GE5211 Dynamic Environments

Module folder

Prepared by Denitza Voutchkova

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Semester 1, AY 2018/2019
Instructors: Dr. Denitza Voutchkova & Dr. Winston Chow
Enrolment cap: max 20 students
Duration: 3 hours (2.5 h, usually)
100% CA

INTRODUCTION

Dynamic Environments is a graduate level module offered by the Department of Geography once each two years. It falls under the Physical Geography pillar, so usually it is taught by TEC research group members. This is the first time I am coordinator of GE5211 & the first time I am co-teaching (and co-planning) a module. Historically, this module has been taught by Prof. Ziegler (on sabbatical) and was with a strong focus on field-based methods, with a week-long fieldwork in Thailand. Since the module description is quite broad, and Dr. Chow and I have little experience with research in Thailand, we decided that this year the module activities will be based in Singapore.

The module aims at focusing students' attention on different aspects of the dynamism we are dealing with in various Physical Geography and Environmental fields. Its broad description (see Module Description, Synopsys) allows for different interpretations and could accommodate vast variety of approaches, techniques, sub-disciplines, and topics. Dr. Chow and I will be leading seminars on topics from our own research interests. I decided to lead a seminar on abrupt Ecological Changes and Disturbance Hydrology (week 3), and on Socio-hydrology, which is a new sub-discipline of hydrology dealing with the co-evolution of social & hydrological systems (week 5). Dr. Chow will be leading seminars on the history of our disciplines (environmental science/physical geography) in week 1 and on the methods and techniques used in climatology (week 4). So, overall our module will be focusing on climate change, hydrologic and ecologic change, and the anthropogenic influence of other "natural" changes of the Earth system.

We have planned this semester, so that there is a balance between class & field activities, as well as balance between individual & group assignments. The first half of the semester (week 1-5) there will be seminar-style sessions led by us (Dr. Chow: week 1 & 4; and I: week 3 & 5), followed by group-activities or student-led sessions (weeks 6, 7, 11, 12), and field-trips (weeks

8, 9, 10). The individual assignments include an oral presentation of how student's research interests and/or methods fit within the Dynamic Environments framework (10-15min, 30%) and a blog or vlog reporting on one of the field-trips (30%). The group activity is to prepare & present an academic poster on their group project (40%). Students will be choosing which field activity to report on, and what their group projects will be dealing with. As it is seen from the assignments (see also the Module Description for details), we are focusing on practicing (& improving) students' presentation skills. This includes both academic communication (poster/oral presentation) and outreach to the general public (blog/vlog). From my experience with another 6000 level, our local students (NUS bachelors continuing further) usually have no problems discussing openly topics & communicating clearly their opinions and ideas. However, we cater also to a lot of foreign students, for whom this is a first semester in NUS, and a first semester in predominantly English-speaking environment. The signing for this module is ongoing, but currently we have 9 students, for most of which this is the first semester in NUS (status 10 Aug 2018). It is expected that the total number of students will reach 12, but there will be more clarity on that at the end of week 1 (the module is capped on 20, but the meeting room can barely accommodate 15 students).

While the seminars are introducing the Dynamic Environments framework, helping practice new terminology and methodology, and promoting in-class discussions on wide variety of globally relevant topics, the field-based activities are focusing on more locally & regionally relevant topics. We are currently planning the field trip to the Geography weather station (or tentatively Changi airport station, if not possible), so students get to learn about different instruments used to observe climate and weather variables. The other two field trips will be to Lee Kong Chian Natural History Museum and the Future Cities Lab research center, where the focus will be on environmental change in Singapore and the region.

Another pedagogical approach we adopt in this module is the peer-review. We will be using it for both the oral and the poster presentations. From my previous experience, students' peer-review is very successful in two ways: 1) students pay attention, listen actively, and provide meaningful feedback to their fellow-students; 2) it presents an opportunity to teach students how to provide constructive feedback. The usual approach I use is to explain to students that they should identify positive sides too, instead of focusing only on what needs improvements. I have previously collected all peer-review feedback, compiled it, summarized it where needed, anonymized it, and sent it to the respective student or group of students. The feedback students' provide (even at upper undergraduate level) is quite insightful to not only what they find interesting, but also what the level of understanding of the module material is.

Since this is a graduate module, we expect (hope) that students will participate actively in class and prepare for class activities. I have experience with one 6000 level module, where each student prepared and led a seminar session on a topic of their choice. This level of independent learning was well accepted, however the level of the module was the highest that the Department of Geography offers. Because Dynamic Environments is 5000 level (not 6000), after a discussion, Dr. Chow and I decided that there is a need for more guidance and structure.

Further in this module folder, you can find the detailed Module Description (identical to the information provided to students on IVLE), two scoring sheets we will be using with Dr. Chow to grade assignments (one of them will be used also for the student peer-review), the lecture slides for our seminar-style session for week 3 (+ annotations), and achievements and foreseeable challenges. There is no sample of student work, since this is the first time I teach this module and this is also the first time I using blog/vlog type of assignment. I am especially curious if students will welcome the more creative vlog option. I have prepared the scoring sheet & the grading criteria, so they are medium independent (blog vs. vlog).

GE5211 Dynamic Environments

Semester 1, AY 2018/2019

Instructors: Dr. Denitza Voutchkova (geoddv@nus.edu.sg) & Dr. Winston Chow (winstonchow@nus.edu.sg)
Office hours: By appointment only
Date/Time: Wednesdays 2-5 pm,
Venue of class: Geography Department Meeting Room AS2 #03-16

SYNOPSIS

This module introduces techniques through which dynamic environmental conditions can be measured and monitored and provides a basis for reasoned debates about issues related to environmental change. Students following the module can expect to be tutored in a number of techniques that may include (depending upon expertise of staff who are available to teach the module) geomorphic hazard mapping, micro-meteorology, palaeoecology and remote sensing. The module goes on to discuss the implications to humans of past and present environmental dynamism and of predicted environmental changes. Among the topics for student-led discussions in this part of the module are the dialectic of global climate change; the contribution of urban areas to global climate change; possible relationships between biodiversity and environmental instability; and inequalities in the degree of human vulnerability. A seminar presentation focusing on the relevance of the module to their thesis or on thesis topic is expected. (copy/paste from CORS)

LEARNING OUTCOMES

By the end of this course, students should be able to:

- Critically engage in discussion on globally, regionally, and locally relevant topics on Dynamic Environments
- Position their own research interests and methods within the frameworks of Dynamic Environments
- Communicate academic activities/events to the general public via blog/vlog post
- Design & present an academic poster based on a student-defined group project

TEACHING MODES

Seminar-style sessions (weeks 1-5, 13), group-activities & student-led sessions (weeks 6, 7, 11, 12), field-trips (weeks 8, 9, 10). Students are expected to prepare and participate actively in discussions. More information will be provided in the introductory lecture during week 1.

PREREQUISITES

Nill

PRECLUSIONS

Nill

SCHEDULE/SYLLABUS

Time	Activity/Topic	Milestones
Week 1	Intro to module (WC): History and overview of environmental science/physical geography	
Week 2	HARI RAYA HAJI HOLIDAY	
Week 3	(DV): Abrupt ecosystem changes and disturbance hydrology	
Week 4	(WC): Methods and techniques in climatology	
Week 5	(DV): Socio-hydrology, hydrosocial research & water science in the Anthropocene	
Week 6	Students present on how their research fits into the topic of Dynamic Environments module/framework	Submit presentation
Recess	-	-
Week 7	Brainstorming group-projects on Dynamic Environments	
Week 8	*(tentative, week # may change)* Geography weather station (visit)	
Week 9	*(tentative, week # may change)* Visit of Lee Kong Chian Natural History Museum	(Submit field Report)
Week 10	*(tentative, week # may change)* Visit of Future Cities Lab research center	(Submit field Report)
Week 11	Gap-week (poster-prep session)	(Submit field Report)
Week 12	Academic poster presentations (group-projects)	Submit poster
Week 13	Module wrap-up + cake/candy :)	

Lecturer-led seminars: (WC) Dr. Winston Chow, (DV) Dr. Denitza Voutchkova

ASSESSMENT & ASSIGNMENTS

100% CA

Research presentation (individual assessment) (30%)

- How does your research (current or past) fit into the broad topic of Dynamic Environments?
- 10-15 min presentation (to be determined based on student number)
- Grading based on content (how well it fits the assignment), presentation skills (effective communication), peer-evaluation

Blog OR Vlog field report (individual assessment) (30%)

- Your blog/vlog post should address the question "How did the field trip relate to the module topic (Dynamic Environments)?" and should contain personal reflection elements
- It should be an example of effective communication with target audience "the general public"
- You have full creative freedom: you can chose to write a blog post OR to prepare a vlog; you can include maps, graphs, illustrations, photos, etc. (+ video footage for the vlog)
- Word/time limit:
  - blog: max 1000 words, first person
  - vlog: minimum 3 min, maximum 5 min long
- Due a week after selected field trip (e.g. if you chose to report based on week 8 field trip, your blog/vlog is due in week 9)

Academic poster & poster presentation of group projects (40%)

- Group-defined project topic within the broad Dynamic Environments framework
- Group-work (2-4 students) (to be determined based on student number)
- Grading based on the poster, poster presentation & peer-evaluation

Additional grading details

- Presentations (poster/oral) grading: We will be using the criteria & scoring sheet for the "Outstanding Student Presentation Award" (OSPA) that both of us have used in past American Geophysical Union (AGU) Fall Meetings. Relevant links: Info for the OSPA judges & pdf form *(see revised form in next folder section)*
- Blog/Vlog rubric or details on grading criteria (will be uploaded to IVLE in due time)
- Peer-evaluation: all students will fill-in IVLE survey forms based on the OSPA form *(see revised form in next folder section)*. We will compile, anonymize, and send to each group/student the relevant peer feedback.
- Further information will be provided in week 1

LITERATURE

Week 1 Readings on history and overview on environmental science/physical geography:

1. Ashmore, P., & Dodson, B. (2017). Urbanizing physical geography. The Canadian Geographer, 61(1), 102-106.https://doi.org/10.1111/cag.12318
   a. Brazel, A. J. (2017). Urban climate and physical geography: A response to Ashmore and Dodson. The Canadian Geographer, 61(1), 112-116. https://doi.org/10.1111/cag.12351
2. Pitman, A. J. (2005). On the role of geography in earth system science. Geoforum, 36(2), 137-148. https://doi.org/10.1016/j.geoforum.2004.11.008
3. Ruddiman, W. F. (2018). Three flaws in defining a formal 'Anthropocene'. Progress in Physical Geography: Earth and Environment, https://doi.org/10.1177/0309133318783142
4. Weart, S. R. (2010). The idea of anthropogenic global climate change in the 20th century. Wiley Interdisciplinary Reviews: Climate Change, 1(1), 67-81. https://doi.org/10.1002/wcc.6

Week 3 Readings on Ecosystem changes and Hydrology:

1. Ratajczak et al. (2018): Abrupt Change in Ecological Systems: Inference and Diagnosis (Review) in Trends in Ecology & Evolution https://doi.org/10.1016/j.tree.2018.04.013
2. Seidl et al. (2017) Forest disturbances under climate change (Review) in Nature Climate Change https://doi.org/10.1038/nclimate3303
3. Ummenhofer & Meehl (2017) Extreme weather and climate events with ecological relevance: a review in Philosophical Transactions B https://doi.org/10.1098/rstb.2016.0135
4. Only Sections 2,3,5 of Mirus et al (2017) Disturbance Hydrology: Preparing for an Increasingly Disturbed Future (Commentary) in Water Resources Research https://doi.org/10.1002/2017WR021084

Week 4 Readings on methods and techniques in climatology

1. Oke, T. R. (1988). The urban energy balance. Progress in Physical Geography, 12(4), 471-508. https://doi.org/10.1177/030913338801200401
2. Oke, T. R. (2006). Instruments and observing methods: Report No. 81: initial guidance to obtain representative meteorological observations at urban sites. World Meteorological Organization, WMO/TD (1250), 51. http://www.wmo.int/pages/prog/www/IMOP/publications/IOM-81/IOM-81-UrbanMetObs.pdf
3. Stewart, I. D., & Oke, T. R. (2012). Local climate zones for urban temperature studies. Bulletin of the American Meteorological Society, 93(12), 1879-1900. https://doi.org/10.1175/BAMS-D-11-00019.1
4. Weart, S. R. (2018). The Discovery of Global Warming: General Circulation Models. Harvard University Press. https://history.aip.org/climate/GCM.htm

Week 5 Readings on Socio-hydrology, hydrosocial research, and water science in the Anthropocene:

1. Sivapalan, Savenije, and Blöschl (2011) Socio-hydrology: A new science of people and water in Hydrological Processes https://doi.org/10.1002/hyp.8426
2. Savenije, Hoekstra, and van der Zaag (2014) Evolving water science in the Anthropocene in Hydrology and Earth System Sciences https://doi.org/10.5194/hess-18-319-2014
3. Linton & Budds (2014) The hydrosocial cycle: Defining and mobilizing a relational-dialectical approach to water in Geoforum https://doi.org/10.1016/j.geoforum.2013.10.008
4. Wesselink, Kooy, and Warner (2016) Socio-hydrology and hydrosocial analysis: toward dialogues across disciplines in WIREs Water https://doi.org/10.1002/wat2.1196

>> To be used by DV & WC only <<

Student (Name/Number):

Blog/Vlog Title:

Field Trip (week):

Submitted on time *(penalty for being late)*	≥5d	+4d	+3d	+2d	+1d	Yes
	0	1	2	3	4	5
Effective use of allotted time OR word-count *(penalty for not meeting the length; vlog: time in minutes, blog: wordcount)*	Shorter/ longer	±750w/ ±1.5'	-	±500w/ ±1'	-	1000w/ 3-5'
	0	1	-	3	-	5
Appropriate language *(general public → limited sci. jargon or appropriate explanation of terminology)*	WHAT?	Poor	Fair	Good	V. Good	Outstanding
	0	1	2	3	4	5
Originality & Creativity *(triggering emotions, capturing attention, unique style; original visual expression)*	-	Poor	Fair	Good	V. Good	Outstanding
	-	1	2	3	4	5
Reference to Dynamic Environments concepts/ topics/ literature *(putting the fieldtrip activity/ies in context)*	No	Poor	Fair	Good	V. Good	Outstanding
	0	1	2	3	4	5
Personal reflection *(presence of elements of personal reflection, authentic "voice" or unexpected & challenging viewpoint…)*	No	V. Limited	Limited	Some	V. Good	Outstanding
	0	1	2	3	4	5
Structure, Logic, Internal Coherence	No	Poor	Fair	Good	V. Good	Outstanding
	0	1	2	3	4	5
Total Score (max 35)						

Strengths	
Improvements needed	

Graded by (circle or underline): WC DV

>> NOTE: to be used for taking notes ONLY <<

Please, enter your scores and feedback online (see IVLE Survey for week 6 or week 12) not later than 3 days after the oral/poster presentation. We will compile and anonymize your feedback before sending it to the respective student/group. This scoring sheet is provided to aid your note-taking during the oral/poster presentations and it is not mandatory. If you prefer you could use the IVLE Survey tool directly.

Presenter(s): _____

Title of poster/presentation: _____

_____

Scoring Scale	0	1	2	3	4	5
	Absent/NA	Poor	Fair	Good	Very Good	Outstanding

Presentation (max 20)

• Visuals	0	1	2	3	4	5
• Effective use of allotted time or space	0	1	2	3	4	5
• Diction (enunciation, volume, clarity)	0	1	2	3	4	5
• General presentation style, liveliness, and stage presence	0	1	2	3	4	5

Content (max 25)

• Relevance/connection to the Dynamic Environments framework/topics	0	1	2	3	4	5
• Appropriate comprehension/knowledge of field	0	1	2	3	4	5
• Organization and logic	0	1	2	3	4	5
• Significance and originality	0	1	2	3	4	5
• Clear explanation & ability to answer questions	0	1	2	3	4	5
Overall impression compared to the rest of the poster/oral presentations **(max 5)**	0	1	2	3	4	5

Total Score _____/ 50

Provide additional qualitative feedback in the space below. It is important to be constructive in your feedback. Remember that the idea is to help your fellow students to identify their strengths and the areas which need further improvement.

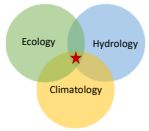
Strengths	
Improvements needed	
Comment visible to lecturers only	

Abrupt ecosystem changes and disturbance hydrology

Week 3, GE5211 ('18/'19)

1

Today…



1. What is ***abrupt*** ecosystem change?
2. How can we deal with interactions of ***disturbance drivers***?
3. How do we define ***extreme weather & climate events***? (relevant to ecosystems' change)
4. What is ***disturbance hydrology*** & how does my unfinished postdoctoral research fit within the discipline?

What is the connection between these topics and Dynamic Environments?

2


Abrupt Change in Ecological Systems: Inference and Diagnosis

Ratajczak et al. (2018)

Forest disturbances under climate change

Seidl et al. (2017)


Extreme weather and climate events with ecological relevance: a review

Ummenhofer & Meehl (2017)

Disturbance Hydrology: Preparing for an Increasingly Disturbed Future

Mirus et al. (2017)

3

I'll start with the scope of today's seminar… What are our goals? (answering 1-4 Qs); How are we going to do it? (unpacking the readings, slide 3); What examples are we focusing on? (Yellowstone ecosystem and the re-introduction of wolfs; Mountain Bark Beetle outbreak & western US);

1.

Abrupt change in ecological systems: inference & diagnosis

4

Definitions

System
- Generally: a collection/combination of elements & their interactions;
- Usually there is a well-defined spatial boundary & relevant temporal resolution & period

External drivers → **System** (**State variables**) ← External drivers

State variables — Major components of the system that change over time

(External) Driver
- External to the system;
- Affect the system without the system affecting them;

5

Definitions

Abrupt change

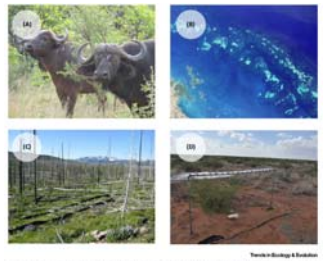
substantial changes in the *mean or variability* of a system that occur in a *short period* of time relative to typical rates of change

Disturbance

relatively *discrete event* in time that alters the biotic and/or abiotic components of an ecosystem.

System state

the *characteristics* used to describe the status of an ecosystem at a *particular domain in space and time*.



6

This shouldn't be lecture, where I speak for 2.5 hours. Next to asking questions regularly, we are also going to discuss videos, to apply terminology to specific cases (e.g. the wolf reintroduction), and to explain/discuss the figures from the papers.


https://youtu.be/ysaSOBhXz-Q

7

Driver 1
- Mean
- Variability

Driver 2
- Mean
- Variability

…

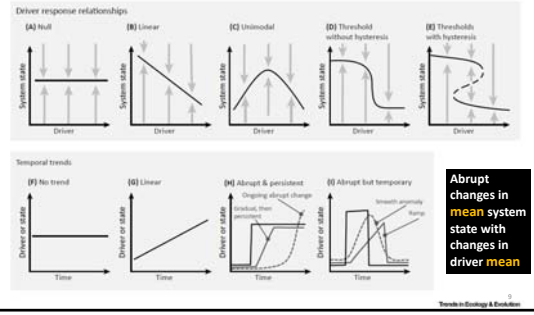
Driver n
- Mean
- Variability

Change

1. WE make a clear distinction between the system (& its state variables) & the external drivers.
2. WE then can ask the questions:
   - How does change in the DRIVER (e.g. 1, 2, …, n) affect the State variable?
   - How are the drivers interacting?

State Variable(s)
- Mean
- Variability

8



9

student activity group discussion & explanation of these figures

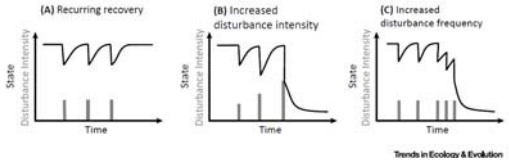
Questions to students: Could you summarize this video? Which system was it about? How was the system defined? What are the system's elements and how do they interact? What is the driver in this context? Could you identify direct/Indirect effects? What can we view as disturbance in this case and what is the abrupt change? What is trophic cascade? The idea is practice the terminology and to put it in context.

Abrupt changes involving variability in system and/or drivers — p. 519

- Changes in **driver variability** can lead to an abrupt change in the **mean state** of an ecological system
- Changes in the **mean of a driver** can lead to an abrupt change in the ecological **system variability**
- Changes in **driver variability** can lead to abrupt changes in the **ecosystem variability**

another activity: read a paragraph & write down examples for each category; groups could provide additional examples.

Changes in the **disturbance regime** (altered intensity or frequency) **outside of historical range** of variability can alter the **recovery capacity** of ecosystems.

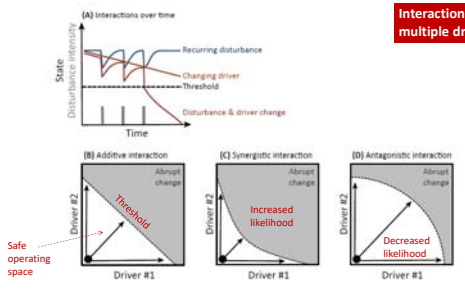


Disruption of **disturbance-recovery cycle**

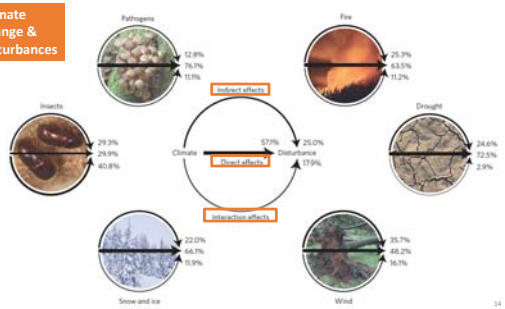
2.

Disturbance drivers interactions & forest disturbances under climate change

Interactions between multiple drivers



Climate change & disturbances



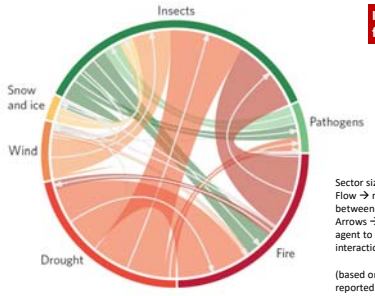
Processes through which climate influences forest disturbances

Disturbance agent	Direct effects	Indirect effects	Interaction effects
Fire			
Drought			
Wind			
Snow & Ice			
Insects			
Pathogens			

Seidl et al., Table 1

fill the gaps... groups, 1st trying on their own to guess, then looking at the Table 1 from the paper, where there are explanations

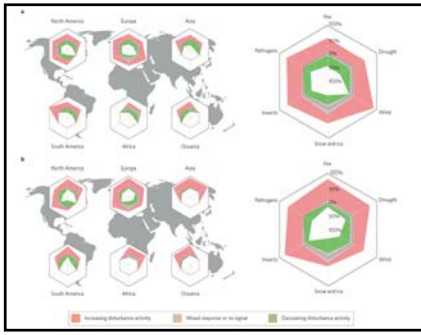
Interactions between forest disturbance agents



Sector size → distribution of interactions
Flow → relative importance of interactions between individual agents
Arrows → pointing from the influencing agent to the agent being influenced by the interaction

(based on the number of observations reported in synthesized literature)

how do we read this kind of diagrams --> students could try to guess before I explain what is the meaning of this figure.

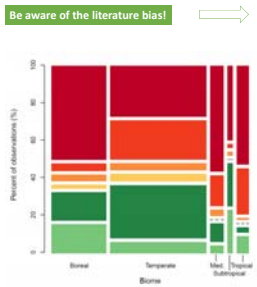


warmer and wetter

Global disturbance response to changing temperature & water availability

warmer and drier

Be aware of the literature bias!



Fire
Drought
Insects
Pathogens

North America
Europe

*"It remains unclear, for instance, whether the **increasing effect of future climate change with latitude** reported here … is the result of an **increased exposure of boreal forests to climate change** in combination with naturally lower tree species diversity, **or** whether it is simply the effect of a **publication bias towards these ecosystems**."*

note: Tropical & sub-tropical research gap. Potential topic for additional discussion: How can we bridge the research gap in climate & disturbance? What could be the reasons for this gap.

3.

Defining weather & climate events as extreme

19

What is defined as extreme climatic event?

"…the occurrence of a weather or climate variable above (below) a threshold value near the upper (lower) end of the range of observed records of the variable."

The threshold value:
→ would vary, but usually it would be 1%, 5%, 10% relative to a reference period.
→ Could be absolute value too, if/when it is relevant.

The reference period:
→ Historical period (30 or more years).
→ Changing the reference period may result in change in our results and conclusions.

This type analysis is very sensitive to data availability, quality, and consistency.

20

shift of the entire distribution toward a warmer climate

present T future

increase in T variability with no shift in the mean

altered shape of the distribution (here: asymmetry toward the hotter T)

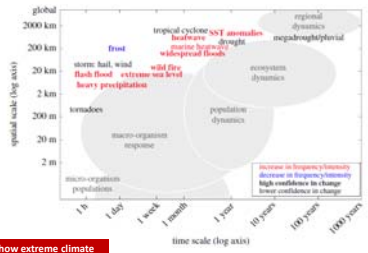
21

brushing up on some statistics... it is not clear what is the background of our students. Depending on what Dr. Chow presents in week 1 (haven't seen the lecture plan), I may link to his lecture. If not, we'll spend some time on distributions & spatio-temporal scales

Characteristics that may be relevant when thinking about climate events as disturbances:

→ magnitude,
→ probability or return frequency,
→ duration,
→ spatial extent,
→ timing,
→ onset date or seasonality
→ preconditioning

Usually it is in terms of temperature, precipitation or moisture, or the combination of these.



What are the challenges in assessing how extreme climate events impact biological systems?

22

4.

What's disturbance hydrology?

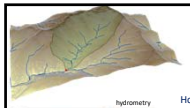
23

Disturbance hydrology

- Interdisciplinary
- Borrows terminology from ecology (& abrupt ecosystem changes), but the focus is on the hydrologic function of a system.

24

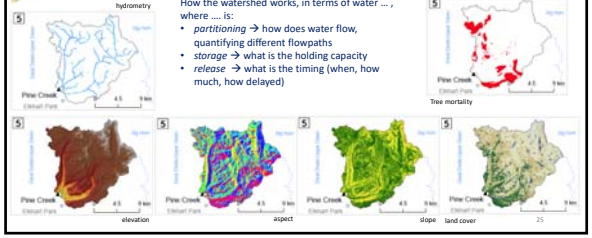
The examples in this part of the lecture are predominantly US-centered, because that's what I have experience with. However, depending on the students' research interests & participation, we could try to discuss other examples.



Hydrologic function of a system?

the watershed, usually…

How the watershed works, in terms of water … , where …. is:
- *partitioning* → how does water flow, quantifying different flowpaths
- *storage* → what is the holding capacity
- *release* → what is the timing (when, how much, how delayed)



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Hydrologic disturbance includes event that changes the **previously understood** hydrologic function.

Departure from **"normal"** spatio-temporal patterns and conditions.

Challenge #1

It can be characterized by:
- Abruptness
- Magnitude
- Duration

t1 t2

Disturbance

Hydrologic vs. Ecologic

Beginning/end not always clear

Pulse disturbance → abrupt, acute
Press disturbance → chronic

Discrete/abrupt disruption

Volcano eruption
Insect infestation
Wildfire
Climate change

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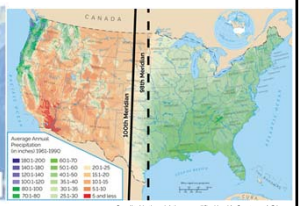
Challenge #2

Constrain the timescales of return periods & duration of hydrologic disturbance drivers against potential timescales of recovery

Challenge #3

Disentangling the "cause-effect" in a fully coupled Earth System with intertwined processes & overlapping disturbances.



From @nature-LANDFIRE data: https://www.landfire.gov/mfri.php

Credit: National Atlas, modified by K. Cantner, AGI

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again, we don't know if students have any hydrology background, so in this two slides I'll be explaining the basics in hydrology & what are the major challenges that we face when working within the disturbance hydrology field.

Week 5

Disturbance hydrology vs. **Socio-hydrology**

- It could accommodate human activity as a disturbance, however…
- … the focus is on the "natural" disturbances.
- It may be more productive to consider **how humans influence the severity & frequency of different disturbances**, than to differentiate between **anthropogenic & non anthropogenic** ones.

- Bidirectional feedbacks between humans & water supply
- Co-evolution of environmental & social processes.

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connection to week 5 topic

Mountain Bark Beetle tree die-off in the Western US

Case-study

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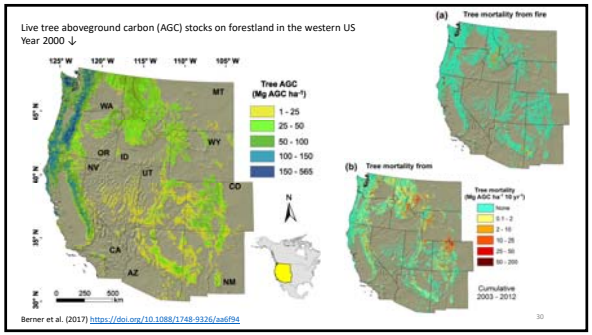

Berner et al. (2017) https://doi.org/10.1088/1748-9326/aa6f94

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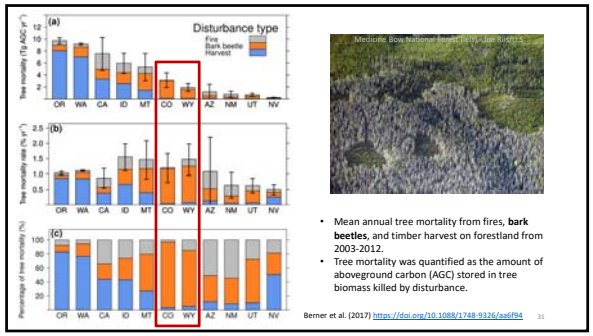
relevant example from my post-doctoral research (unfinished/current?); Students will have to link their own research/interests to the topic/framework of Dynamic Environments, so providing example from my research may help them understand what we will be looking for when they present in week 6.



- Mean annual tree mortality from fires, **bark beetles**, and timber harvest on forestland from 2003-2012.
- Tree mortality was quantified as the amount of aboveground carbon (AGC) stored in tree biomass killed by disturbance.

Berner et al. (2017) https://doi.org/10.1088/1748-9326/aa6f94

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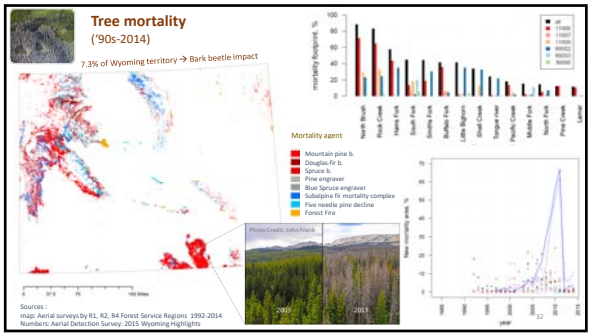

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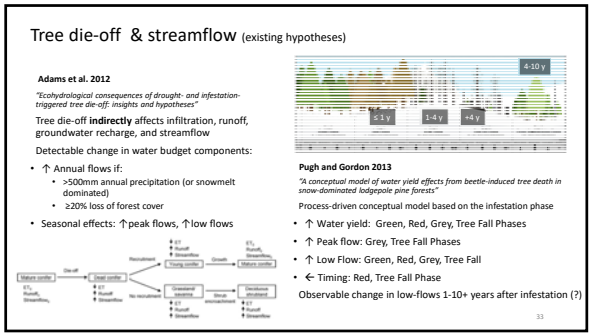

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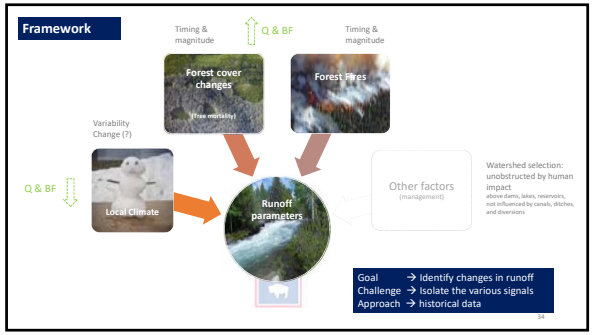

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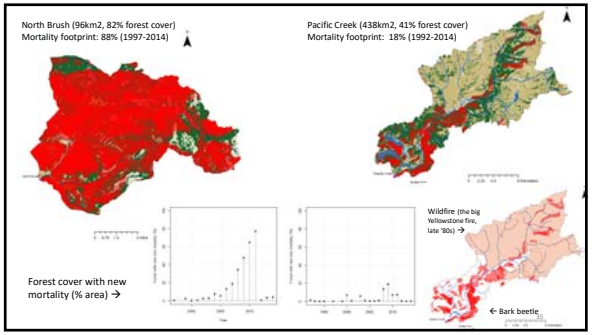

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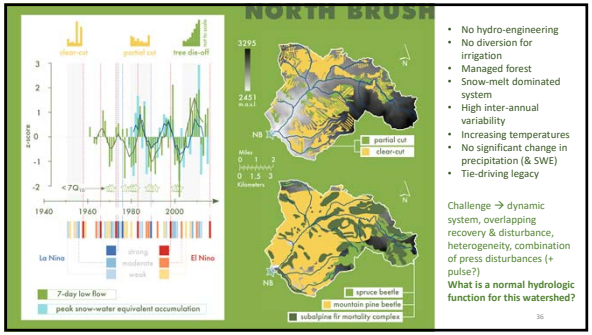

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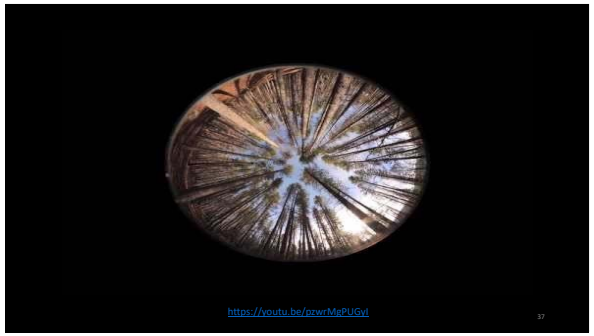

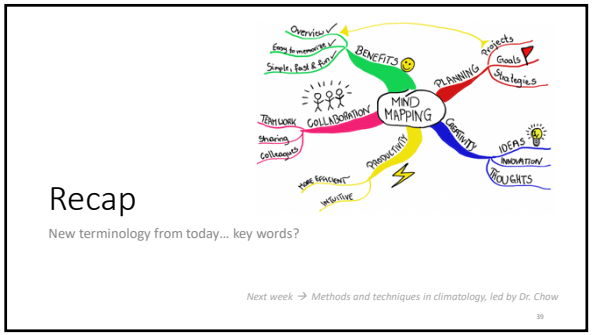

these two videos are on the same topic, but have different viewpoints. I want students to identify these viewpoints and to compare them (differences/similarities).

I'll ask students to 1) write down all the keywords (terms) we used 2) try to make a mind map - how does the terms relate & what is the connection to the module topic "Dynamic environments".
Depending on how many students are in class and how active they have been until this point, this will be either individual or group activity.

GE5211 Dynamic Environments

Achievements & Challenges

Prepared by Denitza Voutchkova

ACHIEVEMENTS

As mentioned before, this is the first time I co-teach this module and we have changed substantially the module content. Currently it is not clear, if we will be teaching this module again in two years, or if Dr. Ziegler will take it back. So far, even though Dr. Chow and I have different research interests, we have managed to plan what I find to be a coherent module. I am personally quite excited about all the topics and activities we have planned and am looking forward to participate and be present also in the seminars Dr. Chow will be leading. My experience in co-planning this module so far has been very positive.

I have no student feedback for this module, so it is hard to discuss "achievements" in this respect. So far our achievement is that both of us (Dr. Chow and I) have found common ground on what we thing this module should look like, how we will be assessing students' learning, and what are our grading criteria. The last can be found in the scoring sheets (attached). If the students need additional explanation, we will spell out what is considered to be "outstanding" or "very good" assignment. So far, we have found out that our understanding of these adjectives are very similar. We will decide how to split the grading after we know how many students will be reading the module, but we have been discussing the options to either grade all assignments and take the average grade, or to split the assignments (if the number of students is high).

CHALLENGES

The challenge of planning this module is mainly in (1) uncertainty of student numbers, and (2) student background diversity. A lot of our planned activities depend on number of students; for example, the size of groups could be 2, 3, or 4 people; the duration of the individual presentations (10, 15, 20 min) will also depend on how many students have signed. Aspects of fieldtrip planning are also somewhat dependent on number of students. Transportation options for 5-20 students vary, the space around the Geography weather station cannot accommodate safely large number of students, either. That's why we will be deciding on some of the details after our first lecture in week 1 and after the module drop-out is closed (week 2-3).

The second issue with the diversity in students' backgrounds is a little bit more challenging to tackle. My experience from last year (the 6000 level module) and from what we can see so far from the list of signed students is that there will be roughly 3 groups of students: 1) Geography research master/PhD students (1st or 2nd year), 2) GIS master students (1st year, predominantly foreign students), 3) NUS master/PhD students from other NUS Faculties or Centers. It can be challenging to accommodate different English language abilities, different cultural backgrounds (in terms of active class participation), and different knowledge level or field focus. The major challenge we will have to overcome is in bridging these gaps and pitching the material on appropriate level. The level may need to be adjusted based on week 1 experience.

The foreseeable challenge in teaching this module is mostly associated with the motivation and willingness of students to prepare for class activities and to participate in discussions. If this is going to be an issue depends on the specific mixture of individuals and how well I/we will manage to involve them in the learning process. Generally, I prefer informal atmosphere, where there is no display of hierarchy/power on my part. My last year experience with 6000 level was very positive, so I hope this year will be no different.