EGU 2013 Short Course:

How to Write (and Publish) a Scientific Paper in Hydrology

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Introduction

presentation is targeted at early stage researchers

aims at helping in developing the *skill* of writing scientific papers

needs practice

needs proper guidance

presentation is based on:

- own experience
- excellent short courses of previous years by:
  - Jeff McDonnel
  - Demetris Koutsoyiannis
  - Günter Blöschl
EGU 2013 Short Course:
‘How to write (and publish) a scientific paper in hydrology’

Why write a paper?

✓ because it is required in the framework of your PhD
✓ because your promotor demands you to
✓ because you believe your research could be of interest to others
✓ because you aim at an academic career

What is important?

- number of papers (per year) you have published
- quality of the journals you publish in
- number of citations for your publications
If you consider to publish, then the following questions should be posed

- How should you write a paper?
- What journal should be chosen?
- How can you get cited?

For whom do I want to bring my message?
If you consider to publish, then the following question should be posed

For whom do I want to bring my message?

1. Define your message
2. Define who would be most interested in this message
3. Search for journals that are read by the target public
4. Rank them according to their impact factor
5. Choose amongst the highest ranked journals the one for which your message best fits the scope of the journal
6. Write your paper
   - considering the background of the journal’s public
   - crystal clear describing the problem and your solution or message
Hydrology journals

- 78 journals listed by ISI in category ‘Water Resources’
- top journals:

<table>
<thead>
<tr>
<th>Journal</th>
<th>ranking</th>
<th>impact factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrology and Earth System Sciences</td>
<td>2</td>
<td>3.148</td>
</tr>
<tr>
<td>Water Resources Research</td>
<td>3</td>
<td>2.957</td>
</tr>
<tr>
<td>Journal of Hydrology</td>
<td>4</td>
<td>2.656</td>
</tr>
<tr>
<td>Hydrological Processes</td>
<td>6</td>
<td>2.488</td>
</tr>
<tr>
<td>Advances in Water Resources</td>
<td>7</td>
<td>2.449</td>
</tr>
<tr>
<td>Journal of Contaminated Hydrology</td>
<td>9</td>
<td>2.324</td>
</tr>
<tr>
<td>Ecohydrology</td>
<td>12</td>
<td>2.133</td>
</tr>
<tr>
<td>Ground Water</td>
<td>19</td>
<td>1.785</td>
</tr>
<tr>
<td>Hydrological Sciences Journal</td>
<td>26</td>
<td>1.541</td>
</tr>
</tbody>
</table>

reflects the average number of citations to recent articles published in the journal.
How to get cited?

- Choose **topic** that is **of much interest** to the community
- Be **amongst the first** on a ‘new’ (not yet hot) topic
- Tell something **useful or new** to the reader
- Choose an **appealing title**
- Write a **review paper**
Guidelines in writing a scientific paper

Paper consists of:

- title
- authors
- abstract
- introduction
- materials/methods/data/model → often separate sections
- results
- discussion → often taken as one section
- conclusion
- acknowledgements
- references
Guidelines in writing a scientific paper

STEP 1. Before starting to write:

precisely define the **message(s)** you want to bring

What have you learned from your research that is of interest to the hydrologic community?

Maybe additional research is needed to make it interesting

*e.g. in order to demonstrate that:*

- **your technique is robust / widely applicable**
- **your model is a worthy alternative for other ones**
- **the results are statistically significant**
- **your application has significant impacts**
- ...
Guidelines in writing a scientific paper

STEP 1. Before starting to write:

- Precisely define the **message(s)** you want to bring.
- Formulate the **science question** to be used in introduction and conclusion.
- Select the **journal**.
Guidelines in writing a scientific paper

STEP 2. Write a preliminary title

- should reflect the **science question**
- use **descriptive** titles: title should give idea of what is covered
- use words that allow for **indexing** the subject
- do **not** make the title **too long**
- revise after writing the entire paper

Many papers are selected for reading based on the title as it appears in reference lists of other papers
Guidelines in writing a scientific paper

**STEP 3. Select authors**

- **first** author: who actually did the work
- **last** author: often supervisor
- **other** co-authors: whomever contributed (ideas, data or actual work)

> when you doubt: be inclusive!
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Guidelines in writing a scientific paper

**STEP 4. Write a preliminary abstract**

- **Miniaturized version** of the paper
  - should identify the key information quickly and accurately

- dense and compact **but easy to read**

- **is self-contained**

- **no duplicated sentences** from the paper

- **does not contain info that does not appear elsewhere** in the paper
Guidelines in writing a scientific paper

STEP 4. Write a preliminary abstract

contains three parts

- **beginning**: statement that frames your work
- **middle**: describes the approach (method of investigation) used and the main results
- **end**: draws the main conclusions

revise after writing the entire paper
Guidelines in writing a scientific paper

STEP 5. Make an outline of the paper

- respect the general structure of a paper (introduction, materials/methods/data, results, discussion, conclusion)
- focus on results and discussion
  - separate sections or jointly presented?
  - structure this/these section(s): what should be presented first?
  - select figures and tables that should be included
Guidelines in writing a scientific paper

STEP 6. Write the introduction

Most difficult part of the paper!

Clearly states the issue dealt with (linked to science question)

Allows readers to understand background of the study

depends on the audience you address!

if reader is a hydrologist then don’t explain basics of hydrological processes!
STEP 6. Write the introduction

Briefly **reviews literature** on the science question

- are there different (contradictory?) findings reported or are all papers stating the same?
- are there different approaches used to address the problem (analysis techniques / models / observation systems / ...)
- indicate gaps in knowledge

Should clearly state the **purpose** of the paper

“The main objective of this paper is ...”
“This paper aims at ...”
Guidelines in writing a scientific paper

STEP 6. Write the introduction

Structure

- Definition of objectives
- How can this problem be fixed?
- Why is this a problem?
- What’s wrong with state-of-the-art?
- current state-of-the-art
Guidelines in writing a scientific paper

STEP 6. Write the introduction

Structure

Part 1: Framing the research question

- Where does your research fit within hydrological sciences?
- Start fairly general and progressively become more specific
  “With the advent of ..., there has been a growing interest in ...”
  “Many studies have focused on ...”
- Make sufficient references to literature, but don’t exaggerate!

what have other researchers concluded on this topic? rather than mention that these researchers were active on this topic.
Guidelines in writing a scientific paper

STEP 6. Write the introduction

Structure

Part 2: Highlight a need

Should be linked to your research question

“These studies have emphasised ..., however, it remains unclear ...”

“Many studies have focused on ...”
Guidelines in writing a scientific paper

STEP 6. Write the introduction

Structure

Part 3: Present your research

- Explicitly state the purpose of your research
  “The primary objective of this paper is ...”
  “In this study we aim at ...”

- Briefly summarise your approach
  “To address this objective, we present an efficient algorithm for ...”
  “This paper presents an extension of the ... model ...”
Guidelines in writing a scientific paper

STEP 6. Write the introduction

Structure

Part 4: Structural clarification

- summarises the structure of the paper to guide the reader
  
  “The remainder of the paper is organised as follows ...”
  “In section 2 the data used in this study is briefly discussed. Section 3 describes the model used ...”

- can be omitted
Guidelines in writing a scientific paper

STEP 7. Write the materials/methods/data/model section

- can be separate sections
- balance between what is and what is not of interest to reader
- be sufficiently specific
  - provide sufficient details
    - e.g. measurement device used, geographical location, basic statistics, mathematical description of techniques used, model layout and description, ...
  - avoid plagiarism
Guidelines in writing a scientific paper

STEP 8. Write the results and discussion sections

- results and discussion can be jointly presented in one section

Results section

- contains **most** of the **figures**
- **state the facts**: what can be learned from the figures?

Discussion section

- **interpret** your findings and **confront** these with literature
- connects the partial findings
- discussion allows for some (clearly stated) speculation
Guidelines in writing a scientific paper

STEP 9. Write the conclusions

- present the **advances in knowledge** through the paper
- should be **correct**: avoid overgeneralisations
- each conclusion should have a **sound basis**
  - cannot contain new material
  - cannot contain conclusions that come from nowhere
- can **highlight** the **importance/significance** of the work
- can contain **criticism** on the work done (e.g. shortcomings)
- can contain recommendations
Guidelines in writing a scientific paper

STEP 10. Carefully go through the manuscript

- revise title if necessary
- revise abstract if necessary
- revise introduction
  - extend with references that are used in discussion section
  - remove excessive text
- revise materials/methods/data/model section such that it provides sufficient information to follow the results and discussion sections
- revise conclusion section if it insufficiently answers the objectives
- check reference list / tables / figures: are all referenced in text?
Guidelines in writing a scientific paper

**STEP 11. Ask your co-authors to read through the manuscript**

two types of questions can be expected

- **clarification is needed**: some parts of the paper are not understood
  
  if they don’t understand, then reviewers will probably also experience problems
  
  **rewrite (part of) manuscript until they understand**

- **methodological problems**
  
  further discussion is needed
  
  methods/model/analysis tools used may have to be revised
  
  **rewrite (part of) manuscript**

Once all problems are solved (iterative process!): paper is ready to be submitted
The review process

Once paper is submitted:

1. **Paper is sent out** by (associate) editor generally to 2-3 reviewers

2. Based on the (anonymous) review comments, editor makes one of the following **decisions**:
   
   a) accept as is  
   b) minor revision 
   c) major revision 
   d) reject

   *(Rare)*

   *(Not often)*

   *(Common)*

   *(Common)*

3. In case of b) or c): **respond to review comments and revise paper**

4. Submit revised paper along with a rebuttal letter

5. **Editor decides**: a), b), c) or d), possibly based on re-review

6. In case accepted: paper gets type set, you have to check the proofs

7. Paper is published in journal (maybe first online)
The review process

How to deal with reviews?

- What type of comments can be made by reviewers?

  1. Clarification, language
     
     explanation is unclear
     
     grammatical errors
     
     ...

  2. Methodological problems
     
     analysis is not adequate
     
     model is not valid
     
     ...

  3. Concerns with respect to the science
     
     relevance of the research is unclear
     
     robustness of technique is questioned
     
     ...
The review process

How to deal with reviews?

- Provide a detailed list of how you addressed each review comment
  list contains:
  (1) the comment of a reviewer (e.g. in italics)
  (2) your response (reply to the comment + how you addressed it
     in the revised version) (e.g. in plain font)

**Recommendation:**
Take all reviewers’ comments seriously even if you disagree

- explain extensively why you disagree (and try to provide prove), but do not argue or doubt the reviewer!
- do not disagree on too many points

- Submit this rebuttal to the editor along with the revision
The review process

How to deal with rejections?

- Try to redo the analyses as suggested by the reviewers
- If necessary extend content by including further research
- Choose a different journal

Submit an **updated** version of the paper!
Chances are that the same reviewers receive this version

- If you are convinced of your research: DON’T GIVE UP!
  some very important papers have been rejected at first... (e.g. Beven and Kirkby, 1979)
- If you are not convinced of your research: try something else!
If your paper gets accepted then

Celbrate!

Be happy!

Enjoy

You’re allowed to be proud!