrosqueezing wavelet transform](#) by *Yangkang Chen, Tingting Liu, Xiaohong Chen, Jingye Li, and Erying Wang*, **Journal of Seismic Exploration**, 23, 303-312, (2014)
- [Deblending using normal moveout and median filtering in common-midpoint gathers](#) by *Yangkang Chen, Jiang Yuan, Zhaoyu Jin, Keling Chen, and Lele Zhang*, **Journal of Geophysics and Engineering**, 11, 045012, (2014)
- [A robust approach to time-to-depth conversion and interval velocity estimation from time migration in the presence of lateral velocity variations](#) by *Siwei Li and Sergey Fomel*, **Geophysical Prospecting**, 63, 315-337, (2015)
- [Iterative deblending of simultaneous-source seismic data using seislet-domain shaping regularization](#) by *Yangkang Chen, Sergey Fomel, and Jingwei Hu*, **Geophysics**, 79, V179-V189, (2014)
- [Lowrank seismic wave extrapolation on a staggered grid](#) by *Gang Fang, Sergey Fomel, Qizhen Du, and Jingwei Hu*, **Geophysics**, 79, T157-T168, (2014)
- [Random noise attenuation by f-x empirical mode decomposition predictive filtering](#) by *Yangkang Chen and Jitao Ma*, **Geophysics**, 79, V81-V91, (2014)
- [Selecting an optimal aperture in Kirchhoff migration using dip-angle images](#) by *Alexander Klokov and Sergey Fomel*, **Geophysics**, 78, S243-S254, (2013)
- [Local skewness attribute as a seismic phase detector](#) by *Sergey Fomel and Mirko van der Baan*, **Interpretation**, 2, SA49-SA56, (2014)
- [Structural uncertainty of time-migrated seismic images](#) by *Sergey Fomel and Evgeny Landa*, **Journal of Applied Geophysics**, 101, 27-30, (2014)

Useful examples in “RSFSRC/book”

```
[cjb@dell225 RSFSRC]$ ls
```

admin

api

AUTHORS.txt

book

build

CITATION.txt

config.log

config.py

config.pyc

config.py.download.version

config.py.from.99.225.mada

configure

COPYING.txt

env.csh

env.sh

framework

include

INSTALL.txt

lib

Makefile

Makefile.in

NEWS.txt

pens

plot

README.txt

scons

SConstruct

su

system

TODO.txt

trip

user

VERSION.txt

```
[cjb@dell225 book]$ ls
```

bei

data

geo391

icp

Recipes

slim

trip

chen

gallery

geostats

jlu

rsf

swag

tutorial

cup

gee

gpgn658

milano

SConstruct

tccs

uwa

cwp

geo384w

hansung

osu

sep

tongji

xjtu

Useful examples in “RSFSRC/book”

```
[cjb@dell225 book]$ ls
bei      data      geo391    icp       Recipes  slim      trip
chen     gallery   geostats  jlu       rsf       swag      tutorial
cup      gee       gp gn658  milano   SConstruct tccs      uwa
cwp      geo384w   hansung   osu       sep       tongji    xjtu
```

```
/home/cjb/RSFSRC/book/tutorial/authors
```

```
[cjb@dell225 authors]$ ls
cwp      geophys   paper.log  paper.tex  slides
data     handout   paper.ltx  README     thesis
demobib.bib intro.tex  paper.out  SConstruct
eage     paper.aux _paper.pdf seg
```

Agenda



- Motivations
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- An Example in **RSFSRC/book/tutorial/authors**

An Example in

RSFSRC/book/tutorial/authors

```
/home/cjb/RSFSRC/book/tutorial/authors
```

```
[cjb@dell225 authors]$ ls
```

cwp	geophys	paper.log	paper.tex	slides
data	handout	paper.ltx	README	thesis
demobib.bib	intro.tex	paper.out	SConstruct	
eage	paper.aux	_paper.pdf	seg	

Starting from scratch is a bad idea!

- 1) mkdir project_name
(e.g., `mkdir mytest`)
- 2) `cd mytest`
- 3) cp tex, bib, and Sconstruct[1] ./
(e.g., `cp ~/RSFSRC/book/tutorial/authors/geophys/*.tex ./`)
(e.g., `cp ~/RSFSRC/book/tutorial/authors/*.bib ./`)
(e.g., `cp ~/RSFSRC/book/tutorial/authors/geophys/Sconstruct ./`)
- 4) Try to produce the paper using “scons”

`SConstruct <==> scons`

`Makefile <==> make`

Sconstruct

```
from rsf.tex import *

# These arguments build the actual Geophysics paper.
Paper('geophys',
      lclass='geophysics',
      options='twocolumn,twoside',
      use='times,natbib,amsmath,graphicx,color,amssymb,
amsbsy,lineno,ulem,setspace')

# These arguments build the manuscript to send for review.
#Paper('geophys',
#      lclass='geophysics',
#      options='manuscript',
#      use='times,natbib,amsmath,graphicx,color,amssymb,
amsbsy,lineno,ulem,se#tspace,rotating',
#      include=r'''
#      \linenumbers*[1]
#      '''
#      )

End(use='color')
```



```
[cjb@dell225 geophys]$ scons
scons: Reading SConscript files ...
Xlib: extension "RANDR" missing on display "localhost:11.0".
scons: done reading SConscript files.

scons: warning: Support for pre-2.7.0 Python version (2.6.6) is deprecated.
    If this will cause hardship, contact scons-dev@scons.org
File "/home/cjb/RSF/bin/scons", line 199, in <module>
scons: Building targets ...
dummy(["dummy.tex"], [])
latify(["geophys.ltx"], ["geophys.tex"])
scons: *** [geophys.aux] Implicit dependency `data/Fig/noise.pdf' not found, needed by target `geophys.pdf'.
scons: building terminated because of errors.
```



scons -c

- 1) mkdir project_name
(e.g., `mkdir mytest`)
- 2) `cd mytest`
- 3) cp tex, bib, and Sconstruct[1] ./
(e.g., `cp ~/RSFSRC/book/tutorial/authors/geophys/*.tex ./`)
(e.g., `cp ~/RSFSRC/book/tutorial/authors/*.bib ./`)
(e.g., `cp ~/RSFSRC/book/tutorial/authors/geophys/Sconstruct ./`)
- 4) mkdir example_name
(e.g., `mkdir example1`)
- 5) `cd example1`
- 6) cp existed_example ./
(e.g., `cp ~/RSFSRC/book/tutorial/authors/data/* ./`)

```
/home/cjb/RSFSRC/book/tutorial/authors/geophys/example
[cjb@dell225 example]$ ls -l
total 4
-rw-rw-r--. 1 cjb cjb 417 Jul  7 17:19 SConstruct
```

7) Run the program or example using "scons"

scons

or

scons -c

scons lock

```
/home/cjb/RSFSRC/book/tutorial/authors/geophys/example
[cjb@dell225 example]$ ls -l
total 28
drwxrwxr-x. 2 cjb cjb 4096 Jul  7 17:19 Fig
-rw-rw-r--. 1 cjb cjb  923 Jul  7 17:19 fourier-imag.rsfs
-rw-rw-r--. 1 cjb cjb  923 Jul  7 17:19 fourier-real.rsfs
-rw-rw-r--. 1 cjb cjb  755 Jul  7 17:19 fourier.rsfs
-rw-rw-r--. 1 cjb cjb  491 Jul  7 17:19 noise.rsfs
-rw-rw-r--. 1 cjb cjb  417 Jul  7 17:19 SConstruct
-rw-rw-r--. 1 cjb cjb 1106 Jul  7 17:19 spectra.rsfs
```

ls -l Fig

```
[cjb@dell225 example]$ ls -l Fig/
total 8
-rw-rw-r--. 1 cjb cjb 1570 Jul  7 17:25 noise.vpl
-rw-rw-r--. 1 cjb cjb 1150 Jul  7 17:25 spectra.vpl
```

8) Produce a paper using "scons"

vim geophys.tex

```
%\inputdir{data}  
\inputdir{example}
```

Change the folder name

```
\begin{figure}  
  % \includegraphics[width=0.45\textwidth]{data/Fig/noise}  
  \includegraphics[width=0.45\textwidth]{example/Fig/noise}  
  \caption{The signal.}  
  \label{Fig:noise}  
\end{figure}
```

scons

```
/home/cjb/RSFSRC/book/tutorial/authors/geophys  
[cjb@dell225 geophys]$ ls -l  
total 136  
-rw-rw-r--. 1 cjb cjb 260 Jul 7 17:36 dummy.tex  
drwxrwxr-x. 3 cjb cjb 4096 Jul 7 17:25 example  
-rw-rw-r--. 1 cjb cjb 4113 Jul 7 17:36 example.html  
-rw-rw-r--. 1 cjb cjb 1463 Jul 7 17:36 geophys.aux  
-rw-rw-r--. 1 cjb cjb 61 Jul 7 17:36 geophys.bbl  
-rw-rw-r--. 1 cjb cjb 1255 Jul 7 17:36 geophys.blg  
-rw-rw-r--. 1 cjb cjb 15210 Jul 7 17:36 geophys.log  
-rw-rw-r--. 1 cjb cjb 6260 Jul 7 17:36 geophys.ltx  
-rw-rw-r--. 1 cjb cjb 72812 Jul 7 17:36 geophys.pdf  
-rw-rw-r--. 1 cjb cjb 5907 Jul 7 17:30 geophys.tex  
-rw-rw-r--. 1 cjb cjb 539 Apr 13 2015 SConstruct
```

9) Display the paper using "scons"

gv geophys.pdf

or

evince geophys.pdf

Why no reference?



INTRODUCTION

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec lacus urna, porta nec facilis eget, ultricies non purus. Donec dui leo, vestibulum ut rutrum in, fringilla sit amet dui. Sed cursus, nunc ac congue varius, ante nisi commodo velit, ut auctor lorem magna nec neque. Vivamus et tempor augue. Sed vulputate congue nulla, non feugiat dolor auctor a. Etiam lectus diam, fringilla at adipiscing non, blandit sit amet nunc. Donec tincidunt, erat id molestie tincidunt, libero ligula facilis tellus, ac cursus justo nulla sed magna. Aenean arcu mi, fermentum eu mattis ut, scelerisque sit amet sem. Cras vitae dictum felis. Ut ut ante fermentum metus posuere consectetur at sed ligula. Maecenas eget ante et lorem dignissim pretium. Curabitur quam sem, malesuada a porta quis, rhoncus ut dui. Ut malesuada sapien in lectus lobortis molestie. Sed non tellus tincidunt ligula congue convallis et auctor dolor.

THEORY

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DEMONSTRATION

Here's a short demo of how to use some common features inside of the provided `lATEX` classes.

Equations:

$$\nabla^2 u - \alpha \frac{\partial u}{\partial t} = 0 \quad (1)$$

Here is how we use equations: 1. Here is how we can make citations (???). Or we can cite inline as in 2.

We can also make figures using our Madagascar plots. There are two ways to do so, 1 - using built-in macros and 2 - using the default `lATEX` macros.

The first way:

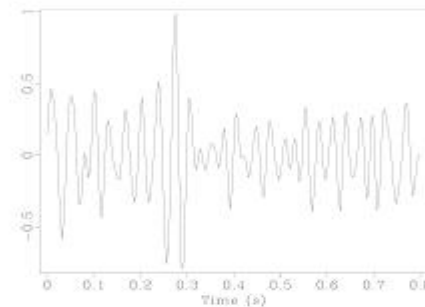


Figure 1: A plot of our signal.

Or we could use `includegraphics` as usual:

To reference figures we use Figure 3a, or we can use, Figures 3a- 3b. Note, the example here has had numbering because we plot the same figure multiple times which confuses `lATEX`. No normal paper would plot the same figure multiple times, and numbering would be correct.

We can also use any other `lATEX` commands as usual. You just have to include the correct packages in your `SCostruct`.

RESULTS

Sed vitae elit neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Phasellus rhoncus, augue in egestas egestas, elit neque tempor diam, eget vulputate nisi odio sit amet neque. Vestibulum ante ipsum primis in faucibus

Assignment

10) Complete the reference using

```
cp ~/RSFSRC/book/tutorial/authors/*.bib ./
scons -c
```

11) Produce the paper again

12) Extend or change the example, change to “**seg**” for SEG abstract

Thanks for you attention