

The Crux of (first) Paper Writing

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Extracting Shear Wave Polarizations From Different Source Orientations: Synthetic Modelling

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Shear wave splitting, diagnostic of some form of seismic anisotropy, has been identified in the past, principally by examining polarization diagrams and **by** rotating the axes of recordings to separate the shear wave polarizations. We introduce a new technique for identifying polarizations of shear waves when the data has been recorded with more than one source orientation. The technique, suitable for vertical seismic profiles (**VSPs**) or reflection data, averages over an entire shear wavetrain, eliminating source related effects while retaining the anisotropy related polarizations. In shear wave reflection experiments and shear wave **VSPs** the distribution of displacement directions depends on the elastic properties of the medium (anisotropy), the source orientation, and the effects of scattering. We linearly combine seismograms from different source polarizations in order to

Aspects to be covered ...

- The initiation process
- The work flow
 - All sections visited
- Authorship, multi-author
- Writing process
- Reproducibility
- Tools
- Choice of Journal
- Mental health
- Intellectual property



... before starting ...

... you better like writing ... what if you don't?



When to start?

- Now!
- Ideas vs results
- „my research is not worth it“



Paper structure (Draft)

- Title
- Author list
- Abstract
- Introduction
- Methods/Theory
- Observations/Results
- Discussion
- Conclusion
- Acknowledgments
- References
- Figures
- Appendices



(My) Work flow ...

1. **Figures (almost) first!**
(Make them entirely self contained)
Expressive and complete captions
2. Methods, Data, Results
3. Discussion, Conclusions

During all this:

Title, Abstract, References

Sometime:

Introduction

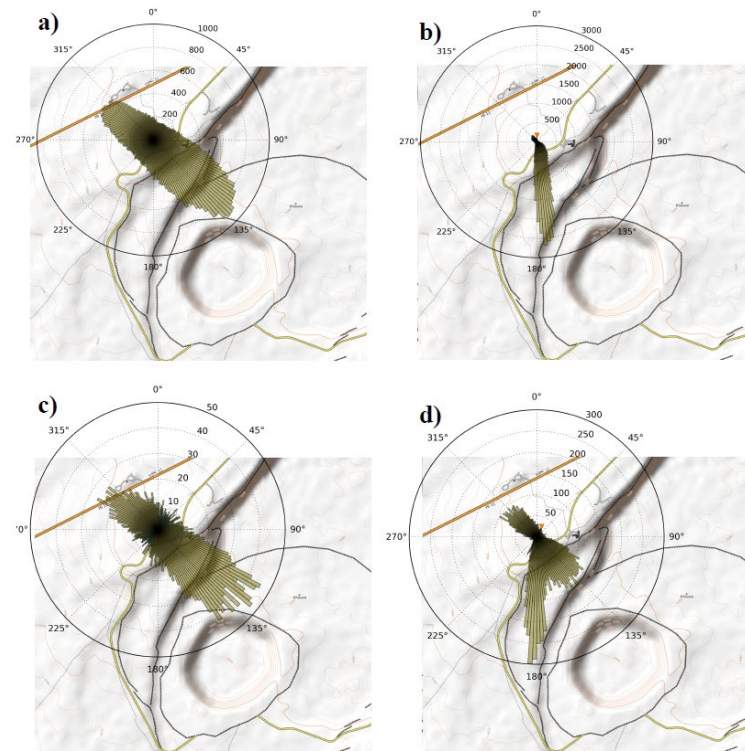


Fig. 2: Backazimuth estimation using vertical rotation rate and transversal acceleration is shown in a) and c) in the frequency range of 1 - 5 Hz (a) and 0.1 - 1 Hz (c), respectively. In b) and d) the estimates of using only the horizontal components are presented using the same frequency bands. While a) & c) represents pure SH-type motion, b) and d) show only SV-type motion. In total roughly 4 hours of data are used which are displayed in Fig. 1.

Somebody else's suggestion

<https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously>

Steps to organizing your manuscript

- 1 Prepare the **figures and tables**.
- 2 Write the **Methods**.
- 3 Write up the **Results**.
- 4 Write the **Discussion**. Finalize the Results and Discussion before writing the introduction. This is because, if the discussion is insufficient, how can you objectively demonstrate the scientific significance of your work in the introduction?
- 5 Write a clear **Conclusion**.
- 6 Write a compelling **introduction**.
- 7 Write the **Abstract**.
- 8 Compose a concise and descriptive **Title**.
- 9 Select **Keywords** for indexing.
- 10 Write the **Acknowledgements**.
- 11 Write up the **References**.

The Work flow ... Title

Reviews of Geophysics

Q

L. Knopoff

First published: November 1964 | <https://doi.org/10.1029/RG002i004p00625> | Cited by: 290



PDF



TOOLS



SHARE

Exercise: Please write down a title of a paper you are about to write!

Abstract

- Really short
- Context
- Innovation
- Result
- Conclusion

Single-component ring lasers have provided high-resolution observations of Earth's rotation rate as well as local rotational ground motions. Here we present the design, construction, and operational aspects of ROMY, a four-component, tetrahedral-shaped ring laser installed at the Geophysical Observatory Fürstenfeldbruck near Munich Germany. Four equilateral, triangular-shaped ring lasers with 12 m side length provide rotational motions that can be combined to construct for the first time the complete vector of Earth's rotation. Combined with a classic broadband seismometer we obtain the most accurate 6 degree-of-freedom ground motion measurement system to date, enabling local and tele-seismic observations as well as the analysis of ocean-generated Love and Rayleigh waves. The specific design and construction details are discussed and the resulting consequences for permanent observations. We show that the geometry and operational parameters allow recovering instantaneous polar motion to within 3 m accuracy. We present seismic observations of local, regional, and global earthquakes as well as seasonal variations of ocean-generated noise.

The Work flow ... Introduction

- The **BIG** picture, **context**, why is this important, motivate the reader!
- References to all previously published work
 - Either cite all
 - Or cite (e.g., Kuepper et al., 1986) review paper
 - Beware of work of potential reviewers (causes most problems!)
- Motivate, excite, maybe show intro graph
- End with „This paper is structured as follows ...“ (i.e., give a roadmap)

The Work flow ... Methods/Theory

- What background is needed to understand the paper?
- Did you develop new methodologies? Then detail!
- Are you using standard methodologies, then refer to appropriate papers

Put nasty details in an appendix! **Readability!**

Suggestions for Figures

"a figure is worth a thousand words."

When presenting your tables and figures, appearances count!

- Avoid overcrowded plots
- Think about appropriate axis label size
- Include clear symbols and data sets that are easy to distinguish
- Throw out everything unnecessary
- Can you condense results?
- Never include long boring tables (e.g., chemical compositions of emulsion systems or lists of species and abundances). You can include them as supplementary material.
- **Captions!** Make Figures understandable just with the caption!

The Work flow ... Observation/Results

- This where you should **excel**
- You re the **expert**, nobody has done this before (you think)
- Provide all detail, make it fully reproducible. If needed put details in an appendix
- Expressive figures, condense results
- Only describe and report, DO NOT JUDGE RESULTS

The Work flow ... Discussion/Conclusions

- Separate or not?
- Here you can express opinions, weight your results, interpret your results
- Put them in context with other people's work
- What are the consequences
- Outlook, what else needs to be done
- ... *goes beyond the scope of this paper ..*

Acknowledgements

- One of the most read parts of a paper ...
- Who reviewed?
- Who was associated to the project, who contributed opinions ...
- NEVER forget to acknowledge funding support (even participation in a meeting funded by X in which you had discussions It s only FAIR)

References

- Omg Often a catastrophe
- Find a good means of organizing your refs (bibtex, etc ...)
- Follow accepted formats ...
- Make sure all info is there (journal, paper, doi, ...)
- Cross-referencing helps and makes consistency easy (e.g. bibtex)

Authorship - Multiauthor

- Does your supervisor want to be first author?
- Who else deserves to be coauthor?

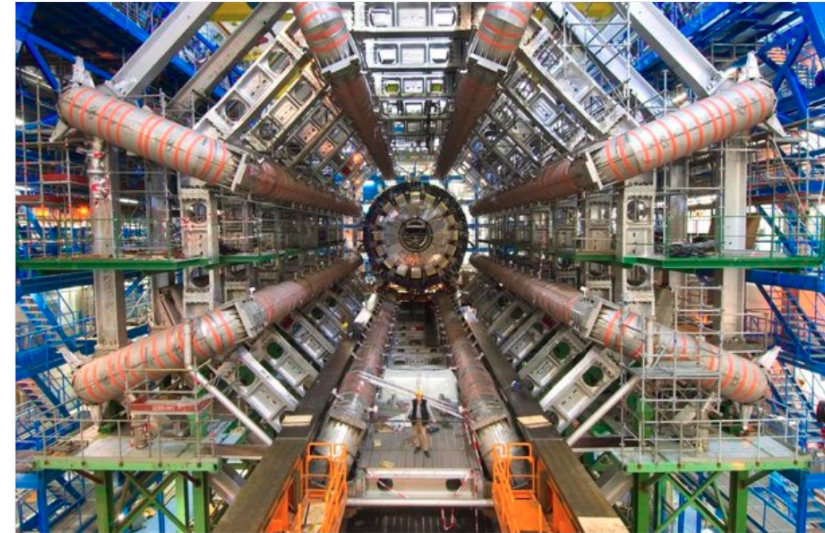


Paper authorship goes hyper

A single field is behind the rise of thousand-author papers

30 January 2018

Smriti Mallapaty



ATLAS Experiment (c) 2007 CERN

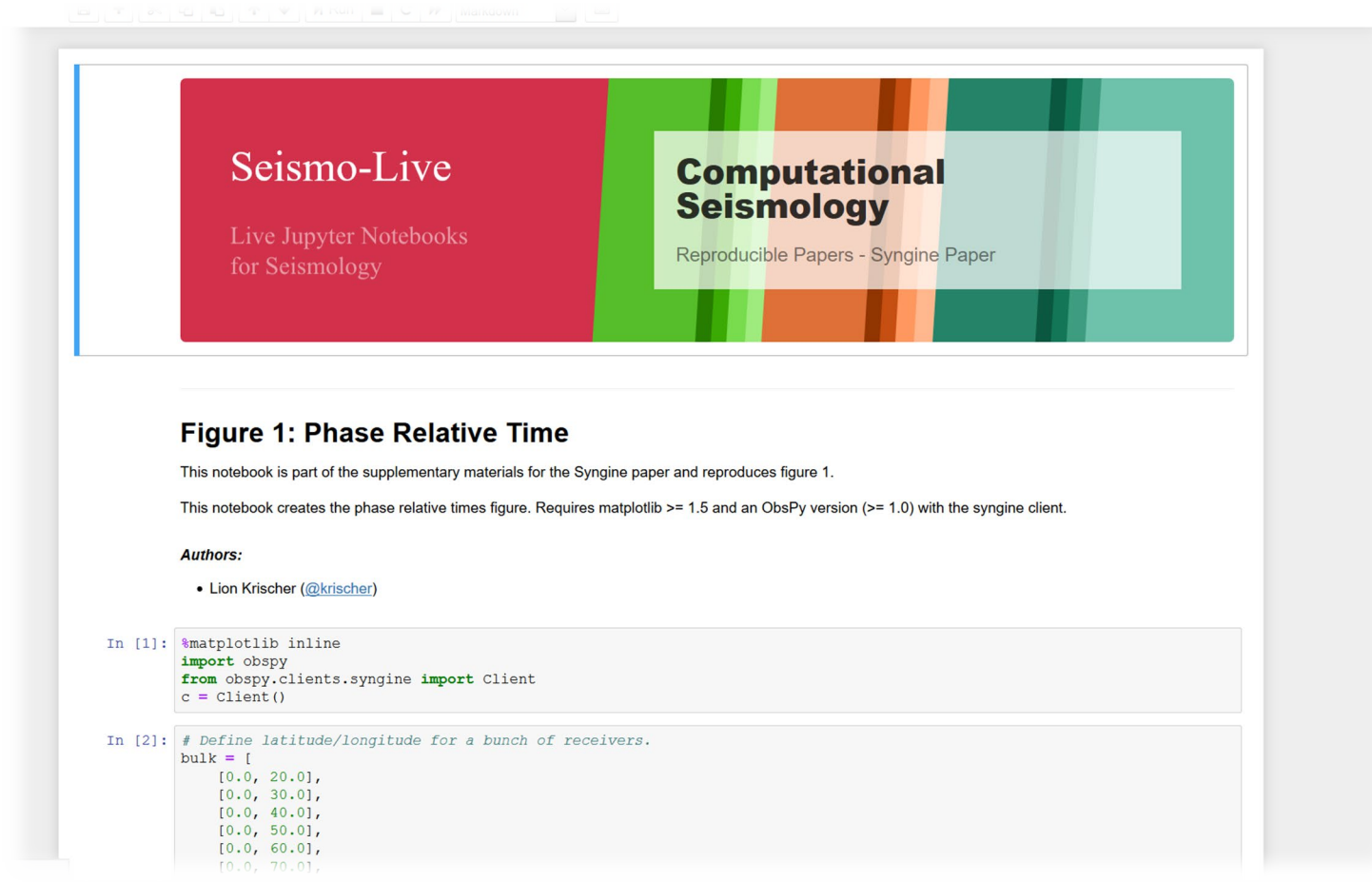
The team operating the ATLAS detector at CERN, Switzerland, authored a 5,000 author paper in 2016.

Writing Process

- Read, read, read
- Copy, copy, copy (style, wording, beauty, grammar, **not content**)
- Put well written papers around you



Reproducibility – www.seismo-live.org



The screenshot shows a Jupyter Notebook interface. At the top, there is a banner for 'Seismo-Live' with the text 'Live Jupyter Notebooks for Seismology' and 'Computational Seismology' with 'Reproducible Papers - Syngine Paper' below it. The notebook content starts with the title 'Figure 1: Phase Relative Time'. Below the title, there is a paragraph stating: 'This notebook is part of the supplementary materials for the Syngine paper and reproduces figure 1. This notebook creates the phase relative times figure. Requires matplotlib >= 1.5 and an ObsPy version (>= 1.0) with the syngine client.' Below this, the 'Authors:' section lists 'Lion Krischer (@krischer)'. The notebook then shows two code cells. The first cell, labeled 'In [1]:', contains the following code:

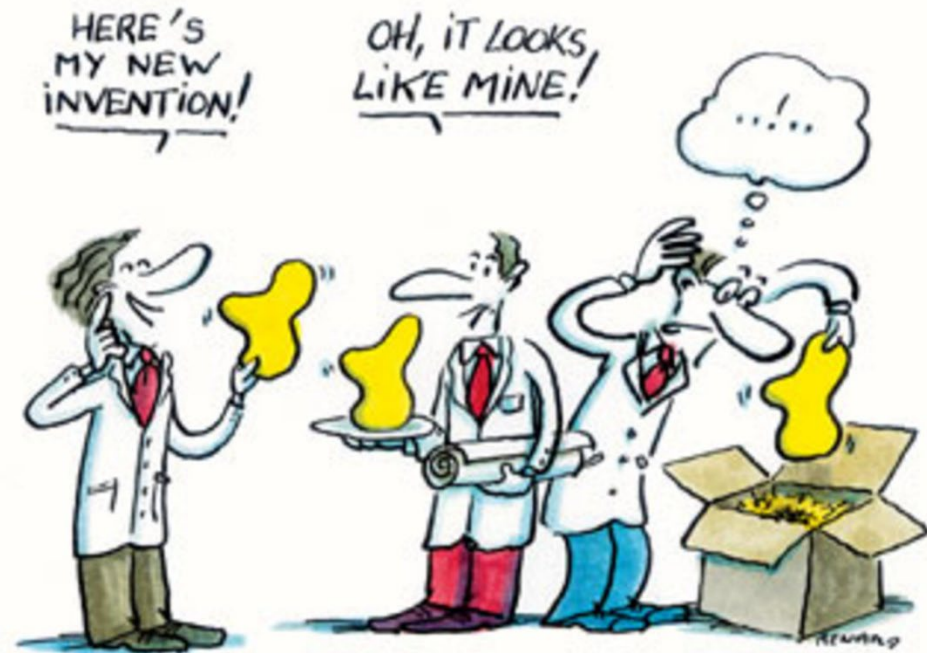
```
%matplotlib inline
import obspy
from obspy.clients.syngine import Client
c = Client()
```

 The second cell, labeled 'In [2]:', contains the following code:

```
# Define latitude/longitude for a bunch of receivers.
bulk = [
    [0.0, 20.0],
    [0.0, 30.0],
    [0.0, 40.0],
    [0.0, 50.0],
    [0.0, 60.0],
    [0.0, 70.0],
```

Intellectual Property

- Did you steal any ideas?
- Conversation during conferences
- Did you once agree to cooperate and publish together?



Mental Health in the Process

- „writer's block“ (it will come!)
- Be patient with yourself (is your supervisor?)
- Treat it as a multi-task adventure
 - References, graphics, grammar (on the sofa while watching ... listening ...)
 - Creative part – take each moment wherever you are, whenever, grab it!
 - Discipline helps, timing, regular, when is your high-time?
- Surprisingly: **It always works out in the end**

Final thoughts

- Think in stories
- Prepare bullet lists before writing
- Think and write in 10-15 line blocks, each containing one idea/concept
- Get inspiration from great papers on
 - How to express things
 - How to make fantastic figures
 - How to condense results
 - How to just plot what is needed
 - How make a great title
 - How to motivate the reader to READ
 - How to ask questions and respond to them
 - etc

Choice of Journal

- Very technical (easier)
- High-profile (Nature, Science, Nature Geo etc)
- Next level down (GRL, PRL ...)
- Publication costs, open access policy counts?

Quantitative Aspects

Length of the manuscript

Again, look at the journal's Guide for Authors, but an ideal length for a manuscript is 25 to 40 pages, double spaced, including essential data only. Here are some general guidelines:

- **Title:** Short and informative
- **Abstract:** 1 paragraph (<250 words)
- **Introduction:** 1.5-2 pages
- **Methods:** 2-3 pages
- **Results:** 6-8 pages
- **Discussion:** 4-6 pages
- **Conclusion:** 1 paragraph
- **Figures:** 6-8 (one per page)
- **Tables:** 1-3 (one per page)
- **References:** 20-50 papers (2-4 pages)