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Unstable Antarctic ice sheets in the news media: a 10-year headline analysis

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Abstract: For most people, Antarctic encounters are mediated through texts such as online and print news articles. One of the Antarctic issues appearing in the news media in recent years is ice sheet instability and its implications for future global sea level rise – an issue also of central concern to the scientific community. Drawing on the Thomson Reuters Westlaw print media database, we used sentiment analysis and reflexive thematic analysis to examine headlines of news stories from 2013, 2018 and 2023 that featured Antarctic ice sheets and sea level rise. Unsurprisingly, we found that negative sentiment dominated these news headlines and increased over time. After excluding words with a weak or neutral sentiment, we further identified an evolution of sentiment language from 2013, when "loss" was the dominant sentiment word, to 2023, when "collapse" was the dominant sentiment word. We categorised the headlines into 10 themes: violence, juggernaut, scale, heroism, fragility, dread, uncertainty, mystery, hope, culpability. Headlines coded to violence, scale, fragility, dread and juggernaut increased over time, while those coded to uncertainty, mystery and culpability decreased over time. For scientists and communicators who interact with media frequently, understanding and awareness of these themes may be useful for anticipating how particular words, phrases, or language use are likely to be thematically contextualised.

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1 Introduction

1.1 Antarctica in the news media

For most people, Antarctic encounters are mediated through texts, ranging from news reports through expedition narratives, documentary films and artistic responses. News media is a particularly important source of knowledge about Antarctica for many members of the public (Hunt et al., 2026). The ways in which news media represents Antarctica therefore has a significant influence on the key messages that communities receive about the region and the types of issue they may engage with (Alexander et al., 2022).

While Antarctic news coverage includes a range of topics, including science, geopolitics, and the experience of being in Antarctica (Hunt et al, 2025a; Hunt et al, 2025b), climate change is an important recent focus. Antarctic ice sheet instability has been a topic for scientific research since John Mercer's seminal paper in 1978 (Mercer, 1978), but research into this topic has increased in recent years, with news articles and headlines responding to this increase in scientific interest, focusing on potential impact on humanity, primarily through sea level rise. Intergovernmental Panel on Climate Change (IPCC) reports predict that rising seas will impact billions of people by 2050 (IPCC, 2023). Beyond 2050, Antarctic contribution to sea level rise remains a key area of scientific uncertainty. Uptakes in climate change media coverage – both Antarctic-specific and general – follow publication of these IPCC reports (Bruns et al, 2026; Boykoff and Pearman, 2019), with ice sheet instability a key topic.[1]

This paper investigates themes and sentiments attached to accounts of Antarctic ice sheet instability in the news media, using headlines as our unit of analysis. While print and online written news is only one means by which members of the public engage with the Antarctic region, it is nonetheless a primary source of information for many people: in the national survey mentioned above, it was the third largest source of information about Antarctica for members of the public, after television and radio news and documentaries (Hunt et al., 2026). Here, we use sentiment analysis and reflexive thematic analysis to categorise more than 1800 news headlines dealing with Antarctic ice shelves and ice sheets in a climate-change context over a 10-year period. The aim of our analysis is to help those who engage with the public about ice sheet instability understand how their use of language – phrases or even individual words – might be contributing, consciously or not, to the sentiment of news coverage, and one or more thematic associations. These sentiments and themes can in turn feed into the media framing of particular events or issues and how the public understand and respond to these issues.

[1] The 2013 IPCC report highlighted that, in order to make credible projections of future sea level rise, one urgent research priority was reducing uncertainty regarding future ice loss from Antarctica, particularly around the possibility of ice sheet collapse (IPCC, 2013). Five years later, the 2018 report (IPCC, 2018) stated that Marine Ice Sheet Instability (MISI) could be triggered if global temperatures reached between 1.5°C and 2°C above pre-industrial levels, and in 2019, the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC, 2019) noted that acceleration of ice flow observed in parts of West Antarctica might signal the beginning of irreversible ice sheet instability.

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1.2 Antarctica in public discourse

With the southern polar region facing a range of urgent environmental crises linked to anthropogenic climate change, Antarctic policy makers are becoming increasingly aware of the importance of public engagement as a means of driving behaviour change at a community and political level (Salmon et al., 2011; Salmon and Priestley, 2019; Xavier et al., 2019; Leane and Marx, 2025). Strategic public engagement requires robust empirical research into how various communities think about, and interact with, Antarctica. Research to date within the Antarctic social sciences and humanities has, for example, included quantitative studies into public knowledge and attitudes (e.g. Goh et al., 2019; Estrada-Goic et al., 2023; Hunt et al., 2026), qualitative examinations of the public's relationships with Antarctica and its communities (Herbert, 2014; Marx et al., 2025), and case studies on programs relating to the arts (Jackson, 2019; Stevens and O'Connor, 2024) and citizen science (Cusick et al., 2025).

Antarctica's representation in news media is emerging as a key area of research for those interested in polar public engagement. Alexander et al. (2022), for example, examine Antarctica's depiction in print media during COVID-19; Hunt et al. (2025a; 2025b) look at the interplay between Antarctic science and geopolitics in Australian news media; and Bruns et al. (2026) investigate the representation of Antarctica, climate change, and sea level rise in U.S. news media. Despite this attention to Antarctica and news media, alongside a broader interest in the cryosphere from within the humanities and social sciences (e.g. Ruiz et al 2024; Dodds and Sörlin, 2022; Antonello 2017, 2018), there is to our knowledge currently no study of Anglophone media representation of ice sheet instability.

This absence is particularly striking given that climate change media coverage more generally is the subject of extensive secondary literature – Guenther et al. (2024) identify several hundred articles – and that within news media, as well as in other forms of public discourse, Antarctica's unstable glaciers and ice shelves have frequently functioned as a stand in for the broader issue of climate change (van der Watt, 2017). The depiction of Antarctic ice sheets should, therefore, be understood as sitting within a broader context of climate-focused media studies. For this reason, it should come as no surprise if many of the key trends found in such studies – including uncertainty, tipping-points discourse, linguistic slippage from environmental into social contexts, and pressure on journalists to be sensational (Russill and Nyssa, 2009; van der Hal et al., 2018; Hansson et al., 2026) – are also evident in media reporting on Antarctica's ice sheets and shelves.

However, while there are clear thematic overlaps between Antarctica and climate change, the southern continent also has its own distinct identity within public discourse. Although recorded human interaction with the continent is only two centuries old, Antarctica has existed far longer as a geographical idea (Murray, 2005). Recently, researchers have begun to analyse the place imaginaries attached the continent, which vary with historical and cultural context (Leane, 2012; Nielsen, 2023; Kelman, 2020; Wainschenker and Leane, 2019; Guijarro Ceballos, 2010). In Anglophone culture, for example, Antarctica has featured in both fiction and nonfiction texts as a place for heroic endeavour; an extreme testing ground; a place outside of ordinary time; a place that transforms those who encounter it; a site of gothic horror and secret conspiracies; a threatened environment; a natural laboratory for

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science; and a pure, uncontaminated environment (Leane, 2012; Alexander et al., 2022; Nielsen, 2023; Leane et al., 2023). Place imaginaries impact "both individual expectations and globally circulated representations" (Sinanan, et al., 2025). Thus, members of the public who encounter information about Antarctica – for example, in news headlines – do not do so as blank slates who absorb such messages passively. Rather, responses to new ideas are inflected by their alignment (or departure from) pre-existing place associations.

Media representation of Antarctic ice sheet and ice shelf instability, then, needs to be understood through a range of different lenses. On the one hand, such representation is likely to share some of the same elements as media coverage of climate change. However, Antarctica's own distinct place imaginaries, which are themselves internally complex, overlapping and sometimes contradictory, are also likely to inform this coverage. Here, we bring our experience with Antarctic representation and imaginaries, and climate change communication, to an analysis of news headlines of stories that engage with Antarctic ice sheet instability.

Headlines are a key element of news media and a common focus of analysis. As noted in Molek-Kozakowska's 2017 study of *New Scientist*, headlines "not only announce the issue and attract attention but also tend to prime and frame the audience's interpretations of scientific work" (p. 895). Headlines play a key role in competing for readers' attention and can substitute for the news story itself (Dor, 2003; Chuey et al., 2024) – an effect that may well be especially evident in online fora. In this sense, headlines are in themselves "self-contained frames capable of influencing news reception, reader engagement, and even shaping political discourse" (Chowdhury, 2025).

As detailed below, we focus both on the sentiments associated with particular headline words and on the thematic patterns into which such headlines can be categorised. We then consider ways in which these sentiments and themes resonate with broader discourse attached to both climate change in general and Antarctica in particular. Our hope is that, by recognising the ways in which their commentary is likely to be sentimentally and thematically contextualised, scientists and communicators will be better equipped to choose their words advisedly.

2 Methods

2.1 Research questions

RQ1: What are the prevailing sentiments in headlines from news articles referring to Antarctic ice sheet instability and how have they changed over time?

RQ2: What themes are identifiable in headlines from news articles referring to Antarctic ice sheet instability and how have they changed over time?

2.2 Data generation

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We used Thomson Reuters Westlaw (an online print media database) to collect our data, performing a search for all articles containing the works "Antarctic*" + "ice sheet" + "sea level". This data was collected in 2024, and we chose to sample three separate years (2013, 2018, and 2023) as a means of exploring if and how representations have changed over time. We focused our search on English language media, but we see potential to expand this focus in future research.

We adopted the following as exclusion criteria:

- Institutional press releases released through *Targeted News Media*
- Articles with headlines that were exact duplications
- Letters to the editor, obituaries, editorials, and TV program guides

Our final dataset contained 1869 news articles: 489 articles from 2013, 753 from 2018, and 627 from 2023. For our analysis, we opted to focus specifically on the headlines of each article rather than the entire text. All our data is sourced from a publicly available database and our dataset can be provided on request from the authors.

2.3 Sentiment analysis

Sentiment analysis is an approach that analyses "opinions, sentiments, appraisals, attitudes, and emotions" (Liu, 2020, p. 1). Originally developed by computer scientists, sentiment analysis identifies sentiment words, assigns them a positive or negative polarity, and often focuses on whether, and to what degree, a text (such as a document or a sentence) has positive, neutral or negative sentiment (Liu 2020). However, specific words have multiple connotations in addition to positive or negative sentiment – connotations that may be activated or shut down depending on the context in which the words are used (Beer, 2009) and which may in turn relate to broader thematic associations. Our focus on sentiment *words*, as well as their numerical sentiment values, aligns with the approaches taken in recent papers by Levy et al. (2024) and Duncan et al. (2024).

To respond to our first research question – What are the prevailing sentiments in headlines from news articles referring to Antarctic ice sheet instability and how have they changed over time? – we used the AFINN sentiment lexicon, originally developed from tweets about the United Nations Climate Change Conference COP15 (Nielsen, 2011), to identify sentiment words in our headline dataset. The latest version of the lexicon, AFINN-en-165,[2] contains more than 3000 words, each of which has a polarity score from +5 to -5, with positive integers assigned to words with positive sentiment (e.g., good, success, hope) and negative integers assigned to words with negative sentiment (e.g., loss, collapse, fear). For each year (2013, 2018, 2018) we created an Excel spreadsheet containing all the headlines in one column, and the AFINN-en-165 lexicon in another column, then instructed M365 copilot to use "whole-word matching with word boundaries" (i.e., we looked for exact matches of whole words, ignoring partial matches or parts of other words) to search the headlines and identify words from the AFINN-165 lexicon. For

[2] Accessed from https://review.gale.com/2023/08/22/understanding-recent-enhancements-to-sentiment-analysis-in-gale-digital-scholar-lab/

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quality control, we then manually checked all headlines containing sentiment words. Through this process, 11, 20 and 22 words were removed from the 2013, 2018 and 2023 lists of sentiment words, respectively. Some of these words (such as like, resolution, Grand) were removed because they had multiple meanings, and were not, in the headlines, used as a sentiment word; other words were removed because they appeared in a headline, or a part of a headline, that had no connection to ice melt, climate change, or sea level rise (some headlines in the dataset contained multiple short headlines); while other words were removed because they were preceded by a negation (three instances of "good" were removed because the word was preceded by "not").

We also noted that our headlines contained some words that we considered to be sentiment words (e.g., dangers, cataclysmic, doomsday) that were not in the AFINN-en-165 lexicon. While most of these words occurred only once, and would not have impacted our results, we chose to include the word "doomsday" in our 2023 corpus as it was a notable sentiment word for this year, appearing six times in those headlines. We assigned "doomsday" a polarity of –2, the same as the AFINN-en-165 lexicon polarity for "doom" and "doomed".

These final lists of sentiment words we call 2013a, 2018a, and 2023a. We then used NVIVO 15 for Mac to run a word frequency analysis on each corpus. We looked at whole words, rather than grouping according to root (e.g., we treat danger and dangerous, warn and warning, as separate words, in line with the fact that the AFINN-en-165 lexicon assigns them different integers).

To assess the mean sentiment value of each corpus, and how this changed over the period under study, we exported the word frequency data into Microsoft Excel for Mac (Version 16.114.2) and plotted the data on a box and whisker graph (see Figure 1).

For the sentiment word analysis, we created three new corpora (2013b, 2018b, 2023b) which excluded (1) sentiment words with a polarity of -1 or +1, and (2) sentiment words that appeared only once in each corpus. We did this so as to focus on words with moderate or strong sentiment, and to make each corpus more suited to visualisation in a word cloud. Using NVIVO, we then generated word clouds for each year, where the size of each word is proportional to the frequency of its appearance in the corpus (see Fig. 2). To represent the sentiment as well as the frequency of each word, we colour-coded each word according to the polarity of its sentiment, with increasingly darker shades of purple for negative sentiments (-2, -3, -4, -5) and increasingly darker shades of green for positive sentiments (+2, +3, +4, +5). As NVIVO did not offer this functionality, the word cloud was imported into Photoshop for colour selection, with the final graphic compiled in InDesign.

2.4 Reflexive thematic analysis

We conducted a multi-staged reflexive thematic analysis to explore our second research question: What themes are identifiable in headlines from news articles depicting Antarctic ice sheet instability and how have they changed over time? Thematic analysis is a well-established method for exploring, interpreting and reporting relevant patterns of

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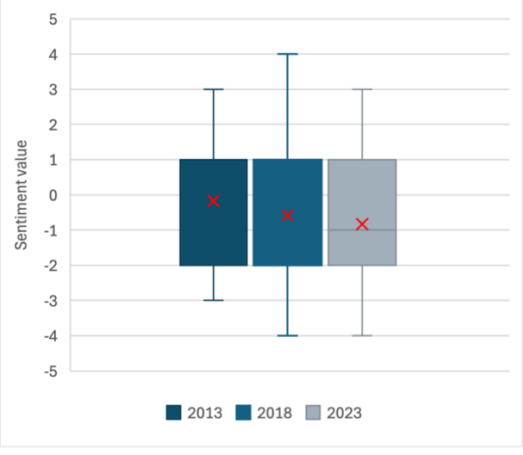
meaning across a dataset (Braun and Clarke, 2022), and has previously been used in studies relating to Antarctic news media (Alexander et al., 2022). We chose reflexive thematic analysis because it positions the researchers' subjectivity and skill at the centre of the analysis and was the best tool to allow us to capture both explicit and underlying meanings of the data we were analysing (Braun and Clarke, 2022). We took an inductive approach to our analysis, meaning that we did not start with any pre-defined coding framework but instead generated codes through our engagement with the data, informed by our roles as members of the INStabilities & Thresholds in ANTarctica (INSTANT) Scientific Research Programme[3], and as scholars concerned with Antarctic representation and imaginaries, climate change communication, and public engagement with science more broadly. Using the 2023 corpus as our initial sample, we began by working through each headline as a group during a collaborative Zoom session to generate a preliminary list of fourteen codes. We then then used this preliminary list to code the 2013 and 2018 headlines, with each member of the research team coding a selection of each year's headlines. Having completed this first stage of analysis, we met once again as a group to review each other's coding and to refine our preliminary list of 14 codes into our 10 themes, as shared below in the Results section.

3 Results

3.1 Sentiment analysis

3.1.1 Numerical sentiment analysis

Fig. 1 shows the range of sentiment for each corpus, with the red crosses indicating the average (mean) sentiment value for each year. The upper and lower quartile markers, indicated by the extent of the boxes, have remained the same across the dataset, with Q1 at -2 and Q3 at 1, showing an overall negative skew across the dataset. The mean sentiment value has become increasingly negative over time: from -0.17 in 2013, to -0.58 in 2018, to -0.83 in 2023.



[3] https://scar.org/science/research-programmes/instant

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Figure 1: Overall sentiment score based on the AFINN sentiment lexicon (AFINN-en-165) for each headline corpus. Red crosses indicate the average (mean) sentiment value. Shaded boxes contain the interquartile range, and whiskers show the minimum and maximum sentiment values for that year.

As shown on Fig. 1, there were no words in the headline with a polarity of +5 or -5: in the AFINN sentiment lexicon there are only a few words with a polarity of +5 (breathtaking, hurrah, outstanding, superb, thrilled) and all the words with a polarity of -5 are words that are considered to be swear words or other offensive words, which we would not expect in our dataset.

Across the dataset the most frequent sentiment word in each corpus is "rise" (featuring 51 times in 2013, 80 times in 2018, and 35 times in 2023), which is unsurprising given that "sea level" was one of our search terms, and the word "rise" in our corpus is almost always associated with the phrase "sea level". In the AFINN sentiment lexicon, "rise" has a polarity of +1. This is a problematic aspect of the lexicon, for our study. While the word "rise" is generally considered to have positive connotations, due to its frequent use in relation to concepts such as growth, progress, and success, "sea level rise" is almost always associated with negative consequences, so the prevalence of the word "rise" in our dataset will be skewing our sentiment to be more positive than it should be. For this reason, we re-calculated the mean sentiment value of each corpus if we excluded the word "rise": the values become -0.47 in 2013, -0.84 in 2018, and -0.96 in 2023. This correction does not strongly change our overall results. The corrected means are all more strongly negative than when we included "rise" in the corpus, and there continues to be an increase in negativity over time, though not as much of an increase as in the first calculations. The reason for this is that occurrences of the word "rise" (and therefore references to "sea level rise") decrease in our headlines over time: "rise" is 20.48% of all words in 2013, 14.23% of all words in 2018, and 6.76% of all words in 2023. This means that in our dataset, stories in some way "about" Antarctic ice sheets and sea level are less likely to refer to sea level rise in their headlines over time.

3.1.2 Sentiment word analysis

Word clouds created from these new corpora give a visual representation of the sentiment in our headlines, with a dominance of purple words (indicating negative sentiment) over green words (indicating positive sentiment) (see Fig. 2).

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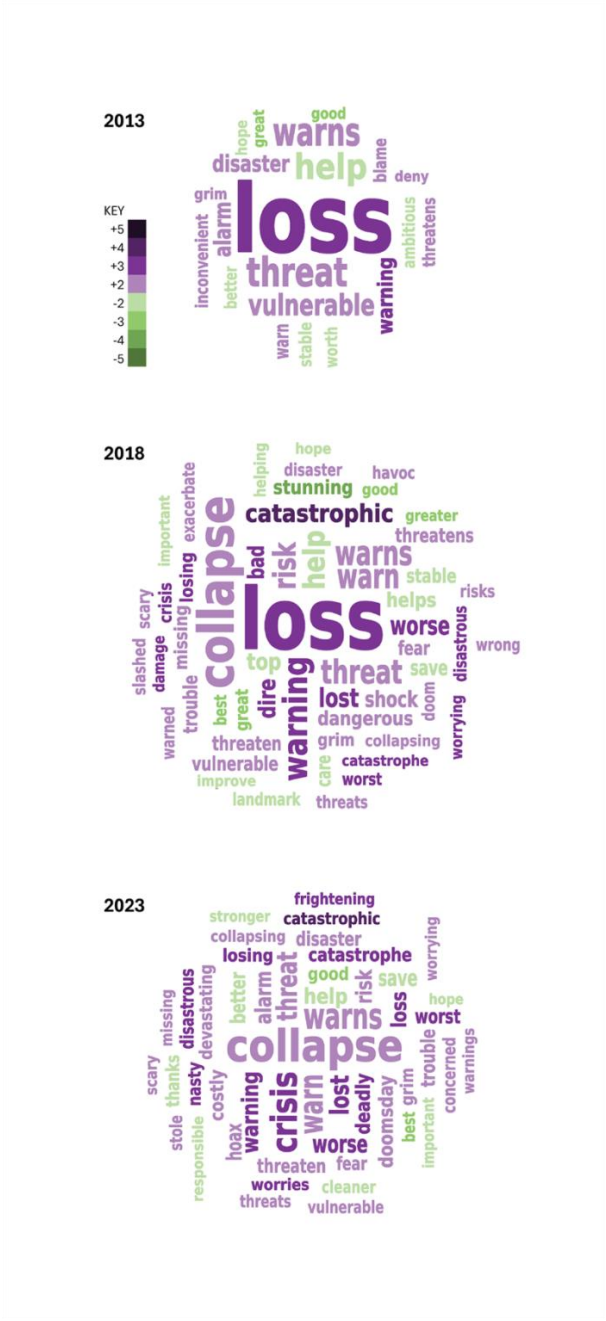

Figure 2: Sentiment word clouds from corpora 2013b, 2018b, 2023b. The size of each word is proportional to its frequency in that year's corpus, and the colour of each word is dictated by its polarity score (2, 3, 4 or -2, -3, -4) on the AFINN-en-165 lexicon – green for positive sentiment and purple for negative sentiment. Words with a polarity of +1 or -1 were excluded from these corpora and there were no words in the dataset with a polarity of +5 or -5.

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In 2013b, the most dominant word in the corpus is "loss" (15 occurrences), followed by "help", "threat", "warns" and "vulnerable" (six, six, five and four occurrences respectively). In these headlines, loss was in all cases a reference to ice loss, whether in the exact phrase "ice loss", or as part of longer phrases such as "ice shelf loss" or "loss of glacial ice mass". The word "help", which has a positive sentiment, is used in headlines that reference how additional funding, or research, will address various problems, for example "NASA Satellite Data Help Pinpoint Glaciers' Role In Sea Level Rise" (*AP Alert – Business*, 17 May 2013). Most headlines that include the word "threat" do so in relation to the threat of sea level rise. Headlines containing the word "warns" reference "climate change tipping points", "rising seas" and "rising temperatures" while headlines including the word "vulnerable" do so either in reference to ice sheet vulnerability, or coastal vulnerability to sea level rise.

In 2018b, the word "loss" continues to dominate (32 occurrences) – again with all headlines referencing ice loss. Six instances of "loss" refer to a tripling of ice loss, reporting on a paper that examined the mass balance of Antarctica from 1992 and 2017 (the IMBIE team, 2018) and responding to press releases that referred to a tripling of ice loss (e. g. NASA, 2018). Loss was followed by a new entry to the corpus: "collapse" (19 occurrences). Collapse appears in reference to "ice shelf collapse", "ice sheet collapse" and "Antarctic glacier collapse", with three appearances of collapse appearing in September 2018 in relation to proposals to construct "underwater walls" to stop Antarctic ice sheet collapse (e.g., "1,000ft underwater walls 'considered to stop Antarctic ice sheet collapse' ", *Daily Star Online*, UK, 21 September 2018). The next most frequent words are "warning", "help", "threat", "risk" and "warn" (with 11, nine, nine, eight, and eight occurrences respectively). Headlines that contained the word "warning" or "warn" referred to warnings issued by "researchers", "scientists," the UN, and unnamed experts, workshops, or climate models, in regard to sea level rise, melting ice caps, floods, and runaway global warming. In 2018, "help" was used in a much wider sense than in 2013, referencing studies that "help explain", or "help predict" glacier movement or ice loss, as well as environmental factors such as rising bedrock and Antarctic seals, that "may help delay" or "can help predict" Antarctic ice melt, respectively. In addition to references to the coastal "threat" posed by sea level rise, more wide-ranging threats – such as "threats to food security", "sustained global threat", and "humanity under threat" – appear. The word "risk" appears in reference to the risk of "irreversible ice sheet loss", "irreversible greenhouse state", "hothouse climate" and "dangerous rise in sea level". Other notable words that entered the corpus in 2018 include "catastrophic" and "catastrophe" – used in reference to "catastrophic collapse" of the West Antarctic Ice Sheet, "climate catastrophe", "catastrophic global warming" and "catastrophic melting of ice sheet".

The word "collapse" dominates the 2023b corpus (30 occurrences), compared to the second-most frequent word, "crisis" (17 occurrences). Most instances of the word "collapse" were in relation to literal collapse of the West Antarctic Ice Sheet (WAIS), either at some time in the past (as revealed by a new study) or in the future, where collapse was variously described as "inevitable" or "unavoidable" or "not inevitable". Some of these headlines referenced recently published research: for example, using octopus DNA to determine past history of the WAIS (Lau et al., 2023) or making future projections of ice-shelf melting (Naughten et al., 2023). The word "collapse" also

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appeared in headlines in a more metaphorical sense, for example in relation to "ecosystem collapse", "Gulf Stream collapse", "Atlantic Ocean Current collapse", "civilisation collapse" and "collapse of life on Earth". Sixteen of the 17 instances of the word "crisis" were in the phrase "climate crisis". The next most frequent words are "warns", "warn", "threat" and "lost" with 14, 12, 11, and nine occurrences respectively. The words "warns" and "warn" were used primarily in references to warnings from "scientists" and the UN, but also in relation to warnings issued by an unnamed report, study or expert. These warnings were often global in nature, with reference to rising sea levels, melting glaciers, climate change tipping points, and "giant killer tsunamis" caused by the climate crisis. In this corpus, the "threat" comes from "melting ice", "rising sea levels", or "climate" more generally and mentions some specific places under threat – the Dorset coast, the UK, the Netherlands, the "world's largest coal port" – as well mentioning "threat to humanity" and "global threat". Here, the word "lost" appears three times in relation to a study that asserted humans have "lost control" of ice shelf melting, as well as in warnings that "Most glaciers would be lost at 2°C" (*Energy Mix*, 21 November 2023). "Loss" remains in this corpus but with only five occurrences. A notable entry to the 2023 corpus is "doomsday", with four of the six occurrences in relation to news about the Thwaites Glacier, which was coined the "Doomsday Glacier" by Jeff Goodell (2017) in a *Rolling Stone* magazine article.

While analysis of individual words is useful for teasing out specific connotations and their thematic resonances (see Discussion below), there are limitations to focusing on decontexualised individual words within a headline. A more nuanced analysis can be made by looking at the headlines in their entirety, rather than the individual words within the headlines. This provides our motivation for the thematic analysis that follows.

3.2 Reflexive thematic analysis

3.2.1 Generation of themes

From our headlines dataset, we generated 10 key themes, described in order of prevalence in Table 1.

Theme	Description	Frequency	% of total
Violence	A sudden or damaging departure from the status quo.	345	18.5
Juggernaut	Something unstoppable or inevitable.	334	17.9
Scale	Quality of being spatially, temporally, or financially large.	300	16.1
Heroism	A brave and perilous effort; having qualities above the norm.	288	15.4
Fragility	Quality of being particularly vulnerable or easily damaged.	226	12.1
Dread	Feeling of strong fear about something to come.	201	10.8
Uncertainty	Doubt or a lack of confidence (in scientific or political processes).	181	9.7
Mystery	Something enigmatic, otherworldly, holding dark secrets.	122	6.5

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Theme	Description	Frequency	% of total
Hope	Feeling of expectation of a preferred outcome.	90	4.8
Culpability	Focus on cause of climate change; assigning of blame.	36	1.9

Table 1. An overview of the 10 themes generated though our reflexive thematic analysis. Headlines could be connected to one or more themes so the "% of total" column does not add up to 100.

Violence

The most common theme, *violence*, refers to news headlines that described Antarctic ice melt as a sudden and damaging departure from the status quo. The language used here was generally physical, rather than psychological or emotional, and the violence itself was either directed towards the Antarctic landscape ("Giant Antarctic iceberg snaps into the ocean" *Mashable*, 30 October 2018), towards wider planetary systems ("The impact of 'global boiling'" *Daily Mail Online (UK)*, 12 August 2023), or towards people ("The heat will kill you first" *The Daily News*, 26 Oct 2023, "Running from rising seas" *Southland Times*, 6 March 2018, "Like a 'punch in the guts'" *Guardian (UK)*, 30 Dec 2023). While the associated news items were focussed on ice sheets, the violent metaphors were more likely to attach to warming or changing sea level.

Juggernaut

Juggernaut describes something huge whose advance cannot be stopped. Headlines within this theme depicted ice loss and sea level rise as unstoppable ("Irreversible 'Hothouse' state" *India Water Review,* 8 August 2018, "Glacier mass loss: Past the point of no return" *UPI Space Daily* 20 March 2018, "West Antarctic glacial melt may be beyond all hope" *USA Today*, 26 Oct 2023). While these headlines tended to focus on the physical characteristics of Antarctic climate change, some headlines also gave a similar treatment to the discourse surrounding climate change ("You can't deny the facts" *Western Morning News (UK)*, 21 November 2013). Headlines within this theme frequently also described Antarctic ice melt and climate change as accelerating ("Ice shrinks at unprecedented rate" *Los Angeles Times*, 14 June 2018) or having already arrived ("Climate change is upon us" *Chicago Sun Times*, 8 October 2018, "The climate crisis is here" *NewsBase*, 12 September 2023). Explicit references to climate tipping points formed a small part of this overall theme (for example "West Antarctic Ice Sheet Has Not Reached Tipping Point Towards Irreversible Collapse – Yet" *Eurasia Review,* 11 September 2023) but were not dominant.

Scale

As a theme, *scale* has multiple dimensions. These include a focus on the physical size of ice loss ("Earth losing 300bn tonnes of ice every year" *Times of India*, 17 July 2013, "Antarctica loses area of ice 'the size of London'" *Belfast Telegraph*, 3 April 2018); the number of people or places set to be impacted by climate change ("Flooding threatens 1 million homes in Florida" *The Florida Times*, 18 June 2018); or the amount of resources dedicated to addressing the issue ("NASA set to launch $1 BILLION space laser" *Daily Mail Online*, 13 September 2018). This

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category also included headlines focusing on the record-breaking aspects of Antarctic climate change ("Antarctic sea ice levels are now at their lowest on RECORD" *Daily Mail Online*, 17 Feb 2023).

Heroism

The heroism theme focused on the efforts to address Antarctic climate change and the people and teams behind these efforts. Most headlines within this category focused specifically on Antarctic scientists ("Antarctic mission for scientist" *Sunday Sun*, 7 October 2013) or on broader scientific expeditions ("U.S. and UK join forces in biggest ever Antarctic field campaign" *Digital Journal*, 30 April 2018). In both cases, these headlines tended to emphasise the exceptional quality of Antarctic scientists and the brave nature of their work, using battle-focused/polemic/military language such as "mission" and "join forces" to underscore this point. Heroic headlines also depicted Antarctic scientists as seers, frequently describing them as giving warnings to the broader population ("Scientists issue climate wake-up call", *States News Service*, 27 September 2013). A smaller number of headlines within this category positioned the broader population as potential heroes by referring to efforts or actions that could save the southern continent ("How to save Antarctica and the rest of Earth too" *Health Policy and Law Daily*, 26 June 2018).

Fragility

Fragility refers to headlines that emphasised the vulnerability of particular environmental or social systems to climate change. Most headlines coded to this theme focused on the specific sensitivity of Antarctic ice sheets and shelves ("Antarctic ice shelves risk CRUMBLING into sea" *Express Online*, 19 July 2018, "Antarctica's great ice sheet is losing ground" *ValueWalk*, 3 April 2018, "Ice sheet doomed to slow melt" *UPI Space Daily*, 4 April 2018), while a much smaller number focused on the vulnerability of particular countries or groups of people ("Arctic peoples first to feel climate effects" *New Zealand Herald*, 23 April 2013). Unlike the "violence" theme, "fragility" was very often applied to ice sheets and shelves rather than other aspects of the environment impacted by climate change.

Dread

Headlines coded under *dread* focus on strong fear of something to come, and can be differentiated from *violence* by a sense of heightened psychological and ontological danger. Some headlines were included in this category because of their use of specific words such as "grim" or "disturbing" ("Grim tidings from science" *Agence France Presse English Wire*, 2 December 2018, "Disturbing sea level studies" *Pressenza International Press Agency*, 16 April 2023) or because they directly encouraged to the reader to feel fear ("Get scared at what's coming this way" *Hartford Courant*, 8 August 2013). Other headlines made apocalyptic allusions, describing a forthcoming environmental and societal collapse ("Deathwatch" *Redding Record Searchlight*, 15 December 2013; "Stones for our kids" *Arkansas Democrat Gazette*, 9 July 2018, "We are witnessing the first stages of civilization's collapse" *Nation's Blogs*, 22 August 2023). References to doom and doomsday were included in this theme ("Climate doom: Rising seas, submerged hotels, thousands jobless", *The Star Kenya*, 31 Jan 2018). At times, Antarctica (or parts of

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it) was specifically framed as being doomed ("Ice sheet doomed to slow melt" *Timaru Herald*, 25 Oct 2023), whereas in other headlines Antarctic melt spelled doom for the rest of the world ("Ice melting in the Antarctic could doom south Louisiana" *New Orleans Times*, 17 June 2018). There were a small number of headlines referencing the Thwaites' "Doomsday Glacier" moniker, but these were confined to a cluster of reporting in February 2023 ("Thwaites 'Doomsday Glacier' is melting faster than expected: Concerns over sea level rise grow" *USA Today*, 16 Feb 2023).

Uncertainty

One of the more complex and wide-ranging themes, *uncertainty* refers to headlines that may in some way inspire doubt about the scientific or political efforts underway to understand and address Antarctic climate change. This includes headlines that questioned the anthropogenic origins of Antarctic climate change ("Jury still out on cause of melting ice sheets" *The Australian*, 15 July 2023); headlines that attempted to address misinformation about climate science ("No, Greta Thunberg did not say climate change is a hoax" *USA Today*, 3 February 2023); headlines that hinted at suppressed knowledge ("Ice sheets melting faster, claims leaked report" *Sydney Morning Herald*, 7 September 2013); headlines that emphasised the unreliability of current models ("Sea-level rise predictions could be flawed" *Laboratory News*, 7 August 2013); and headlines that depicted climate scientists themselves as being unsure or caught unawares ("Extreme drop-off in sea ice baffles experts" *New Zealand Herald*, 26 July 2023). One common sub-category within this theme related to the revising of scientific knowledge ("Climate science tweaked" *New Scientist*, 5 October 2013), either in directions that were optimistic ("World's biggest ice sheets likely more stable than previously believed" *UPI Space Daily*, 29 May 2013) or decidedly pessimistic ("Antarctica underwater melting worse than thought" *Newsmax.com*, 2 April 2018).

Mystery

In a number of different ways, *mystery*-coded headlines depicted Antarctica or the drivers of Antarctic climate change as strange, otherworldly, or ominous. Headlines within this theme featured references to ancient times ("Ancient warning of a rising sea" *WashingtonPost.com*, 17 November 2023), hidden secrets ("Unexplored ocean set to reveal secrets" *Taranaki Daily News*, 9 July 2013, "Climate clues hidden under Antarctic ice" *UPI NewsTrack*, 6 March 2013), and unexplained phenomena ("Antarctic Ice Shelf is Making Strange Noises" *I4U News*, 21 October 2018).

Hope

While hope was generally in short supply within this dataset, a degree of optimism could be found within 4.8% of headlines. As with the *uncertainty* theme, however, the headlines within this category tended to represent a cross section of political beliefs and agendas. At one end of the spectrum, this category includes headlines that counselled the reader not to worry about climate change ("Don't be alarmed, it's the natural rhythm" *The Australian*, 12 December 2018), and at the other end, headlines that sought to inspire the reader towards climate action ("What you can do to save the planet" *The Stamford Advocate*, 16 August 2023, "A vision of a net-zero world in 2050 and how

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we got there" *Scotsman*, 27 September 2023). Also included in this theme were headlines depicting Antarctic scientific expeditions as a pathway forward ("Nasa's ice sheet hope" *Sunday Mail*, 16 September 2018) and one headline that contended that one impact of climate change might serve to mitigate another ("Climate tipping: West Antarctica ice sheet collapse may stabilise northern ocean currents" *NewsRx Science Daily*, 16 February 2023).

Culpability

Finally, *culpability* focuses on headlines that sought to assign blame for either causing climate change or for failing to take action to prevent it. This included headlines framing climate change in a criminal light ("Crimes against the Earth" *Dissident Voice*, 15 December 2018), highlighting the inaction of policy makers ("Politicians are asleep on the job" *States News Service*, 27 September 2013) or emphasising our collective culpability as a species ("Scientists now 95 percent certain we are mostly to blame" *Christian Science Monitor*, 20 August 2013, "We were warned" Newsbusters.org, 18 June 2018, "Act of God or act of carelessness?" *Nigerian Tribune*, 17 September 2023).

3.2.2 Changes over time

When comparing the 2013, 2018, and 2023 headlines, we observed a number of changes in the frequency of specific themes (Fig. 3). Firstly, we noted a steady increase in the percentage of articles coded to *violence* (12.3% in 2013, 18.3% in 2018, and 23.4% in 2023), *scale* (12.7%, 15.3%, 19.6%), *fragility* (9.6%, 11.4%, 14.8%), and *dread* (4.7%, 10.8%, 15.5%). Articles coded to *juggernaut* also increased over time (8.8%, 19.8%, 22.6%), with a particularly marked jump between 2013 and 2018. In contrast, articles coded to *uncertainty, mystery, and culpability* decreased over time (12.3%, 9%, 8.5%; 9%, 6.5%, and 4.6%; and 2.5%, 2%, and 1.4% respectively). Finally, we observed a spike in articles coded to *heroism* in 2018 (13.7%, 20.5%, 10.7%), which may be partially attributable to events such as the launch of NASA's laser-equipped ice monitoring satellite IceSAT-2 in September 2018, which received a significant amount of heroism-coded coverage.

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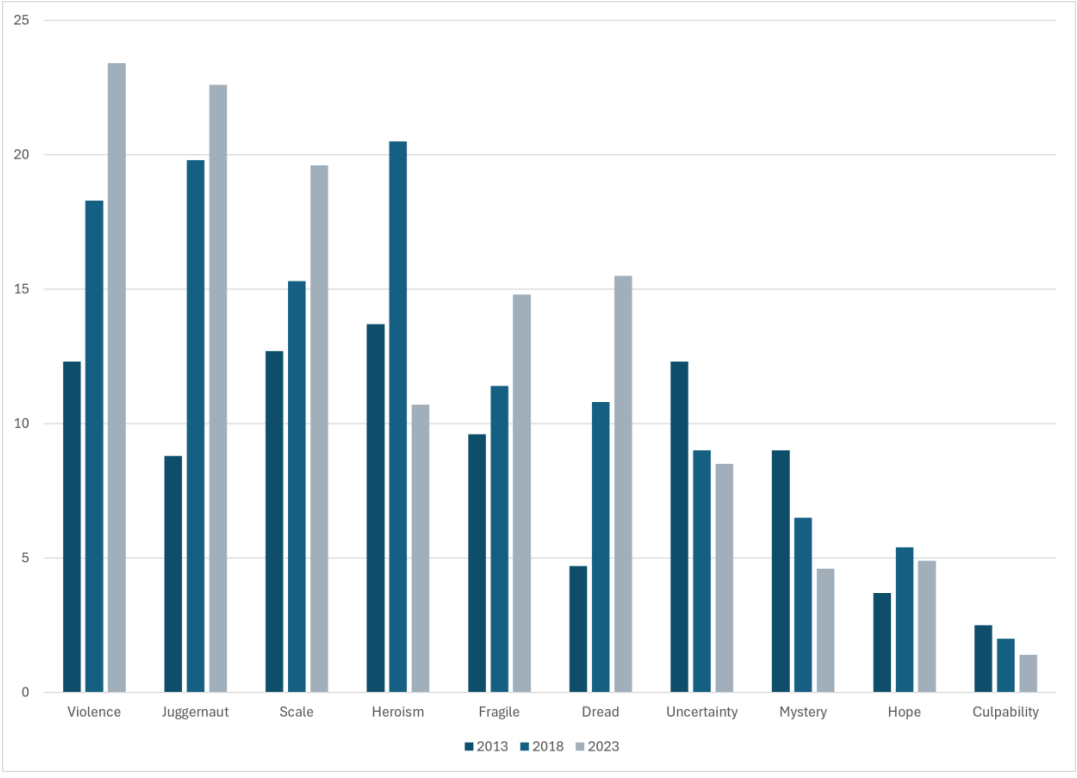

Figure 3: Shows the percentage of headlines that include representation of each theme across 2013, 2018, and 2023. Some headlines were coded to more than one theme, so totals may add up to more than 100%.

We explored whether some of the patterns in news coverage could be linked to prominent publication or geophysical events. A number of peer-reviewed publications received considerable media attention within our sampled time periods and might therefore be seen as "events" within Antarctic climate media. Prominent examples include Steffen et al.'s 2018 paper on Earth systems in the Anthropocene, Marzeion et al. (2018) on climate change mitigation and glacier mass loss, Naughten et al. (2023) on WAIS melt, and Lau et al. (2023), whose genetic analysis of an Antarctic octopus revealed insights into the history of the WAIS. In examining these events, we observed that language used by the papers' authors was frequently directly quoted within headlines, often making a substantial contribution to the overall presence of particular themes within a given time period. The phrase "hothouse Earth", for example, was coined by Steffan et al. (2018), repeated thirteen times within our 2018 corpus, and coded to *violence* within this analysis. Naughten et al.'s paper inspired 42 headlines within our 2023 corpus, with the majority of headlines being coded to the *juggernaut* theme. The word "unavoidable", which features in the paper's title "Unavoidable future increase in West Antarctic ice-shelf melting over the twenty-first century," was used 23 times. Other headlines reporting on the paper used a variety of thematically linked words and phrases, including "inevitable", "unstoppable", "lost control", and "beyond all hope".

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4 Discussion

Given our subject matter – melting Antarctic ice leading to sea level rise – our finding that headlines in all three years have a negative sentiment is not surprising. This negative sentiment often first arises in the scientific papers and press releases that led to some of the news headlines in our dataset, but it is also worth noting that negative sentiment is known to increase click-through rate (Robertson et al., 2023), providing an incentive for subeditors to write headlines with negative sentiment. A study examining online news headlines across all topics from 2010 to 2023, found that negative sentiment increased over this time period, which includes the time under study in our paper (Nickl et al., 2025). Both the overall negativity of our headlines, and the increase in negative sentiment over time, are likely related to this broader trend as well as our specific subject matter.

As noted in the Results section, a problematic aspect of our results is that the most common word in our headlines was "rise" – a word with negative connotations when part of a reference to "sea level rise" but which has positive valence in the sentiment lexicon we used. However, given that the purpose of our numerical sentiment analysis was to determine whether average (mean) sentiment was positive or negative, and the trend over time, analysis both with and without the word "rise" both yielded a negative skew to headlines, with increasing negativity over time. The reduction in headline references to "rise" (and therefore sea level rise) over time, is interesting, but our data does not provide any clear reason for this change. Further investigation is needed to see if this trend continues or is apparent in other media, and what might explain it.

In our analysis of sentiment words with moderate to strong valence, we saw a move from dominant words being "loss" in 2013, to both "loss" and "collapse" in 2018, then "collapse" and "crisis" in 2023. While negative, "loss" has comparatively gentle connotations, and indeed is often used as a euphemism for human death; it can refer to something partial or gradual. "Collapse", by contrast, suggests a sudden, all-encompassing failure. References to "loss" in all cases examined referred to some form of ice loss. Notably, by 2023, "lost" was more prevalent than "loss", suggesting a complete rather than ongoing process. As noted above, the emergence of "collapse" in 2018 is associated with references to ice sheet or ice shelf collapse, and its dominance in 2023 is associated with a series of papers that focused on the past or potential collapse of the WAIS, but also in relation to broader metaphorical uses, such as reference to collapse of the Gulf Stream or "civilisation collapse". The dominance of "crisis", in 2023 follows the increasing use of the phrase "climate crisis", a phrase that became increasingly common from 2019 – for example, after Greta Thunberg used the phrase in her December 2018 Tedx Talk (Tedx Talks, 2018) and *The Guardian*'s 2019 decision to use the phrase "climate crisis" (Carrington, 2019).

The group of themes into which we have categorized news headlines about Antarctic icesheet instability draw partly from broader climate change discourse and partly from ideas and images characteristically associated with the Antarctic. The former include violence, juggernaut, dread, uncertainty, and the latter heroism, fragility and mystery. Some, such as scale, sit across both discourses.

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The most common theme – *violence*, meaning a sudden, damaging departure from the status quo – has increased steadily (as a percentage of all identified themes) over the three sampled years. In this sense, it is aligned with "collapse", which also indicates a sudden change. However, close inspection indicates that while this theme appears in headlines about Antarctic ice, the violence itself is associated with other aspects of climate change, such as heat or sea-level rise. The second-most common theme – what we have termed *juggernaut*, meaning something unstoppable or inevitable – aligns strongly with established climate change framings of fear, catastrophe and doomism (e.g. Hulme, 2008; Stuart, 2026). The same is true of *dread*, the sixth highest of our themes. These two themes increase over the observed periods more rapidly than any other, suggesting that framing of ice sheet instability has become increasingly dominated by climate change discourse – not a surprising result. At the same time, *uncertainty* – also a term associated with broader Antarctic climate change media representation (Bruns et al., 2026) – decreased over the period. While we have not examined the language used across the scientific papers our news headlines are reporting on, this shift could be associated with a general decrease in uncertainty language in the scientific publications, which would align with Yao et al's (2023) finding of a decrease in uncertainty language in papers published in *Science* over the past 25 years.

Scale, the third most common theme, increased over the 10 years, although less rapidly than some other themes. Scale – in the sense we use here, of spatial, temporal or financial enormity – is often identified as one of the features of climate change that makes it difficult for humans to understand or grapple with (Morton, 2013). However, Antarctica, as a place of extremes, has itself long been associated with large scale (particularly spatial); icebergs breaking off the continent were compared in size to large cities and small countries long before climate change became a well-recognised public issue (e.g. Kalb, 1956).

The fourth and fifth most common topics – *heroism* and *fragility* – both speak strongly to pre-existing Antarctic imaginaries. *Heroism* lends its name to a periodisation of Antarctic history – the so-called "heroic era" of the late nineteenth and early twentieth centuries, in which explorers such as Roald Amundsen and Robert F. Scott led exploratory expeditions to the continent's interior. Changing understandings of heroism have influenced the legacies of such explorers (Barczewski, 2007), while the legacy of the heroic era itself continues to influence contemporary imaginaries of Antarctica (Nielsen, 2023). In the headlines we examined, heroism most commonly attaches to scientists – a phenomenon noted in other cultural analysis (Glasberg, 2012). *Fragility* aligns with the sense of Antarctica as a threatened environment – an idea that, while in conflict with the heroic image of the explorer conquering the hostile continent, nonetheless goes back at least to the nineteenth century, when commentators such as novelist James Fenimore Cooper (1849) highlighted of the decimation of the continent's wildlife. *Fragility* increased as a percentage of themes identified over the five-year period, although not as much as some other themes. *Heroism* had a spike in 2018, associated with media coverage of the NASA space laser program, and then fell in 2023 to below the 2013 level – perhaps reflecting decreasing public trust in scientists over the second half of our period, at least in places such as the U.S. (Pew Research Center, 2024).

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The most characteristically Antarctic of the themes identified in the headlines in our sample is *mystery*. Many researchers have noted the literary construction of Antarctica (and the polar regions more broadly) as gothic – remote, isolated, rugged, its deep ice harbouring untold secrets, from ancient horrors to alien spaceships to Nazi hideaways (Leane, 2012; Lenz, 1991; Bowers, 2017). The terms "polar gothic" and "Antarctic gothic" have been used to describe this cultural imaginary (Lenz, 1991; Bowers, 2017), which is linked to literary texts (by authors such as S.T. Coleridge and Edgar Allan Poe), and well-known, much-adapted pulp science fiction stories by H.P. Lovecraft and John W. Campbell Jr (Leane, 2012). News headlines exploit such associations, using terms such as "ancient", "hidden", and "strange" to attach some of the mystery and glamour of this gothic imaginary to otherwise straightforward physical phenomena and scientific discoveries. However, this theme is unusual in that it decreases monotonically over the period sampled (*culpability* is the only other theme to do so). Again, the results suggest that characteristically Antarctic themes in the headlines are being replaced by themes associated with climate change more broadly, suggesting that ice sheet collapse is recognised primarily as climate change phenomena rather than a distinct feature of Antarctica. However, the influence of the polar gothic continues to linger, with several headlines personifying climate change itself as a monstrous and imposing figure ("Will rising seas eventually devour California's beachfront homes?" *Hamilton Spectator*, 30 April 2018, "An Unforeseen Climate Beast Awakens!" *Dissident Voice*, 26 September 2018). One of the risks of using the language of mystery and the gothic in relation to ice sheet instability or climate change more generally is that it feeds into longstanding popular conspiracy theories relating to the Antarctic (Roberts, 2016).

Our analysis suggests that individual scientific papers – and the language used in them – can have a significant impact on news headlines. Recent research (Stavrova, et al., 2025) has shown that use of promotional language in scientific articles leads to increased online media and social media coverage, as well as increased citations, thereby incentivising scientists to use such language in their publications. However, tracing the causal pathway between the original source and media reporting was not our focus, so we can draw no systematic conclusions from our dataset on this point. Future research should aim to identify the key factors that inform the uptake of specific Antarctic research papers (and the language within them) by news media. In turn, this could further support research teams to take an evidence-based approach when communicating with the wider public. We also note that, while, social media is an increasingly dominant sphere within public discourse (Cinelli et al., 2021), studies on Antarctic social media have, to date, been limited to the subject of Antarctic tourism (e.g. Hardy et al. 2025). We see strong potential, therefore, for future research to also examine the representation of Antarctic ice sheets, and ice sheet research, on various social media platforms.

5 Conclusion

This study shows that first, sentiment in news headlines of articles dealing with ice sheet instability are likely to be negative; and second, that these headlines can be categorised into a range of themes, each with its own cultural and

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historical resonances. Moreover, while the negative sentiment of news headlines, the sentiment words used in these headlines, and the themes identifiable within news headlines include persistent elements, they also change over time. Negative sentiment is increasing and themes that align with climate change news discourse broadly are beginning to dominate more distinctively Antarctic thematics.

Bruns et al (2026, p. 400) argue that "Communicating the importance of Antarctica to Earth's global climate system and SLR requires nuance and context that is best understood by a select group of highly trained polar experts". We further argue that to communicate effectively these polar experts need to understand how their media engagement is likely to be sentimentally and thematically contextualised. As Antarctic experts, scientists will continue to play a key role in interpreting and translating scientific studies for a wider audience. As interest in Antarctic ice sheet instability intensifies, scientists will continue to be asked for media comment about this topic. The more aware scientist-commentators are of the ways in which ice sheet instability has been represented in the media in the past, the better informed they will be in providing commentary in the future.

Author contributions

RP: Conceptualization, formal analysis, visualization, Writing (original draft preparation), Writing (review and editing); KM: Conceptualization, data curation, formal analysis, visualization, Writing (original draft preparation), Writing (review and editing); EL: Conceptualization, formal analysis, Writing (original draft preparation), Writing (review and editing).

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Competing interests

One author is a member of the editorial board of *The Cryosphere*.

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