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Alix Varnajot, Emmanuel Salim. The hauntology of climate change: glacier retreat and dark tourism. *Tourism Geographies*, 2024, pp.1-18. 10.1080/14616688.2024.2328607 . halshs-04509282

HAL Id: halshs-04509282

<https://shs.hal.science/halshs-04509282v1>

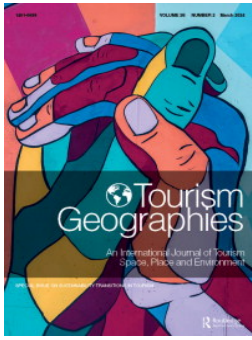
Submitted on 18 Mar 2024

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Tourism Geographies

An International Journal of Tourism Space, Place and Environment

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rtxg20

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To cite this article: Alix Varnajot & Emmanuel Salim (18 Mar 2024): The hauntology of climate change: glacier retreat and dark tourism, *Tourism Geographies*, DOI: [10.1080/14616688.2024.2328607](https://doi.org/10.1080/14616688.2024.2328607)

To link to this article: <https://doi.org/10.1080/14616688.2024.2328607>



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Published online: 18 Mar 2024.



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The hauntology of climate change: glacier retreat and dark tourism

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ABSTRACT

In recent decades, glaciers have become infamous symbols of climate change, and as they thaw and retreat, they leave behind haunted spaces favorable for the development of dark tourism practices. Commemorative plaques and funerals, but also comparative before-and-after photographs, on-site interpretative boards indicating where glaciers used to be 20, 50 or 100 years ago, as well as more recent developments of virtual reality (VR) tools all participate in the production of specters of vanished glaciers. These all constitute practices where gone glaciers must live in the present. In parallel, little empirical evidence demonstrates if tourists engaging in glacier tourism develop follow-up pro-environmental behaviors, and if they do, if this lasts in the long-term. In this conceptual article, we contend that reframing glacier tourism as a form of dark tourism may transform people relationship with glaciers and speed up conservation efforts. Our analytical basis is grounded in Derrida's framework of hauntology, wherein glaciers are considered as geographical specters (or ghosts), neither invisible nor visible, dead nor alive. This work critically explores the complex connections between dark tourism, glacier retreat and spectral geographies, and argues that framing glacier tourism as dark tourism can improve tourists' pro-environmental behavior changes, as well as expand climate change discourses, ethics, and politics.

ARTICLE HISTORY

Received 14 June 2023
Accepted 25 February 2024

KEYWORDS

Climate change; glacier tourism; dark tourism; glacier retreat; ambassadorship; hauntology

1. Introduction

In recent years, an increasing number of people have experienced ecological grief due to significant changes in their environment (Willox, 2012). Increasing wildfires and extreme weather events, changing weather patterns, biodiversity loss and

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accumulating pollution have triggered global concerns about our planet (Westoby et al., 2022), including vanishing glaciers (IPCC, 2019; Welling et al., 2015; Zemp et al., 2019). The global melting of the glaciers can even be considered a major event of the Anthropocene. The Anthropocene refers to a new epoch wherein '[the] human imprint on the global environment has now become so large and active that it rivals some of the great forces of Nature in its impact on the functioning of the Earth system' (Steffen et al., 2011, p. 842). In the Anthropocene, glaciers have become infamous symbols of climate change, to such an extent that Carey (2007, p. 497) considered them to be 'endangered species' and Inkpen (2022, p. 84) to be 'fellow mortals of the present'. Small glaciers (IPCC, 2019) and tropical glaciers (Veettil & Kamp, 2019) are estimated to be the most vulnerable around the globe. As glaciers thaw and retreat to ultimately disappear, they leave behind what could be understood as haunted spaces, or Derridean ghosts (1994). It has been argued by Salim (2023) that both the death of glaciers and the associated production of haunted spaces is favorable for the development of dark tourism practices. Dark tourism is defined as 'visitations to places where tragedies or historically noteworthy death occurred and that continue to impact our lives' (Tarlow, 2005, p. 48). Generally, dark tourism refers to tourism and experiences of places associated with human deaths (Sharma, 2020; Sharpley & Stone, 2009; Stone & Sharpley, 2008). Typical examples include genocide sites (see Miles, 2002; Sharpley & Gahigana, 2014), or sites of natural or industrial disasters (see Robbie, 2008; Stone, 2013). Nevertheless, in the Anthropocene, dark tourism is increasingly encompassing places associated with the death of non-human entities (Varnajot & Saarinen, 2022; Zheng et al., 2020).

In this Anthropocene context, people are increasingly visiting glaciers before they are gone for good (Lemieux et al., 2018; Salim & Ravanel, 2023), a phenomenon known as last-chance tourism (LCT) (see Lemelin et al., 2010). It is often argued that glacier tourism, and the experience of the ice in general, can lead to pro-environmental behavior changes and to enhance public awareness and concerns for environmental issues (Lv et al., 2023; Maher et al., 2003). Nevertheless, studies focusing on people's pro-environmental behavior changes after first-hand experiences with ice generally focus on intentions rather than actual long-term changes (Salim et al., 2022; see also Dolnicar, 2015). In addition, Varnajot & Saarinen (2021) argue that, in the Anthropocene, visits to sites of vanishing glaciers can be understood as a form of dark tourism, where tourists come to gaze at disappearing non-human entities. As glaciers disappear, glacier tourism may therefore shift from LCT to dark tourism. As Salim (2023) notes, this shift from LCT to dark tourism becomes an opportunity for destinations to both rebrand themselves as sites devoted to the observation of climate change impacts on glacial landscapes, and better soliciting tourists' affect (see Dannevig & Rusdal, 2023; Martini & Buda, 2020). Indeed, literature in geography has long shown the intricate interconnections between dark tourism, affect, and place (see Martini & Buda, 2020; Smith et al., 2016; Wang et al., 2019; White & Frew, 2013). In general, affect refers to 'the potential to elicit intense embodied, psychological responses with very powerful effects' (Sather-Wagstaff, 2016, p. 12).

By examining the geographical production of haunted spaces at sites of glacier retreat, this article aims to propose a new conceptualization of glaciers, whereby dark tourism could transform people's relationship with disappearing glaciers, facilitating

and speeding up conservation efforts. Indeed, by triggering affect among tourists, dark tourism is expected to be an efficient tool in creating glacier ambassadors, for example. Our conceptual approach is grounded in Jacques Derrida's (1994) work on hauntology. Hauntology is the neologism of 'haunting' and 'ontology', referring to the figure of the ghost, and defining objects, entities or individuals that are neither present nor absent, dead nor alive (Davis, 2005). More specifically, we approach glaciers as traumascapes, defined by Maria Tumarkin (2019, p. 5) as 'places constituted by experiences of particular [traumatic] events and their aftermath'. Tumarkin (2019, p. 5) continues and argues that traumascapes are haunting places 'where visible and invisible, past and present, physical and metaphysical come to coexist and share common space.' More than literal 'ghosts' (Jameson, 1999), these spectral glaciers, and traumascapes, are vestiges of the past that are still charged in the present time (Gan et al., 2017), understood as 'the sense of the presence of those who are not physically there' (Bell, 1997, p. 813).

By better understanding the complex connections between dark tourism and glacier retreat, and by extending the analysis of the production of haunted spaces to specters of glaciers, we argue that conceptualizing glacier tourism through the lens of dark tourism can become a powerful means for triggering pro-environmental behaviors among tourists visiting sites of glacier retreat. The next section of this conceptual paper concentrates on glacier tourism and provides some historical, environmental, and economic context on the significance of glaciers for communities dependent on tourism. Understanding this background is essential to better grasp the importance of glaciers in people's lives, and therefore to better explain the loss of glaciers as a bereavement. The focus then shifts to the production of spectral glaciers and associated dark tourism practices and experiences by investigating how glacier retreat is (re)presented to visitors. The last section discusses the implications of traumascapes through dark tourism at sites of vanishing glaciers and investigates how spectral glaciers—and ghosts of non-humans—can facilitate tourists' pro-environmental behavior changes, as well as promote climate change discourses, ethics, and politics (Willox, 2012).

2. Glaciers and tourism: perceptions, roles, and values

Glaciers are more than climate sentinels. They are humanized, racialized, and gendered (Gagné, 2018; Inkpen, 2022) and belong to many cosmologies around the world (Gagné et al., 2014)—and this is why they will be referred to as 'non-human entities' throughout the text. In India, for example, the Gangotri and Yamunotri Glaciers were granted the status of legal personhood by the Uttarakhand High Court because they are deemed essential for both water and religion (Carey et al., 2022). Glaciers have important spiritual and aesthetic roles, embodying symbolic and sacred meanings for some local populations like in the Peruvian Andes or the Nepalese Himalayas (Allison, 2015). Glaciers also have significant economic and functionalist roles for downstream populations (Carey et al., 2022; Salim et al., 2021). Indeed, they are important resources for drinking water, irrigation, farming, and energy (Schaeffli et al., 2019), and represent opportunities for economic

development, by attracting millions of tourists, for example (Abrahams et al., 2021; Lemieux et al., 2018).

Visits to glaciers, understood as recreational activities can be traced back to 1741, when British explorer William Windham and anthropologist Richard Pococke, went to the Mer de Glace, in Chamonix (France), as part of the Grand Tour, following rumors of grandeur, magnificence, awe and mystery associated to these bodies of ice, highlighting the aesthetic values of glaciers (Jóhannesdóttir, 2010; Schirpke et al., 2016). While the exploration of glaciers had its origins in Europe, in other parts of the world, glaciers were often revered, embedded in local cosmologies, remaining unexplored by local communities (Frömming, 2009, Gagné et al., 2014). It was only at the turn of the twentieth century that European colonial expansion and desires for conquests led to the exploration of non-European mountains (see Sharp & Dowder, 2011). For example, although China is home to numerous glaciers, their exploration only started to develop in the early 1900s, and glacier tourism as we know it today only emerged in the mid-1980s (Hong-Min et al., 2021; Shijin et al., 2020). In recent decades, however, glacier tourism has become a global phenomenon (Welling et al., 2015), and among the most visited glaciers are Baishui (China), Athabasca (Canada), Franz Josef (New Zealand) or the Perito Moreno (Argentina) Glaciers.

Typical tourist activities at glacier sites include hiking (with specific gears like spikes and ice axes) and sightseeing from purposefully built platforms such as at the Perito Moreno. Other activities include skiing or visits to artificial ice caves, sometimes referred to as ice-caving, which have become popular tourism products in Iceland or some glaciers of the Alps (e.g. Mer de Glace, Rhône). In addition, one can visit glaciers using kayaks on proglacial lakes (e.g. Møsevatnet, Norway), or several types of motorized vehicles like snowmobiles and ATVs, off-road 'glacier-tamed' tour buses (several glaciers in Iceland), small airplanes (e.g. Kaskawulsh Glacier, Canada, Figure 1), or by ship to tidewater glaciers (e.g. Nordenskiöldbreen, Svalbard). Glaciers have become significant opportunities for economic development for local communities, through for example, the need for guides and experts, gear selling and rental services, safety, search and rescue personnel, access infrastructures (ticketing), but also accommodation, catering services and souvenir shops (Abrahams et al., 2021; Wang et al., 2010).

Furthermore, the economic value of glacier tourism is emphasized when glaciers are included in the process of the creation of national parks (Stewart et al., 2016). As recalled by Gagné et al. (2014, p. 799), national parks are 'intricately linked to the landscape [aesthetic] which has grown out of 19th-century romanticism and the colonial expansion of the twentieth century'. More recently, following the increasing awareness of anthropogenic impacts on the planet, national parks have also been created for nature conservation purposes (Saarinen, 2019). Examples of popular national parks with glaciers include Grand Teton National Park and Rocky Mountain National Park, respectively in Wyoming and Colorado (USA), Sagarmartha National Park (Nepal) dominated by Mount Everest, or the Kilimanjaro National Park (Tanzania). Although these national parks are supposed to be protected wilderness spaces, organized commercial tourism operating in those areas still represents a threat to the local environment (Duffy, 2002; Saarinen, 2019).

Nevertheless, along the sublime, has recently emerged the motivation to visit glaciers before they vanish, or at least before they are irrevocably changed (Salim &



Figure 1. Flightseeing tours are a popular way to visit Kaskawulsh Glacier in Yukon (Canada). Photo: Alix Varnajot.

Ravel, 2023). Studies from Abrahams et al. (2021) and Lemieux et al. (2018) have shown that LCT has become a significant motivation for tourists to engage in glacier tourism, to such an extent that the ongoing vanishing of ice provides a substantial economic opportunity for local communities (Varnajot & Saarinen, 2021, 2022). Investigations in the Alps also have highlighted that LCT is often driven by the desire to understand the impacts of global warming on the environment, particularly at iconic sites that have become symbols of climate change (Salim & Ravel, 2023), and it is expected that this dynamic creates increasing numbers of glacier ambassadors. Interestingly, this argument provides a form of legitimacy for the tourism industry to keep growing at sites of glaciers, as advocated by Lv et al. (2023).

Nevertheless, besides LCT, visiting (remnants of) glaciers as victims of climate change has also recently become a growing motivation, which could be associated with dark tourism. Indeed, people around the world have been organizing funerals for vanished glaciers, for example. This is not surprising given the spiritual, moral, economic, and aesthetic values glaciers have, as well as their ubiquitous presence in many communities' everyday life (Inkpen, 2022). In this context, it is easy to assimilate their retreat as a dying process, their vanishing as a death, and the place they leave behind as a haunted space, providing opportunities for dark tourism practices and experiences. As such, glacier retreat results in the creation of both dark tourism practices (Varnajot & Saarinen, 2021) and specters where

glaciers are physically gone but still have tangible effects for locals and tourists (Salim, 2023).

3. Hauntology and specters of glaciers in practice

According to Derrida, hauntology is a logic transcending all binary opposites such as the self and the other, the presence and absence, the visible and invisible, life and death, the being and nonbeing, or the real and unreal (Derrida & Stiegler, 1996; Harris, 2015). With the concept of hauntology, Derrida critiques the Husserlian phenomenological approach to being, whereby physical presence is a necessary foundation for being (Frers, 2013). While the Husserlian approach to being is concerned with pure logic and consciousness, Derrida argues that entities are, on the contrary, not present to consciousness; that those entities are only accessible *via* a supplementation, a sign (Derrida, 1973). Thus, in his deconstructionist writings, Derrida challenges the rational, the ordered, and the sane of physical presence and phenomenological approaches to geography (Frers, 2013; Wylie, 2007). More so, hauntology points to absences, referred to as ghosts—that threatens to destabilize established categories of self as well as place' (Frers, 2013, p. 433). In addition, those absences can be experienced, particularly through emotions, feelings of loss, and remembering actions (Maddrell & Sidaway, 2010).

Glaciers thus become Derridean ghosts of the Anthropocene (see Tsing et al., 2017), still among us—for most of them, but haunted by an imagined state of future loss (Varnajot & Saarinen, 2022). Temporality is key for Derridean ghosts as they may be 'coming from the future as well as from the past' (Barad, 2010, p.257). On the one hand, as Good et al. (2022) and Turner (2020) noted, haunting, and thus traumascapes like sites of vanishing glaciers, are often associated with emotions of anxiety about the future, which resonates with characteristics of the Anthropocene, that has been associated with anxiety-driven narratives (Buck, 2015) due to deterministic apocalyptic and doomed futures (Huijbens, 2021; Varnajot & Saarinen, 2022). In this context, for Chioventa & Chioventa (2018) individuals and groups are haunted by an anticipated form of violence. At the time of writing, most of the glaciers are still there, visible, alive, and present, and some others have completely melted already and are now gone, dead or absent. This ghostly characteristic is even emphasized due to increasingly accurate forecasts from climatologists and glaciologists on the future state of glaciers threatened by global warming. On the other hand, Derridean ghosts also come from memories, care, or thoughts provoked by 'unseen or immaterial visitants' from the past, to use Good et al.'s words (2022, p. 440). As such, haunting appears to be an affective phenomenon (Turner, 2020), triggering a wide range of feelings, emotions, and experiences embedded in troubling temporalities.

Furthermore, glaciers are epitomizing the complex and multifaceted links between spectrality and the spatial dimension, which has been termed 'spectro-geographies' by Maddern & Adey (2008). This ghostly geography is not new. Tim Ingold (2007), for example, talks about 'ghostly lines' for geodesic lines (e.g. the grid of latitudes and longitudes). According to Ingold (2007, p. 49), these lines may exist on maps but 'have no physical counterpart in the world that is represented on these maps' (see

Varnajot, 2019, 2023). For Ingold (2007), these ghostly lines are not tangible in physical space, they have no body, texture, nor color, but rather, are abstract, visionary, and conceptual. Similarly, glaciers may exist on maps drawn decades ago but may have retreated or even melted away since then. This situation is often encountered in remote regions of the Arctic (e.g. Greenland's East coast) where nautical charts are not updated as fast as tidewater glaciers retreat. Nevertheless, for Barad (2017), these hauntings are not necessarily immaterial, and therefore neither are Derridean ghosts, also argues Stümer (2023). From a spatial perspective, the study of glaciers as Derridean ghosts is relevant since they have concrete impacts on landscapes as well as communities and tourists' practices (Stümer, 2023), as examined in this section. Thus, specters of glaciers become tangible elements in tourists' experiences.

Vanished glaciers may still exist and live in the present through various practices and installations developed by the tourism industry or other independent initiatives. Among these various practices are the mourning of glaciers which has been recently reported in various media following the story of Okjökull, a vanished Icelandic glacier. Okjökull was located northeast of Reykjavik and was one of the many small glaciers found in Iceland. It formed at the beginning of the Little Ice Age and was still about 15 sq. km in size at the turn of the twentieth century. Nevertheless, in September 2014, Icelandic geologist Oddur Sigurðsson told on national TV that Okjökull could not be considered a glacier anymore because it was not meeting the criteria to be considered as such, namely being massive enough to be able to move under its own weight (Árnason & Hafsteinnsson, 2020). Five years later, in August 2019, anthropologists Cymene Howe and Dominic Boyer from Rice University (USA) organized a proper funeral for Okjökull. A ceremony gathering about 100 people was held to pay tribute to the lost ice, and a commemorative plaque was fixed on a bare rock, where the glacier used to be (Bennett, 2020). Interestingly, this ceremony for Okjökull was not an isolated event, and several other funerals have been organized for vanished glaciers such as for Pizol (Switzerland), Clark (USA), or Arriel, in the French Pyrenees (Figure 2) (Varnajot & Saarinen, 2022).

As a result, these sites where glaciers used to be become sacred, and people visiting them become pilgrims engaging 'in journeys to a distant sacred goal' (Barber, 1991, p. 1). Pilgrimages are understood as travels to places with sacred values (Olsen & Timothy, 2021), such as (gone) glaciers. The installation of commemorative plaques and the organization of such funerals for glaciers can be interpreted as collective and public mourning responses to irrevocable changes in the environment (Willox, 2012) and lead to the sanctification of these natural objects (e.g. the ice, glaciers, rapidly changing glacial landscapes). Although there is a long history of sanctification of nature by many and diverse communities around the world (Timothy, 2013), paying tribute, organizing funerals, and creating memorials for the lost ice, or animal species and natural environments, in general, seem to become a significant practice in the Anthropocene. Visits to sites of vanished glaciers for mourning motivations, therefore, provide compelling examples of the connections between pilgrimages and dark tourism (see Olsen & Korstanje, 2020), but also between dark tourism and affect (Martini & Buda, 2020; Pimentel Biscaia & Marques, 2022). Through collective and public grief, these mourning ceremonies also highlight the emotional embodiment of hauntology (see Turner, 2020).



Figure 2. The commemorative plaque for vanished Arriel glacier, in the Pyrenees. “The Arriel glacier, the westernmost Pyrenean glacier is gone, just like 50% of Pyrenean glaciers these past few years. They will probably all disappear by 2040. This plaque acknowledges that we know what is happening and what needs to be done. Only you know if we did it”. Photo: Alix Varnajot.

Glacier retreat is a worldwide phenomenon (IPCC, 2019) and it seems clear that glacier retreat will worsen as global climate change continues, with modelling forecasting a significant reduction in ice volume by 2100 (Bosson et al., 2019). These facts have already been integrated by tourism operators. Indeed, Nesur et al. (2022) have recently showed how these tourism operators are highlighting glacier evolution in their mediation strategies in France and Switzerland. In both cases, these mediation strategies are implemented locally by the community or by tourism entrepreneurs themselves. As such, it is common to find on-site interpretative boards showing the retreat of a glacier using two (or more) photographs taken at different periods of time. This technique, called ‘before-and-after photographs’ (when using two comparative photographs) or ‘repeat photography’ (for more than two photographs), is used to reveal changes in the landscape and ‘shows without question that glaciers are shrinking’ (Garrard & Carey, 2017, p. 101)—or dying. This method allows visitors to witness changes in glacial landscapes over a long-term perspective as repeat photography can document glacier retreat over years, decades, and centuries when using landscape paintings of glaciers from the Little Ice Age (Garrard & Carey, 2017). This technique let visitors realize the volume of emptiness created behind as a glacier retreats on the one hand, but also to mentally fill this emptiness with imaginary, fictitious ice when gazing at the landscape on the other hand, creating a specter of the gone—or about to vanish—glacier (see Frers, 2013). Figure 3, for example, shows an interpretative board displaying before-and-after photographs of the Tasman Glacier (New Zealand) from 1990 and 2011. At the bottom of the board, one can see a



Figure 3. Comparative before-and-after photographs between 1990 and 2011, showing the retreat of the Tasman Glacier (New Zealand). Photo: Emmanuel Salim.

contemporary photograph of the glacier overlaid with a ‘white specter’ showing the extent and altitude the glacier was back in 1990.

Besides spatial visualizations, the creation of specters of glaciers can also be the result of how glacier retreat is illustrated from a time perspective. Indeed, another (and similar) way of creating these specters is by showing past glacial extensions—and thus the speed of the retreat—using plaques indicating the level of the glacier with its corresponding year. A popular example of such an installation can be found at the Mer de Glace (France), where several plaques indicate the level of the glacier from 1850 to the present day (Figure 4). In order to reach the Mer de Glace, one first needs to hop on the Montanvers train all the way to a viewing platform (1913 m a.s.l.), only a few meters up to where the glacier used to be back in 1909. Then one needs to go down the glacial valley with a gondola lift built in 1988 and continue by walking down metallic stairs, built along the mountain slope as the glacier was shrinking to finally reach the current level of the Mer de Glace, which at the time of writing, lies at 1690 m a.s.l. This is while walking down the stairs that the chronological plaques have been fixed. While walking down towards the glacier, the plaques indicate how the landscape is rapidly changing over time. Interestingly, about 15 new steps need to be added every year to keep up with the melting ice, and this effort to keep glaciers accessible also represents a concrete sign of shrinking glaciers.

The use of the time perspective allows visitors to be able to witness past glacier retreat, but also calls to the future and leads people to ask themselves where the ice



Figure 4. Plaque showing the level of the Mer de Glace glacier in 1990. Photo: Emmanuel Salim.

will be in 10, 50 or 100 years from the time of their visit. Going back in time while walking down to the glacier may provoke what Willox (2012) termed 'anticipatory grieving' for expected losses. This anticipatory grieving is in fact, based on previous experiences of death (Doherty & Clayton, 2011). In this context, haunting emerges from an anticipatory future violence (see Chiovenda & Chiovenda, 2018), that would be 'populated with certain possibilities derived from the past' (Blanco & Preen, 2013, p. 13). In the context of glacier tourism, experiencing the retreat of glaciers by going back in time with the plaques or even by counting the steps to get access to the ice may act as a trigger for anticipatory grieving. In this case, glaciers are out of both space and time, and haunting unfolds in temporalities where past, present, and future collide. Nevertheless, both the use of before-and-after photographs and the time perspective focus on loss and apocalyptic narratives (Garrard & Carey, 2017). According to several authors such as Garrard & Carey (2017), Varnajot & Saarinen (2022) or Jackson (2015) these narratives showcasing a doomed, dystopian, and unescapable future are reductionist and deterministic. These narratives oversimplify historical processes and may overlook local communities' perspectives on the issues associated with glacier retreat at stake.

More recently, local tourism actors have been using the development of technology such as VR to take tourists in the past or in the future, and therefore creating haunting glaciers. Based on photographs and various archives, the conditions of the past are virtually reproduced and can provide visualization in three dimensions of a landscape that is usually seen in two (e.g. photographs, paintings). In addition,

due to increasingly accurate IPCC reports and research in glaciology and climatology, it is also possible for visitors to witness future changes in glaciers. Although this type of mediation is still relatively rare, it allows visitors to be confronted with the past conditions of the glacier, but also with forecasts and future shrinking—or even disappearance. These VR tools are usually developed in tourist centers like in the Diavolezza VR Experience, dedicated to the Morteratsch Glacier (Switzerland). As such, through the process of virtual reproduction, the use of VR can also lead to the creation of specters of glaciers. These VR tools are usually developed along exhibitions, events, or guided excursions meant to provide instructive experiences. In the Villa Cassel, close to the Aletsch glacier (Switzerland), for example, one could have visited the ‘wheel of time’ temporary exhibition which showcased issues related to the shrinking of the Aletsch Glacier and climate change in general. Tourist centers like the Villa Cassel or the Glaciorium at the Mer de Glace are therefore great examples showing that sites of death and dark tourism can also have an educational role (Cohen, 2011). Indeed, as argued by Iliev (2021, p. 970), ‘[a] number of individuals visit sites of dark tourism [...] for education, learning, understanding about what happened at the site’.

4. Discussion: glacier retreat, dark tourism and pro-environmental behaviors

By examining dark tourism practices associated with the death of glaciers, this article makes novel and innovative connections between hauntology, climate change, and tourism. It is argued that these various practices to materialize glacier retreat and death in tourism may be understood as a form of trauma, fed by the will to remember the lost ice. These practices are ‘active [attempts] to keep the memory of the past loss present and alive in the public sphere’ (Bednar, 2011, p.27). This materialization of memory leads to ‘an undecidable ‘in-between’ status’ (Roberts, 2012, p. 386), wherein glaciers are located between the material and immaterial and past and present. As such, funerals, commemorative plaques, boards, photographs, VR experiences, and tourist centers give a spectral nature to glaciers, but also facilitate the merging between traumatic experiences and physical places (Tumarkin, 2019). In that sense, sites of glacier retreat become traumascapes (Tumarkin, 2005). Traumascapes are sites where traumatic events and tragedy took place or are ongoing, and visits to these specific sites of trauma are often referred to as dark tourism (Kaelber, 2007). As a result, the use of dark tourism at glacier traumascapes can serve several purposes, including sustaining remembering as seen with the funerals, pilgrimages, and commemorative plaques. Dark tourism can also create communities of mourners, wherein grief and affect is expressed publicly and collectively as healing responses (Cunsolo & Ellis, 2018). Dark tourism practices related to non-human deaths can also become catalysts, sites of conscience, for truth-seeking and justice-seeking (Tumarkin, 2019) by providing educational experiences regarding climate change and our role, as humans, in these vanishing processes, which may even lead to feelings and experiences of shame (Tumarkin, 2019).

The staging of vanishing glaciers as dark tourism sites and traumascapes provides a powerful opportunity to trigger affect among visitors and therefore, create glacier

ambassadors in a more effective way. Indeed, in a recent study on dark tourism destination image and behavioral change intentions, Qian et al. (2022) found that when a dark tourism site is perceived as a place for leisure, visitors are less likely to experience behavioral changes. Conversely, if a site of dark tourism is understood as a memorial or an educational place, positive intentions in pro-environmental behavioral changes were observed. In the ongoing climate crisis, it is therefore crucial to consider glaciers as memorials and traumascapes. As a result, dark tourism at glacier sites may foster visitors' pro-environmental behavior changes, by for example, creating ambassadors. As recalled by Alexander et al. (2019, 498), 'ambassadors of a place would advocate on behalf of said place and share their enthusiasm for this place.' The educational component of dark tourism (see Iliev, 2021) can particularly be beneficial in this context. Indeed, a recent study around the Mer de Glace showed that the more visitors understood the climatic and geomorphological processes leading to the shrinking of glaciers, the greater are their intentions to act pro-environmentally (Salim et al., 2022). Nevertheless, this raise concerns relating to the sustainability of glacier tourism since tourists can engage in long-distance travel to experience the ice, and as such, participate in global glacier retreat due to associated greenhouse gas emissions. This is a well-known paradox that has also been described in other contexts like polar tourism (see D'Souza et al., 2023; Eijgelaar et al., 2010).

By 'telling ghost stories', to use Edensor's (2005, p.845) words, and by creating glacier ambassadors through emotional connections to spectral spaces, dark tourism can transform places of remembering, mourning, and grieving into places of action. Indeed, sites of death, disasters, commemoration, and burials, as well as memorials (e.g. the Normandy American Cemetery and Memorial or the 9/11 Memorial & Museum) are becoming highly respected, sacred, and sanctified sites. Nevertheless, according to American philosopher Judith Butler (2004), not all lives, bodies, and entities are equally grieved. Sexual, ethnic, and political minorities (to name a few) are usually left out of ethical and political considerations in global discourses. Willox (2012) goes further and includes non-human entities such as animal, vegetal and mineral bodies. Therefore, turning sites of non-human death into sacred, symbolic and sanctuaried places—through dark tourism practices for example—like for Okjökull, Arriel, Clark and Pizol may have powerful implications in creating glacier ambassadors, supporting the protection of and education about glaciers and vulnerable environments in general. As such, the negotiation of glaciers' retreat, remembrance, and bereavement in tourism, but more generally in public space, is critical in the Anthropocene and the ongoing climate crisis.

Through the concept of traumascapes, hauntology provides a means of understanding the tangible effects of glacier retreat on tourists and local communities, but also a framework for better using affect in tourism. Indeed, turning vanishing glaciers into traumascapes keeps memories, histories, and legacies of the ice in the present, providing a relevant tool for enhancing tourists' pro-environmental behaviors. Nevertheless, as Dolnicar (2015) raises, behavioral studies have generally been limited to intentions rather than monitoring actual changes. This is due to implementation challenges, particularly in longitudinal studies focusing on long-term changes. Despite these challenges, future research needs to investigate the effectiveness of behavioral changes following experiences of glaciers through the dark tourism lens. This is critical in order to know

which emotions are triggered, and how affect can thus be used as a leverage to speed up conservation efforts and ambassadorship.

Overall, by recognizing the fragility, vulnerability, and deaths of non-human entities, traumascapes allow for a better recognition of our political and ethical responsibilities in the Anthropocene (Willox, 2012), and can thus better call for action, in creating ambassadors for the lost ice, by inciting public participation in mourning and grieving environmental losses. As such, by producing traumascapes and specters of glaciers, dark tourism is expected to be a meaningful and powerful tool to promote and expand ambassadorship's long-term efficiency and actions. In addition, as recalled by Derrida (1993, p. 61), there is 'no politics without an organization of the time and space of mourning.' More so, the development of dark tourism practices associated with the death of glaciers participates in the expansion of grief to non-human entities that are usually left out from mourning practices, as raised by Butler (2004) and Willox (2012).

The recognition and sacralization of traumascapes will only come from a shared capacity in mourning and remembering following a traumatic experience. In the end, this effort of creating a community of glacier ambassadors becomes critical in light of the various threatening slow-onset disasters of the Anthropocene. This is why through dark tourism, we need to keep lamenting the lost ice, keep commemorating gone glaciers, and keep organizing funerals for those glaciers that will vanish in the future. We need to keep reading out the names of these small glaciers like Okjökull, Arriel, Clark or Pizol that have disappeared, and not just eulogizing the massive, majestic, and iconic glaciers losing ice.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Funding

This study was supported by the Academy of Finland [Arcl (Arctic Interactions), grant number 318930; ANTS (Biodiverse Anthropocenes), grant number 336449].

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