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Writing scientific papers

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Research from start to finish

- Research design
- Implementation of research
- Publication
 - Manuscript development
 - [Journal selection](#)
 - Response to reviews

Friedland's ideas about ideas

- Research is not about ownership, but about sharing [ideas]
- Don't let fears of having your ideas taken without credit diminish your relationships with collaborators and colleagues

Effective writing skills

1. *Choose* a concise and informative title
 2. *Funnel* from a big picture to the specifics of your project
 3. *Unify* the voice and central goals; map literature review to objectives, and objectives to conclusions.
 4. *Highlight* your most important points; do not bury critical information
 5. *Focus* the reader's attention with a road map and topic sentence; avoid information that dilutes your message
 6. *Give credit* where credit is due
 7. *Rewrite* if conclusions are weak
- *Respond constructively* to review comments
 - Never *plagiarize* in any form or shape

Source: Friedland, et al

A title may be more important than you think

- Present your title in a clear, concise and meaningful manner
- Avoid jargon and overstatement
- Consider the impact of using buzzwords
- Avoid titles that are cute or too informal

Source: Friedland

How short is a title short enough?

- "Investigation of evaporative enrichment in a dynamic chamber using the evaporation flux stable isotope ratios measured by a tunable diode laser"
- "Isotopic enrichment of liquid water during evaporation"

Three common problems in writing significance statement

- Big picture too big
 - CO₂ is the most important greenhouse gas and its increase constitutes a critical change of the earth climate system. A number of networks have been established to monitor the carbon cycle in the environment. Consequently, the accuracy of coordinate rotation is the vital basis of all the estimation and models
- Leap of faith
 - A precise understanding of soil respiration is vital to accurate prediction of ecosystem feedback on the climate system. Weather forecast models have been widely used to predict wind motion associated with cyclonic systems. This study represents the first attempt at using these models to simulate the air flow inside a wheat ecosystem and to assess the impact of air turbulence on soil respiration.
- Intermediate links missing
 - Understanding water budgets of a variety of aquifers has global importance and cannot be undervalued given the enormity of environmental problems related to contamination of aquifers. Our technique has the potential to revolutionize the way that groundwater studies are conducted. It may also greatly affect the rates of species extinction, global warming, and frequency of El Nino events.

Sloppy and informal presentation

- Typographic errors
- Cute font/format
- Font and graphics too small
- Too many significant digits
- Crowded figures
- Fancy color combination
- Sloppy symbol notations
- Too many symbols and abbreviations
- Sophisticated adjectives
- Figure of speech

One fine point: when to use italic/math font?

- Abbreviation in upright roman (IPCC, LAI, NEE, NEP, GPP, VPD)
- Units in upright roman
- Math symbols in italic
- Mathematical functions in upright roman

Paragraphs are building blocks of technical writing

- One idea per paragraph, no more, no less
- Topic sentence
 - Detail 1
 - Detail 2
 - Detail 3
 - .
 - .
 - .
- Concluding sentence: a hypothesis in disguise, a logical deduction, or an inference

[47] Temporal shifts in water use have been extensively studied at the plant scale using water isotope labeling [Dawson *et al.*, 1998]. These shifts are usually associated with the onset of the dry period in environments where wet and dry seasons are present. As the top soil dries, plants become more dependent on deep soil water and groundwater for transpiration [Zencich *et al.*, 2002; Ewe and Sternberg, 2002; Williams and Ehleringer, 2004; Smith *et al.*, 1997; Thorburn *et al.*, 1993]. Figure 8 demonstrates that the phenomena could also occur at the ecosystem scale and in the semihumid southern New England climate where precipitation was evenly distributed throughout the year. In our case, depletion of water in the shallow pool was caused by a lack of rain input, but rather by ET exceeding precipitation in the late growing season (Figure 7). The rapid shift to the deep water pool around DOY 200 can be considered an example of switches in biophysical regulations of ecosystem processes [Baldocchi *et al.*, 2006].

Source: Lee *et al.* 2007 GBC

Citation basics

- Cite only papers that you have actually read
- All citations should be accurate
- Avoid too many references or references that are too vague
- Place references properly in the text
- Cite a paper in context of your results; avoid handwaving reference
- Use neutral or positive tone when citing previous studies

Source: Day

Citation examples

- Bad – Air pollution affects plants in a variety of ways (Black and White 2003; Joe et al. 1994; Smith and Smith 2001; Sun et al. 1999; Pearce and Omer 1999)
- Good – Air pollution affects plants in a variety of ways (e.g., Black and White 2003)

Source: Friedland

Citation examples

- Bad – We have examined a digital method of spread-spectrum modulation for multiple-access satellite communication and for digital mobile radiotechnony (Gusto et al. 2008; Fullingan 1997)
- Good – We have examined a digital method of spread-spectrum modulation for multiple-access satellite communication (Gusto et al. 2008) and for digital mobile radiotechnony (Fullingan 1997)

Source: Day

Bad citation examples

- Our work builds on Smith's elegant contribution
- Smith (2004) did not study the edge effect on evapotranspiration
- Smith (2004) totally overlooked the edge effect on evapotranspiration

Source: Day

More citation problems

- Repeated citations to one or two individuals
- Repeated citations to your own work or your mentor's work
- Inaccurate citations / sloppiness
- Citations too old / too new
- Citation to non peer-reviewed literature ("grey literature")
- Citation to journals in Chinese
- Biased citation to one school of thought
- Few or no citations to people who may review your work
- Citations in Abstract

Citation ethnics

- Proper attribution of credit
- Use of tense: When you state previously published findings, you should use the present tense. Your own present work should be referred to in the past tense.

Source: Day

Use of tense

- According to Black (2003), *S. everycolor* grows best at 37°C. Our results show however, the optimal temperature was around 30°C.
- Table 1 shows *S. everycolor* was most susceptible to agent x at pH 8.2, whereas *S. nocolor* is most susceptible at pH 7.6 (6,9). These values are significantly greater for males than for females of the same age.

Source: Day

Weak conclusions

- Our data show that environmental lapse rate can be modified by slope and aspect.
- Soil moisture is a crucial parameter in controlling the net ecosystem carbon production. Accounting for the moisture effect in our model can change some parts of China from a net source to a net sink and other parts a net sink to a net source
- Our model predictions fail to capture the observed seasonal variations. More research is needed in the future.

How to respond to review comments

- Answer completely – itemize your response; pay special attention to vague, irritating, or negative comment
- Answer politely – disagree with respect; avoid arrogant remarks; identify common ground; answer as if you were personally speaking to the reviewer
- Answer with evidence – explain why you disagree; back up your argument with data or new references

Source: Day

Table II. Some useful phrases to begin your replies to critical comments

We agree with the referee that ____, but...
 The referee is right to point out ____, yet...
 In accordance with the referees' wishes, we have now changed this sentence to ____.
 Although we agree with the referee that...
 It is true that ____, but...
 We acknowledge that our manuscript might have been ____, but...
 We, too, were disappointed by the low response rate.
 We agree that this is an important area that requires further research.
 We support the referee's assertion that ____, although...
 With all due respect to the reviewer, we believe that this point is not correct.

Source: Williams

Response to review of JGR manuscript 2009JG000925 by Wei et al.
 (review query in *italic*, response in *upright Roman*)

Response to associate editor's comment

I found it well written, interesting, and potentially important. I would like to see the authors respond to these concerns, particularly the equation concerns of reviewer 2 and the methodological ones raised. With respect to reviewer 1's concerns about focus, I think the authors could successfully take either tack, but they do need to choose.

We have revised the equations as suggested by reviewer 2. This has resulted in some minor changes in the model output but has not altered the overall conclusion of our study. In response to review 1, we have decided to focus on model-data comparison and sensitivity analysis. Description of the model is now moved to three appendices.

We have added one figure to highlight a key result of this study, that relative humidity exerts a dominant control on the ecosystem ^{18}O - CO_2 exchange (Figure 9). To keep the paper within a reasonable length, we have deleted a few non-essential figures (original Figures 10-12).

Response to review 1

1) [The paper] suffers from something of an identity crisis - it begins as a model description paper, but then abandons the comprehensive description of all the model components that should accompany such a paper. I think the authors should be encouraged to either develop this into a full-blown model description paper, or else greatly condense the model description and focus more on comparing the simulated values to measured values.

We have followed the second strategy suggested by the reviewer. Details of the model are now described in three appendices. Our first objective has also been modified. We now state "This paper aims to investigate, using a simple isotopic LSM (ISLM), the isotopic exchange of ^{18}O - H_2O and ^{18}O - CO_2 between a soybean ecosystem and the atmosphere. ... Our strategy is to constrain the standard flux parameterizations with the field observations but keep to a minimum the tuning of parameters related to the isotopic processes. The disagreement between the calculated and observed isotopic fluxes should therefore help us identify deficiencies in the current knowledge of the isotopic exchange." (Lines 69 - 83). The title has been changed to reflect this sharpened focus on model-data comparison and model sensitivity analysis.

2) The CO_2/O_2 methods section (3.4) comes across as almost an afterthought, when it should play

When you must cite or risk committing plagiarism

- Introduce two or more words used in a way unique to the source
- Introduce facts found in a source
- Paraphrase ideas, interpretations or conclusions in a source
- Introduce information that is not common knowledge
- Borrow the plan or structure of another source
- Build on another's method
- Build on another's computer program
- Collaborate with others in producing knowledge

Source: Yale Writing Center