READING JOURNAL ARTICLES

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MENTI POLLS

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PERCEPTIONS OF SCIENTIFIC RESEARCH LITERATURE AND STRATEGIES FOR READING PAPERS DEPEND ON ACADEMIC CAREER STAGE (HUBBARD AND DUNBAR 2017)









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	Form your own opinion
2007	Learn about the rigor of the scientific method
L - 77	Improve critical thinking skills
43	Improve analytical skills
	By reading journal articles you can gain skills that aren't just important for research jobs
- -	

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SCIENTIFIC PROCESSING SKILLS

Acclimation

Competency

Proficiency

Takes place over an extended period spanning multiple career stages!

context

Research supervisors should also be mindful that saying "go and read a paper" may be interpreted differently by individuals at different career stages, so should be clear in their instructions and expectations.

► Familiarity with scientific language and the wider research

Degree of intrinsic motivation for reading

READING SCIENTIFIC LITERATURE: A GUIDE

1. Determine WHY you are reading this paper

Before you read the paper, consider what you want to get from. Is this essential background material? Are you most interested in the dataset or model setup? Do you want to apply the method to your research? Are the results important to compare to yours or a starting point for your research? This will help you to focus when reading the paper.

2. Skim the article and identify its structure

Most journals use a conventional IMRD structure: An abstract followed by Introduction, Methods, Results, and Discussion. Each of these sections normally contains easily recognized conventional features, and if you read with an anticipation of these features, you will read an article more quickly and comprehend more.

Features of Abstracts

Abstracts usually contain four kinds of information:

- purpose or rationale of study (why they did it)
- methodology (how they did it)
- · results (what they found)
- conclusion (what it means)

Most scientists read the abstract first. You should usually begin reading a paper by reading the abstract carefully and noting the four kinds of information outlined above. Then move first to the visuals and then to the rest of the paper.

Features of Introductions

Introductions serve two purposes: creating readers' interest in the subject and providing them with enough information to understand the article. Generally, introductions accomplish this by leading readers from broad information (what is known about the topic) to more specific information (what is not known) to a focal point (what question the authors asked and answered)

1. DETERMINE WHY YOU ARE READING THE PAPER

What you want to get out of an article should influence your approach to reading it. This will help you to focus when reading the paper.

You are entering a new field and want to learn what is important in that field Is this essential background material? Are you most interested in the dataset or model setup? Do you want to apply the method to your research? Are the results important to compare to yours or a starting point for your research?

ARTICLE STRUCTURE – SKIMMING!

- Skim (look over) to identify structure
- \blacktriangleright MOST COMMON = AIMRD
 - ► Abstract Paragraph: why it matters, how they did it, what they found, what it means ► Introduction Describe current understanding and situate the current work

 - > Methods
 - \succ Results
 - ► Discussion

- What was done to answer the research question
- Statements of what was found and visual data representations
- *Placing the results in context of the broader field answering the research question!*

SKIM 1.

Get the "big picture" by reading the title, key words and abstract carefully; this will tell you the major findings and why they matter

- Quickly scan the article without taking notes; focus on headings and subheadings
- Note the publishing date; current research is more relevant
- Note any terms and parts you don't understand for further reading



ACTIVE READING

- ► Being engaged with the text!
 - ► Read with a specific focus
 - Break the text into portions
 - Questioning the text
 - ► Take notes as you read

ANNOTATION & NOTE TAKING

- > There are many ways to take notes but this is a personal style choice
- > Try different ways, but use the one that fits you best and engages you in active reading
- ► MY ADVICE: NO HIGHLIGHTERS FOR THE FIRST READ!!
- Only highlight very important quotes or terms.
- Methods mapping, outlining, 2-column
- Taking notes helps recall and comprehension
- ► Note taking is not the same as summarizing!

ANNOTATION

enerate the linear response to orogcussed in the following two sections, turbed zonal mean fields from the the GCM orography.

smaller mountains: A nearly

2 km) in the GCM have similar ray





Figure 8. Box whisker diagram of Ψ_N^* for each reanalysis data set during DJF for the 1979–2008 period. Markers represent critical stream function values for individual seasons throughout the period and are categorized by the ENSO bhase. Box plot boundaries indicate the

is also smaller than previously reported (0.41° decade⁻¹,

quently, there is no simple correspondence of either mean the intensity and width or related HC trends (i.e., conser-The separation between neutral and cold events was more The separation between neutral and cold events was more vation of mass alone would predict a narrowing trend with HC intensification) in some of the reanalysis data sets. Finally, it is worth noting that although the range in esti-mates of the HC width increase among the reanalysis mates of the HC width increase among the reanalysis (Figure 7), five of the reanalyses converge near the ENS data set (ENS50), comprising stream fu value by 2008. The increase in ensemble variability is therefore attributed to just a few data sets which become weighted, restricted ensemble average containing only those

as to how ocean-atmospheric interactions might modulate the long-term and interannual variability of the HC through connections with ENSO anomalies. Although Oort and remaining data sets.

wer and thus more

lated for Ψ_{λ}^* and Ψ_S^* with the long-term trend ved and further categorized by ENSO phase (either as a rent) for each data set using the ON throughout the period and are categorized by the ENSO phase. Box plot boundaries indicate the sample median and 25th and 75th percentiles, with whiskers indicating maximum and minimum values. The long-term trend has been removed from the data to focus on interannual variabil-ity. The ENSSO classifications for the average of selected data sets. ENSO classifications for the average of selected data sets. ming events, with a corresponding Interannual variability estimates for the southern cell during JJA ranged from 16% to 27% (ENS 12%).

is also smaller than previously reported (0.41° decade⁻¹, not statistically significant). The trend becomes slightly more comparable to the work of *Hu and Fu* [2007] when using their criteria for HC width (averaging the stream function throughout the 600-400 hPa layer in place of the 700-400 hPa as done here), producing a statistically sig-nificant widening of 0.54° decade⁻¹. Differences in the exact values of the ERA40 widening trends might arise from the use of different data resolutions and the regridding methods described in section 2, though these hypotheses require further investigation. [26] Comparison of the HC trends reveals no clear rela-[26] Comparison of the HC trends reveals no clear rela-tion the relation of the trends reveals no clear rela-tion the relation of the trends reveals no clear rela-tion the relation of the HC trends reveals no clear rela-individual ENSO categories may occasionally be large and contain overlap with other phases, a simple *I* test statistic Ψ_{N}^{*} , also has the greatest widening trend (Table 3). Con-tionship between intensification rate for the annual average Ψ_{N}^{*} , also has the greatest widening trend (Table 3). Con-ically different (at 95%) for warm-neutral and/or warm-cold comparisons during DJF for most reanalyses (Table 4). ring the second half of the 1979–2008 period sample means for the normer cell, similar significance patterns were identified for a special long-term (1958–2008) activities autiouted to just a few data sets which become more pronounced outliers near the end of the period. **3.3.** Interannual Variability and Connections to ENSO [27] As previously identified, it remains a topic of debate [27] As previously identified, it remains a topic of debate identical phase means (18.30×10^{10} kg s⁻¹, Table 4). A

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uning Dor		21 1	Mautral	(Number)	La Niña	(Number)	All	(Number)
Data Set RA ^b RAINT ^c RA40 ^d NRP NDRP CFSR MERRA 20CR ENS	El Niño 21.96 (WN) 22.08 (WN, WC) 25.89 (WN) 17.88 (WN, WC) 22.67 (WN, WC) 22.13 (WN, WC) 18.92 (WN) 21.07 (WN, WC) 20.62 (WN, WC)	(Number) (9) (6) (6) (9) (9) (9) (9) (9) (9) (9) (9)	20.62 20.93 (NC) 23.03 16.66 20.05 20.62 17.49 19.49 18.99	(13) (8) (11) (13) (13) (13) (13) (13) (13) (13	20.55 20.15 23.28 16.50 20.02 20.03 18.03 19.07 19.00 18.30	6 (5) (5) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	21.04 21.09 23.84 17.00 20.85 20.95 18.06 19.88 19.50 18.65	(28) (19) (23) (29) (29) (29) (29) (29) (29) (29) (29

⁽³⁰⁾ The ENSO clustering for the southern (winter) cell ring JA is less evident than the corresponding northern misphere winter cell (compare Tables 4 and 5). Only four the reanalyses indicate a statistically significant difference the mean values of Ψ_{3}^{*} for warm-neutral and/or warm-d conditions all eight data sets demonstrated as ENSO. luring JJA is less evident than

cells may be partially controlled by stratospheric ozone. Recent studies have suggested variability on interannual time scales linking ENSO and polar stratospheric tempera-tures in the southern hemisphere [*Hitchman and Rogal*, 2010; *Hurwite et al.*, 2011]. Polar stratospheric temperatures are generally warmer during El Niño events, resulting in a weaker polar vortex. The relaxation of the meridional temperatures radient results in a reduced jet intensity and a presumably narrower (and thus stronger) HC given the absence of any significant poleward jet contraction. The polar stratospheric ture, suggesting the expected ENSO effects inside the tropics, suggesting overturning values should be more significant (i.e., com-pensating for the weaker SST anomalies during JJA) when

in the mean values of Ψ_S^* for warm-neutral and/or warm-cold conditions; all eight data sets demonstrated an ENSO dependency for Ψ_N^* during the local hemispheric winter. Furthermore, the long-term ensemble average (ENSO) [31] Although the average ENSO SST anomalies are generally weaker in JJA than those observed during DJF, the different behavior between the northern and southern winter cells may be partially controlled by stratospheric ozone.



10 of 14

Summer cer



Very idealized QCM * East VOL. 49, NO. 6

NAL OF THE ATMOSPHERIC SCIENCES

Figures 3b-d show the eddy streamfunction at 350 mb from the 0.7, 1, and 2 km mountain experiments, with values normalized by mountain height (multiplied o mountain) integration and force by 1 km/H, so that the four panels of Fig. 3 would be identical if the response were exactly linear. The flow is dominated by a single wave train propagating to the southeast in each case. In the 0.7 km mountain case, an eddy streamfunction maximum is almost dis induced over the "small" moun- rectly west of the orography maximum, with a minimum to the east. As H increases, this pattern rotates

Migo (Janu + Kin) mountains



light on these topics sponds to idealized. heights in a GCM h solutions from a xperiments are defirst concerns how aphic forcing is es $t h = \epsilon f(x, y)$ then, e atmosphere must nlinear interaction s negligible, but to mountain on the

oonse break down l mechanisms are es the most signifthe mountain or with the presence

transient eddies, liscussed in sec-

comparison as = 0.025, 0.095, 5, and 6. 10, and 0.990). lent to a transand about 4.5° teady-state verequations linasic state. The e physics that cesses are kept

ing an iterative pro- for water vapor in addition to the primitive equations. ns neglected in linear For this study, the model's boundary conditions are ortant in the atmo- highly idealized. There are no continents, and the entire surface is covered by an immobile "swamp" ocean that ye serves as an infinite source of water vapor for the atmosphere but has no heat capacity. The surface albedo is 0.1 everywhere, and sea ice is not allowed to form. wet surface Clouds are zonally uniform, hemispherically symmet- 200 weat ric, and prescribed with the same distribution in both capacity hemispheres. Solar radiation is given its annual mean no ocech value with no diurnal variation.

The control integration of the GCM has a flat sur-face, and is spun up from isothermal, motionless initial $C_{\rm LM}$ and $C_{\rm LM}$ conditions. A climatology is formed from the last 1400 Stc every days of an 1800-day-long integration. Figure 1 shows the zonal-mean zonal wind as a function of height from ting field be taken the control climatology. The model climate is hemispherically symmetric, with 30 m s⁻¹ zonal wind maxmits of validity of ima in the upper troposphere near 40° latitude and ical relevance. For surface easterlies in the tropics. Unlike observations, of the atmosphere the surface easterlies do not penetrate to the upper troposphere, where weak westerlies are maintained in the model.

The linear model is that described in Ting and Held (1990) and uses a matrix inversion method suggested by Schneider (1989). The treatment of dissipation in the model has some effect on the solutions Dissipation

described in sec- parameterizations include 1) surface friction precisely responses of both as described by Nigam et al. (1988), 2) thermal dampcompared in sec- ing below 830 mb on pressure (not sigma) surfaces v linearity breaks with a damping time scale of 5 days, and 3) biharmonic ins. In section 6, diffusion $(\nu \nabla^4)$ of vorticity, divergence, and temperature with $\nu = 10^{17} \text{ m}^4 \text{ s}^{-1}$. The surface friction is not presented. The an exact linearization of the GCM's nonlinear formulation, but produces stresses of roughly similar amplitude. Some additional damping of temperature is needed near the ground to avoid a noisy low-level temperature field. We follow Valdes and Hoskins (1989) in damping the temperature perturbation on pressure is study, an at- (not sigma) surfaces. The biharmonic diffusion coefficient is a factor of 10 larger than that used in the and time-depen- GCM. The sensitivity of the linear response to the dis-M and the linear sipation in the linear model is discussed in sections 4,

idal truncation 3. Experiments

In the GCM experiments, a Gaussian mountain is imposed at the surface at 45°N, so that the height of the surface, h, is given by

$$h(\lambda,\phi) = H \exp\left\{-\left[\frac{(\lambda-\lambda_0)^2}{a^2} + \frac{(\phi-\phi_0)^2}{b^2}\right]\right\} \quad (3)$$

where H is the maximum height of the mountain and olution (R15) a and b are the longitudinal and meridional half-widths, e Climate Dy- respectively. The half-widths are both 15°N in all ex-Fluid Dynam- periments, which produces a response that is of large ostic equation enough scale to be resolved by the low-resolution model



NOTE TAKING

(broad topic)						
Main Idea	Details					
 Slide 	 Record details for each main idea 					
titles	 Concise sentences/thoughts 					
· Cues	 Short hand symbols (&,>, =, etc.) 					
· Diagrams	 Abbreviations (w/, b/c, etc.) 					
· Prompts to	Lists					
help you	· Draw a line across the page when you					
study	change main ideas					
WHEN:	WHEN:					
During note	During note taking					
taking and/ or during review						
• Pierret idea	Summary					
 Diggest locas 	WHEAT					



Traditional Body Language and Oral Presentations Format

I. BODY LANGUAGE (conveys your state of mind)

- A. Movement 1. Strive for natural movement. 2. Control distracting mannerisms. (pacing, penclicking).

 - 3. Develop natural style penclicking).
 3. Develop natural style penclicking).
 (a) Move forward to stress points.
 (b) Step back and focus attention on screen.
 4. Hold objects so audience can see them. (Never pass them aroand.)
 5. Avoid excessive and uncontrolled movement.

B. Facial Expressions

- 1. Smile. 2. Appear relaxed and friendly.
- C. Gestures
 - 1. Use natural gestures to emphasize what you're saying.
 - 2. Integrate and coordinate gestures with text.
 - 3. Examples
 - (a) number of fingers = number discussed. (b) sizes, shapes tall, short 4. Use gestures to help pace yourself. 5. Use gestures based on audience size.
- D. Posture

 - 1. Practice good posture. 2. Don't prop up against wall or desk. 3. Don't sit unless it's part of presentation.

BEFORE AND DURING READING

- work?
- Is there terminology I don't understand?
- better?
- > Am I spending too much time reading the less important parts of this article?
- > Who can I talk to about the confusing parts?

> Who are the authors? What journal is this? Might I question the credibility of the

> Have I gone back to read an article or review that would help me understand this

DURING AND AFTER READING

- ► What specific problem does this research address? Why is it important?
- ► Is the method used a good one? Were there others?
- ► What are the specific findings? Could I summarize them in two tweets?
- > Are the findings supported by persuasive evidence?
- ► Is there an alternative interpretation that wasn't addressed?
- ► How are the results unique/new or supportive of other work?
- How do these results relate to the work I'm interested in or have read about?
- ► What are some of the applications? What next?

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DISTINGUISHING THE MAIN POINTS

- ► Words or phrases to look for...
 - ► In contrast with previous work
 - ► Has seldom been addressed
 - ► Surprising
 - ► Unexpected
 - ► We hypothesize that
 - ► We develop
 - ► We propose
 - ► The data suggest
 - ► We introduce

I'M STUCK AND FRUSTRATED

- That's okay everyone experiences it
- > You will not understand everything in every paper
- ► Tips:

 - stick to your reading purpose)
 - ► Read the article more than once
 - Ask your advisor or mentor or instructor for help
 - Break it into chunks to read over a few days
 - > Ask yourself if the non-understandable part is essential for your purpose
 - Confusion is not a threat it's an opportunity!

> Jot down the parts you don't understand as you read - sometimes something is clearer by the end ► Use google or class notes to help with jargon or methods (but avoid the rabbit hole of doom -

RE-READ 2.

Read the article again, asking yourself questions such as:

- What problem is the study trying to solve?
- Are the findings well supported by evidence? Were assumptions made?
- Are the findings unique and supported by other work in the field?
- Is the study repeatable?
- What factors might affect the results?
- What questions are still unanswered? What were the limitations?
- Draw influences based on your own experience and knowledge.

If you are unfamiliar with key concepts, look for them in the literature



DRAWING INFERENCES

- Not everything you might learn is stated explicitly
- Critical analysis

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► Questioning is good!

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Rainfall variability and predictability issues for North America

.B.G.Hunt¹

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Abstract A multi-millennial simulation with a coupled global climatic model has been used to investigate extreme rainfall events, mainly droughts, over North America. A rainfall index, based on the US Dust Bowl region, was used to generate a time series from which the extreme events could be identified. A very wide range of drought and pluvial multiyear sequences was obtained, all attributable to internal climatic variability. This time series reproduced the basic characteristics of the corresponding observed time series. Composites of years with negative rainfall anomalies over North America from the simulation replicated the observed rainfall composite for the Dust Bowl era, both in spatial character and intensity. Examination of individual years of a simulated composite revealed not only a wide range of rainfall anomaly patterns, dominated by drought conditions, but also ENSO distributions that included El Niño events as well as the expected La Niña events. Composites for pluvial conditions over North America were associated with composited El Niño events, as expected. Correlation of the simulated Dust Bowl rainfall with global surface temperatures identified a principal connection with the ENSO region. No systematic relationship was obtained in the simulation between the Atlantic multidecadal oscillation and Dust Bowl region rainfall, with the simulated oscillation having a much more variable periodicity than that found in the limited observations. However, a marked connection was found for SST anomalies adjacent to the northeast coast of North America, but this appears to be forced by ENSO events. A scatter diagram of NINO3.4

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Keywords North American rainfall · Dust Bowl simulation · Predictability of North American rainfall Multi-millennial simulation

Megadroughts in the USA are a recurring feature of its climatology (Woodhouse and Overpeck 1998). They report that a decadal length drought occurred about every 500 years. Systematic studies of the causes of such droughts have been made using atmospheric climatic models forced with observed sea surface temperature (SST) anomalies. Thus, Schubert et al. (2004a, b) were able to replicate the major features of the famous Dust Bowl region drought, 1932 to 1939. They conducted a number of idealised experiments which identified that tropical (primarily ENSO-related) SST anomalies were the principal cause of this Dust Bowl megadrought. Seager et al. (2005) similarly used an atmospheric model to investigate the causes of North American droughts between 1856 and 2000. They also noted the dominance of tropical Pacific SST anomalies associated with La Niña events in generating such droughts, but also found that SST variations outside of the tropical Pacific Ocean strengthened such droughts.



SST anomalies with the Dust Bowl region rainfall anomalies, for observations and the simulation, revealed inconsistencies between the occurrence of an ENSO event and the "expected" rainfall anomaly. This, and other analysis, resulted in the conclusion that annual or longer term rainfall predictions over North America, with any systematic confidence, are unlikely because of stochastic influences inherent in the climatic system associated with internal climatic variability.

1 Introduction



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EXAMPLE FROM AN ARTICLE

Megadroughts in the USA are a recurring feature of its climatology (Woodhouse and Overpeck 1998).

They report that a decadal length drought occurred about every 500 years.

Systematic studies of the causes of such droughts have been made using atmospheric climatic models forced with observed sea surface temperature (SST) anomalies.

Thus, Schubert et al. (2004a, b) were able to replicate the major features of the famous Dust Bowl region drought, 1932 to 1939.

They conducted a number of idealised experiments which identified that tropical (primarily ENSO-related) SST anomalies were the principal cause of this Dust Bowl megadrought.

Seager et al. (2005) similarly used an atmospheric model to investigate the causes of North American droughts between 1856 and 2000.

They also noted the dominance of tropical Pacific SST anomalies associated with La Niña events in generating such droughts, but also found that SST variations outside of the tropical Pacific Ocean strengthened such droughts.

UNPACK EACH FIGURE AND TABLE

- ➤ The data is the key!
- reading the article -> there is no best way, try different methods!
- ► For each figure
 - > Work to understand the axes, color scheme, statistical approach, labels etc.
- ► For each table
 - Identify which experimental groups and variables are presented
 - > What is shown and how were the data collected?
- Refer back to the methods section if and when needed
- context, what do they show, interpretation etc.)

> One approach: scrutinize the figures and tables (including captions and legends) before

► Ask the same questions for each figure/table as for the entire article (motivation, methods,

BE CRITICAL

- > Published papers are not truths etched in stone!
- Science is a never-ending work in progress
- Critically evaluate interpretations and conclusions different people may interpret data different ways
- Critical Thinking: evaluate data while minimizing bias
 - > Are there other, equally likely, explanations for what is observed?
 - > Do I find this paper compelling (or not) because it affirms something I already think (or wish) is true?
 - > Am I discounting their findings because it differs from what I expect?
- ► Individuals with different life, academic, and work experiences may think of several alternative hypotheses, all equally supported by the data

INTERPRET 3.

- Examine figures and tables carefully
- Try to interpret data first before looking at captions
- When reading the discussion and results, look for key issues and new findings
- Make sure you have distinguished the main points. If not, go over the text again.

SUMMARIZE

- Summarize the paper by synthesizing your notes
- Use these notes for writing introductions and literature reviews
- Keep the documents organized and accessible
- Follow a template for consistency
- plagiarize

4. SUMMARISE

- remember key points and prepares you for thesis/dissertation/paper writing
- markers and comments. Do this AFTER reading and interpreting the article.

> Put quotation marks around exact wording from the paper so you don't accidentally

Take notes on the key findings, methods and issues; it improves reading comprehension, helps you

If you have a printed version, highlight key point and write on the article. If it's on screen, make use of



Complete citation. Author(s), Date of publication, Title (book or article), Journal, Volume #, Issue #, pages:

If web access: url; date accessed:

Key Words:

General subject:

Specific subject:

Hypothesis/Outstanding problem to solve:

Methodology:

Result(s):

Summary of key points:

Context (how this article relates to other wo findings by others, including yourself):

Significance (to the field; in relation to your own work):

Important Figures and/or Tables (brief description; page number):

Context (how this article relates to other work in the field; how it ties in with key issues and

