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Winning the discursive struggle? The impact of a significant environmental crisis event on dominant climate discourses on Twitter

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ABSTRACT

The devastating 2019–2020 Australian bushfires attracted significant activity on social media, both in Australia and worldwide. We use corpus-based discourse analysis to explore the impact of this significant environmental crisis event on climate discussions on Australian Twitter, with a focus on discursive struggle and (de-)legitimation. We examine the most-retweeted tweets across three 30-day time periods, combining quantitative and qualitative approaches. Methodologically, we analyse hashtags to identify dominant Twitter discourses in the three phases. We also explore tweets that support or oppose the link between climate change and the fires, and the misleading arson discourse. We use collocation and concordance analysis, developing a new approach to categorising tweets for support and opposition. Results show that the bushfires had a clear impact on dominant Twitter climate discourses, that this intensified at the height of the bushfires, but receded significantly afterwards. Additionally, climate disinformation discourses seem to be a 'minor' dominant discourse rather than a 'major' dominant discourse in the Twitter datasets under investigation. Our study suggests that discursive legitimation becomes an outcome of discursive struggle; the very act of retweeting a tweet suggesting the bushfire crisis is indicative of the urgent need for broad climate action is, in a sense, contributing to the legitimisation of this discourse and countering the arguments of those who do not see the issues as linked.

1. Introduction

Crisis events are often moments of intense discursive construction, through which individuals and communities make sense of happenings as they unfold. But crises also offer opportunities for publics to reaffirm or challenge existing social discourses, for example through engaging in 'lexical struggle' (Eades, 2006) over labels and thereby attempting to discursively (de-)legitimise the socio-political issues that are at stake. Twitter is particularly well-suited for these purposes as it enables users to draw attention to, and interact with, communities as crisis events are unfolding, thus functioning as a collective space where discourses can be represented, legitimised, and made part of larger issues of social significance (Murthy, 2013; Papacharissi, 2014).

In this study, we take this discursive mediality of Twitter as a starting point in studying how a particularly significant crisis event (the 2019–2020 Australian bushfires) impacts on existing discourses, in this case climate discourses. Climate change discussion has become more visible in new and social media such as Twitter, while it has declined in traditional news coverage (Boykoff et al., 2015). Both types of media are contested, dynamic spaces where actors compete with each other to shape how the public understand and engage with climate change (Boykoff et al., 2009,

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2015). It is clear that anthropogenic climate change is a topic of immense significance due to its simultaneous effects at the local, national, and global level. It is also "a high-stakes, high-profile and highly politicized issue" (Boykoff et al., 2009, p. 136). Extreme climate events of the previous years, including the 2019–2020 Australian bushfires, have brought climate to the forefront of discussion worldwide. Scientists have linked climate change explicitly to bushfires, explaining that it has led to an increase in elevated fire weather days and has caused longer and more intense fire seasons (CSIRO, 2020). We focus on the 2019–2020 Australian bushfire season because it was particularly devastating. These fires covered Eastern Australia in extensive smoke, killed or displaced nearly three billion animals, took at least 33 human lives, and destroyed 3000 buildings and over 24 million hectares of land (Royal Commission Report, 2020). The bushfire crisis also attracted significant activity on Twitter. Disinformation spread via the platform about these bushfires included claims that bushfires were not related to climate change, that these bushfires were not unusual, that they were caused by arson, and that backburning was reduced because of green activists (Weber et al., 2020). This finding is in broad alignment with existing understandings of Twitter as a counterpublic space where climate sceptics are given easy access to an audience that they would find more challenging to secure in traditional media (Moernaut et al., 2020).

To date, only a few studies have analysed Twitter activity in relation to this event (e.g. Schweinsberg et al., 2020 on tourism impacts; Mirbabaie et al., 2021 on digital nudging), two of which focus primarily on the spread of arson disinformation, including by bots and troll accounts (Graham & Keller, 2020; Weber et al., 2020). However, very little systematic analysis of discourses has been undertaken. In contrast, our study aims to trace the dynamics of discourses on Australian Twitter in relation to how this external crisis event impacted on ongoing climate discussion. This is important for understanding the role such communication plays in facilitating discursive construction and legitimation of issues of social significance at the backdrop of crisis events. Our specific interest lies in *dominant discourses*, which we operationalise in terms of retweets. We deliberately examine a small dataset (9000 tweets) of most-retweeted tweets across three 30-day time periods (Fig. 1), which allows us to combine quantitative and qualitative approaches.

These time periods correspond to different phases: The early period captures tweets during the early phase of the bushfire crisis, the earliest time period for which we collected data. The second period captures the height of the bushfire crisis, the most intense time period of the bushfires for New South Wales (NSW), Victoria, and the Australian Capital Territory (ACT). The third period captures tweets after the bushfire crisis had ended and before the start of the next bushfire season. This broadly aligns with investigations of cataclysmic weather events (Fink, 1986 in Spence et al., 2015), which suggest that communication around natural disasters proceeds in four stages: *prodromal*, when an impending crisis is being discussed among the publics who share information from media sources; *acute*, commenced by the first crisis events taking place; *chronic*, when the crisis event has been ongoing for some time; and finally, *termination*, which follows the resolution of the crisis which diminishes its significance for the publics.

Our specific interest lies therefore in the temporal dynamics of discourses on Australian Twitter, i.e. potential development or change over time. From a theoretical perspective, we are particularly interested in the lexical and discursive struggles that can be observed and how these relate to discursive legitimation. As mentioned earlier, Eades (2006, p. 154) uses the term *lexical struggle* to refer to the "struggle over labels, descriptions, or lexical items" in the legal system (i.e. how events, issues, acts are referred to). In the context of the bushfires, a lexical struggle can be observed between hashtags such as #climateemergency and #arsonemergency. Such a struggle is also indicative of a broader *discursive struggle* in society, i.e. a struggle between discourses that compete with each other to define aspects of the social world (e.g. Jørgensen & Phillips, 2002), often seeking to *legitimise* one perspective or action – or discourse – and simultaneously *delegitimise* another. These two concepts – discursive struggle and legitimation – should therefore be seen as being inextricably linked, as the very label of 'struggle' is suggestive of resistance, opposing views and ideals, or differing values and beliefs. Such a struggle tends to occur with one party seeking to establish legitimacy for its views and to delegitimise the arguments of those in opposition. Discursive legitimation becomes an outcome of discursive struggle; for instance, the very act of retweeting a tweet suggesting the bushfire crisis is indicative of the urgent need for broad climate action is, in a sense, contributing to the legitimation of this discourse and countering the arguments of those who do not see the issues as linked. In relation to bushfires, this process also includes a struggle between competing discourses of causality or blame, which (de)legitimise views on who/what is responsible for the bushfires.

In this view, then, discursive legitimation relates to how discourses legitimise (support) or de-legitimise (undermine) the legitimacy of discourses and the actors involved in them. On a very general level, salient discourses may establish the legitimacy of topics for public discussion and debate. On a more specific level, salient discourses may (de)legitimise specific existing discourses tied to the external crisis event, including those that establish or deny causal links between the bushfires and climate change. To be clear, we approach discursive legitimation as a theoretical lens through which to (partially) interpret our results, rather than as an analytical framework for discourse analysis. Further, we consider

Fig. 1. Key events for each dataset.

legitimation on a macro rather than a micro level. This means that we are not undertaking analysis of strategies of legitimation and how they are linguistically realised (e.g. van Leeuwen 2007). Rather, we aim to view the observed discourses theoretically through the lenses of discursive struggle and legitimation. More specifically, we ask the following research questions:

- RQ1: What was the impact of the 2019–2020 bushfire crisis on climate discourses on Australian Twitter, and what were the dynamics throughout the stages of the crisis?
- RQ2: How did the Australian bushfire-related discourses feed into the broader climate discourses on Twitter? What key discourses can be detected over time?
- RQ3: What lexical and discursive struggles can be observed and how do these relate to discursive legitimation? Is there any evidence of discourses of causality or blame?

Summarising our novel contributions, we (1) develop an approach to locate and categorise bushfire-related discourses in public climate discussion, which, in turn, allows us to (2) trace the broader temporal and spatial dimensions of these discourses and the struggle among them, and (3) to interpret them in relation to discursive legitimation. This will allow us to understand the interaction between a significant crisis event and existing climate discourses, including discursive, temporal and social dimensions. The paper proceeds as follows: first, we provide a background on extreme weather events and Twitter discourses; then, we introduce our data and methodology; we end by presenting our findings and discussing them in terms of discursive struggle and legitimation. As such, we aim to make a contribution to the analysis of the "cultural politics of climate change", defined by Boykoff et al (2009, p. 136) as "those oft-contested and politicized processes by which meaning is constructed and negotiated across space, place and at various scales."

2. Extreme weather events and Twitter discourses

The interaction between crisis events and Twitter has attracted previous attention in relation to civil unrest, mass shootings, and terrorist attacks, but the type of crisis event most relevant to this study concerns extreme weather events (e.g. Kim & Hastak, 2018; Murthy & Longwell, 2013). Anderson and Huntington (2017, p. 598) suggest that "weather events are conduits for public perceptions around climate change", and Twitter has proven an effective channel through which to communicate these perceptions. A growing body of research therefore focuses on Twitter use following extreme weather events, such as Hurricane Sandy in the US (Cody et al., 2015; Kirilenko & Stepchenkova, 2014; Roxburgh et al., 2019), Typhoon Haiyan in the Philippines (An et al., 2014; Takahashi et al., 2015), and bushfires in Australia in 2013 (An et al., 2014) and 2019–2020 (Weber et al., 2020). These studies reveal that a range of discourses are generated by such crisis events. Many of these are focused around community resilience and can broadly be described as information-sharing (Rachunok et al., 2019). This is supported by Matheson (2018) in relation to the 2011 Christchurch earthquake in New Zealand, where Twitter discourse served a community self-organising function through the sharing of information. Similarly, Bruns et al. (2012) found that the most prominent tweets during the 2011 Queensland floods were related to giving advice and requesting or providing information. In response to hurricanes, along with information and coordination uses, Roxburgh et al. (2019) also found discourses emphasising links between climate change and extreme weather, criticising the media, contesting science, and representing political and ideological struggle. In a study about extreme weather in the Philippines, Takahashi et al. (2015) found Twitter discussions of the causes of the weather were prominent, as well as criticising the government in relation to both causes and responses. As mentioned above, Weber et al. (2020) showed the spread of disinformation in relation to the 2019–2020 Australian bushfires.

Our study differs from these studies, in that we do not aim to analyse all Twitter activity generated by the bushfires, nor do we focus just on disinformation. Rather, we are interested in how this crisis event impacted on ongoing climate discourses in Australia, and the discursive struggles that can be observed. Our focus is specifically on *dominant discourses*. In the context of the affordances of Twitter, we define these as discourses that are expressed in tweets that are frequently retweeted, because such content appears most frequently in users' timelines. Our approach is corpus linguistics, as this (i) is a user-friendly methodology suitable for communication and media scholars (Bednarek & Carr, 2020), (ii) enables both quantitative and qualitative insights, and (iii) is increasingly used to study social media (e.g. Rüdiger & Dayter, 2020).

3. Data and methodology

3.1. Datasets

In corpus linguistics, it is common to use production or reception criteria to design a dataset. Production criteria consider the variability in the texts that are produced, while reception criteria consider their reception, for example by selecting popular texts with a high readership. For Twitter, the application of reception criteria might mean selecting only tweets from accounts with multiple followers, or only including tweets with multiple likes or retweets. In this study, we used a reception criterion to build our corpus, selecting tweets that were the most retweeted rather than selecting specific user accounts. This makes our analysis tweet-based rather than account-based; i.e. we do not focus on user networks and behaviour.

More specifically, the datasets were gathered using the Twitter streaming API. All tweets containing the word *climate* were captured between 12 November 2019 and 17 June 2020 (hashtag and other uses). The API caps the number of tweets at 1% of the total volume of tweets; however, as the activity of *climate* tweets is far below this limit, we expect we have captured all relevant tweets, aside from brief outages when local systems were updated.

From this total climate dataset, we selected only those English-language tweets which self-identify as coming from an Australian account (tweets with the word *Australia* in the location data). This is a subset of *climate* tweets originating from within Australia and may also contain tweets from users who identify in some way with Australia but do not necessarily reside in the country. We refer to this userbase using the shorthand 'Australian Twitter'. Note that the alternative (selecting tweets geo-located in Australia) was deemed inferior, because only a small subset is geo-tagged and may be biased towards a specific user type. It should be noted that if the tweet from 'Australian Twitter' is a **re**tweet, then the original tweet may be from a non-Australian account. The resulting set of tweets forms our base dataset. Beginnings and ends of tweets were marked with tags (<TWEET> … </TWEET>).

This base dataset was split into daily sets of tweets, with a new day taken to occur at GMT + 0. Within these daily aggregates, all retweets were ranked by frequency and the top 100 most retweeted tweets were selected, excluding duplicates within a day. However, the same tweet may make it into multiple days if it was retweeted enough to make it into the top 100 on different days. Discourses that are present across multiple days can be

1	shows the role climate change played in our most recent	**bushfires**	and the risk it poses in the future. I really hope the Govt is
2	by burning coal and gas is here, now. Catastrophic floods and	**bushfires**.	Blistering heatwaves. Reef bleaching. Severe drought.
3	selected as their candidate for Eden-Monaro, even after the worst	**bushfires**	season in history. <https://t.co/Qfd6c1Lhne> </TWEET>
4	is a bushfire like a coronavirus? Instead of making us forget the	**bushfires**,	evidence suggests coronavirus will make us more
5	out?" 😱 "Worth a shot. Run it." </TWEET> <TWEET> Australia's	**bushfires**	drew global attention to climate health concerns. But they
6	Tune into #qanda to hear what Labor's response will be to the	**bushfires**	and first up is their climate change spokesman Mark
7	</TWEET> <TWEET> Where there's smoke, there are lies:	**Bushfires**	a sign of a catastrophic political reckoning | The New
8	The science says fossil fuels cause climate change and makes	**bushfires**	<https://t.co/x17wn9OG2s>'s not complicated #auspol
9	placed to benefit! <https://t.co/1iC9vo34kX> </TWEET> <TWEET>	**Bushfires**	ignite the wrong debate <https://t.co/5pqbqB4NWJ>
10	every right to be extremely anxious, I'd say. #auspol #ClimateCrisis	**#bushfires**	<https://t.co/JSTG20IP2p> </TWEET> <TWEET> my
11	climate change' - whatever that means - would've prevented the	**bushfires**	is unhinged. It's also bad maths </TWEET> <TWEET>
12	climate action, but last week many schools were closed due to	**bushfires**	& children were being sent home sick due to air pollution
13	potential ruin as insurers spooked by climate change, drought and	**bushfires**	refuse to cover crops worth billions of dollars." <https://t.
14	</TWEET> <TWEET> Woman rescues burnt koala amidst Aussie	**bushfires**	and fire tornadoes fueled by climate change 🐨Good
15	😷 @ScottMorrisonMP: "OK, maybe climate change increases	**bushfires**.	.. but our emissions are nothing to do with that. And
16	are many people running around lately saying things like: "The	**bushfires**	aren't caused by Australia. We're only 1.24% of global
17	<TWEET> Coal & gas companies make climate change &	**bushfires**	worse. It's time they paid up. We want a $1 levy on coal &
18	</TWEET> <TWEET> Australia is headed for "50 degree days, more	**bushfires**,	more days when we can't breathe." Journalists who
19	about the lack of controlled burning (hazard reduction) for 50 years.	**Bushfires**	are being used by climate activists, politicians and
20	we need to do more about climate change. #VoteChaser #auspol	**#bushfires**	<https://t.co/yvgvnttwS2> </TWEET> <TWEET>
21	If, as he says, climate change is at emergency levels, with endless	**bushfires**	and the seas rising by metres, why is Malcolm Turnbull
22	<TWEET> We're facing a crisis and we need #ClimateActionNow	**#Bushfires**,	#drought and #heatwaves are ravaging our
23	change denial means. </TWEET> <TWEET> To those battling	**bushfires**	- Thankyou. To the thousands who have lost everything.
24	clear words #Pressebericht #ClimateChange #ClimateEmergency	**#bushfires**	</TWEET> <TWEET> Former fire chief Greg Mullins just
25	be bushfires when all the arsonists are minority reported. And those	**bushfires**	are becoming more intense for longer. But by all means,

Fig. 2. A concordance (possible to adjust to show the complete tweet).

regarded as particularly dominant and influential. We further split the dataset into 'early', 'height' and 'after' periods, each consisting of thirty days and each containing 100 tweets per day (3000 per dataset). It is important to note that no fire-related words or words referring to any of the events in Fig. 1 were used as criteria for the dataset construction.

In total, our dataset consists of 9000 tweets. While this is small for a Twitter study, this decision was made deliberately to allow for qualitative analyses and to develop and test analytical techniques that can be upscaled at a later stage. It is also justified by our focus on dominant discourses rather than all Twitter activity.

3.2. Methodology

Our first set of analyses focusses on the frequency, distribution, and keyness of hashtags across the three datasets. Using the corpus linguistic program WordSmith (Scott, 2020a), we first identified all hashtags and ordered these in turn by raw frequency (rf) and distribution (d), where e.g. d = 3 means the hashtag occurred in three of 30 days in the respective dataset. (To do so, WordSmith settings allowed apostrophes, hashtags and hyphens within words. Entries of the resulting word list containing a hashtag were then sorted and ranked.) As a next step, we identified hashtags that are 'key' in each dataset when compared against the other two datasets. Key hashtags are hashtags that are statistically speaking unusually frequent in the target corpus (one dataset) when compared against reference corpora (the other two datasets). A key item in a dataset is not necessarily highly frequent in terms of absolute raw frequency, but is unusually frequent in comparison with the reference dataset. All datasets were compared with each other in turn.[1]

We also identified key words in each dataset whether these were used as a hashtag or not – however, our main focus is on hashtags. This is because hashtags are an important multifunctional semiotic resource. They serve a pragmatic function by creating 'ambient affiliation' (Zappavigna, 2011) with certain publics or counterpublics (De Cock & Pizarro Pedraza, 2018). Hashtags can be integrated into the linguistic structure (*Former NSW Fire Chief exposed as a **#Climate #Scam** bullshit artist*) or be outside it (*This helps put into perspective the scale of Australia's bushfires. We are facing a climate emergency… **#AustralianFires***). As a form of searchable metadata, hashtags categorise tweets into similar topics (Page, 2012) and are often used to express attitudes and emotions (Lee, 2018) that position people within communities and allow them to engage in self-presentation (Matley, 2018). Due to the 'multilogic' nature of Twitter, where indefinite numbers of people can engage in the same 'conversation', hashtags are thus a significant means for sharing and contesting meanings and values (Zappavigna, 2018). With respect to the role of hashtags for discursive legitimation, Andersen and Lybæk (2020, pp. 57-58) suggest that "a hashtag can be seen as the phrasing of a *generative theme* [italics in original], revealing aspects of the world and hence also implicit normative wishes for an alternative state of affairs," and posit that this has the potential to facilitate a change of discourse and legitimation of knowledge in postmodern communities. To examine the use of key hashtags qualitatively, we used WordSmith's Concord tool, which displays all instances of a search term with surrounding text (Fig. 2).

In addition to hashtags, we also explore word co-occurrence (collocation), examining words that occur repeatedly near *climate*. Collocation analysis is a technique that is often used to identify discourses in corpus linguistics (e.g. Baker et al., 2008). We used WordSmith (Concord) to produce a list of all 'collocates' of *climate* in the three datasets, that is words co-occurring within five words to the left or right, as illustrated below for three different tweets:

We retrieved collocates within tweets rather than across tweets by using the 'stop at sentence break' setting and redefining the start and end of a sentence through the tags <TWEET> and </TWEET> .

[1] Keyness retrieval is based on comparing normalised frequencies and applying statistical measures, including log likelihood, log ratio and Bayes Factor (BIC) (Scott, 2020b). Settings: p value $\leq$ 0.05; minimum frequency 2, min. log ratio 1.5, min. BIC 2.5; exclude negative KWs but include text dispersion.

about	terrorism.	This	is	what	**climate**	induced	#bushfire	terrorism	looks	like.
after	losing	homes	to	the	**climate**	fires	think	about	this.	
the	fires	were	arson	not	**climate**	change				
L5	L4	L3	L2	L1	N	R1	R2	R3	R4	R5

Other than a minimum raw frequency of two, we set no other thresholds in order to compile a complete summary of co-occurring words. We are taking a frequency-based approach to collocation because our main interest is not in the strength of word association. Rather, we are interested in the co-occurrence of *climate* with fire-related words to identify whether tweets link the bushfires to climate change. In addition, we use this frequency information for down-sampling, i.e. focusing our qualitative analysis on the four most frequent fire-related collocates. Once we identify these collocates, we use WordSmith (Concord) to retrieve all instances where *climate* occurs with the respective collocate ('context word'). This provides us with a set of tweets for additional analysis regarding the link between the fires and climate change. To do so, we developed coding manuals (available in Bednarek, 2021) for hand-coding tweets. The whole tweet was analysed, not just the collocation, including any duplicates across days (see 3.1). In practice, this assigns more numerical weight to such tweets, which are considered as particularly influential/dominant.

4. Results

4.1. Hashtag analysis

4.1.1. Fire-related hashtags

To identify any potential impact of the bushfires on climate discourses, we first examine whether any fire-related hashtags occur and how they are distributed. 398 to 637 different hashtags are used at least once in each dataset (hashtag types), with between 2000 and 3000 respective total instances (see Table 1). All hashtag types in row 1 were then manually analysed to identify any fire-related hashtags, i.e. those containing a direct reference to fire(s), burning, or smoke (see Bednarek, 2021). We included #blacksummer, but not #blackfriday because it refers to a shopping event; we included #bushfireroyalcommission but not #royalcommission because it could refer to a different royal commission; we further excluded #theashglobe; #gregmullins and instances where *burn/-fire* do not refer to the bushfires (#burnnewscorp; #firemorrison; #firescomo).

The early period contains 26 fire-related hashtag types (~6% of hashtag types in this dataset) – this number rises to 44 during the height of the bushfires (~11%) and reduces to 14 in the 'after' period (~2%). The total instances (tokens) of these hashtags also rise from 174 ('early') to 362 ('height') before they fall to 41 ('after'). Examining all hashtags therefore indicates that the bushfires had an impact on dominant climate discourses on Twitter, that this intensified at the height of the bushfires and receded significantly after the bushfires had ended. The 'height' period shows the highest productivity in fire-related hashtags types (the greatest number of different fire-related hashtags) as well as the highest use of fire-related hashtag types (the greatest number of fire-related hashtag tokens occur, over twice as many as in the 'early' phase). Additional analysis of tweet activity (the number of times tweets containing these hashtags were retweeted in the Australian Twitter stream) confirms these findings, showing that the fraction of hashtagged tweets (according to Twitter metadata, i.e. here identified as hashtags by Twitter rather than by WordSmith) containing fire-related hashtags increases from 17.3% ('early': 4248 of 24,616) to 33.6% ('height': 17,823 of 53,070) before dropping to 2.2% ('after': 227 of 10,518).

Table 1
Hashtags.

Hashtag types and tokens	Early	Height	After
Number of hashtag types	419	398	637
Raw frequency of hashtag tokens	2437	2044	2857
Number of fire-related hashtag types	26	44	14
Raw frequency of fire-related hashtag tokens	174	362	41
Retweets (fire-related hashtags)	4248	17,823	227

If we consider the makeup of these fire-related hashtags (in Table 1) qualitatively, there are unmodified references (e.g. #fire, #smoke) and labels for the crisis (#blacksummer) as well as references to fire fighters or services (#firefighters; #nswrfs). More complex hashtags contain geographical information (e.g. #australiaisburning, #vicfires), the names of politicians or parties (e.g. #morrisonfires; #greensfire) or a reference to relevant inquiries (e.g. #bushfireroyalcommission; #bushfireinquiry). Explicit framing as a crisis event (e.g. #fireemergency; #bushfirecrisis) also occurs, as well as construals of a causative link to climate change (#climatefires) and calls to action (#protecttheunburnt). These components can be combined (e.g. geographical + crisis frame: #australianbushfiresdisaster). The hashtags that include geographical locations differ in their force: #australiaburns and #australiaisburning are more dramatic than noun-based hashtags (#australiafires, etc.) because they construct the fires as a process, not an entity, and imply that all of Australia is affected. In addition, the progressive *is burning* in #australiaisburning frames this process as an ongoing and immediate threat. Some of the hashtags themselves thus construct discourses:

- Discourses of blame or causality: Blaming politicians and/or activists (e.g. #morrisonfires; #greensfire); attributing the fires causally to climate change (e.g. #climatefires)
- Discourses of emergency: Framing as crisis event (e.g. #bushfirecrisis), as ongoing threat (#australiaisburning), or with reference to extreme extent (e.g. #megafires)
- Discourses of prevention: Calls to protect unburnt country (#protecttheunburnt)

Through the lens of discursive (de)legitimation, blame discourses delegitimise the politicians or political parties being blamed, while discourses of causality legitimise the view that the fires are linked to climate change (as further discussed in section 4.2). Emergency discourses legitimise calls for urgent and significant action, and discourses of prevention can be interpreted as delegitimising those who are *meant* to be protecting the country and simultaneously legitimising a call for climate action. We suggest that the hashtags themselves have the potential to construct these discourses (of blame, causality, emergency, prevention), and that using these hashtags therefore represents acts of discur-

sive (de)legitimation. At the same time, the hashtags are indicative of discursive struggle. Consider the following examples:

Example 1:. *NSW farmers should sue @gladyb and @ScottMorrisonMP. Their lack of action to mitigate the effects of #climatechange are quite criminal and the extent of the NSW bushfires is far worse due to their inaction.* ***#berejiklianbushfires****.*

Example 2:. *imagine being the prime minister of a country that's currently facing a massive fire crisis that's making even old people believe climate change is a real threat, and then not only ignoring it while pushing climate skepticism but going on a holiday to Hawaii* ***#MorrisonFires***

Example 3:. *Yes the climate is changing as it always does every year every century. These fires are* ***#greensfire*** *lit by firebug trying to push the #climatechangehoax fools like @AdamBandt and @GretaThunberg will next say that because fires rely on oxygen that oxygen is bad😂😂😂😂 #auspol*

The hashtags #berejiklianbushfires and #morrisonfires in Examples 1 and 2 are a concise shorthand for both blaming and delegitimising Liberal (Conservative) politicians (Gladys Berejiklian, Scott Morrison), while the competing hashtag #greensfire in Example 3 blames and delegitimises the political party of the (Australian) Greens. At the same time, further analysis of the co-text would show whether additional acts of (de)legitimation occur (e.g. Examples 1 and 3 are blaming a range of different political actors) and whether tweeters align or disalign with the specific hashtag. We will see examples of the latter in section 4.3, where we analyse how tweeters support or oppose the hashtag #arsonemergency.

Because of their affective/evaluative components, the hashtags associated with these discourses have the clear potential to not just mark the discourse, but also to create affiliation or disaffiliation with users around this (de)legitimation. However, it is noteworthy that the most frequent fire-related hashtags do not include any that in and of themselves construct a discourse of emergency (unless we include #australiaburns). The most frequent fire-related hashtags are:

- **Early**: #nswfires (rf = 43; d = 18); #bushfires (rf = 41; d = 23), #qldfires (rf = 10; d = 8); #sydneysmoke (rf = 10; d = 4)
- **Height**: #australiaburns (rf = 70; d = 23); #australiafires (rf = 45; d = 21); #bushfires (rf = 26; d = 19); #nswfires (rf = 26; d = 17)
- **After**: #bushfires (rf = 10; d = 8); #bushfire (rf = 6; d = 5); #bushfirerc (rf = 6; d = 4)

However, these do not necessarily rank within the most frequent hashtags per dataset: Ten of the 25 most frequent hashtags in the 'height' dataset are fire-related, compared to only two in the 'early' dataset, and none in the 'after' dataset.[2] The difference between the 'early' and 'height' datasets shows a correlation between the intensity of the bushfire event and the intensity of hashtag usage as measured in frequency ranking. That fire-related hashtags do not rank highly in the 'after' dataset indicates that the link between climate change and bushfires was no longer a significant concern for Australian climate-tweets in that period.

[2] If we consider the most distributed hashtags, the picture changes only slightly: The same results are obtained for the 'early' and 'after' lists. In the 'height' dataset, seven fire-related hashtags from the 'most frequent' list appear in the 'most distributed' list, with two additional ones identified (#australianfires, #vicfires), and three no longer appearing (#australianfire, #australiaburning, #australiaonfire).

4.1.2. Key hashtags

So far, we have only discussed fire-related hashtags. Analysis of 'key' hashtags shows which discourses are significant in each time period, as identified through statistical measures (see 3.2). As a reminder, such key hashtags are not necessarily highly frequent within each dataset, but they are unusually frequent in that target dataset *in comparison to* the reference datasets. Table 2 presents the results for all possible comparisons. Classification of these hashtags into different categories was based on qualitative analysis of either all instances of the hashtag or of 25 random instances. For instance, #koalakiller was classified as relating to political discourses, since it is used to critique Australian politicians, and the hashtag #nametheday was classified as relating to climate action because it supports starting the conversation (and action) on climate change. The hashtag #tech was categorised as related to 'climate action' discourses, because relevant tweets refer to climate change 'solutions' like solar energy. In contrast, #health was not classified as 'COVID-related', because it is not generally used with reference to the coronavirus. Categorisation was always based on majority usage (e.g. only three of 13 instances of #springst are about the street) and double classifications were avoided.

Note that this technique identifies an arson disinformation discourse, with #arsonemergency identified as key in the height dataset. This hashtag was already used in 2019 but gained greater traction from late November and peaked around 7 January 2020 (Graham & Keller, 2020; Weber et al., 2020). We will discuss the arson disinformation discourse in more detail below, as it can be referenced by those who oppose it. More generally, it is apparent that both the early and the height datasets contain fire-related key hashtags which are absent from the 'after' dataset, which instead contains COVID-related and racism-related key hashtags. This provides further evidence that the bushfires had an impact on dominant climate discourses on Twitter (evident in both the early phase and at the height), but that this receded after the bushfires had ended. The results in Table 2 further show that fire-related discourses seem to have been supplemented by discourses related to the coronavirus and racism, which come to the fore in the 'after' dataset. Results also show some consistency in other discourses across the three datasets (e.g. political, climate action) – discourses which appear throughout.

A keyness analysis of *all* word forms (whether used as hashtag or not) essentially confirms these results (see Bednarek, 2021).[3] Furthermore, *smoke* and *burns* are identified as additional fire-related key words in the 'early' dataset; *smoke*, *burns*, *wildfires*, *firefighters*, *burned* are identified as additional fire-related key words in the 'height' dataset, which also contains the key word *arsonists*. In the 'after' dataset, additional coronavirus-related key words not already identified are *pandemic* and *virus*, while additional racism-related key words are *racism*, *racial*, *racist*.

It is not self-evident why COVID- and racism-related key hashtags/words occur in tweets about *climate*. How are these tweets associated with climate discussion? Concordance analysis of the COVID-related key hashtags/words (#covid19 [rf 33], #coronavirus [rf 7], #covid [rf 10], pandemic [rf 83], virus [rf 22]) showed that tweets were varied in nature, but that the publics were linking climate change and the pandemic in the following ways:

[3] Keywords settings as above; language settings: hyphens and apostrophes allowed within words. Focus here only on those occurring in at least 15/30 texts. Collocates that are only very indirectly associated with fire (e.g. *Mullins*, *commission(er)*, *royalcommission*, *pyrocene*) or that could point to ignition sources (e.g. *fuelled*, *hazard*, *lightning*, *cigarettes*) were not included. Also excluded were collocates that could be part of fire-related expressions (e.g. *bush*, *catastrophic*, *black*, *back*) and collocates that relate to energy sources (e.g. *energy*, *oil*, *electricity*, *coal-fired*) or climate/temperature (e.g. *temperature(s)*, *hotter*, *warms*).

Table 2
Key hashtags.

Target	Reference: Early	Reference: Height	Reference: After
Early	–	**Fire-related:** #qldfires **Political:** #lnp; #springst; #qt [question time] **Climate action:** #renewables; #solar; #nametheday **Other:** Television program references: #qanda; #insiders Places: #nsw; #denmark's	**Fire-related:** #nswfires; #qldfires; #bushfires; #nswbushfires **Political:** #nswpol; #notmypm; #greens; #koalakiller **Climate action:** #consciencevoteonclimate; #extinctionrebellion; #nametheday **Time-bound climate events:** #cop25; #cop25madrid
Height	**Fire-related:** #australianfires; #australiaburns; #australiafires; #bushfirecrisis; #morrisonfires; #bushfiresaustralia **Arson disinformation:** #arsonemergency **Political:** #scottyfrommarketing; #scomomustgo; #wherethebloodyhellareyou **Climate action:** #climateactnow; #wakeupaustralia **Other:** Media critique: #thisisnotjournalism	–	**Fire-related:** #australiaburns; #australiafires; #nswfires; #vicfires; #bushfirecrisis; #australianbushfires; #bushfiresaustralia; #australianfires **Arson disinformation:** #arsonemergency **Political:** #scottmorrison; #scomomustgo; #wherethebloodyhellareyou **Climate action:** #wakeupaustralia **Time-bound climate events:** #cop25
After	**Political:** #edenmonaro; #scottyfrommarketing; #auspol2020; #lnpcrimefamily **Racism-related:** #blacklivesmatter **COVID-related:** #covid19; #coronavirus; #covid **Climate action:** #buildbackbetter; #climateimpactsvic; #marshdumpadani; #biodiversity; #fossilfuels; #solarenergy; #noconsent **Time-bound climate events:** #cop26; #worldoceansday **Climate personalities:** #greta [including references to Naomi Seibt, as 'the anti Greta'] **Other:** Television program references: #4corners Places: #pacific	**Political:** #edenmonaro; #springst; #auspol2020; #lnpcrimefamily; #lnpfail; #qldpol; #bcpoli **Racism-related:** #blacklivesmatter **COVID-related:** #covid19; #coronavirus; #covid **Climate action:** #buildbackbetter; #renewables; #climateimpactsvic; #vicclimatesolutions; #solar; #marshdumpadani; #ecologicalbreakdown; #biodiversity; #cleanenergy; #fossilfuels; #tech; #noconsent **Time-bound climate events:** #worldoceansday **Climate personalities:** #greta [including references to Naomi Seibt as 'the anti Greta'] **Other:** Television program references: #qanda; #insiders; #4corners Places #pacific Generic #science; #health	–

- Listing climate change and the pandemic as simultaneous concerns (lines 1–2 in Fig. 3);
- Comparing the pandemic to climate change as big problems requiring big solutions/responses (lines 3–7), whether actual (line 4–5) or necessary (line 6–7);
- Presenting both climate change and the pandemic as having a common solution (lines 8–10).

Less frequent were tweets that (i) compared climate change deniers and pandemic deniers (line 11), (ii) suggested climate change was a cause of or exacerbator of pandemics (line 12), (iii) claimed that climate change and the pandemic have a shared cause (line 13), (iv) discussed changes in emissions during the pandemic (line 14), (v) noted the use of the pandemic as an excuse for climate destruction (line 15).

Qualitative analysis of racism-related key hashtags/words (#blacklivesmatter [rf 22), racism [rf 51]; racial [rf 34], racist [rf 28]) suggested that such tweets were less varied and identified three important categories:

- Listing climate change and racism as simultaneous concerns (lines 1–4 in Fig. 4)
- Explicitly linking climate [action] and racism/racial justice (lines 5–8)
- Comparing the climate action movement and the Black Lives Matter movement (lines 9–10)

1	#auspol #thedrum #qanda </TWEET> <TWEET> "We are in a very important moment," says @Janefonda . "We have an election coming, we have a **pandemic** crisis, we have a climate crisis, we have a race crisis and we have a choice to make." <https://t.co/7XkP3qzgiu> <https://t.co/QBpM8eU3HN>
2	, and waves of climate emergencies that threaten the habitability of much of the continent's landmass. 8/ </TWEET> <TWEET> Race riots, 112k dead from **#coronavirus**, attacks on media & the social media he's used as a weapon, record heat in May due to #climate change. Is Trump's America great yet? "Trump
3	it here: <https://t.co/w7XeMlEl2N> @RobHarcourt @MPRG_MQ @MQBiology @IMOS_AUS @MEPS_IR <https://t.co/fVlzKP96OU> </TWEET> <TWEET> **#COVID19** is a global crisis, and it's up to all of us to solve it. We must build sustainable solutions that enable us not only to beat the pandemic, but to tackle the
4	support to the fossil fuel industry. <https://t.co/4ujfWYr7i4> </TWEET> <TWEET> "How come we're allowed to harm the economy in addressing a crisis like **#COVID19** but when it comes to things like climate change or welfare -- we're told we cannot 'afford' to do anything to address them?" asked @RDNS_TAI in
5	more of the Bureau's climate outlook at: <https://t.co/l5TkRkBrz9> <https://t.co/N1WMlcu593> </TWEET> <TWEET> Recent months have seen the COVID-19 **pandemic** emerge as a global crisis requiring immediate, wide-spread and evidence-based action. So why is the response to climate change different? Join
6	. And whatever we do should be consistent with action to mitigate climate change. </TWEET> <TWEET> We've shown that we can listen to science. We did for **#COVID19**. We stayed home. Let's now listen to science on nature & climate. -- @UNEP chief @andersen_inger says it os time for us to pay attention to
7	be a cop in this toxic environment? Thanks #BLM a$$hats! <https://t.co/c8Vqu8ahtu> </TWEET> <TWEET> PM wants us all to follow scientific advice on **virus** pandemics but continues to ignore climate scientists. #auspol </TWEET> <TWEET> "The more we learn, the more fragile the Earth system seems to
8	climate impacts #qanda </TWEET> <TWEET> Workers and communities need to be supported with secure and decent jobs. To rebuild our economy after **#COVID19**, a plan to tackle the climate change crisis is essential to creating secure jobs. #qanda </TWEET> <TWEET> Racism, Sexism, Tribalism, Bigotry and
9	@FIVH @350 <https://t.co/Op7kvF09m2> </TWEET> <TWEET> It's time we rethink our relationship with nature. To help avoid future pandemics like **#COVID19**, we need to fight #climate breakdown and protect #biodiversity. Only 15% of the world's #forests remain intact. When we protect nature, nature protects
10	#climatecriminal <https://t.co/Gl66zMQ9xi> </TWEET> <TWEET> Over 40 million health and medical professionals are calling for a Healthy Recovery from **#COVID-19** putting public health and climate action at the centre of economic recovery packages, to help avoid future crises and build economic and social
11	on the ruthless exploitation of people & planet. There's no profit in healing injustices. </TWEET> <TWEET> The countries that have been most infected by **#COVID19** are the same ones whose leaders are most infected by climate denial. - #COVIDIOTS #climatecrisis #climatepoli </TWEET> <TWEET> Ecosystem
12	message was urgent. "Climate change is real. Renewables are the future. Earth cannot withstand unfettered growth. And - wait for it - there will be a new viral **pandemic**. " Extraordinarily prescient. Listen @ABCClassic & ABCListen App </TWEET> <TWEET> 'Nature is speaking to us very loudly right now. We'd
13	rRNsQgaCyq> </TWEET> <TWEET> Australia has been hit by one ecological disaster after another this year : first the devastating bushfires, then the COVID-19 **pandemic**. Both are part of the same rising environmental crisis, and without meaningful action, we're headed toward dystopia. <https://t.co/
14	</TWEET> <TWEET> May 2020 saw the highest monthly total of CO2 concentration ever recorded . The short-term reduction in emissions during the **pandemic** "didn't even show up as a blip." Fossil fuel pollution is changing the climate dangerously & faster than expected. <https://t.co/7gaa6PifCc> </TWEET>
15	#exCrookedCopperNowCrookedMinister #MinisterforHomeauPairs <https://t.co/Q1mqPFqlcp> </TWEET> <TWEET> Meanwhile, the fossil fuel lobby is using the **virus** as cover for more grifting and climate destruction. (Good work from @350Australia) <https://t.co/PXmxbiYZpw> </TWEET> <TWEET>

Fig. 3. Concordance lines illustrating COVID-related discourses in the climate dataset.

Thus, it appears that tweets about climate join trending discourses about other crisis events, co-opting, as it were, current hashtags to integrate climate discourses. This makes climate discourses topical and searchable, and perhaps attempts to connect different networked publics, i.e. attracting new users to the climate action public. Interestingly, this finding indicates that climate discourses feed into broader social justice discussions on Twitter and that discursive links are established between them.

4.2. Collocation analysis

Our 'keyness' analysis above has identified multiple fire-related key hashtags and key words. However, these hashtags/words could occur anywhere in the tweet, not necessarily in the vicinity of the word *climate*, and not necessarily establishing causal links between climate change and the bushfires. Only certain hashtags (such as #climatefires) directly establish such a discourse of causality (see section 4.1.1). To identify discourses of causality that do link these two events and thereby to further explore the dynamics of discursive legitimation, additional collocation and concordance analysis is necessary to first identify cases where relevant words co-occur, and then analyse how they are used (see 3.2).

After retrieving a list of all *climate* collocates in the three datasets (Table 3), we manually inspected all of the types in row 1 (6177 words) to identify any fire-related collocates, namely words that contain a reference to fire (e.g. *fire*, *bushfires*, *firefighter*, *in-*

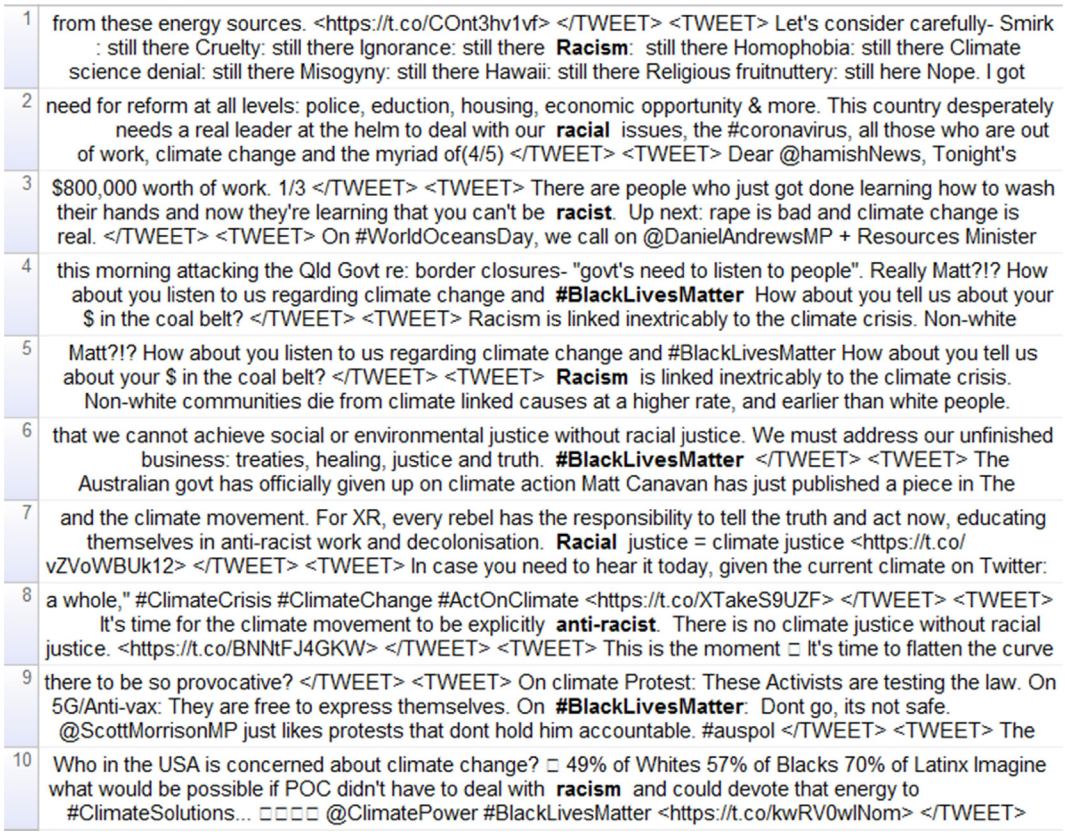

Fig. 4. Concordance lines illustrating racism-related discourses in the climate dataset.

Table 3
Number and frequency of *climate* collocates.

Number and frequency of collocates (types/tokens)	Early	Height	After
Number of *climate* collocates (types)	2,043	1,997	2,137
Frequency of *climate* collocates (tokens)	26,795	25,593	25,132
Number of fire-related *climate* collocates (types)	19	34	11
Frequency of fire-related *climate* collocates (token)	358	410	75

ferno), burning (e.g. *burnt*, *burning*) or smoke (e.g. *smoke*).[4] This allows us to trace the impact of the bushfires on climate discourses in a different way, by focusing on tweets that contain climate and fire-related words in close proximity. We also assumed that such collocations may be used in tweets that link the bushfires to climate change. Results in Table 3 essentially confirm the findings from the hashtag analysis, and thus provide additional empirical evidence for our results through triangulation of different corpus linguistic techniques.

Across all three datasets, the words *bushfire*, *bushfires*, *fire* and *fires* are consistently the most frequent fire-related *climate* collocates, and we therefore decided to investigate these four collocates further using newly developed coding manuals (see Bednarek, 2021). One author (Doran) coded all instances, and a second author (Carr) coded a subset. Intercoder agreement ranged from 83.12% to 89.03%, and Cohen's Kappa from 0.70 to 0.76. We included collocates that were hashtags, but only if they were part of the sentence structure. Analysis then focused on whether the tweets that contain *climate* and these four collocates mentioned a link between the Australian bushfires and climate change, and if so, whether that link was supported (Example 4) or opposed (Example 5). We also investigated *how* such links were supported or opposed, and *who* (self or other) supported or opposed them. Future analysis could focus on legitimation strategies that were used in supporting/opposing the link; thus Examples 4 and 5 both show an appeal to scientific authority (*evidence*, *science*; *hardest of data*).

Example 4:. *For journalists reporting on the* ***#cavefire, please mention climate change****. There's lots of evidence. You can use this fact sheet if you need some help making* ***the links****. The science is abundantly clear.* ***Call this crisis by its name****.*

Example 5:. *@RichardDiNatale I implore ppl to look beyond politicians & journalists climate alarmism rhetoric.* ***The hardest of data when critically analysed doesn't support the correlation b/w CO2, drought & fire***

The first result is that only a small number of the 620 coded tweets are 'not applicable' (11) or not relevant (16). This means that collocation analysis works for identifying cases where a link between climate change and the bushfires is supported/opposed. In other words, when *climate* occurs in the vicinity of fire-related collocates, the tweet does indeed mention this association. This means the method can be upscaled to a larger dataset to identify relevant tweets. Table 4 presents the results of tweets that support and oppose the climate change link, including their sources (self/other). A few tweets were excluded from the table because they

[4] Collocates that are only very indirectly associated with fire (e.g. *Mullins*, *commission(er)*, *royalcommission*, *pyrocene*) or that could point to ignition sources (e.g. *fuelled*, *hazard*, *lightning*, *cigarettes*) were not included. Also excluded were collocates that could be part of fire-related expressions (e.g. *bush*, *catastrophic*, *black*, *back*) and collocates that relate to energy sources (e.g. *energy*, *oil*, *electricity*, *coal-fired*) or climate/temperature (e.g. *temperature(s)*, *hotter*, *warms*).

Table 4
Coding results.

	Early				Height				After			
	Total	Self	Other	Unclear	Total	Self	Other	Unclear	Total	Self	Other	Unclear
Link supported:												
direct link	119	80	38	1	85	56	27	2	24	12	12	0
implied link	88	57	29	2	77	57	20	0	27	18	9	0
denial rejected	21	19	2	0	23	19	4	0	6	6	0	0
Total support	**228/ 91%**	**156/ 62%**	**69/ 28%**	**3/ 1%**	**185/ 81%**	**132/ 58%**	**51/ 22%**	**2/ 1%**	**57/ 95%**	**36/ 60%**	**21/ 35%**	**0/ 0%**
Link opposed:												
direct denial	4	0	4	0	10	3	7	0	0	0	0	0
implied denial	7	6	1	0	7	7	0	0	1	1	0	0
link rejected	11	6	5	0	26	11	15	0	2	2	0	0
Total opposed	**22/ 9%**	**12/ 5%**	**10/ 4%**	**0/ 0%**	**43/ 19%**	**21/ 9%**	**22/ 10%**	**0/ 0%**	**3/ 5%**	**3/ 5%**	**0/ 0%**	**0/ 0%**

were highly ambiguous, lacked context, or were instances of the compound *fire chief(s)* (details in Bednarek, 2021). Some of the tweets coded as 'other' may endorse the position that is attributed to another source (Weber et al., 2020), but this remains unclear without additional analysis.

As evident, the period at the 'height' of the bushfires proportionally saw the most tweets opposing the link, although the differences are relatively small, and numbers seem to revert back in the 'after' period. For instance, with tweets coded as 'Self', we can see a shift from 62% supporting a link in the early period, down to 58% at the height and back to 60% in the after period. Correspondingly, there is a shift from 5% opposing the link (early) up to 9% (height) and back to 5% (after). Examining user behaviour from 31 December to 17 January for #arsonemergency, Weber et al. (2020) found that users supporting the arson discourse produce more tweets than those opposing it. If we assume that there is an overlap between tweeters pushing the arson discourse and those opposing the link between climate change and the bushfires, this could partially explain these results. Further analysis of retweet activity, users and networks as well as more fine-grained temporal analysis is necessary – especially as we do not want to over-interpret the small percentage differences in our analysis. In any case, the majority of coded tweets clearly do not support the climate disinformation discourse, suggesting this is a minor dominant discourse rather than a major one.

Finally, Table 4 identified three main ways in which the link between climate change and the bushfires were supported/ opposed:

1. The link or denial was made directly (Examples 4 and 5 above)
2. The link or denial was (indirectly) implied (Example 6)
3. The link was mentioned and then rejected (Example 7), or the denial was mentioned and then rejected (Example 8).

Example 6:. *Let it be known that Australia is burning. Our cities have been covered in smoke the last couple of weeks, and this is Sydney, right now.* ***Climate change is real. Bush fires are still raging****. The air isn't safe to breathe.*

Example 7:. *Opening statement on Bushfire Royal Commission in very first breath..bushfires and changing global climate..how can you beat* ***this propaganda****..even in govt paid investigations? these scumbags continue to hold control*

Example 8:. *I am disgusted with Amanda Vandstone. Fancy, pointing to a* ***stupid*** *climate denying article by Chris Kenny who denies the link between fires and climate change.* ***Beyond pathetic. And irresponsible****.*

It appears that the third, dialogic strategy was (proportionally) more important for tweeters who opposed the link. In addition, the drop from 21 and 23 of 'denial rejected' to 6 in the 'after' period could indicate that tweeters no longer saw the need to rebut the denials by explicitly mentioning them. (Further examples of the coding categories are presented at Bednarek, 2021).

4.3. The arson discourse

Our earlier 'keyness' analysis retrieved #arsonemergency and *arsonists*, which point to the other disinformation discourse where the bushfire crisis is attributed to arson. In this section we explore the presence of this discourse in the climate dataset in more detail to focus on the dynamics of a specific discursive struggle. Examining all hashtag and collocate types (row 1 in Table 1 and Table 3) retrieves four arson-related hashtags and collocates, two of which are associated with a discourse of emergency (#arsoncrisis, #arsonemergency). For a temporal comparison, Fig. 5 shows a timeline of the combined frequencies of arson- and fire-related *emergency* and *crisis* hashtags from Australian Twitter covering the complete period from 12 November 2019 to 17 June 2020 (based on the full population of tweets and retweets, i.e. going beyond the three sample datasets). This indicates that the fire emergency/crisis discourses as indicated through hashtags have a range of ongoing peaks, while the arson emergency/discourses have one strong peak and then recede in significance (see further Graham & Keller, 2020; Weber et al., 2020). This suggests that the arson discourse has lost the discursive struggle on Australian Twitter.

However, the arson discourse is not just expressed through hashtags. While there are only 15 total instances of arson-related hashtags (#arsonists, #arsoncrisis, #arson, #arsonemergency) across the three datasets (albeit each retweeted multiple times), a search for any word containing *arson* retrieves 32, 105 and seven total instances respectively (Table 5). It is noteworthy that *arsonemergency* – the focus of Graham and Keller (2020) and Weber et al. (2020) – is not that frequent in our dataset (nine of 144 instances). Because these words can be used by Opposers and Supporters of the arson disinformation discourse (Weber et al., 2020), we coded each tweet containing at least one instance of an arson-related word as supporting or opposing the arson discourse (coding manual available in Bednarek, 2021).

Table 5 suggests that over time there was a reduction of Supporting tweets and a rise in Opposing tweets, especially in the 'height' dataset. This could be the result of widespread media coverage from 7 January onwards, most of which debunked the disinformation, as did the Rural Fire Service and Victorian Police (Weber et al., 2020). Weber et al. (2020) also note that on 7 January 2020 (during our 'height' period), users classified as Opposers posted three times as many tweets as those classified as Supporters, which

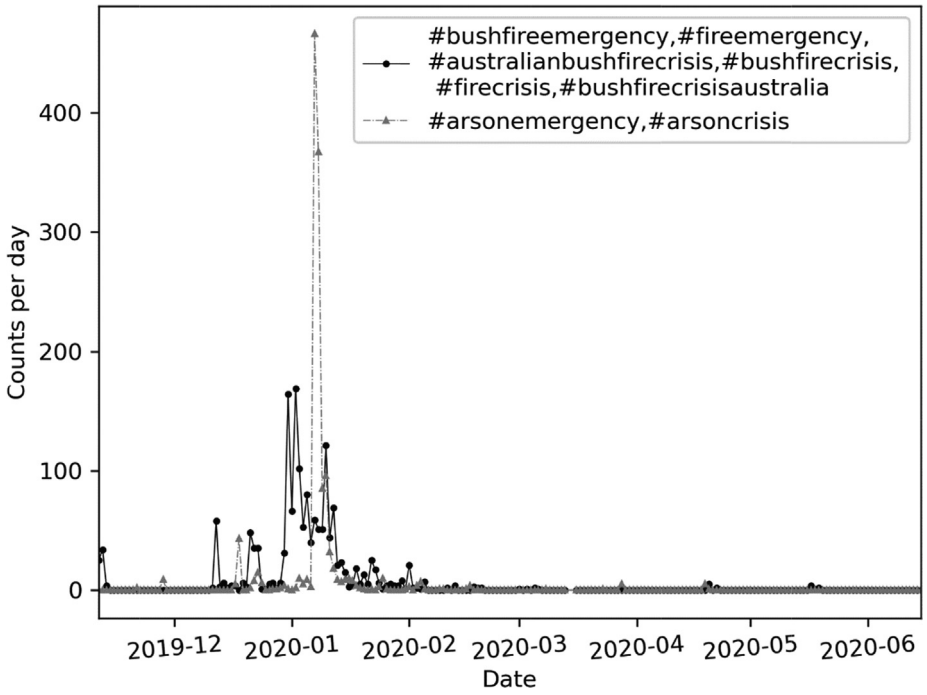

Fig. 5. Timeline of selected hashtags.

Table 5
Coding results (arson).

	Early	Height	After
Arson-related words (hashtags listed separately); rf = 1 unless specified	arson (rf = 10), #arsoncrisis, arsonist (rf = 4), arsonists (rf = 16), #arsonists	arson (rf = 51), #arson (rf = 2), #arsoncrisis, #arsonemergency (rf = 9), arsonist (rf = 5), arsonists (rf = 36), arsons	arson (rf = 4), #arson, arsonist, arsonists
Supporting	16 (50%) – 294 retweets	41 (39%) – 1250 retweets	3 (42.9%) – 26 retweets
Opposing	3 (9.4%) – 69 retweets	56 (53.3%) – 4167 retweets	2 (28.6%) – 60 retweets
Unclear/ ambiguous	1	7	1
N/A	12	1	1
Total instances	**32**	**105**	**7**

aligns with our results. Considering both the number of tweets coded as Supporting and Opposing as well as their associated total retweets, it again appears that the arson discourse has lost the discursive struggle in these datasets. This is the case even though this discourse was initially retweeted more, and even though, as Weber et al's (2020, p. 13) analysis suggests, "Supporters [including non-Australian contributors] were more active and more engaged". These results present clear hypotheses that can now be tested in larger Australian and international datasets.

5. Discussion

With respect to our three research questions, our analysis of hashtags and key hashtags/words showed that the bushfires had an effect on dominant climate discourses on Australian Twitter. In terms of the temporal dynamics, this impact intensified at the height of the bushfires but receded significantly after the bushfires had ended. This case makes it evident that climate-related online discourses may at times be driven by internal, platform-specific dynamics, but are distinctly impacted by external climate events. Our methodology allowed us to identify specific discourses (e.g. discourses related to the bushfires, such as discourses of blame, causality, emergency and prevention or the arson emergency discourse; as well as discourses related to the coronavirus and racism), some of which were 'key' in different time periods. Our analysis indicated that discourses relating to different external crises (bushfires, coronavirus, racism) feed into existing broader climate discourses on Twitter, establishing discursive links. Finally, we uncovered clear evidence of lexical and discursive struggles and of discourses of causality and blame.

How can these results be viewed theoretically through the lens of discursive legitimation? On the one hand, the fact that discussion of the bushfire event occurs in general climate tweets at all is tied to legitimation on a very general level in that it legitimises external crisis events as topics for climate-related discussion and debate. It also appears that the Twitter activity around the Australian bushfires impacted the dominant climate discourses such that this crisis event was used to discursively strengthen or legitimise the case for action on climate change. In addition, the struggle between competing discourses that we observed in the dataset is related to supporting and opposing the legitimacy of discourses and the (political) actors involved in them. In terms of this discursive struggle, in particular between polarised perspectives such as #climateemergency and #arsonemergency, our findings suggest that Australian users within the digital public sphere were actively seeking to delegitimise disinformation campaigns by engaging in climate-related discussions.

Specific discourses that are connected to legitimacy include discourses of blame, causality, emergency, and prevention. In general rhetorical contexts, blame discourses are founded almost entirely on the act of stripping legitimacy from the target of the blame, and this remains true in the current context with users seeking to delegitimise those who are perceived to be responsible for the fires and related climate concerns. Such discourses also foreground climate action and climate justice as being in the best interests of the population and those who act counter to this (e.g. politicians)

as irresponsible and not warranting legitimacy. As we have suggested, hashtags such as #morrisonfires, #climatefires or #bushfirecrisis concisely package discourses that can be interpreted as (de)legitimising particular ways of viewing an environmental event (e.g. as the responsibility of politicians; as causally linked to climate change; as an urgent crisis). In the case of discursive struggles, tweeters will align (support, legitimise) or disalign (undermine, delegitimise) with particular discourses that are packaged in this way (as our analysis of the support and opposition to the arson discourse has shown). While we have used discursive legitimation here as a lens through which to view our results on a macro level, what we have not investigated is the micro-level of linguistic realisations. A future study could apply existing analytical frameworks for studying how discourses are given legitimacy through particular strategies (e.g. *authorisation* – reference to authority – or *moral evaluation* – an appeal to values; see van Leeuwen 2007) or how authority is constructed and evoked for political discourses through processes of enregisterment (Gal 2019).

Finally, an interesting finding emerged from the 'after' dataset. In this period hashtags related to the COVID-19 pandemic and racism appeared in climate discourses. What this suggests is that climate discourses act as a host to other social justice discourses, which serves two functions. First, users are effectively packaging climate discourses together with other concerns; in other words, climate change is seen not only as an environmental, but also as a social issue, and aligned with other issues such as racial justice and healthcare. Second, the climate discussion acts as a conduit for these other discourses to gain prominence within the digital public sphere, which highlights the emergence of dominant discourses on Twitter as an evolving process. Thus, we can see how, triggered by a significant crisis, conversations about the Australian bushfires not only became part of climate-related discourses (even if this impact was not sustained over time) – they were integrated into broader climate and social justice agendas, connecting the Australian networked publics to international movements to collectively address common issues, find solutions, and demand accountability. This is somewhat reminiscent of how everyday consumption and 'right' or 'moral' actions are defined and constructed in the public realm of cultural politics, with different climate change actions being combined with each other as well as with other projects such as social justice or human rights (see Boykoff et al., 2009).

6. Concluding remarks

Media are discursive spaces where a range of public citizens negotiate meaning, value, power and rhetoric as part of the cultural politics of climate change, shaped by both science and environmental processes (Boykoff et al., 2015). In this study, we focussed on a particular type of media (Twitter) and a particular type of environmental process (an external crisis event). In sum, our results show that (i) the bushfires had a clear but temporally localised impact on dominant climate discourses in Australia, (ii) misleading discourses were present but can be considered as 'minor' dominant discourses in the analysed datasets, arguably losing the discursive struggle, and (iii) crisis discourses did not occur in an isolated way; rather discursive links were established as a means of attempting to establish legitimacy for the discourse about these issues, in turn drawing greater attention to the issue itself.

It is clear that social media analysis can inform us about public opinion regarding political issues (e.g. Cody et al., 2015; Smyrnaios & Ratinaud, 2017). What is surprising is that even qualitative analysis of small datasets seems to do so – Caple (2019) has shown this for Instagram; this study demonstrates this for Twitter. Our results of dominant Twitter discourses seem to align well with surveys of Australians regarding their assessment of the top issues facing Australia: In early 2020, the environment was rated the most important issue, but in October, it dropped to rank five – below economy, unemployment, healthcare, and cost of living (O'Malley, 2020). Another poll suggested that 82% of Australians are worried that climate change will result in more bushfires (Colvin, 2020). This alignment with our results indicates that analysis of a small, curated dataset of most frequently retweeted tweets can be useful for gauging emerging public opinion, as well as the discursive struggles that occur in this process of public (de) legitimation.

Previous studies have shown that extreme weather events can instigate significant discussion and debate around climate change (e.g., Anderson & Huntington, 2017). This was confirmed in the current study, which approached this through the lens of discursive struggle and discursive legitimation. Future research needs to identify and categorise strategies of legitimation in more detail and examine the impact of Twitter discourses and discursive struggles for public debate and public opinion, both with respect to how climate change is debated on Twitter and beyond.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

An, X., Ganguly, A. R., Fang, Y., Scyphers, S. B., Hunter, A. M., & Dy, J. G. (2014). Tracking climate change opinions from Twitter data. *Workshop on Data Science for Social Good Held in Conjunction with KDD 2014*. New York.

Andersen, A.A., Lybæk, S.K., 2020. The performative momentum of the hashtag. In: Van Alphen, F., Normann, S. (Eds.), Cultural psychology in communities: Tensions and Transformations. Information Age Publishing, pp. 43–63.

Anderson, A.A., Huntington, H.E., 2017. Social media, science, and attack discourse: How Twitter discussions of climate change use sarcasm and incivility. Science Communication 39 (5), 598–620.

Baker, P., Gabrielatos, C., KhosraviNik, M., Krzyżanowski, M., McEnery, T., Wodak, R., 2008. A useful methodological synergy? Combining critical discourse analysis and corpus linguistics to examine discourses of refugees and asylum seekers in the UK press. Discourse & Society 19 (3), 273–306.

Bednarek, M. (2021) Australian bushfires and climate discourses on Twitter. Open Science Framework project page, https://osf.io/fuevs/?view_only=8df7a42fb4094b0dae897ed517b4db70

Bednarek, M., Carr, G., 2020. Computer-assisted digital text analysis for journalism and communications research: Introducing corpus linguistic techniques that do not require programming. Media International Australia. 10.1177%2F1329878X20947124.

Boykoff, M.T., Goodman, M.K., Curtis, I., 2009. Cultural politics of climate change: Interactions in everyday spaces. In: Boykoff, M. (Ed.), The politics of climate change: A survey. Routledge, pp. 136–154.

Boykoff, M.T., McNatt, M.B., Goodman, M.K., 2015. Communicating in the anthropocene: The cultural politics of climate change news coverage around the world. In: Hansen, A., Cox, B. (Eds.), The Routledge handbook of environment and communication. Routledge, pp. 221–232.

Bruns, A., Burgess, J., Crawford, K., & Shaw, F. (2012). *#qldfloods and @QPSMedia: Crisis communication on Twitter in the 2011 South East Queensland floods*. Report for ARC Centre for Excellence for Creative Industries and Innovation. Brisbane.

Caple, H., 2019. "Lucy says today she is a Labordoodle": How the dogs-of-Instagram reveal voter preferences. Social Semiotics 29 (4), 427–447.

Cody, E. M., Reagan, A. J., Mitchell, L., Dodds, P. S., & Danforth, C. M. (2015). Climate change sentiment on Twitter: An unsolicited public opinion poll. *PLOS ONE*. https://doi.org/10.1371/journal.pone.0136092

Colvin, R., 2020. October 28). New polling shows 79% of Aussies care about climate change. So why doesn't the government listen? The Conversation. https://theconversationcom/new-polling-shows-79-of-aussies-care-about-climate-change-so-why-doesnt-the-government-listen-148726.
CSIRO, the Commonwealth Scientific and Industrial Research Organisation. (2020). *The 2019-2020 Bushfires: A CSIRO Explainer* < https://www.csiro.au/en/Research/Environment/Extreme-Events/Bushfire/preparing-for-climate-change/2019-20-bushfires-explainer>
De Cock, B., Pizarro Pedraza, A., 2018. From expressing solidarity to mocking on Twitter: Pragmatic functions of hashtags starting with #jesuis across languages. Language in Society 47 (2), 197–217.
Eades, D., 2006. Lexical struggle in court: Aboriginal Australians versus the state. J. Sociolinguistics 10 (2), 153–180.
Fink, S. (1986). *Crisis management: Planning for the inevitable*. AMACOM.
Gal, S., 2019. Making registers in politics: Circulation and ideologies of linguistic authority. J. Sociolinguistics 23 (5), 450–466.
Graham, T., Keller, T.R., 2020. January 10). Bushfires, bots and arson claims: Australia flung in the global disinformation spotlight. The Conversation. https://theconversationcom/bush_res-bots-and-arson-claims-australia-ung-in-the-global-disinformation-spotlight-129556.
Jørgensen, M., Phillips, L.J., 2002. Discourse analysis as theory and method. Sage.
Kim, J., Hastak, M., 2018. Social network analysis: Characteristics of online networks after a disaster. Int. J. Inf. Manage. 38, 86–96.
Kirilenko, A.P., Stepchenkova, S.O., 2014. Public microblogging on climate change: One year of Twitter worldwide. Global Environ. Change 26, 171–182.
Lee, C., 2018. Introduction: Discourse of social tagging. *Discourse, Context & Media* 22, 1–3.
Matheson, D., 2018. The performance of publicness in social media: Tracing patterns in tweets after a disaster. *Media, Culture & Society* 40 (4), 584–599.
Matley, D., 2018. "This is NOT a #humblebrag, this is just a #brag": The pragmatics of self-praise, hashtags and politeness in Instagram posts. *Discourse, Context & Media* 22, 30–38.
Mirbabaie, M., Ehnis, C., Stieglitz, S., Bunker, D., Rose, T., 2021. Digital nudging in social media disaster communication. Information Syst. Frontiers 23 (5), 1097–1113. https://doi.org/10.1007/s10796-020-10062-z.
Moernaut, R., Mast, J., Temmerman, M., Broersma, M., 2020. Hot weather, hot topic: Polarization and sceptical framing in the climate debate on Twitter. *Information, Communication & Soc.* https://doi.org/10.1080/1369118X.2020.1834600.
Murthy, D., Longwell, S.A., 2013. Twitter and disasters: The uses of twitter during the 2010 Pakistan floods. *Information, Communication & Soc.* 16 (6), 837–855.
O'Malley, N. (2020, November 22). Survey shows Australian support for Paris Agreement and net zero target. *The Sydney Morning Herald*. https://www.smh.com.au/environment/climate-change/australians-back-the-paris-agreement-and-want-a-net-zero-target-20201122-p56gtw.html?btis
Page, R., 2012. The linguistics of self-branding and micro-celebrity in Twitter: The role of hashtags. Discourse & Commun. 6 (2), 181–201.
Papacharissi, Z., 2014. Affective publics. Oxford University Press.
Rachunok, B.A., Bennett, J.B., Nateghi, R., 2019. Twitter and disasters: A social resilience fingerprint. IEEE Access 7, 58495–58506.
Roxburgh, N., Guan, D., Shin, K.J., Rand, W., Managi, S., Lovelace, R., Meng, J., 2019. Characterising climate change discourse on social media during extreme weather events. Global Environ. Change 54, 50–60.
Royal Commission into National Natural Disaster Arrangements. (2020). *Report of the Royal Commission into National Natural Disaster Arrangements*. Commonwealth of Australia.
Rüdiger, S., Dayter, D., 2020. Corpus approaches to social media. John Benjamins.
Scott, M. (2020a). *WordSmith Tools 8*. Lexical Analysis Software.
Scott, M., 2020. WordSmith Tools Help. Lexical Analysis Software.
Schweinsberg, S., Darcy, S., Beirman, D., 2020. 'Climate crisis' and 'bushfire disaster': Implications for tourism from the involvement of social media in the 2019–2020 Australian bushfires. J. Hospitality Tourism Management 43, 294–297.
Spence, P.R., Lachlan, K.A., Lin, X., del Greco, M., 2015. Variability in Twitter content across the stages of a natural disaster: Implications for crisis communication. Communication Quarterly 63 (2), 171–186.
Takahashi, B., Tandoc, E.C., Carmichael, C., 2015. Communicating on Twitter during a disaster: An analysis of tweets during Typhoon Haiyan in the Philippines. Comput. Hum. Behav. 50, 392–398.
Van Leeuwen, T., 2007. Legitimation in discourse and communication. Discourse & Communication 1 (1), 91–112.
Weber, D., Nasim, M., Falzon, L., & Mitchell, L. (2020). #ArsonEmergency and Australia's "Black Summer": Polarisation and disinformation on social media. In M. van Dujin, M. Preuss, V. Spaiser, F. Takes, & S. Verberne (eds). *Disinformation in open online Media.* MISDOOM 2020. Lecture notes in computer science. Springer.
Zappavigna, M., 2011. Ambient affiliation: A linguistic perspective on twitter. New Media & Society 13 (5), 788–806.
Zappavigna, M., 2018. Searchable talk: Hashtags and social media metadiscourse. Bloomsbury.