How to Give an Effective Presentation

GEOG PhD students
Skills Development

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8 February 2023

Why Communicate Research Effectively?

Convey relevance of your research.
Why is what you do important? What do you do all day in the lab?

Increase impact of your research.
Communicating your research to potential end users in an accessible way increases its application beyond academia.

Inspire next generation of researchers.
If we explain concepts, ideas, findings clearly and enthusiastically, we increase appeal and passion to pursue a career in research.

Curtail misinformation.
Miscommunication has consequences.
Need to curtail proliferation of fake news.

Funding.
If funding agencies and grant reviewers don’t understand your research, you won’t get funded.

Typical Academic Presentations

Elevator Pitch / Introduction / Roundtable (< 5 min).
Inspire further discussion, invest in your research, identify opportunities for collaboration.

PhD Upgrade (15-20 min).
Indicate how your PhD will evolve based on what you've done so far.

Conference (15-20 min) (typically shorter online).
New research to garner interest, get feedback, motivate discussions during networking.

Research Seminar (40-45 min).
New research with published research sprinkled in the introduction to advertise what you've done previously..

Celebration Talk (1 h).
Broad and very accessible to a diverse audience. Dominated by published work and contribution made to advancing knowledge.

Funding / Job Interview (highly variable).
Often very prescribed by funder. Convince them that money will be well spent.

Manage your time effectively

Be selective of content to present.

The goal is not to cram in as much information as possible. It's to tell a story.

Elevator Pitch / Introduction / Roundtable (< 5 min).
1-2 slides (3 at a push).

PhD Upgrade (15-20 min).
1-2 slides per minute.

Conference (15-20 min).
1-2 slides per minute.

Research Seminar (40-45 min).
1-3 slides per minute.

Celebration Talk (1 h).
1-3 slides per minute.

Funding / Job Interview (highly variable).
1-2 slides per minute.

Know Your Audience

Your audience determines how to pitch the talk: material/jargon/acronyms/detail to present or avoid, how much background to provide.

Pitch your talk to the most junior member of your audience (Master's or 1st year graduate student, or researchers outside the field).

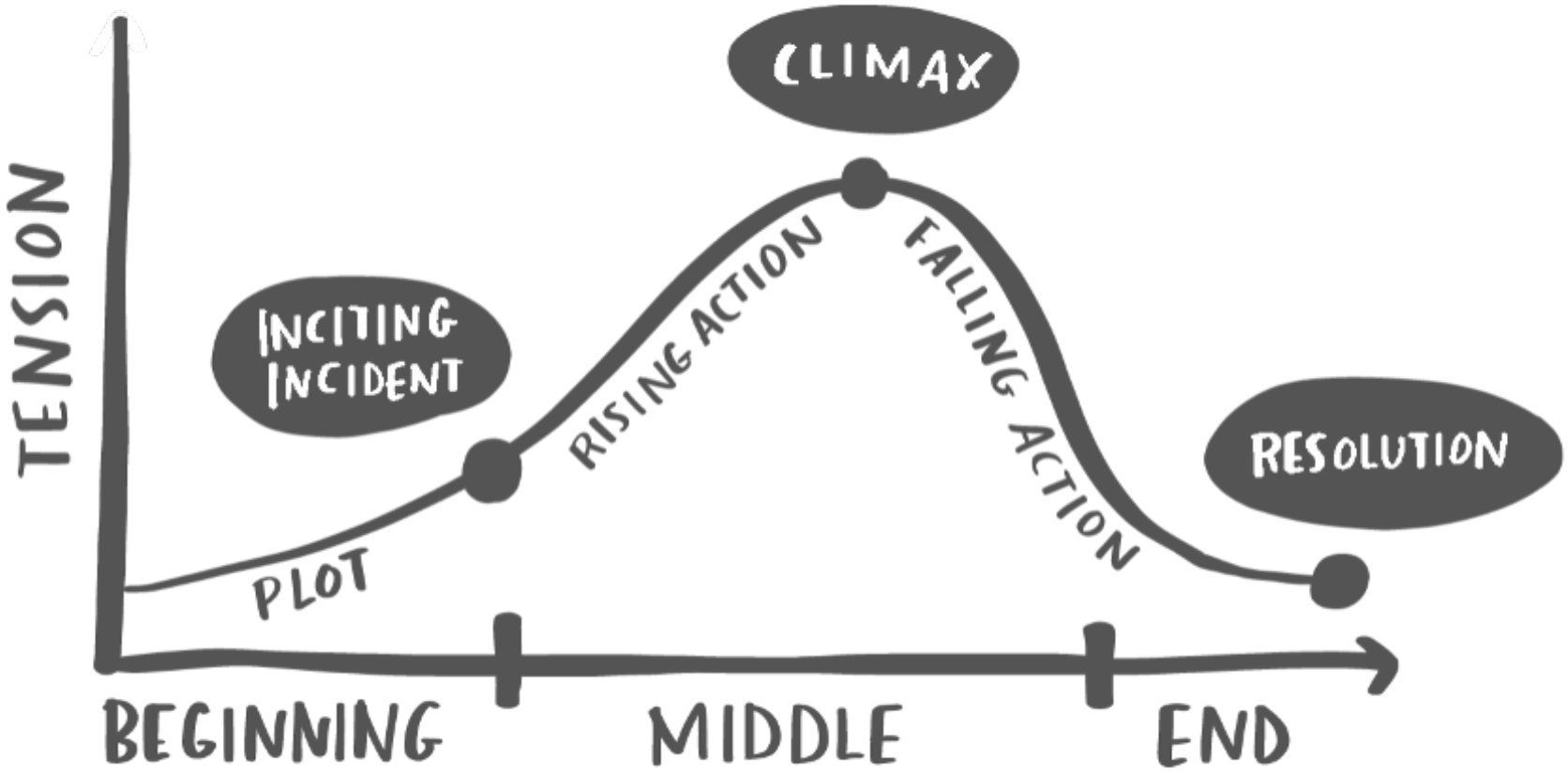
Remember, you've been working on this topic for months / years, but for most of your audience this is the first time they are interacting with the topic.

Comfort Zone: talking about your research to your peers

Discomfort Zone: talking about your research to non-experts

Tell A Story

Setup (Intro) Rising Action (Methods), Climax (Results), Resolution (Conclusion)



Tell A Story

Take your audience on a journey.

The presentation should have the structure of a captivating story:

- Set the scene (background)
- The buildup (materials and methods)
- The climax (results: moment of revelation)
- The denouement (final outcome, relevance and impact)

Make it relatable (give it context)

Make it personal (trials and tribulations of doing a PhD)

Surprise the audience, upend expectations

Evidence that it works: https://www.npr.org/2020/08/18/903545336/the-science-behind-storytelling

Tell Your Story

What if your PhD research story?

Take 10-15 min to prepare a storyline for your PhD research

Then, in 2-3 min (elevator style presentation, no slides), tell the group about it.

Slides: Typical Sequence

Title → Introduction → Research → Conclusions

Example Title (Handshake) Slide

The Billionaire Space Tourism Race Could be One Giant Leap for Air Pollution

Geography Seminar

Eloise Marais

8 Feb 2023

Formatting Best Practices for Content Slides

- Less is more. Keep slides simple and uncluttered.
- Use a plain background. Avoid templates (except a box for the Zoom window).
- Keep text to a minimum. Figures/images/illustrations should dominate.
- Use 18+ font size for text (sometimes smaller font sizes for figures).
- Use Arial-equivalent font types. Avoid decorative fonts, like Times New Roman.
- Animated slides are fine, but keep to a minimum. If overused, these can be distracting.
- Videos or GIFs can be effective, but make sure these work.
- Acknowledge data/literature sources in the same format as in-text citations.
- Steer clear of uncommon **acronyms**. These stand in the way of effective communication.
- All text (including figure labels) must be in your own words (no quotes)

Ban the Bullet Point

These are okay for lecture slides (serve as reference), but not for a talk

Audience reads the text, rather than listens to what you have to say

Find appropriate images with Google, primary literature, in reputable reports

Or create your own!

But... Anything you show, you must know!

Transform Content Slide from this:

Space Tourism Propellants

- Three different types of propellants used by space tourism companies:
  - Virgin Galactic: hybrid solid and liquid
  - Blue Origin: cryogenic
  - SpaceX: liquid

- The different types of propellants include a fuel and an oxidizer:
  - Hybrid: Solid synthetic rubber (HTPB) fuel and liquid nitrous oxide (N_2O) oxidizer
  - Cryogenic: Liquid hydrogen fuel and liquid oxygen oxidizer
  - Liquid: Liquid kerosene and liquid oxygen oxidizer

- Virgin Galactic and SpaceX fuels are carbon-based and so produce CO_2
- Blue Origin fuel has no carbon and so does not produce CO_2

To this:

Space Tourism

Each rocket uses a different propellant

Virgin Galactic

Hybrid:
solid fuel (HTPB) +
liquid oxidizer (N_2O)

Carbon-based fuel

Blue Origin

Cryogenic:
liquid fuel (H_2) +
liquid oxidizer (O_2)

No carbon in fuel

SpaceX

Liquid:
kerosene +
liquid oxidizer (O_2)

Carbon-based fuel

UCL Lunch Hour Lecture: https://www.youtube.com/watch?v=-0HhW1-ybA4

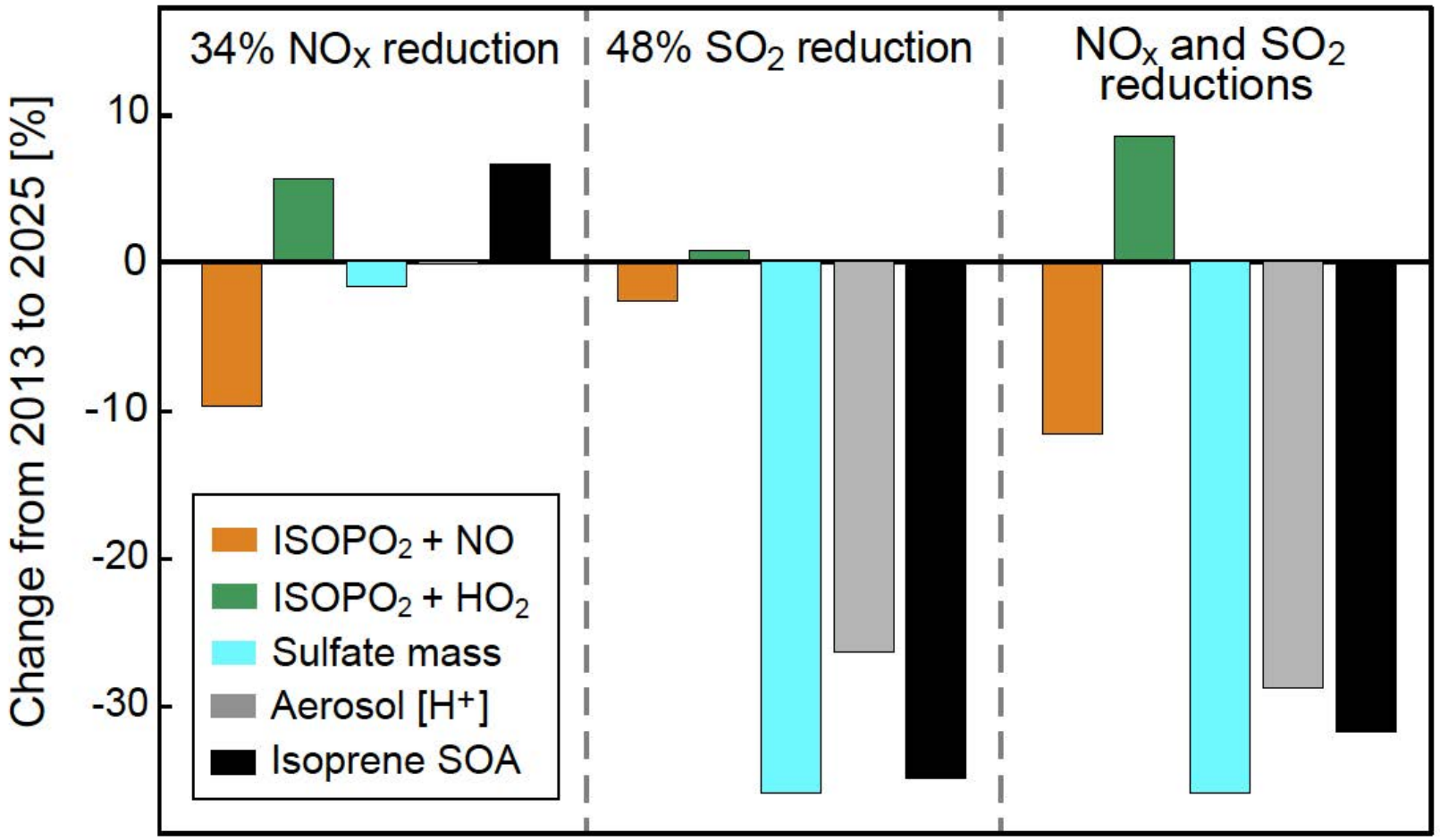
Avoid Tables

Almost always an unimaginative, unrelatable and hard to comprehend way to display data

Why show data in this way?

Environmental factor	Change [%] due to emissions reductions		
	34% NO_x	48% SO_2	34% NO_x and 48% SO_2
$ISOPO_2$ + NO	-10	-3	-11
$ISOPO_2$ + HO_2	6	1	8
Sulfate mass	-2	-36	-35
Aerosol [H^+]	-0.1	-26	-29
Isoprene SOA	7	-35	-30

When it's easier to comprehend like this?



[Marais et al., 2016]

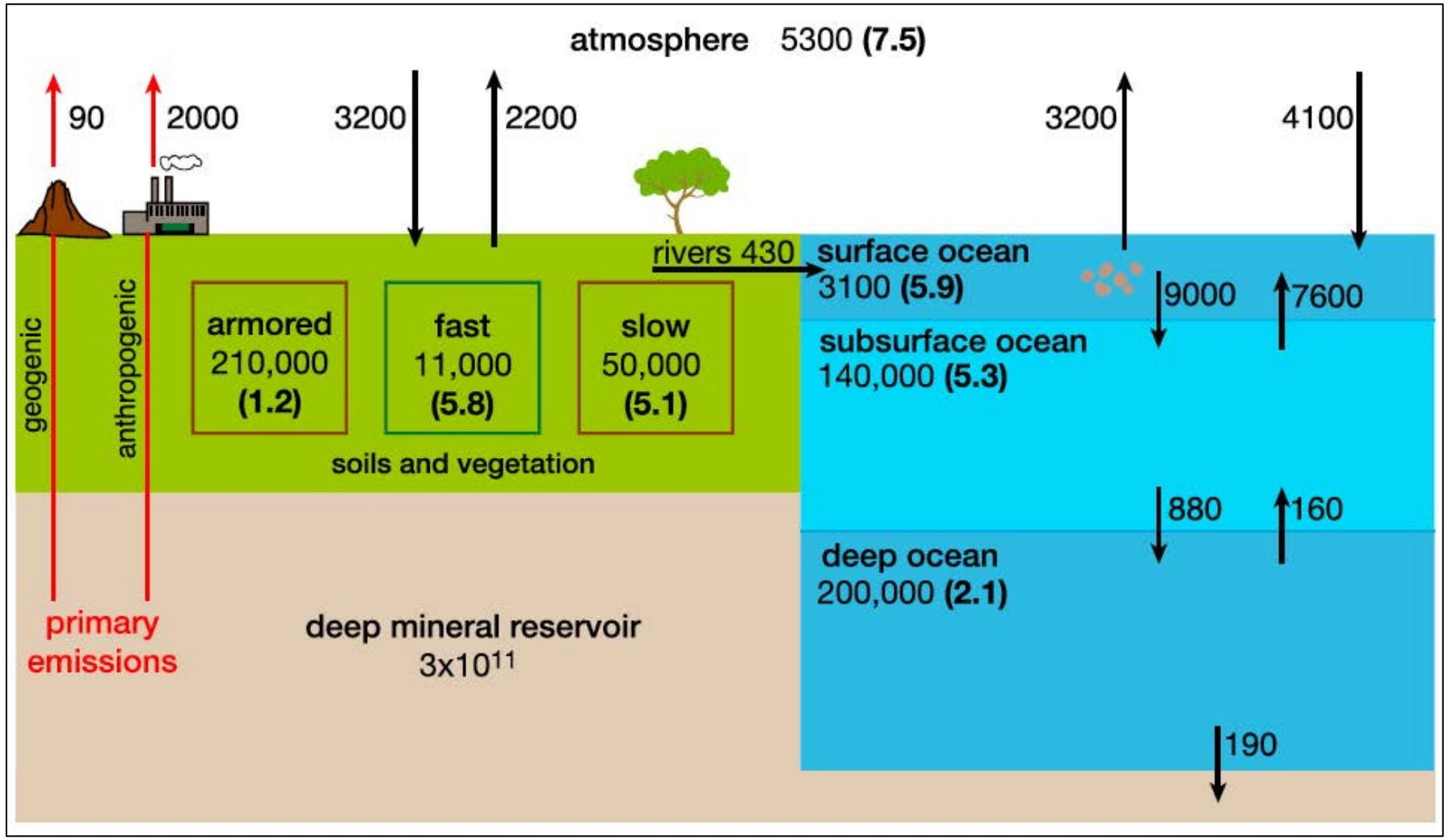
Not Convinced? Here's Another: Data in a table:

Table 1. Present-Day Hg Reservoirs and Flows[a]

	Flows ($Mg\,a^{-1}$)
Atmosphere: 5000 Mg	
Hg(II) deposition to ocean	3900
Hg(0) deposition to ocean	40
Hg(II) deposition to land[b]	1500
Hg(0) deposition to land[c]	1500
Surface ocean[d]: 2900 Mg	
Hg(0) evasion	3000
Particle settling to subsurface ocean	3300
Water transfer to subsurface ocean	5100
Subsurface ocean[e]: 130,000 Mg	
Particle settling to deep ocean	480
Water transfer to surface ocean	7100
Water transfer to deep ocean	340
Deep ocean: 220,000 Mg	
Burial to deep sediments	210
Water transfer to subsurface ocean	180
Fast terrestrial pool: 9600 Mg	
Evasion due to respiration of organic carbon	460
Photochemical re-emission of deposited Hg	850
Biomass burning[f]	290
Transfer to slow pool	330
Transfer to armored pool	10
River runoff to surface ocean[g]	365
Slow soil pool: 35,000 Mg	
Evasion due to respiration of organic carbon	250
Biomass burning	8
Transfer to fast pool	210
River runoff to surface ocean	10
Armored soil pool: 190,000 Mg	
Evasion due to respiration of organic carbon	25
Biomass burning	4
Transfer to fast pool	15
River runoff to surface ocean	5
Deep mineral reservoir: 3×10^{11} Mg	
Geogenic emission	90
Anthropogenic emissions[h]	2000

[Amos et al., 2013]

Versus data more clearly illustrated:



[Amos et al., 2013]

My Recipe for Structuring a Results Slide

If online, leave space for the video

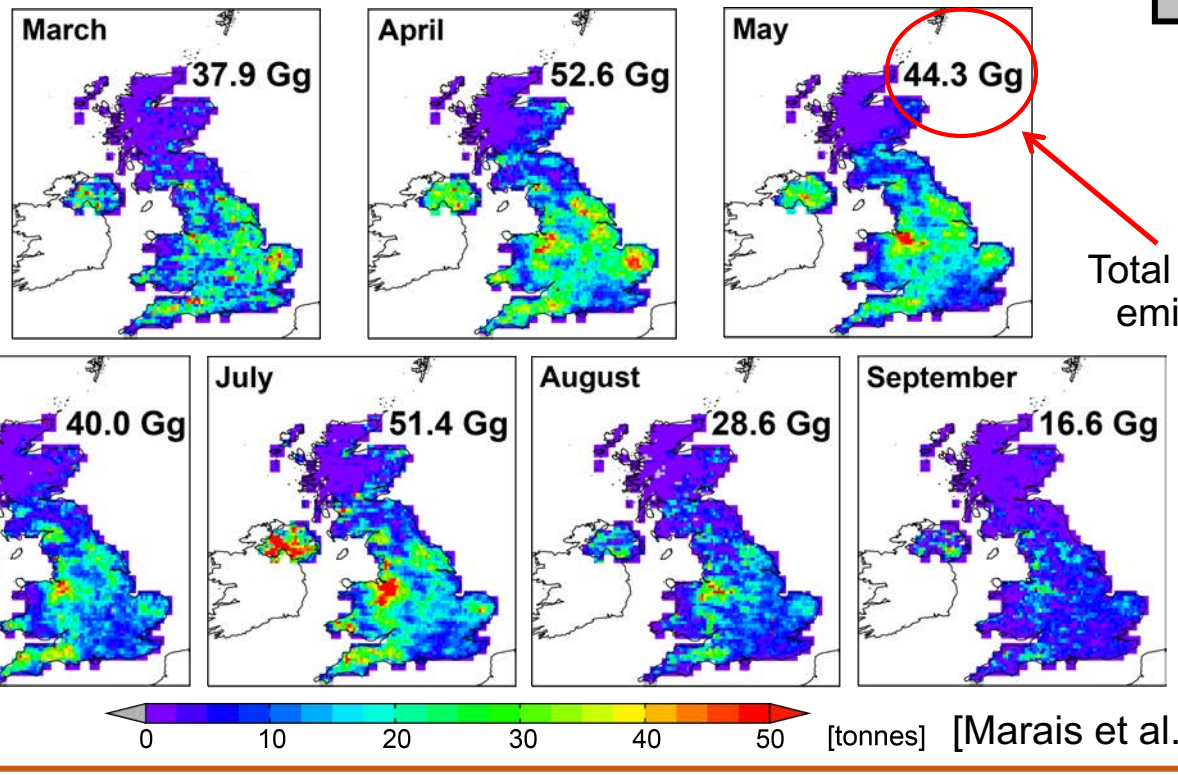
Specific slide title (not generic like "Results")

Satellite-derived ammonia emissions at fine scales (monthly, 10 km)

Top-down ammonia emissions derived with a mass-balance approach

IASI-derived emissions total **272 Gg**

CrIS-derived emissions total **389 Gg**



Total monthly emissions

[Marais et al., 2021]

Prominent and well labelled image

Bottom-up emissions total **199 Gg** and so are 27-49% less than top-down values

Brief, punchy take-home message

Conclusions Slide

The only slide where it's okay to show bullet points and majority/only text

Opportunity to briefly wrap-up presentation

Draw out the most pertinent points (take-home message)

This could include a call to action or a personal reflection on the environmental issue based on your research.

Answering Questions

A sign of a good talk is if the audience asks questions. Relish this!

- A skill that develops with practice, so take advantage of every opportunity to present.
- Know your topic well to avoid the embarrassment of saying “I don’t know!” when you should or fumbling through an incoherent answer if you don’t have one.
- When asked a question, thank the audience member for the question.
- If you’re not quite sure what an audience member is asking or the rest of the audience may not have heard the question, repeat the question before answering. This also gives you time to think through a coherent answer.
- Keep answers brief and on topic so that there’s time for more questions.

Additional Advice

- Convey enthusiasm
- Practice
- Avoid a script, as this gives the talk an impersonal tone (practice and familiarity with content address this)
- Test the technology beforehand
- Aim for text to occupy ~10% of the slide at most
- Each slide must convey a clear message
- Ensure content is relatable
- Figures in papers aren’t always directly suitable for presentations

You as The Audience

Engage.
You're not watching a movie. It's a privilege to have a scientist share their research with you. Make them feel welcome.

Avoid the temptation to open your laptop, check emails or your phone during talks.

Ask Questions.
A question is not an indicator of ignorance, but of curiosity.

PhD students and postdocs that ask questions at conferences get noticed!

Keep questions brief, clear, and concise.

Asking questions can be intimidating. Write it down during the talk to formulate the question more clearly.

Assess Others.
Scrutinize the quality of presentations by other scientists to learn how to give an effective presentation, and what to avoid. This includes fellow PhD students, early career scientists, your supervisor(s), well-established scientists.

Resources

Listen.

Podcasts: Science Magazine, Nature Magazine, Science vs, Shortwave, Hidden Brain, You're The Expert, Radiolab, StarTalk. Seminars by invited and local speakers.

Read.

The Conversation, The Guardian, Science and Nature Magazine opinion and discussion pieces and blogs posts (subscribe to their mailing list). Science/Nature books written for the public.

Watch.

Science documentaries and interviews. Cosmos, Blue Planet, Planet Earth. PBS and BBC have great, accessible science specials. TED talks.

Discuss.

Take opportunities to discuss your research with PhD colleagues, friends, family (possibly your most critical audience!).

Get Feedback.

Get feedback from peers, mentors, senior research group members, your supervisor

Additional Resources

If I understood you, would I have this look on my face? Book on communicating science by Alan Alda

Examples of well crafted slides: https://maraisresearchgroup.co.uk/presentations.html
(& 2 1-hour lectures by Research Fellows in my group!!!)

Nature blog: http://blogs.nature.com/naturejobs/2017/01/11/scientific-presentations-a-cheat-sheet/

How to tell a compelling story in scientific presentations: https://www.nature.com/articles/d41586-021-03603-2

Hidden Brain podcast episode: https://www.npr.org/2020/01/09/794683840/tell-me-a-story-what-narratives-reveal-about-the-mind

How to give a dynamic scientific presentation:
https://www.elsevier.com/connect/how-to-give-a-dynamic-scientific-presentation

Steven Crammer's presentations guides (Harvard-Smithsonian):
https://www.cfa.harvard.edu/~scranmer/cranmer_htgat.html