

# The Rebuttal Updates Project

## Adding plain language summaries to rebuttals on Skeptical Science

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Session EOS1.1 Abstract EGU23-1667

April 25, 2023



Skeptical Science

# INTRODUCTION TO SKEPTICAL SCIENCE

## Skeptical Science (SkS)

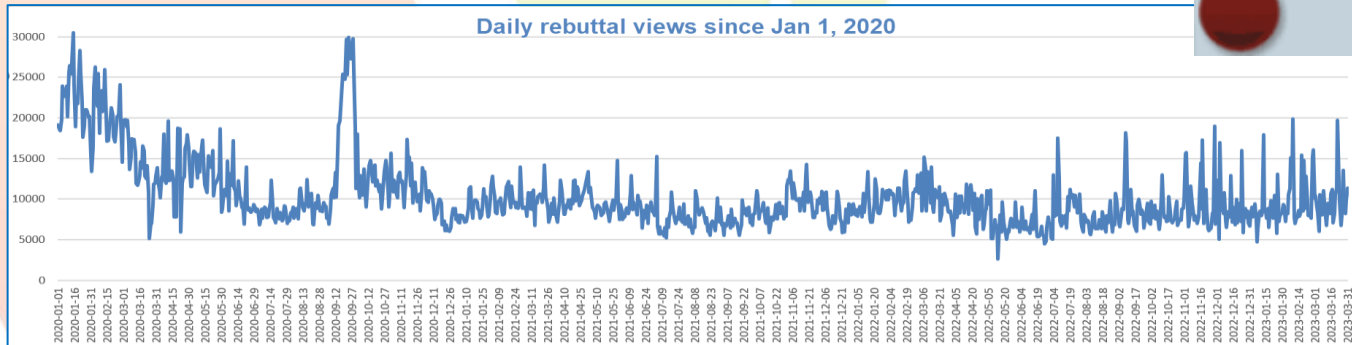
- ... is an international website and non-profit science education organization
- ... was founded by John Cook in 2007
- ... debunks misconceptions and misinformation about human-caused climate change
- ... features a database with more than 200 rebuttals based on peer-reviewed literature
- ... is a team project with volunteers from around the globe.
- ... actively contributes to published research, with one of the highlights being the often cited 97% consensus paper published in 2013.

The screenshot shows the Skeptical Science website homepage. At the top, there is a navigation bar with links for Home, Arguments, Software, Resources, Comments, The Consensus Project, Translations, About, and Support. Below the navigation bar is a search bar and social media icons for Twitter, Facebook, YouTube, and MeWe. The main content area features a section titled "Skeptical Science News: The Rebuttal Update Project" with a sub-headline "Posted on 14 February 2023 by John Mason, BaerbelW, Ken Rice, Doug Bostrom". The text below the headline reads: "We are pleased to announce that a major new project is well underway at Skeptical Science. The work involves not only updating our popular rebuttals for the most-used climate myths but also adding entry-level sections to each topic, thereby widening the accessibility of the resource to as many folk as possible. And we want you, the readers, to join in with the project." Below this text is a collage of various rebuttal documents. To the right of the main content is a sidebar featuring a cartoon character named "Cranky Uncle" with the text "Critical thinking about climate change" and "Winner of the 2011 Australian museum Eureka Prize Advancement of climate change knowledge". At the bottom of the page, there are several resource links including "IPCC FACTS", "Guide to RCPs", "the consensus project", "TREND CALCULATOR", "PRUDENT PATH", and "Lessons from Predictions".

# THE REBUTTALS

## Rebuttals

- ... come with explanations in basic, intermediate, and advanced versions
- ... reference peer-reviewed primary research
- ... tackle common misconceptions about global warming such as “It’s not happening”, “It’s not us”, “It’s not bad”, and “It’s too hard”.
- ... are regularly viewed, some more than 20,000 times per month.
- ... are listed by popularity, fixed numbers or taxonomic categories for systematic access.



## MOST USED Climate Myths

and what the science really says..

- 1 Climate's changed before
  - 2 It's the sun
  - 3 It's not bad
  - 4 There is no consensus
  - 5 It's cooling
  - 6 Models are unreliable
  - 7 Temp record is unreliable
  - 8 Animals and plants can't tell
  - 9 It hasn't warmed since 1998
  - 10 Antarctica is gaining ice
- [View All Arguments...](#)

## Global Warming & Climate Change Myths

Here is a summary of global warming and climate change myths, sorted by recent popularity vs what science says. Click the response for a more detailed response. You can also view them sorted by taxonomy, by popularity, in a print-friendly version, with short URLs or with fixed numbers you can use for permanent references.

Climate Myth	vs	What the Science Says
1 "Climate's changed before"		Climate reacts to whatever forces it to change at the time; humans are now the dominant forcing.
2 "It's the sun"		In the last 35 years of global warming, sun and climate have been going in opposite directions
3 "It's not bad"		Negative impacts of global warming on agriculture, health & environment far outweigh any benefits.
4 "There is no consensus"		97% of climate scientists agree that global warming is happening and is caused by humans.

## Climate Myths sorted by taxonomy

- **It's not happening**
  - Temp record is unreliable
    - Hockey stick is broken
      - Tree-rings diverge from temperature after 1960
      - Ljungqvist broke the hockey stick
    - Dropped stations introduce warming bias
    - It's Urban Heat Island effect
    - 1934 - hottest year on record
    - It's microsite influences
    - Satellite error inflated Great Lakes temperatures
    - Satellite record is more reliable than thermometers
  - It's cooling
    - We're heading into an ice age
    - It's freaking cold!
      - 2009-2010 winter saw record cold spells
      - Record snowfall disproves global warming
        - Record high snow cover was set in winter 2008/2009
    - Oceans are cooling
    - It hasn't warmed since 1998
    - Phil Jones says no global warming since 1995
    - Global warming stopped in 1998, 1995, 2002, 2007, 2010, 2014, 2017, 2020, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100
    - BEST hides the decline in global temperature
      - No warming in 16 years
    - DMI show cooling Arctic
    - We're heading into cooling





# CHALLENGES & ISSUES

- Availability of volunteers
- Finding helping hands for specific time-consuming and often rather mundane tasks (like fixing broken links or keeping published materials current)
- Most of the rebuttals were created between 2007 and 2010
- Content of many hadn't been "properly" updated in the last 5 years or more.

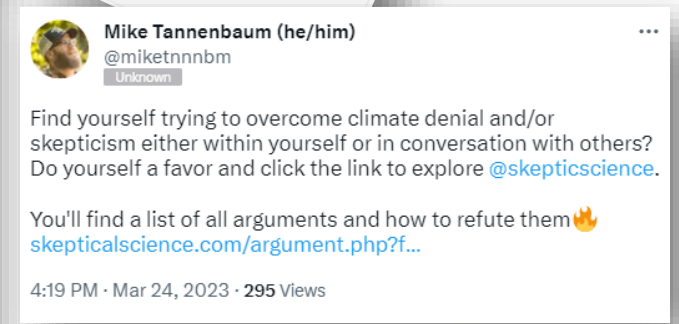
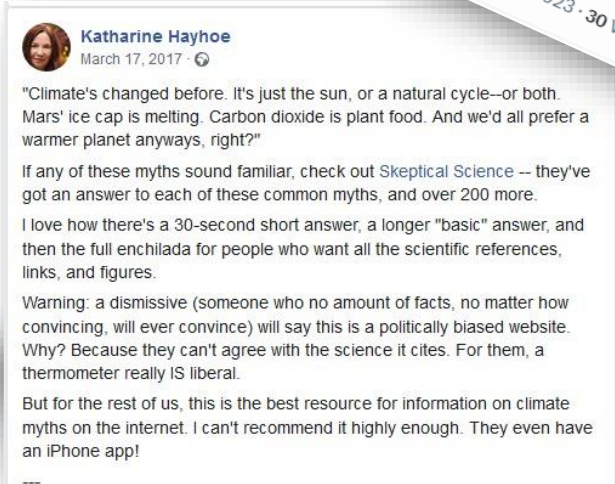
These add up to a rather big issue with rebuttals countering climate myths and misinformation as the information provided should be as current as possible.

Code	Argument Title	Rebuttal Level	Rebuttal Status	Date Created	Last Rebuttal Update
1970s	Ice age predicted in the 70s	Basic	Published	2007-05-08	2015-07-05
1998	It hasn't warmed since 1998	Basic	Published	2007-05-09	2017-09-29
antarctica	Antarctica is gaining ice	Basic	Published	2007-05-21	2020-01-31
climategate	Climategate CRU emails suggest conspiracy	Basic	Started	2009-11-21	2010-08-12
hockey	Hockey stick is broken	Basic	Started	2007-05-08	2010-08-12
lag	CO2 lags temperature	Basic	Published	2007-05-08	2021-04-21
past	Climate's changed before	Basic	Published	2007-05-21	2015-08-06
sun	It's the sun	Basic	Published	2007-05-18	2017-04-02
temp	Temp record is unreliable	Basic	Published	2007-08-11	2017-08-15
thermo	2nd law of thermodynamics contradicts greenhouse theory	Basic	Published	2010-05-19	2017-10-07

# RISK TO PERCEIVED CREDIBILITY

Questions regarding updates on social media and via email

Skeptical Science is often cited as the “go to resource” when myths about climate change need to be debunked.



Skeptical Science



# ADDITIONAL FINDINGS

Some rebuttals lacked a basic version and only offered an intermediate-level explanation going all in with technical details and graphics:

Most lacked an entry level, easy to read and distraction-free introduction aimed at readers not necessarily familiar with scientific jargon:

The screenshot shows the Skeptical Science website interface. The main article is titled "What evidence is there for the hockey stick?". A sidebar on the left lists "MOST USED Climate Myths" with a numbered list from 1 to 10. A cartoon character "Cranky Uncle" is featured on the right side of the article. The article text discusses the "hockey stick" reconstruction of past temperatures and mentions a critique published in 2004 by McIntyre and McKittrick. A graph at the bottom shows Northern Hemisphere temperature changes from 1000 to 2000 AD, with instrumental data in red and proxy reconstructions in blue.

The screenshot shows the Skeptical Science website interface. The main article is titled "What does past climate change tell us about global warming?". A sidebar on the left lists "MOST USED Climate Myths" with a numbered list from 1 to 10. A cartoon character "Cranky Uncle" is featured on the right side of the article. The article text discusses greenhouse gases and their role in climate change, mentioning the Eocene and Cretaceous periods. A photograph of a mammoth in a forest is shown at the bottom of the article.

Figure 1: Northern Hemisphere temperature changes estimated from various proxy records shown in blue (Mann et al. 1999). Instrumental data shown in red. Note the large uncertainty (grey area) as you go further back in time.

A critique of the hockey stick was published in 2004 (McIntyre & McKittrick 2005), claiming the hockey stick shape was the inevitable result of the statistical method used (principal components analysis). They also claimed temperatures over the 15th Century were derived from one bristlecone pine proxy record. They concluded that the hockey stick shape was not statistically significant.

An independent assessment of Mann's hockey stick was conducted by the National

Lush life in the Arctic during the Eocene, 50 million years ago (original art - Stephen C. Quin, The American Museum of Natural History, N.Y.C)








# ADDING AT-A-GLANCE SECTIONS

Initial drafts for some of our most viewed rebuttals were created as Google docs for easy reviewing and collaboration.

Name	↑
01 DRAFT - 1934 - 1934 is the hottest year on record	
01 DRAFT - glacier - glaciers are growing	
01 DRAFT - gore - Is Al Gore's An Inconvenient Truth accurate?	
01 DRAFT - Hurricane - hurricanes-global-warming	
01 DRAFT - models - Models are unreliable	
01 DRAFT - sensitivity-how-sensitive-is-our-climate	
01-DRAFT-cosmic-what's the link between cosmic rays and climate change?	
02 G-DOC COMPLETE - acid - Ocean acidification isn't serious	
02 G-DOC COMPLETE - AGW - It's not us	
02 G-DOC COMPLETE - consensus - There is no consensus	
02 G-DOC COMPLETE - species - Animals and plants can adapt	
03 SkS DRAFT - cooling - It's cooling	
03 SkS DRAFT - iceage - Heading into an ice age	
03 SkS DRAFT - impacts - It's not bad	
Published - 1970s - Ice age predicted in the 1970s	
Published - 1998 - It hasn't warmed since 1998	
Published - antarctica - Antarctica is gaining ice	

We also collected current graphics to use in the updated basic rebuttal versions.

Name	↑
 Rebuttal-Sun-Details-Figure-1-TSI-Solar-cycles-570px.jpg	
 Rebuttal-Sun-Details-Figure-1-TSI-Solar-cycles.jpg	
 SkS DRAFT - sun - It's the sun	
 sun-details-figure-3-AR6-solar-natural.jpg	
 sun-details-figure2-TvsTSI.png	

Name	↑
 hockey_stick_original-TAR.jpg	
 Rebuttal-Hockey-WarmingStripes-past-2000-years-570px.jpg	
 Rebuttal-Hockey-WarmingStripes-past-2000-years.jpg	
 SkS DRAFT - hockey - What evidence is there for the hockey stick	





# UPDATED REBUTTALS

The newly added “At a Glance” section has its own heading and is visibly set apart from “Further Details” via the blue box containing the link to the Feedback form.

The “At a glance” section varies considerably in length depending on the rebuttal’s topic and how much needed to be explained.

The screenshot shows the Skeptical Science website interface. The main article is titled "What evidence is there for the hockey stick?". Below the article, there is a section titled "At a glance" which is highlighted with a blue background. This section contains a brief summary of the article's content and a link to a feedback form. The article text discusses the Hockey Stick graph, its history, and the various objections to it. The "At a glance" section is a key feature that provides a quick overview of the rebuttal.

The screenshot shows the Skeptical Science website interface for a different article titled "What does past climate change tell us about global warming?". Similar to the first screenshot, the "At a glance" section is highlighted with a blue background. This section provides a concise summary of the article's main points and includes a link to a feedback form. The article text discusses the evidence for past climate changes and how they relate to current global warming trends.





# AVOID DISTRACTIONS IN “AT A GLANCE”

- No images and graphics within the “At a Glance” section
- No links to other resources
- No linked references in this section

The screenshot shows the Skeptical Science website interface. At the top, there's a navigation bar with links like Home, Arguments, Software, Resources, Comments, The Consensus Project, Translations, About, and Support. Below this is a search bar and social media icons. The main content area features an article titled "What evidence is there for the hockey stick?" with a sub-section "At a glance". The article text discusses the Hockey Stick graph and its criticisms. To the right, there are several promotional banners: "Cranky Uncle" (Critical thinking about climate change), "Australian museum Eureka Prize Advancement of climate change knowledge", "PROTRUTH PLEDGE", "Climate Science CROWD SOURCING FUNDING", and "FREE COURSE Making sense of climate science denial". The bottom of the page has a footer with the Skeptical Science logo and text.




# ASKING FOR FEEDBACK

We are interested in feedback from our readers, so we designed a Google form which we linked to from the new “At a Glance” section in each updated rebuttal.

**At a Glance - Feedback Form**

Please use this form to provide feedback on the new “At a glance” section in the basic rebuttal. Thanks!

**\* Required**



URL (web address) of rebuttal \*  
Without a link to the rebuttal we'll not be able to match your feedback to the specific rebuttal.

<https://skepticalscience.com/solar-activity-sunspots-global-warming-basic.htm>

How easy to understand is “At a glance”? \*  
Please let us know your initial reaction after reading this new section.

I can't understand this at all

I sort-of understand but it's hard to follow to the end

I had to read this twice before I grasped what it meant

Wow, I totally get this now!

Other: \_\_\_\_\_

How reliable did you find “At a glance”?

0 1 2 3 4 5

Not at all reliable       Very reliable

What influenced your reliability rating?  
Please use this box to let us know why you picked a specific reliability rating. This will be especially helpful if you found it lacking in reliability so that we can improve the content.

Your answer \_\_\_\_\_

How did you happen upon the rebuttal?

Via the blog post

Because I was sent a link

Via Search results

Other: \_\_\_\_\_

Additional feedback  
Please use this box to provide additional feedback about what you liked or didn't like about the addition of the “At a glance” section.

Your answer \_\_\_\_\_

**Next** **Clear form**

The next section asks some optional questions which will help us to evaluate the new “at a glance” section better.

Your gender

Female

Male

Other

Prefer not to say

Your age

Your answer \_\_\_\_\_

Your education  
Please let us know which your highest education level is

High School

College

University degree

Prefer not to say

Other: \_\_\_\_\_

Is English your native language?

Yes

Other: \_\_\_\_\_

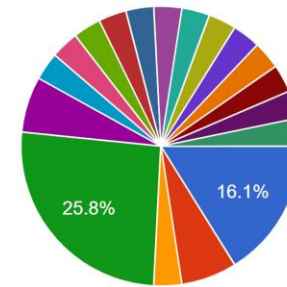


# SPARSE FEEDBACK

- To date received 30 responses
- Data is rather noisy – “all over the place”
- Some responses likely came from science deniers
- Overall hard to draw conclusions from
- Also asked for feedback from groups of students
- Some constructive feedback considered for updates

How easy to understand is "At a glance"?

31 responses

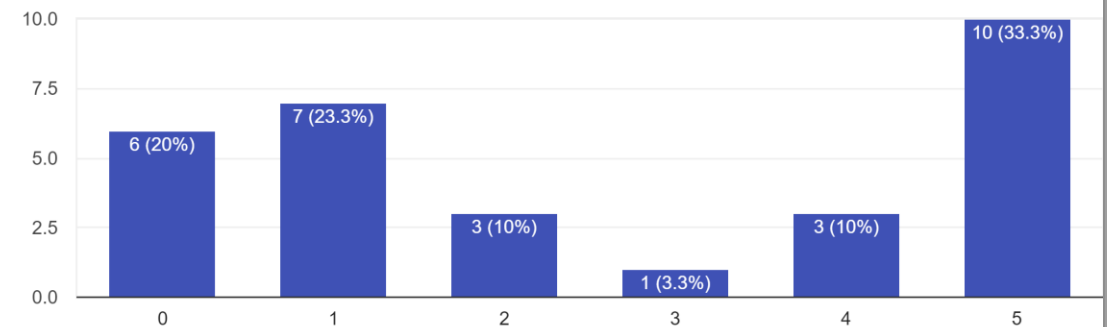


- I can't understand this at all
- I sort-of understand but it's hard to foll...
- I had to read this twice before I graspe...
- Wow, I totally get this now!
- Total waste of resources. All BS
- This seems written more in the style o...
- Generally very good.
- I pretty much understood this before r...

▲ 1/3 ▼

How reliable did you find "At a glance"?

30 responses

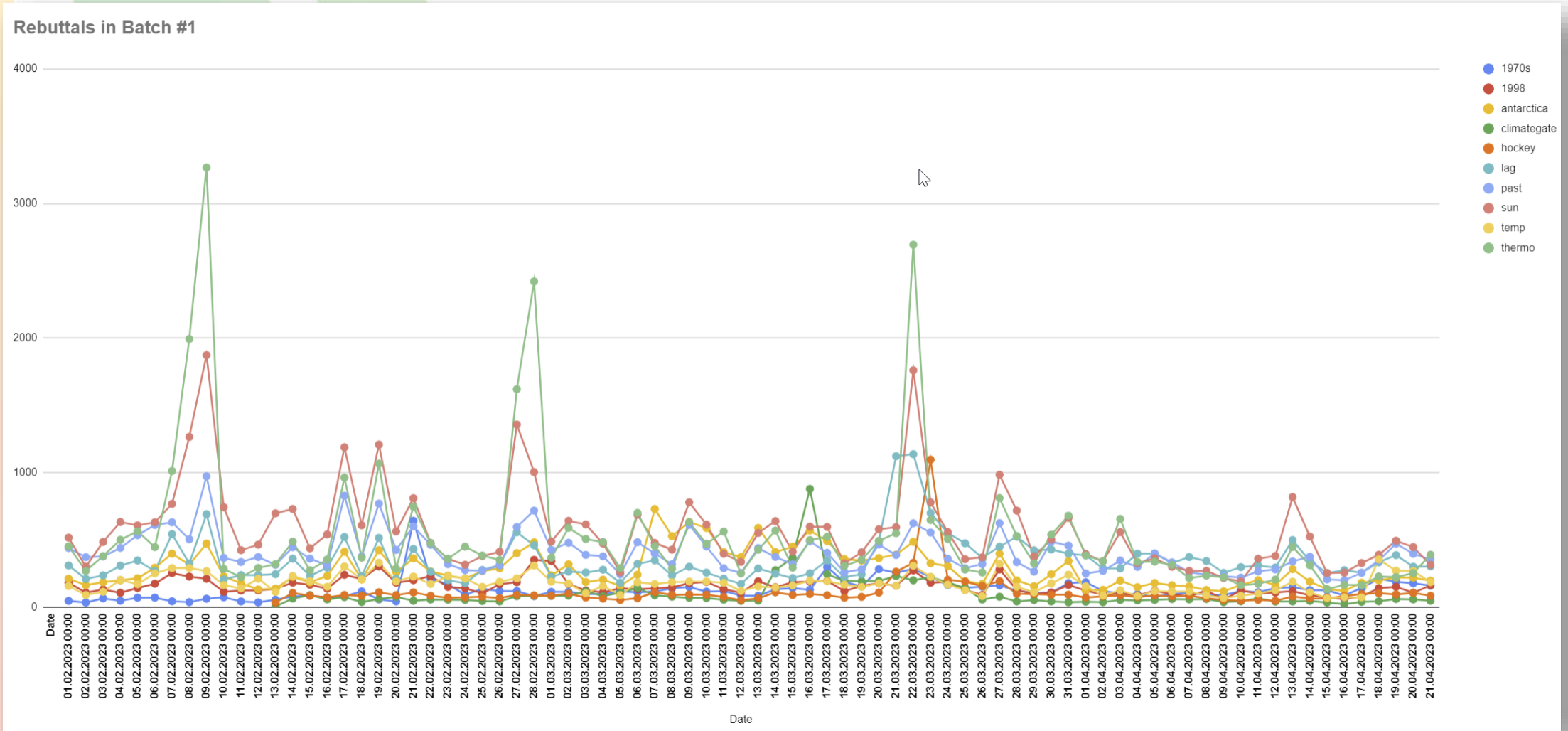






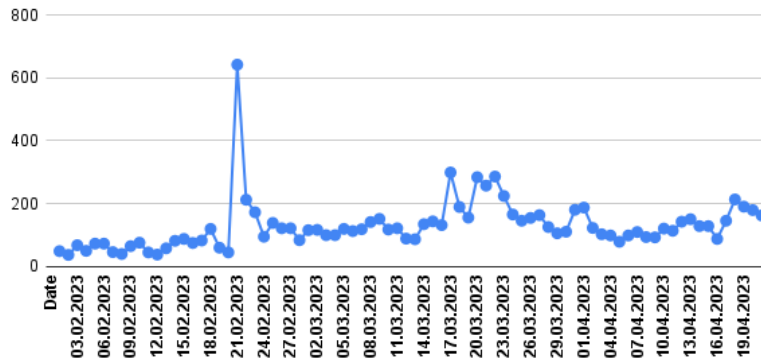
# OVERALL VIEWS

Overall rebuttal views for the 10 rebuttals in batch #1 since Feb 1, 2023 – a rather noisy image!

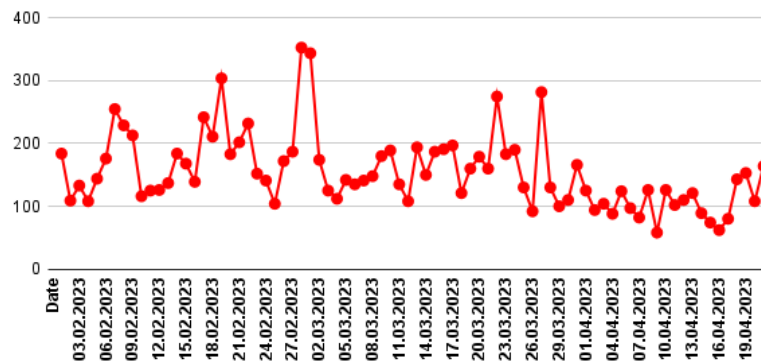


# PEAKS IN DAILY REBUTTAL VIEWS

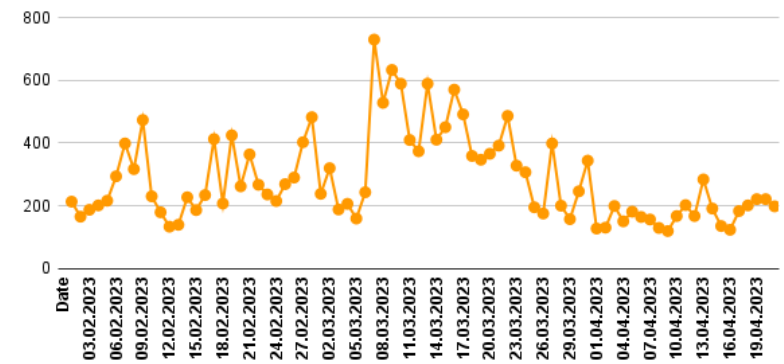
Rebuttal Views "1970s" since Feb 1, 2023



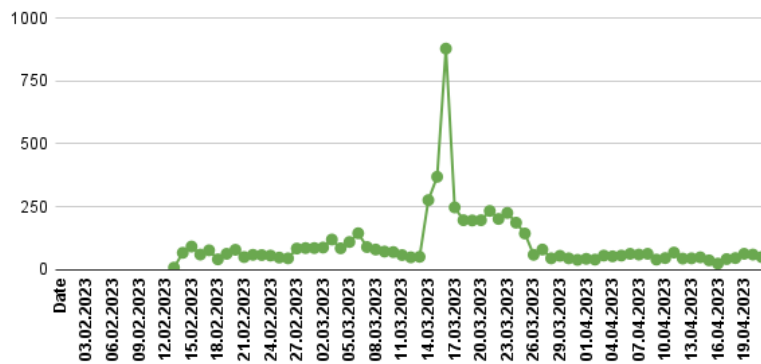
Rebuttal Views "1998" since Feb 1, 2023



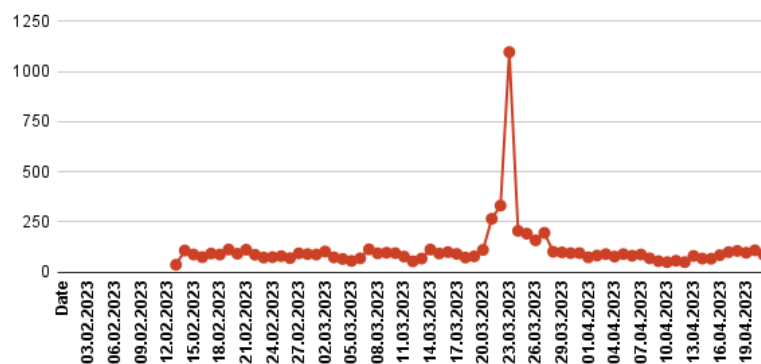
Rebuttal Views "Antarctica" since Feb 1, 2023



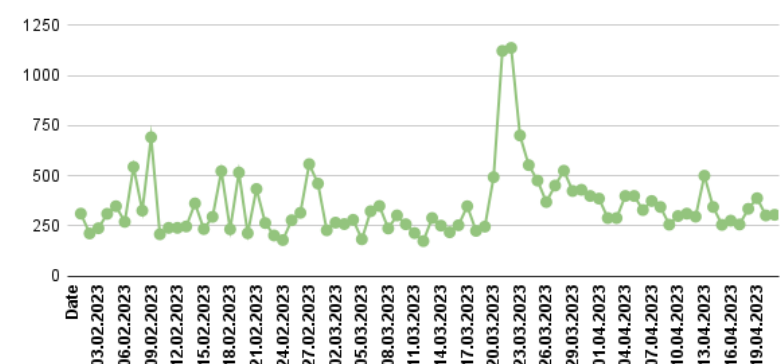
Rebuttal Views "Climategate" since Feb 13, 2023



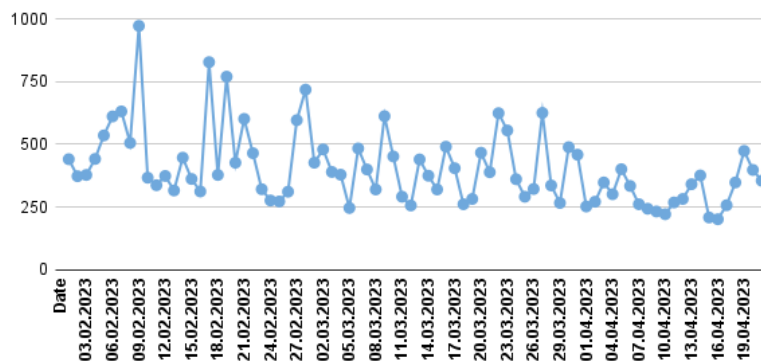
Rebuttal Views "Hockey" since Feb 13, 2023



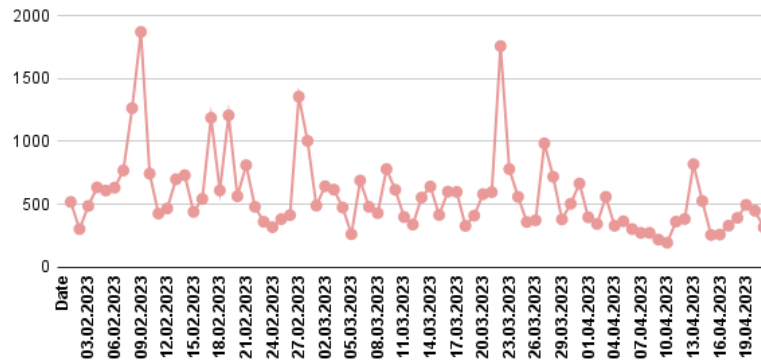
Rebuttal Views "Lag" since Feb 1, 2023



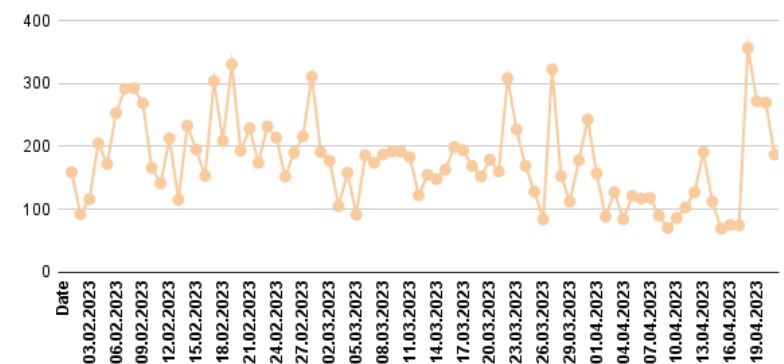
Rebuttal Views "Past" since Feb 1, 2023



Rebuttal Views "Sun" since Feb 1, 2023



Rebuttal Views "Temp" since Feb 1, 2023





# RELATED ACTIVITIES

Updating the Big Picture article to include more current graphics and references

**Skeptical Science**  
Getting skeptical about global warming skepticism

Home Arguments Software Resources Comments The Consensus Project Translations About Support

Search...  
GO

Twitter Facebook YouTube Instagram Medium

Posts Comments Email

### MOST USED Climate Myths

and what the science really says...

- Climate's changed before
- It's the sun
- It's not bad
- There is no consensus
- It's cooling
- Models are unreliable
- Temp record is unreliable
- Animals and plants can adapt
- It hasn't warmed since 1998
- Antarctica is gaining ice
- View All Arguments...

## The Big Picture

It's easy to get bogged down discussing one of the many pieces of evidence behind human-caused global warming, to the extent that we can't see the forest for the trees. Here, we take a step back and see how all of those trees comprise the forest as a whole. Skeptical Science provides extensive resources that examine each individual piece of climate misinformation and rebuts them with hard evidence, so let's make use of these individual pieces to see how they form the big picture.

### The Earth is Warming

We know the planet is warming from surface temperature stations and satellites measuring the temperature of the Earth's surface and lower atmosphere. We also have various tools which have measured the warming of the Earth's oceans. Satellites have measured an energy imbalance at the top of the Earth's atmosphere. Glaciers, sea ice, and ice sheets are all receding. Sea levels are rising. Spring is arriving sooner each year. There's simply no doubt - the planet is warming. Everything to do with temperatures is going up. Everything to do with snow and ice is decreasing. Species are migrating polewards and to higher altitudes (Figure 1).

### Indicators of a Warming World

Figure 1: Indicators of a warming world (click for larger image)

Winner of the 2011 Australian museum Eureka Prize  
Advancement of climate change knowledge

PROTRUTH PLEDGE

Username:   
Password:   
LOGIN New? Register here

## The Big Picture

**Indicators of a Warming World**

**Global Warming**

**ENSO, Volcanic, Solar Removed**

**Comparing the cost of Climate Action vs Climate Inaction**

**Radiative forcing components**

**Global Energy Inventory**

**How we know we're causing global warming**

**"What's the use of having developed a science well enough to make predictions if, in the end, all we're willing to do is stand around and wait for them to come true?"**  
Sherwood Rowland

Our climate has accumulated **3,235,319,146** Hiroshima atomic bombs worth of heat since 1998

http://isks.to/heat

isks.to/BigPicture

# SUMMARY & OUTLOOK

## SUMMARY

- Framework to add “At a Glance” sections is taking shape
- More rebuttal updates are in the works
- Iterative process
- Lessons’ learned session planned
- Laying the foundation for better structured rebuttal content

## OPEN QUESTIONS

- How to better share the workload?
- How to also update translated content?



[\[Back\]](#) [\[Session EOS1.1\]](#)

EGU23-1667

<https://doi.org/10.5194/egusphere-egu23-1667>

EGU General Assembly 2023

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## Adding plain language summaries to rebuttals on Skeptical Science

Bärbel Winkler and John Mason

Skeptical Science ([baerbelw@skepticalscience.com](mailto:baerbelw@skepticalscience.com))

Skeptical Science (SKS) is an international, non-profit science education organization founded by John Cook in 2007. Its main purpose is to debunk misconceptions and misinformation about human-caused climate change based on peer-reviewed literature, featuring a database with more than 200 rebuttals. Many of these rebuttals date back to 2010 or earlier, some have seen updates since then but in a few cases developments in science have rendered these originals out of date. We started an updating programme some years ago, but are now taking a more structured approach.

We decided that rather than fix these rebuttals in an ad-hoc fashion, a full review would be useful as a first step. This review found that most rebuttals lacked an entry-level version for people unfamiliar with the terminology and methods of science, leaving a major accessibility issue. Some rebuttals had a "basic" version but no "intermediate" or "advanced" equivalents. In some cases, there was only an intermediate entry, some basic-level rebuttals were written more accessibly than others, and other rebuttals were intended to update.

As an initial step, we took a sample of the most frequently viewed rebuttals and updated them to include an entry-level version. These at-a-glance sections are short (ideally <500 words) and written in a style that hopefully holds the reader via the following three key principles:

### ENGAGE

This term refers to engaging with and gently leading the reader into a rebuttal, using things they can relate to: the writer is starting a conversation and needs to do that in an accessible way. Questions can feature here but where appropriate, analogy can be used too. Relating the topic to things in everyday life should always be considered.

### HOLD

Avoid all trip-wires. These can be poorly-written or over-lengthy sentences, overly technical terms without proper and full introduction, grammatical issues, repetition: anything that distracts a reader, including links embedded within the text. You want to hold the reader from the start to finish of the rebuttal without distraction.

### FINISH

Always try to have an especially memorable short finishing-sentence, a take-home that stays with the reader.

In order to check the effectiveness of these at-a-glance sections, we accompanied the prototyping with a blog post to make our readers aware of these additions and to actively ask for their feedback. By the time the EGU meeting takes place we expect to have received enough feedback to be able to judge how helpful and effective these new plain language additions to our basic rebuttals have turned out to be.

**How to cite:** Winkler, B. and Mason, J.: Adding plain language summaries to rebuttals on Skeptical Science, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-1667, <https://doi.org/10.5194/egusphere-egu23-1667>, 2023.

THANK YOU!

# AUTHOR INFORMATION

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Bärbel Winkler lives and works in Germany. She has always had a lot of interest in environmental issues and has been active as a volunteer at the local zoo and a conservation group for many years. Over time and while learning more and more about it, Bärbel became increasingly aware and concerned about climate change and what it will mean for generations to come. As a means to turn her concerns regarding climate change into something productive, Bärbel joined the Skeptical Science team in 2010 and started translating selected content into German. Since 2013 she has been coordinating the translation efforts for all languages, contributes a blog-post every once in a while, helps with many projects and became co-author of several consensus-related studies the Skeptical Science team has published over the years. She also coordinates the moderation team for the online course “Denial101x – Making sense of climate science denial”.

<https://sks.to/BaerbelW>



John Mason  
Skeptical Science  
johntherock[at]btopenworld[dot]com

John Mason graduated in geology from Aberystwyth University in 1985. He went on to undertake research on ore genesis and supergene alteration in the metalliferous mining districts of North and Central Wales, leading to an M Phil and a number of key papers. He also worked for a time in mineral exploration with the British Geological Survey and then the private sector. His interest in climate came via investigating severe weather events and their aftermath and seeing the massive changes that past climate shifts have brought to the Welsh landscape. When not doing any of the above, landscape and weather-photography plus sea-angling keep him occupied.

<https://sks.to/JohnMason>





# LIST OF LINKS

## ABSTRACT

EOS1.1 EGU23-1667 <https://sks.to/EGU23-abstract-1>

## INTRODUCTION

Skeptical Science – <https://skepticalscience.com>

## REBUTTALS

Arguments – <https://skepticalscience.com/argument.php>

Fixed numbers – <https://skepticalscience.com/fixednum.php>

Taxonomy – <https://skepticalscience.com/argument.php?f=taxonomy>

## ANNOUNCEMENT REBUTTAL UPDATES

Blog post announcing the updates – <https://sks.to/at-a-glance>

## LIST OF INITIALLY UPDATED REBUTTALS

Ice age predicted in the 1970s – <https://sks.to/1970s>

It hasn't warmed since 1998 – <https://sks.to/1998>

Antarctica is gaining ice – <https://sks.to/antarctica>

CRU emails suggest conspiracy – <https://sks.to/climategate>

What evidence is there for the hockey stick – <https://sks.to/hockey>

CO2 lags temperature – <https://sks.to/lag>

Climate has changed before – <https://sks.to/past>

It's the sun – <https://sks.to/sun>

Temperature records are unreliable – <https://sks.to/temp>

The greenhouse effect and the 2nd law of thermodynamics – <https://sks.to/thermo>

Twitter thread - <https://twitter.com/skepticsscience/status/1628106764276072448>

Big Picture – <https://sks.to/bigpicture>

