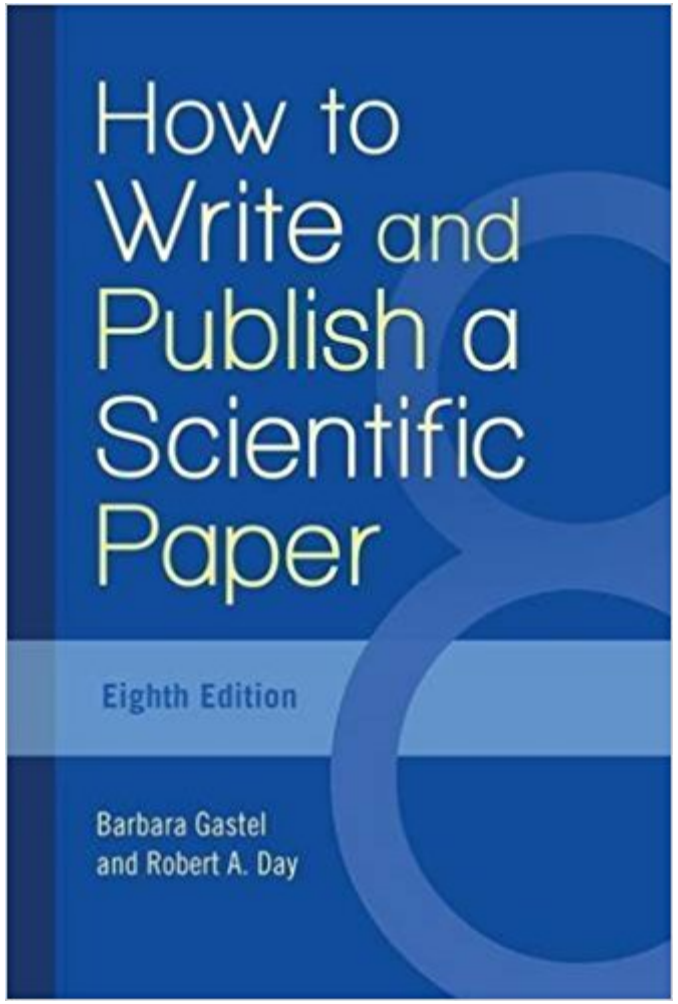
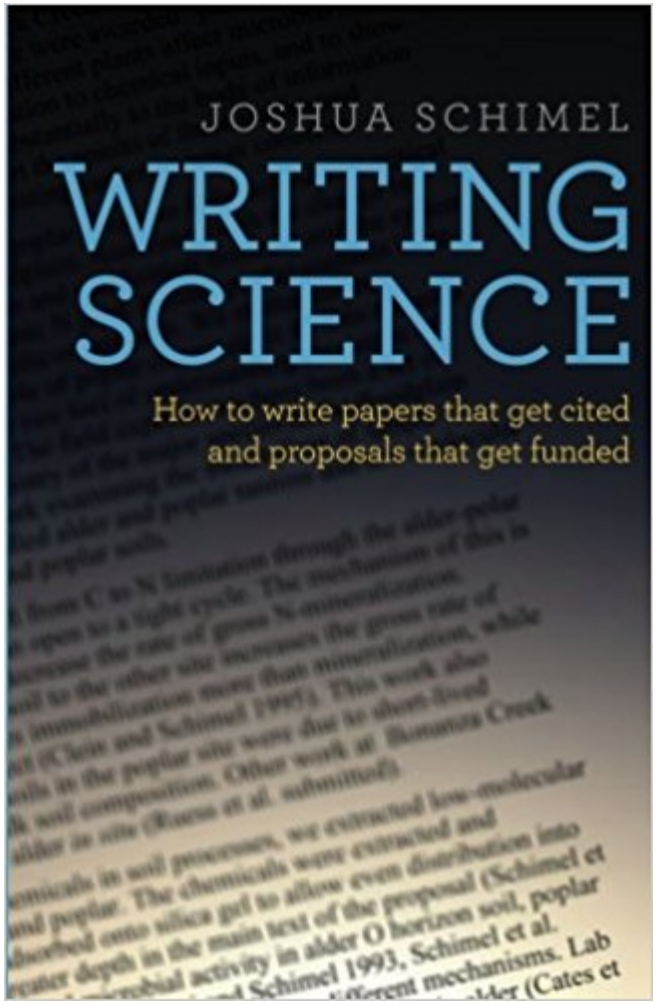
耶鲁大学-南京信息工程大学大气环境中心

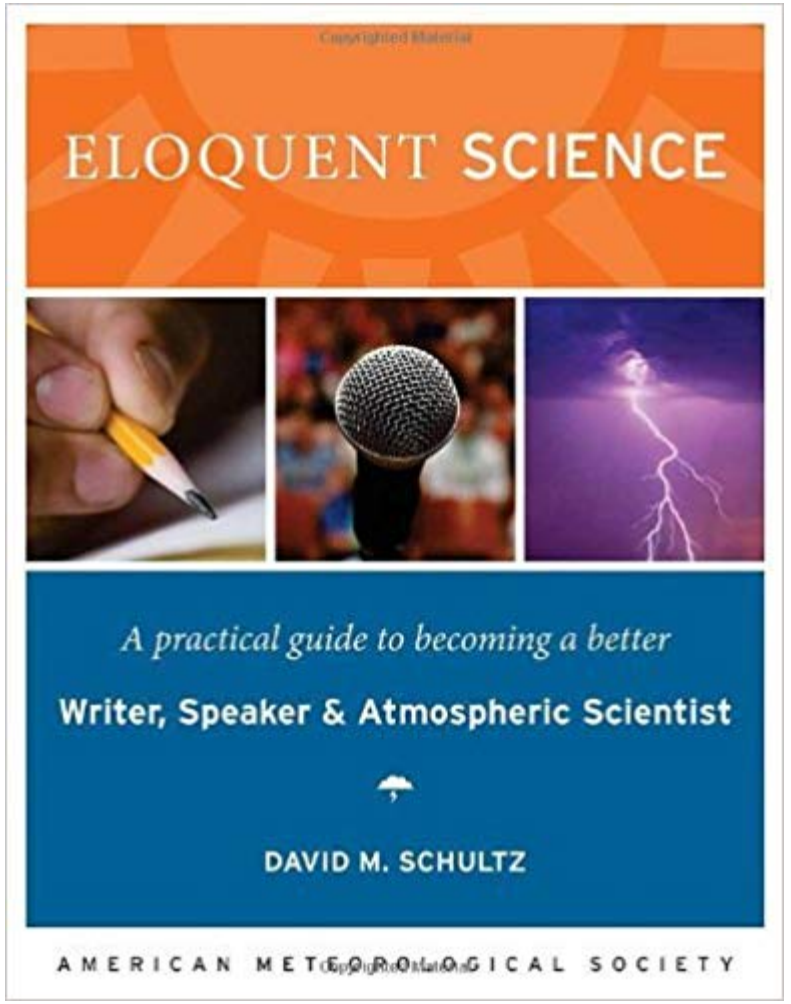
WRITING SCIENTIFIC PAPERS 科技写作技巧

XUHUI LEE 李旭辉

参考材料 Useful resources on technical writing







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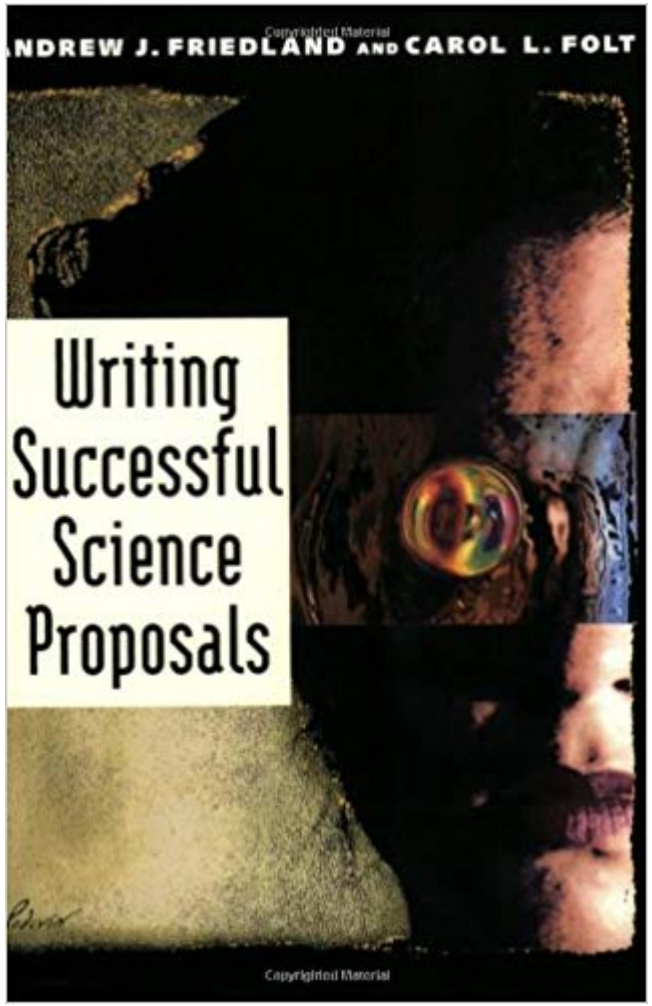

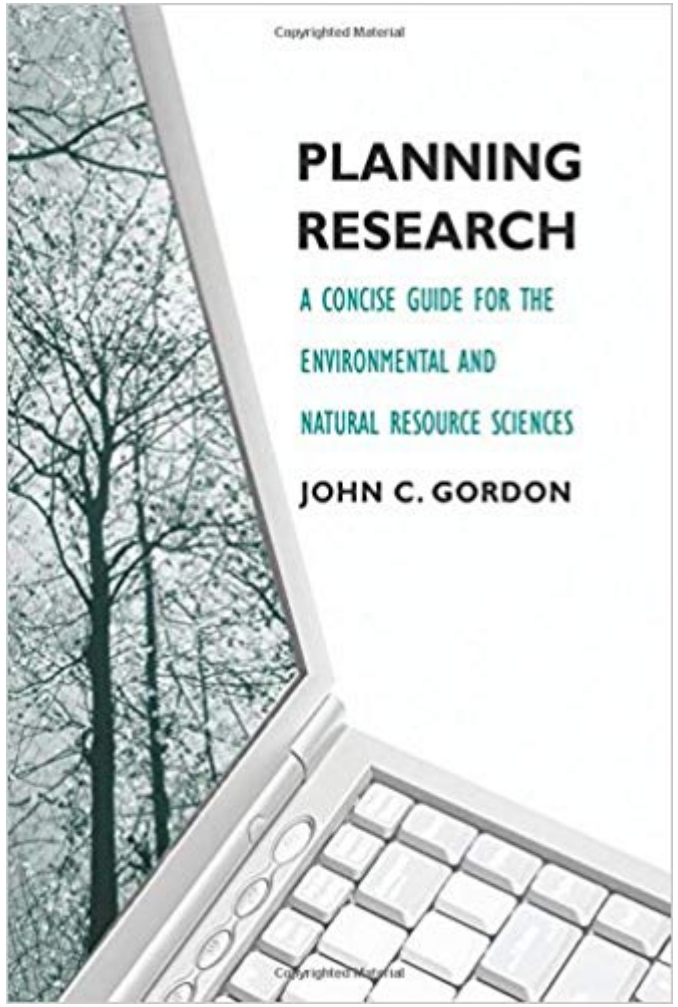

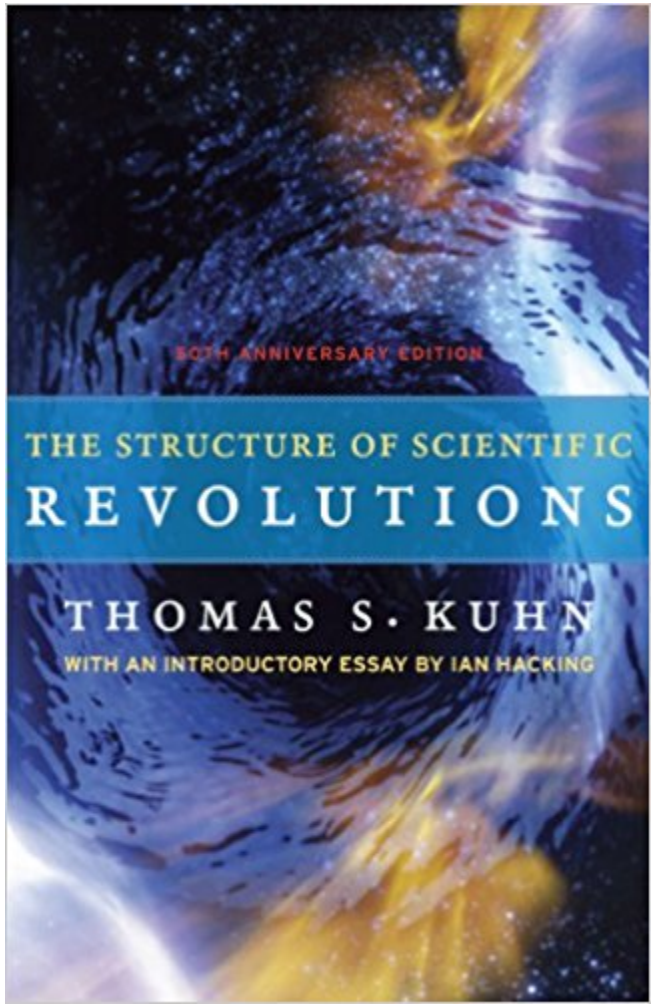

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耶鲁大学-南京信息工程大学大气环境中心 2018 年年会 | 2018 Annual Yale-NUIST Center Workshop

从“范例”开始你的研究 Start your research from paradigms
报告人：刘晓妍/张雯淇/赵恺辉 PPT | 现场录音PPT

寻找研究“切入点” Find gaps in a big picture
报告人：赵佳玉/黄文晶/项妍琨 PPT | 现场录音PPT

用假设做桥梁 Bridge research problem and method with hypotheses
报告人：张圳/鲍孟盈/蒲旖旎 PPT | 现场录音PPT

如何提出好的科学问题 How to formulate good questions
报告人：刘诚/胡勇博/宋文怀 PPT | 现场录音PPT

科技论文中的图、表与方程 Illustrations in scientific papers
报告人：谢成玉/张潇艳 PPT | 现场录音PPT

Meta 分析 Meta analysis
报告人：谢燕红/范美益/刘强 PPT | 现场录音PPT

https://yncenter.sites.yale.edu/yncenter-annual-meeting-2018

自始至终 Research from start to finish

- Proposal development
- Research design
- Implementation of research
- Publication
  - Manuscript development
  - Journal selection
  - Response to reviews

提倡双赢互利的科研文化 Win-win science culture

- Friedland's idea about ideas
  - Research is not about ownership, but about sharing [ideas, data, models]
  - Don't let fears of having your ideas taken without credit diminish your relationships with collaborators and colleagues
- Constructive debates are catalysts of creativity
- Criticisms should be about ideas and approaches but should never be personal attacks

写作要点 Effective writing skills

1. Choose a concise and informative **title**
2. **Funnel** from a big picture to the specifics of your study
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

8. **Respond constructively** to review comments
9. **Never plagiarize** in any form or shape

Sources: Friedland, et al

題目的重要性 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

短比长好 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”

论文标题个例分析 Are these titles good?

- Upland grasslands in Northern England were atmospheric carbon sinks regardless of management regimes
- Micrometeorological measurement of methane flux above a tropical peat swamp forest
- Annual emissions of CO_2, CH_4 and N_2O from a temperate peat bog: comparison of an undrained and four drained sites under permanent grass and arable crop rotations with cereals and potato
- Climate shifts within major agricultural regions for +1.5 and +2.0 °C worlds: HAPPI projections and AgMIP modeling scenarios
- A new paradigm for modeling land-atmosphere interactions
- First and novel validation of the solar dimming hypothesis regarding evaporation trends

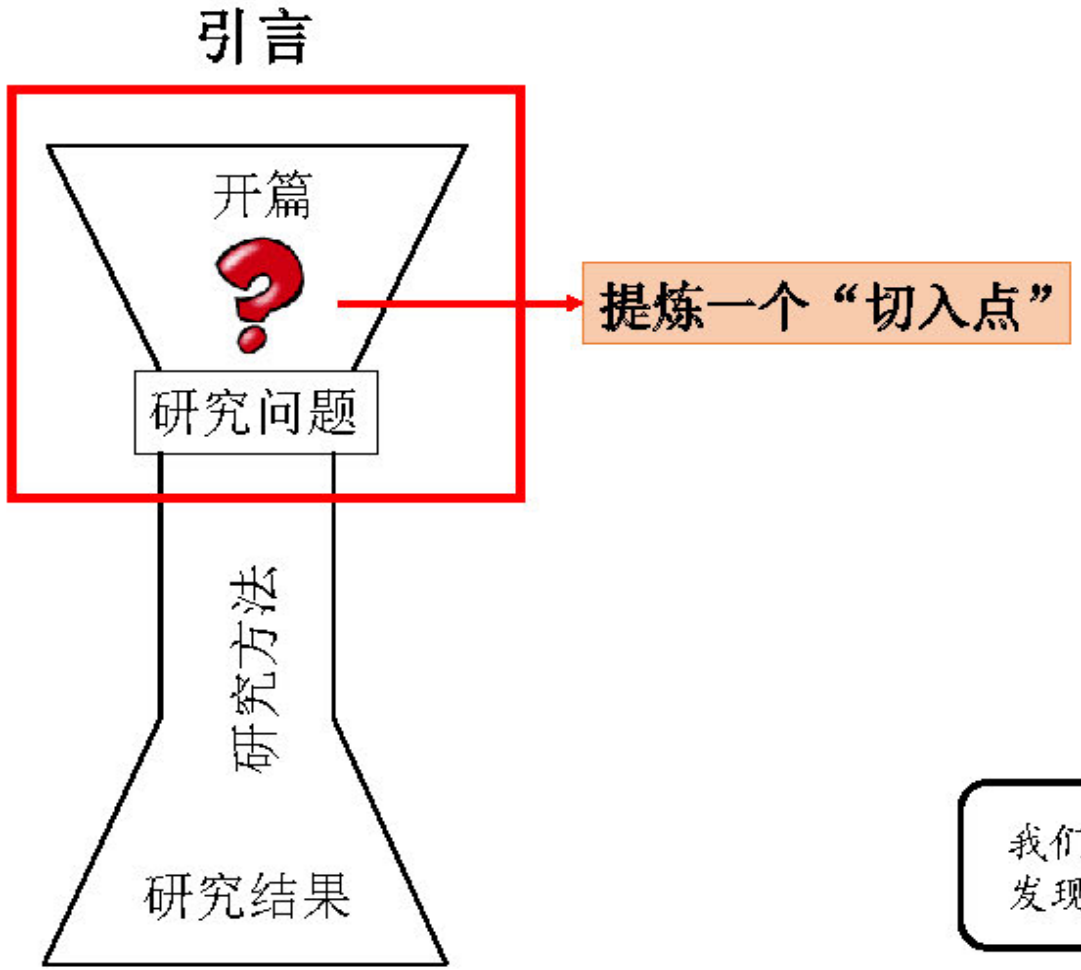
引言中常犯的错误

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.

切入点的提炼 The process of funneling

“切入点”的概念 ——什么是“切入点”



切入点的提炼 The process of funneling

New measurement of the rate coefficient for the reaction of OH with methane

Article (PDF Available) in Nature 350(6317)
DOI: 10.1038/350406a0 · Source: OAI

Of all the trace tropospheric species (that is, excluding H_2O and CO_2) methane contributes most to the infrared heating of the atmosphere[1,2]. Methane is also the most abundant hydrocarbon in the troposphere where it modulates the concentration of the OH free radical and serves as a source of CO. Transport of methane to the stratosphere provides a termination step, via the $Cl + CH_4$ reaction, for the chlorine-catalysed destruction of ozone. The oxidation of methane in the stratosphere is an important source of water vapour in this region. During the past decade[3-5] the abundance of methane in the troposphere has been increasing at a rate between 16 and 13 parts per 10^9 volume (p.p.b.v.) per year. The total input and the identities and strengths of the different atmospheric methane sources are not clearly defined. To understand the atmospheric effects of methane, and possibly to regulate it, we need these parameters. At present, the total flux of methane into the atmosphere is estimated from the measured steady-state abundance and the known removal rate of methane[6]. It has been generally accepted that the only process by which methane is chemically degraded

https://yncenter.sites.yale.edu/sites/default/files/files/02%20.mp4

寻找研究“切入点”Find Gaps in a big picture

描述性论文 Descriptive papers

题目： XXXX模型A、B对比

引言： 1. 模型很重要 2. 因为 A、B模型很重要 ， 所以进行分析对比

材料与方法：1. 什么是A模型 2. 什么是B模型

结果与讨论：
1. A、B模型在X方面表现如何
2. A、B模型在XX方面表现如何 ， 进行评价
3. A、B模型在XXX方面表现如何 ， 是否存在差异，若存在， 原因是XX

结论：对于X研究区域，在X条件下， A模型更适用
对于XX研究区域，在XX条件下， B模型更适用

https://yncenter.sites.yale.edu/sites/default/files/files/03.mp4

描述性论文 Descriptive papers

题目： 某地温室气体XX通量研究

引言：明确某地温室气体XX的排放量已成为气候变化及全球温室气体循环研究中亟待解决的科学问题

材料与方法：在XX地点，采用XX方法做了XX实验

结果与讨论：
1. 某地温室气体XX通量日变化、季节变化、年变化
2. 某地温室气体XX年均通量
3. 影响某地温室气体XX通量的环境因子

结论：某地温室气体XX年均通量值为XX
影响某地温室气体XX通量的环境因子为XX

描述性文章

https://yncenter.sites.yale.edu/sites/default/files/files/03.mp4

用假设做桥梁
Bridge research problem and research design with hypotheses

以假设驱动的论文 Hypothesis-driven papers

- Hypothesis-driven papers are much more interesting than descriptive papers to the editor, the reviewer and the reader
- A key element of hypothesis-driven papers is a concise statement about the state of knowledge in your particular topical area
- This statement can be an explicit hypothesis, a description that implies a conjuncture to be tested, or a “strawman argument”
- The statement serves as a benchmark against which novelty and new insights are measured

以假设驱动的论文 Hypothesis-driven papers

- Example 1: Hypothesis is well-known; new evidence is used to support it

Observed increase in local cooling effect of deforestation at higher latitudes

Deforestation in mid- to high latitudes is hypothesized to have the potential to cool the Earth's surface by altering biophysical processes[1–3]. In climate models of continental-scale land clearing, the cooling is triggered by increases in surface albedo and is reinforced by a land albedo–sea ice feedback[4,5]. This feedback is crucial in the model predictions; without it other biophysical processes may overwhelm the albedo effect to generate warming instead[5]. Ongoing land-use activities, such as land management for climate mitigation, are occurring at local scales (hectares) presumably too small to generate the feedback, and it is not known whether the intrinsic biophysical mechanism on its own can change the surface temperature in a consistent manner[6,7]. Nor has the effect of deforestation on climate been demonstrated over large areas from direct observations. Here we show that surface air temperature is lower in open land than in nearby forested land. The effect

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以假设驱动的论文 Hypothesis-driven papers

- Example 2: Hypothesis is well-known; new evidence is used to refute it

Global lake evaporation accelerated by changes in surface energy allocation in a warmer climate

Lake evaporation is a sensitive indicator of the hydrological response to climate change. Variability in annual lake evaporation has been assumed to be controlled primarily by the incoming surface solar radiation. Here we report simulations with a numerical model of lake surface fluxes, with input data based on a high-emissions climate change scenario (Representative Concentration Pathway 8.5). In our simulations, the global annual lake evaporation increases by 16% by the end of the century, despite little change in incoming solar radiation at the surface. We attribute about half of this projected increase to two effects:

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天际新闻：传统观点认为，湖泊和蒸发皿没有差别，它们的蒸发变化主要受地表太阳辐射控制。该研究发现，在全球变暖情景下，湖泊蒸发将显著增加，而增加的主要原因为地表能量再分配的改变，与太阳辐射无关。随着温度的上升，波文比将下降，更多的辐射能量将被用于蒸发。在中高纬度地区，气温上升将缩短湖面冰期，由于开阔水面反照率低于冰面，湖泊将吸收更多的太阳辐射，进而增加湖泊蒸发。

以假设驱动的论文 Hypothesis-driven papers

- Example 3: New evidence is used to support a common viewpoint

Urban heat islands in China enhanced by haze pollution

The urban heat island (UHI), the phenomenon of higher temperatures in urban land than the surrounding rural land, is commonly attributed to changes in biophysical properties of the land surface associated with urbanization. Here we provide evidence for a long-held viewpoint that the biogeochemical effect of urban aerosol or haze pollution is also a contributor to the UHI. Our results are based on satellite observations and urban climate model calculations. We find that a significant factor controlling the nighttime surface UHI across China is the urban-rural difference in the haze pollution level. The average haze contribution

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- Example 4: New evidence is used to reject a widely-held view

  Strong contributions of local background climate to urban heat islands

The urban heat island (UHI), a common phenomenon in which surface temperatures are higher in urban areas than in surrounding rural areas, represents one of the most significant human-induced changes to Earth's surface climate[1,2]. Even though they are localized hotspots in the landscape, UHIs have a profound impact on the lives of urban residents, who comprise more than half of the world's population[3]. A barrier to UHI mitigation is the lack of quantitative attribution of the various contributions to UHI intensity[4] (expressed as the temperature difference between urban and rural areas, ΔT). A common perception is that reduction in evaporative cooling in urban land is the dominant driver of ΔT (ref. 5). Here we use a climate model to show that, for cities across North America, geographic variations in daytime ΔT are largely explained by variations in the efficiency with which urban and rural areas convect heat to the lower atmosphere. If urban areas are aerodynamically smoother than sur-

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- Example 5: A “strawman argument” is used to bring focus to the paper

  Effects of black carbon and boundary layer interaction on surface ozone in Nanjing, China

  Conventional view: BC should reduce ozone level because of weakening of photochemical production under haze conditions.

  Our work: We find that ozone level is enhanced by BC. We argue that the enhancement is caused by reduction in the depth of the atmospheric boundary layer or mixing volume.

常见的格式问题 Sloppy and informal presentation

- Typographic errors
- Cute font/format
- Mixed use of fonts and line spacing
- 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

用斜体还是正体 When to use Italic or math font

- Abbreviation in upright roman (IPCC, LAI, NEE, NEP, GPP, VPD)
- Units in upright roman: m s^{-1}, mmol m^{-2} s^{-1}
- Math symbols in italic: $A = \pi r^2$
- Mathematical functions in upright roman: $f(x) = \sum_{n=1}^{\infty} \left(a_n + b_n \sin \frac{n\pi x}{L} \right)$

中国作者常犯的格式错误 Common errors by Chinese authors

- The bias reported by Smith (1989) is consistent with our results, as shown in Table 1.
- The shortest distance to the shoreline is 4km.
- We observed a large carbon dioxide flux of 40 μmol/m^2/s.
- The simulation covered the period 2015~2100.
- The model we used is given as $A = \pi(1 + ABC)^2(LAI + 1)$.
- An alternative model is given as $A = \pi A_{bc} r^2$.
- The regression equation is given by $y = a + b * N_{river}$
- The problem is not common, and we only saw such interference once。

段落结构 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

段落个例 An example

[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 d plants become more dependent on deep 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 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].

Topic Sentence

Inference

Source: Lee et al. 2007 GBC

避免抄袭嫌疑 When you must cite or risk committing plagiarism

- Introduce two or more words used in a way unique to the source: “why waste waste”
- Introduce facts found in a source
- Paraphrase ideas, interpretations or conclusions in a source: “An optimist sees the opportunity in every difficulty” → “An optimist finds opportunities even in difficult situations”
- 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

论文引用注意事项 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

论文引用个例 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

论文引用个例 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

论文引用常见的问题 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
- Here we used the eddy covariance method (Hu et al. 2018) to measure methane flux from the fish pond

论文引用常见的问题 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

文献引用和科学道德 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

语句的时态 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

毫无冲击力的结论 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

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