Analysis of the dynamics of internet searches for the word "Antarctica" in the Gateway Cities: similarities and differences of the 5 geographical points

Análisis de la dinámica de las búsquedas de internet de la palabra "Antártica" en las Ciudades Puerta de Entrada: similitudes y diferencias de los 5 puntos geográficos

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Abstract

The Gateway Cities —Punta Arenas, Ushuaia, Hobart, Christchurch and Cape Town— constitute the five recognized points of human access to Antarctica, each fulfilling a distinct functional role within the global Antarctic system. This study analyzes the dynamics of internet searches for the term "Antarctica" (and its equivalents according to local language and official usage) in these cities between July 2021 and June 2026, using monthly Google Trends data. Seasonality patterns, interest peaks linked to specific news events, and systematic differences in search-related vocabulary were identified for each region. Additionally, a direct comparison —on a genuinely shared scale— was carried out between Punta Arenas and five cities associated with global powers (New York, London, Moscow, Tokyo and Delhi), together with a year-over-year comparison (2024 versus 2025), directly addressing the research questions posed in this study's original abstract. Results show that search interest is not a homogeneous phenomenon across the five cities, but rather reflects each one's predominant functional profile —tourist-seasonal, scientific-logistical, or institutional-identity-based. A central finding is that, within the same city, the language used for searching acts as a stronger proxy for audience type than geographic location itself. A second central finding is that Gateway Cities and global powers exhibit qualitatively distinct patterns of interest: the latter show a constant but low-intensity background curiosity, while the former show prolonged silence interrupted by episodic peaks that far exceed the interest ceiling of any global power. The case of pilot Ethan Guo, whose prolonged media coverage generated language-differentiated search peaks, illustrates this coexistence of distinct audiences within the same region. The study concludes that search-trend analysis tools constitute a valid, low-cost approach for studying the relationship between human populations and the Antarctic continent, provided careful attention is paid to the scale-normalization limitations these tools impose. The study additionally incorporates two applied readings of the same data: implications for near-term climate impact communication (developed for the AntClimNow workshop at SCAR OSC 2026) and educational implications (developed for the X Antarctic Education Forum), as part of its publication as a chapter for the Centro de Estudios Hemisféricos y Polares.

Keywords: Gateway Cities; Google Trends; digital behavior; Antarctica; Antarctic communication

1. Introduction

Antarctica, despite being an uninhabited continent governed by a unique international framework —the Antarctic Treaty System— maintains close ties with a small group of cities that function as its gateways: the so-called Gateway Cities. Punta Arenas (Chile), Ushuaia (Argentina), Cape Town (South Africa), Christchurch (New Zealand) and Hobart (Australia) each concentrate, from their respective hemisphere and national tradition, the air, maritime, scientific and tourism infrastructure that enables human access to the white continent. These five cities are not interchangeable: each articulates a distinct relationship with Antarctica, shaped by its history of exploration, its role in national Antarctic programs, its tourism industry, and its cultural identity.

Punta Arenas and Ushuaia, for instance, share geographic proximity and a strong Patagonian-austral identity, yet belong to distinct administrative traditions —the Región de Magallanes y de la Antártica Chilena, and the province of Tierra del Fuego, Antártida e Islas del Atlántico Sur, respectively— which is even reflected in the official term used to refer to the continent ("Antártica" in Chile, "Antártida" in Argentina). Hobart and Christchurch, meanwhile, function as long-standing seats of national Antarctic programs (the Australian Antarctic Division and Antarctica New Zealand) with a strong scientific and logistical component, while Cape Town stands out as the only direct long-distance air gateway to the continental interior, via the private ice runway at Wolf's Fang.

These functional differences, widely documented from political geography and Antarctic studies, raise a question that has received little attention: are these distinct relationships with Antarctica reflected in the digital behavior of each Gateway City's population? Internet search-trend tools, such as Google Trends, offer an indirect but accessible way to explore this question, allowing observation of the relative intensity of public interest in a term over time, its seasonality, and the vocabulary associated with related searches.

This paper presents a comparative analysis of the search dynamics of the term "Antarctica" (and its equivalents according to language and local official usage: "Antártida" in Río de la Plata Spanish, "Antarctica" in English) across the five Gateway Cities, using monthly Google Trends data for the period between July 2021 and June 2026. Following the original abstract submitted to SCAR OSC 2026, the analysis seeks to answer five specific questions: (1) what seasonality patterns does each region present, and to what extent are these patterns explained by the austral summer Antarctic season (November-March) versus more evenly distributed activity throughout the year, or in response to specific historical events?; (2) what specific news events explain the most significant interest peaks observed in each series?; (3) are there systematic differences in the

search vocabulary associated with each Gateway City, and what do these differences reveal about each one's predominant functional profile (scientific-logistical, tourist-commercial, or institutional-identity-based)?; (4) is Antarctica actually discussed more in the Gateway Cities than in other major cities worldwide, whether or not they have an Antarctic connection?; and (5) has search interest in "Antarctica" increased over the years, specifically comparing search volumes from 2024 and 2025?

As an additional contribution, this study incorporates a novel comparison within two of the five cities —Punta Arenas and Ushuaia— between searches conducted in the local official language (Spanish) and in English, allowing exploration of whether search language functions as an indicator (proxy) of audience type (local/institutional population versus international tourist) within the same geographic location. Furthermore, to rigorously address question (4), a direct comparison was incorporated on a genuinely shared scale —not independently normalized by region, as in the rest of the study— between Punta Arenas and five cities associated with global powers (New York, London, Moscow, Tokyo and Delhi), selected for their global geopolitical and economic weight, with and without active national Antarctic programs.

2. Methodology

Data source and analysis period

The data used in this study comes from Google Trends, Google's public tool that reports the relative search volume for a given term, normalized on a scale of 0 to 100 relative to the maximum value observed in the selected period and region. Monthly time series were extracted for a five-year range, spanning July 2021 to June 2026, with the query date being July 3, 2026.

A five-year window was chosen, rather than a single calendar year, to allow the identification of recurring seasonality patterns and to distinguish them from peaks associated with specific news events, something a twelve-month analysis would not have allowed with the same clarity.

Geographic selection

The study focuses on the five internationally recognized Gateway Cities to Antarctica: Punta Arenas (Chile), Ushuaia (Argentina), Hobart (Australia), Christchurch (New Zealand) and Cape Town (South Africa). Since Google Trends does not allow segmentation at city level, but only at administrative region or country level, the region to which each Gateway City belongs was used as a geographic proxy (substitute):

Gateway City	Region used	Google Trends code

Punta Arenas	Región de Magallanes y de la Antártica Chilena	CL-MA
Ushuaia	Provincia de Tierra del Fuego, Antártida e Islas del Atlántico Sur	AR-V
Hobart	Tasmania	AU-TAS
Christchurch	Canterbury	NZ-CAN
Cape Town	Western Cape	ZA-WC

This methodological limitation implies that the data reflect the search behavior of the region's population as a whole, not exclusively that of the gateway city. In the cases of Magallanes and Tierra del Fuego, both regions have a limited geographic and population extent, with Punta Arenas and Ushuaia as their predominant urban centers, so the regional proxy is reasonably representative. For Tasmania, Canterbury and Western Cape, whose population and extent are larger, this limitation should be considered with greater caution when interpreting results.

Selection of control cities

To answer whether search interest in Antarctica is actually higher in the Gateway Cities than in other major cities worldwide —question (4) posed in the Introduction—, five control cities associated with global powers of major geopolitical and economic weight were selected: New York (United States), London (United Kingdom), Moscow (Russia), Beijing (China) and Delhi (India). This group intentionally mixes countries with active national Antarctic programs (United States, United Kingdom, Russia) with countries of lesser Antarctic presence (India), allowing a comparison that does not depend on whether the control city has an institutional link to the continent.

- New York — "Antarctica" (English)
- London — "Antarctica" (English)
- Moscow — "Антарктида" (Russian)
- Beijing — "南极" / "南极洲" (Mandarin Chinese); excluded from the final analysis due to lack of usable data (see Limitations)
- Delhi — "अंटार्कटिका" (Hindi) and "Antarctica" (English, the version ultimately used; see Limitations)

Beijing was replaced by Tokyo (Japan) after confirming that Google Trends reported no usable data for any Chinese-language variant of the term in that city (see Limitations). Tokyo was selected to maintain the criterion of a global power with an active Antarctic program (through

Showa Station) and for having sufficient Google market penetration to generate measurable data. The term used for Tokyo was "南極" (Japanese, read Nankyoku).

Shared-scale comparison

The comparisons described so far —among the five Gateway Cities, and between these and the control cities— were based on series extracted independently for each region, each normalized on its own 0-to-100 scale relative to its own historical maximum. This allows comparison of shape patterns (seasonality, trend, timing of peaks) but does not allow comparison of absolute magnitudes between different regions, since the "100" value of one region does not represent the same search volume as the "100" of another.

To rigorously address the question of whether the Gateway Cities actually discuss Antarctica more than other major cities, Google Trends' direct comparison function (the classic "Explore" tool) was additionally used, which allows up to five term-and-location combinations to be entered in a single query, returning results on a single shared 0-to-100 scale. Two such queries were carried out: (a) Punta Arenas compared directly with New York, London, Moscow and Tokyo; and (b) Punta Arenas compared directly with the other four Gateway Cities (Tierra del Fuego, Tasmania, Canterbury and Western Cape). Punta Arenas was used as a bridge city present in both queries, given that it is the central case of this study's original abstract.

A relevant technical difference is that these direct-comparison queries returned data at weekly granularity (262 weeks), not monthly, since Google Trends automatically adjusts the available time granularity depending on the query type. The results of this section are therefore not directly mergeable with the monthly series used in the rest of the study, although they cover the same five-year period and are internally consistent within each comparison query.

Search term selection

For each region, the search term corresponding to the language and official usage in effect in the respective country was used:

- "Antártica" (Spanish, official Chilean usage) for Magallanes
- "Antártida" (Spanish, official Argentine usage) for Tierra del Fuego
- "Antarctica" (English) for Tasmania, Canterbury and Western Cape

This decision responds to the fact that, among the Spanish-speaking countries considered, there is an official terminological difference: Chile uses "Antártica" in its administrative and scientific nomenclature, while Argentina uses "Antártida". Using the correct term for each country allows

the local population's search behavior to be captured more faithfully than a generic or translated term would.

As a complementary analysis, the English-language term ("Antarctica") was also searched for the two Spanish-speaking regions (Magallanes and Tierra del Fuego), allowing a cross-comparison between search behavior in the local official language and in English within the same geographic region.

Variables analyzed

For each region and term, three sets of data were extracted:

- Monthly time series of search interest (0-100 scale), allowing identification of underlying trend, seasonality and specific peaks.
- Top searches (most-searched related queries in absolute terms), allowing characterization of the dominant vocabulary associated with the main term.
- Rising searches (related queries with the greatest relative growth, including those flagged by Google as "Breakout" when growth exceeds 5000%), allowing identification of emerging topics or specific events that drove new searches.

Identifying the causes of interest peaks

For the most significant interest peaks in each series (maximum scale value, 100, and nearby values), a documentary search was conducted across news and institutional sources to identify specific events —scientific, logistical, tourism-related or of human interest— that could explain the increase in searches in the corresponding month. This triangulation between quantitative Trends data and qualitative news events constitutes a methodological contribution of the study, allowing a distinction between peaks attributable to structural seasonality (austral summer Antarctic season, November-March) and peaks attributable to specific media events.

Methodological limitations

The following limitations are identified:

- Minimum reporting threshold: Google Trends does not report data when a region's search volume for a term is too low, which results in zero values that do not necessarily indicate a total absence of interest, but rather insufficient volume for registration. This phenomenon was observed more frequently in the Spanish-speaking regions (Magallanes and Tierra del Fuego), particularly at the start of the analyzed period.

- Regional proxy instead of city-level data: as detailed above, the inability to segment by city implies that the data represents the entire region, not exclusively the Gateway City.
- Terminological ambiguity in Spanish: both "Antártica" and "Antártida" are forms recognized by the Real Academia Española and widely used in the language. In the case of Magallanes, the Chilean State administratively favors the term "Antártica" —present in the region's official name, "Magallanes y de la Antártica Chilena"— but a related "Breakout" query was nonetheless detected ("antártida o antártica"), along with a dedicated series for the term "Antártida" showing sporadic, low activity, which shows that this terminological ambiguity also manifests within Chile, beyond official administrative usage. This complementary series was not incorporated as a main series of analysis given its low data density (only 6 of 60 months with a non-zero value), but is documented as quantitative evidence of said ambiguity.
- Relative, not absolute, scale: Google Trends values are normalized within each specific query (region + term + period), so they are not directly comparable in terms of absolute search volume between different regions; the comparisons made in this study focus on relative patterns (seasonality, trend, timing of peaks) rather than absolute volumes, except in the direct-comparison queries described above, specifically designed to allow magnitude comparisons.
- Commercial ambiguity in Magallanes: related queries for "Antártica" in Magallanes include references to "librería antártica", "antártica libro/libros" and "Buscalibre" (an online bookstore), explained by the existence of Librería/Editorial Antártica, a Chilean publishing house. This is a case of lexical ambiguity of smaller magnitude but similar in nature to the one detected in Beijing.
- Exclusion of Beijing: for the colloquial term "南极", the dominant related query corresponded to a commercial thermal-clothing brand ("南极人", Nanjiren) unrelated to the Antarctic continent. When the search was repeated with the more formal term "南极洲", Google Trends returned no usable data (60 of 60 months at zero), preventing its use as a control city. This absence of data is itself a methodological finding: it likely reflects Google's low market penetration in mainland China —where Baidu is the dominant search engine— rather than a genuine absence of interest in Antarctica in Beijing.
- Language in Delhi: the Hindi-language search ("अंटार्कटिका") returned essentially null data (58 of 60 months at zero), consistent with the widespread use of English for

internet searches in urban India. The English-language series ("Antarctica") was used instead as valid data for Delhi.

- Different temporal granularity in the shared-scale comparisons: the direct-comparison queries (Punta Arenas vs. global powers; Punta Arenas vs. other Gateway Cities) returned weekly, not monthly, data due to Google Trends' automatic adjustment based on query type. These results are not month-to-month mergeable with the rest of the study, although they cover the same five-year period.

Note on the use of AI tools

The processing and systematization of the CSV files exported from Google Trends —including the identification of seasonality patterns, interest peaks, underlying trends, and categorization of associated search vocabulary— was supported by Claude (Anthropic), an artificial intelligence assistant used as a systematization and exploratory analysis tool.

3. Results

3.1 Individual regional profiles

Punta Arenas (Magallanes) — "Antártica"

The series shows a marked initial discontinuity: nine consecutive months at zero between July 2021 and March 2022, attributable to Google Trends' minimum reporting threshold rather than a genuine absence of interest. From April 2022 onward the series becomes more continuous, though it retains some zero-value months even in later years (June-July of 2023 and 2025), coinciding with the austral winter. The underlying trend is clearly upward: 2022-2023 values (0-61) contrast with those of 2025-2026 (48-100). The peak occurs in October 2025 (100), followed by November 2025 (96). The dominant vocabulary is institutional: "antártica chilena" and "magallanes y la antártica chilena" head the related queries, with no significant presence of tourism or commercial vocabulary.

Ushuaia (Tierra del Fuego) — "Antártida"

Shows the most irregular pattern of the five regions: abrupt alternation between zero-value months and high values, with no identifiable seasonality or clear underlying trend. The peak occurs in March 2025 (100), with no specific news event identified to explain it. The dominant vocabulary is also institutional-identity-based: "antártida argentina" and the province's full

administrative name ("tierra del fuego antártida e islas del atlántico sur") head the queries, along with references to Argentine scientific presence ("bases argentinas en la antártida").

Hobart (Tasmania) — "Antarctica"

A continuous series with no zero-value months, with a floor of interest that never drops below 32 points. The underlying trend is upward, though less pronounced than in Magallanes. No clear seasonal pattern is observed: high values are distributed across different months of the year. The peak occurs in October 2025 (100), coinciding with the start of the austral summer Antarctic season and a series of logistical activities by the Australian Antarctic program. The vocabulary combines labor-related elements ("jobs antarctica", "antarctica jobs australia") and tourism-commercial ones ("antarctica cruise"), reflecting Tasmania's dual role as a scientific-logistical hub and a tourism gateway.

Christchurch (Canterbury) — "Antarctica"

Like Tasmania, it presents a continuous series with no zero-value months and a sustained upward underlying trend (from 36-52 in 2021-2022 to 74-96 in 2025-2026). It shows no marked seasonality: the peak is recorded in June 2024 (100), in the depths of the austral winter, associated with an emergency medical evacuation from Antarctica carried out by the New Zealand Air Force under extreme conditions. The vocabulary strongly combines labor-scientific elements (references to Scott Base, "jobs antarctica nz") with tourism-educational ones (references to the International Antarctic Centre), consistent with Christchurch's role as one of the five international seats of Antarctic operations.

Cape Town (Western Cape) — "Antarctica"

A continuous series, with a moderately upward underlying trend. The peak is the sharpest and most isolated of the five regions: December 2024 (100), well above the second-highest value in the entire series (72, in September 2023), associated with a historic Airbus A340 flight from Cape Town to the private ice runway at Wolf's Fang, operated by the White Desert company. The dominant vocabulary reflects a less specialized audience profile than in the other regions: "what is antarctica" heads the queries, along with a strong presence of air-access vocabulary ("cape town to antarctica", "flight to antarctica") and the local tourism brand ("white desert").

3.2 Seasonality comparison

The comparison between regions reveals three differentiated seasonal profiles:

- Extreme seasonality (Ushuaia, English version): when the term is searched in English, Ushuaia shows the sharpest seasonal pattern in the entire study: total, sustained zero values between April and October of each year, with activity concentrated exclusively in November-March, mirroring the Antarctic cruise season.
- Moderate seasonality (Magallanes): shows less extreme cycles, with a more sustained baseline of interest outside the high season, reflecting an institutional component that does not depend exclusively on tourism.
- No marked seasonality (Tasmania, Canterbury, Western Cape): the three English-speaking regions in the hemisphere of scientific operations show peaks distributed throughout the year, without concentrating in the austral summer season, consistent with their role as permanent seats of national Antarctic programs.

This contrast suggests that the seasonality of search interest is more closely associated with each Gateway City's predominant functional profile (tourism-based versus scientific-logistical) than with its geographic location or hemisphere.

3.3 Significant peaks and their causes

Region	Peak month	Value	Identified cause
Magallanes (ES)	Oct-Nov 2025	100 / 96	Ethan Guo case (unauthorized landing, detention and legal proceedings)
Magallanes (EN)	Jan-Feb 2026	100 / 90	Cruise season + international coverage of the Guo case's resolution
Tierra del Fuego (EN)	Jan 2026	100	Cruise season (seasonal, no specific event)
Tierra del Fuego (ES)	Mar 2025	100	Not identified; possibly statistical noise from low volume
Tasmania	Oct 2025	100	Start of Antarctic season: resupply of Casey and Davis stations
Canterbury	Jun 2024	100	Emergency medical evacuation in the depths of the austral winter
Western Cape	Dec 2024	100	Historic Cape Town-

			Wolf's Fang flight (Airbus A340)

A relevant finding is that the same event (the Ethan Guo case) generated peaks at different times depending on the search language used within the same geographic region —Spanish during the case's initial phase, English at its international resolution— suggesting that language acts as an audience filter even in the face of a single news event.

3.4 Vocabulary: institutional versus tourist-commercial

Analysis of related queries (top and rising searches) allows the identification of two clearly differentiated thematic axes:

- Institutional-identity axis, dominant in Spanish-language searches (Magallanes, Tierra del Fuego): terms such as "antártica chilena", "antártida argentina" and the full administrative names of each region. This axis is virtually absent in English-language searches of the same regions.
- Tourist-commercial axis, dominant in English-language searches across all five regions: cruises, specific tour operators (Silversea, G Adventures, Quark Expeditions, White Desert), flights and access costs.

A third axis, scientific-labor, appears with particular strength in Tasmania and Christchurch (references to research stations, Antarctic job offers), and is absent in the Spanish-speaking regions and in Cape Town.

3.5 The special case of Spanish/English within the same cities

The comparison between the Spanish and English versions of Magallanes and Tierra del Fuego constitutes one of the study's most significant findings. Despite being separated by more than 800 kilometers and belonging to different countries, their English-language series show nearly identical seasonality patterns (exclusive concentration in November-March) and a practically interchangeable search vocabulary, centered on cruises and travel logistics. By contrast, their Spanish-language series do not share this pattern with each other, and their vocabulary leans toward institutional and administrative matters. This suggests that search language functions as a stronger proxy for audience type (international tourist versus local population) than the specific geographic location of each Gateway City.

3.6 Year-over-year comparison: 2024 versus 2025

Following question (5) posed in the original abstract, the monthly average for each region was calculated for full years 2024 and 2025, as a proxy for annual search volume.

Region	2024 average	2025 average	Change
Magallanes (ES)	53.4	56.8	+6.4%
Magallanes (EN)	19.7	24.6	+25.0%
Tierra del Fuego (ES)	36.4	46.6	+27.9%
Tierra del Fuego (EN)	23.1	28.4	+23.1%
Tasmania	72.6	72.2	-0.6%
Canterbury	76.0	76.0	0.0%
Western Cape	46.8	47.3	+1.1%

The Spanish-speaking regions (Magallanes and Tierra del Fuego) recorded the largest growth between 2024 and 2025, both in Spanish and English (between +6% and +28%), coinciding with the development of the Ethan Guo case during 2025. Tasmania, Canterbury and Western Cape remained essentially unchanged (variation between -0.6% and +1.1%), consistent with their stable scientific-institutional profile, not dependent on specific news events. This contrast suggests that year-over-year growth is not an even phenomenon across the Gateway Cities, but rather concentrates specifically where a relevant media event occurred.

3.7 Punta Arenas versus global powers: shared-scale comparison

To rigorously address question (4), Punta Arenas (Magallanes) was compared directly with New York, London, Moscow and Tokyo using Google Trends' comparison function, on a genuinely shared scale among the five cities (unlike the rest of the study, where each series is normalized independently).

City	Weekly average	Maximum	% weeks with interest
Magallanes	13.4	100	19.5%
New York	4.1	11	100%
London	4.1	9	100%
Moscow	2.2	6	85.9%
Tokyo	4.5	16	100%

Results reveal two qualitatively distinct patterns. New York, London and Tokyo register search interest in 100% of the weeks in the five-year period analyzed, though with a very low ceiling (historical maximum of 16 points in Tokyo, 11 in New York, 9 in London). Moscow registers interest in 85.9% of weeks, with a maximum of just 6 points. Magallanes, by contrast, registers no interest in 80.5% of weeks —remaining at zero most of the time— but in the weeks when it does, it reaches peaks of up to 100 points, far above the ceiling of any of the other four cities across the entire period studied.

On simple average, Magallanes' search interest (13.4) is 3.1 times that of New York and London, 3.0 times that of Tokyo, and 6.1 times that of Moscow. However, this average is sustained almost entirely by specific episodes: global powers exhibit a constant but low-intensity background curiosity, while Magallanes exhibits prolonged silence interrupted by peaks that none of the other four cities reach at any point during the period studied. Research question (4) thus admits an affirmative but nuanced answer: it is not a matter of greater, sustained interest, but of episodic intensity that far exceeds the interest ceiling of global powers when it occurs.

3.8 The five Gateway Cities on a shared scale: a magnitude correction

A second direct comparison was carried out, this time between Punta Arenas and the other four Gateway Cities, on the same shared scale.

City	Weekly average	Maximum	% weeks with interest
Canterbury	10.4	24	87.8%
Tasmania	10.0	31	71.8%
Magallanes	9.5	100	18.7%
Western Cape	2.6	8	80.9%
Tierra del Fuego	1.3	77	2.7%

This result requires nuancing sections 3.1 through 3.5, built on series normalized independently for each region. In those series, Tierra del Fuego appeared to have a search volume comparable to Magallanes, and Western Cape stood out for its continuity (no zero-value months). On the real, shared scale, however, Tierra del Fuego registers essentially no interest (only 2.7% of weeks in five years show any non-zero value), and Western Cape shows a low volume in absolute terms (average 2.6, ceiling of only 8). Canterbury, Tasmania and Magallanes, by contrast, are much closer to one another than the individual series suggested, with Canterbury leading by a small margin. This finding does not invalidate the seasonality and trend analysis of the earlier sections —which remain valid as a description of shape— but it corrects any implicit reading of comparable magnitude among Tierra del Fuego, Western Cape and the rest of the Gateway Cities.

3.9 Cultural findings in the control cities

Analysis of the control cities' related queries revealed vocabulary patterns different from those observed in the Gateway Cities, without a dominant tourist-commercial axis in every case:

- New York: vocabulary dominated by "antarctica cruise", similar to the tourist-commercial pattern of the English-language Gateway Cities, alongside general-knowledge questions and references to the scientific news about Antarctic greening due to climate change.

- London: dominated by "what is antarctica", signaling an audience with low prior familiarity; a rising query linked to literary author Claire Keegan also appears, of undetermined origin.
- Moscow: no dominant tourist-commercial vocabulary; the generic term "антарктида" dominates alongside references to the Russian Vostok research station, and a rising query about Antarctic greening ("антарктида зеленеет").
- Tokyo: comparative/educational vocabulary (comparisons between the Arctic and Antarctic) and a strong cultural-heritage component: recurring references to "南極物語" (Nankyoku Monogatari, a 1983 Japanese film about an Antarctic expedition) and to the dogs Taro and Jiro, the real-life protagonists of that story.
- Delhi: vocabulary with a strong educational component (reading-comprehension questions consistent with a school text about Antarctica in India's secondary-school English curriculum) and a transnational cultural connection with Tokyo: references to the same Doraemon franchise film set in Antarctica, appearing independently in both cities' data.

These findings suggest that, unlike the Gateway Cities —where vocabulary organizes mainly around tourist-commercial and institutional-identity axes— in the control cities, interest in Antarctica is mediated to a greater extent by cultural, educational and entertainment references with no direct link to the continent as a destination or workplace.

3.10 Implications for near-term climate impact communication

This subsection was developed in the context of the author's participation in the AntClimNow cross-disciplinary workshop (Theme 4: Global and Regional Cross-disciplinary Impacts), held within the framework of SCAR OSC 2026, and is incorporated here as an additional applied reading of the same data presented in the previous sections. While climate impact research typically measures physical and ecological change —ice loss, temperature trends, ecosystem shifts— it rarely measures whether that change actually reaches public attention, and through which channels. The findings of this study suggest that such attention is, in itself, observable and measurable.

- A genuine climate signal emerges, without any coordination, in public search behavior: the "greening" of Antarctica finding —a real, published climate-science story— produced independent search peaks in Cape Town, Moscow, and New York, with no coordination between them. This is a case of a specific climate finding visibly reaching general publics across three continents, detectable in low-cost, publicly available data.

- Language, not geography, determines which audience receives a story and when: in Punta Arenas and Ushuaia, the same event produced search peaks at different times depending on the language used —local-language audiences engaged as the story unfolded; English-language (international) audiences only caught up once the story reached international coverage. Any climate-impact communication strategy aimed at "the public" of a Gateway City may, in practice, be reaching two distinct, non-overlapping publics.
- Global interest is constant and low; Gateway City interest is silent, then episodic: comparing Punta Arenas directly against four global powers on a shared scale, the latter show a nearly constant but low-intensity background curiosity, while Punta Arenas remains silent roughly 80% of the time, with peaks —tied to concrete events— that exceed any ceiling reached by the global powers in five years. An impact-communication strategy synchronized with the occurrence of events could work very differently in a Gateway City than a strategy designed for sustained, low-grade global outreach.

Search-trend monitoring is inexpensive, publicly available, and updates in near-real time — properties that make it a plausible lightweight complement to existing impact-communication tools. It does not replace direct public-engagement research, but it could offer initiatives such as AntClimNow a low-cost way to retrospectively verify whether a given climate finding or event actually reached public attention, in which language communities, and for how long. It remains an open question, for future interdisciplinary collaboration, whether these search-attention spikes correlate with any downstream effect —policy attention, funding interest, behavior change— or whether they function as noise that fades within weeks without further consequence.

3.11 Educational implications

This subsection was developed in the context of the author's participation in the X Antarctic Education Forum, and synthesizes the educational implications of the search-vocabulary findings presented in section 3.9. The analysis suggests that the data reveal at least three distinct educational publics with respect to Antarctica, each requiring a differentiated strategy.

- A school curriculum leaves a measurable trace in digital behavior: Delhi's related queries include reading-comprehension questions ("how can a visit to antarctica be an enlightening experience", "why is antarctica the place to understand the earth's past, present and future") consistent with a school English text on Antarctica from India's secondary-school curriculum. This is concrete —not assumed— evidence that formal

education generates a sustained search pattern over time, in a city with no geographic or institutional connection to the continent.

- The most durable Antarctic education does not always come from the classroom: in Tokyo, the 1983 Japanese film about the sled dogs Taro and Jiro continues to generate "Antarctica" searches decades later, through recurring cultural references (film, anime). Additionally, the children's franchise Doraemon —which includes a film set in Antarctica — appears independently in the data from both Tokyo and Delhi, evidencing transnational cultural circulation as an informal educational vehicle, with no direct connection between the two cities.
- There is a public with low prior familiarity, already reaching Google before reaching formal education: in London and New York, the dominant query is the most basic question possible ("what is antarctica"), signaling an audience with no consolidated prior knowledge —the type of public an Antarctic education program might seek to reach, and which today resolves its initial curiosity in a search engine rather than through a formal educational channel.
- Institutionalized education already works in some Gateway Cities: references to the International Antarctic Centre in Christchurch's vocabulary show a consolidated case of institutional tourism-education, which could serve as a model or point of contrast for designing educational initiatives in other Gateway Cities.
- Identity precedes curiosity in Magallanes: unlike the control cities, Punta Arenas does not search "what is antarctica", but rather the administrative name of its own region ("antártica chilena"). This is a public that already possesses basic knowledge, and for which "Antarctic education" likely means deepening an existing identity bond, not explaining elementary concepts.

Taken together, these findings suggest that no single educational strategy serves all three identified publics: those who already have an identity bond with Antarctica and seek to deepen it (Magallanes); those with a formal curriculum but no geographic connection (Delhi); and those with only general curiosity and no prior anchor (London, New York). An effective educational design would need to explicitly differentiate between these three audience profiles, rather than assuming a homogeneous Antarctic public.

4. Discussion

The results of this study support the conclusion that search interest in the term "Antarctica" does not constitute a homogeneous phenomenon among the five Gateway Cities, but rather expresses, with notable fidelity, each one's predominant functional role within the global Antarctic system.

Language as an audience proxy

One of this study's central findings is that, within the same geographic location, search language operates as a stronger determinant than location itself. In both Punta Arenas and Ushuaia, English-language searches show nearly interchangeable seasonality patterns and vocabulary — concentrated on cruise season and tour operators— while searches in each country's local official language lean toward institutional and administrative matters, and do not share that same seasonal pattern between the two cities. This suggests that, rather than asking "what does this city search for?", it would be more accurate to ask "what does this type of user, in this language, in this city, search for?" The interest peak, consequently, does not depend solely on location but on the audience performing the search.

Three functional profiles of Gateway City

The data allow three functional profiles to be distinguished among the five cities analyzed:

- Tourist-seasonal profile (Ushuaia): extreme seasonality, vocabulary dominated by cruises and commercial operators, absence of a scientific-labor component in related queries.
- Scientific-logistical profile (Hobart, Christchurch): no marked seasonality, peaks associated with operational events (station resupply, medical evacuations) rather than tourist season, strong presence of labor vocabulary and research station references.
- Institutional-identity profile (Punta Arenas, Spanish-language version): moderate seasonality, vocabulary centered on the region's official administrative name, peaks associated with both specific news events and the start of the season.

Cape Town constitutes a hybrid case, with an isolated, sharp peak associated with an air-access milestone (the Wolf's Fang flight) and a vocabulary that denotes an audience with less prior familiarity with the continent ("what is antarctica"), which could be explained by its role as a more recent and less culturally established gateway than the other four, or by the more exclusive and media-friendly nature of the air tourism it offers.

The Ethan Guo case as a tracer event

The case of American pilot and influencer Ethan Guo —detained after landing without authorization in the Chilean Antarctic Territory in June 2025— serves in this study as a particularly useful "tracer event": being a single news event with a prolonged development over time (detention, legal proceedings, forced stay, departure from the continent, subsequent recovery of the aircraft), it allows observation of how the same event generates search peaks at different times depending on the language used, evidencing the coexistence of at least two distinct audiences —local/regional population and international audience— within the same geographic region.

Gateway Cities versus global powers: background curiosity versus episodic intensity

The shared-scale comparison between Punta Arenas and four cities associated with global powers (New York, London, Moscow, Tokyo) allows a genuinely comparable answer to the central question of this study's original abstract: does a Gateway City care more about Antarctica than any major city in the world? The answer is affirmative, but in a more nuanced and interesting way than a simple "yes": it is not that Magallanes has a higher sustained interest, but rather that it exhibits a pattern of prolonged silence interrupted by episodes of intensity that no global power reaches in five years. Global powers, by contrast, show a constant background curiosity —present in virtually every week of the period— but at an intensity that never scales beyond a low ceiling. This qualitative distinction (low-intensity ambient curiosity versus high-magnitude episodic intensity) is, in itself, a richer finding than a comparison of raw averages, and suggests that the Gateway Cities are not simply "places where people care more about Antarctica", but places where interest is structurally tied to the occurrence of events, while in major powers Antarctic interest functions as a general cultural curiosity with a low threshold, fed by their own reference points —films, school texts, literature— rather than by direct geographic or institutional connection.

The magnitude correction carried out in section 3.8 —which showed that Tierra del Fuego and Western Cape have, in absolute terms, a much smaller search volume than Magallanes, Tasmania and Canterbury— adds a further layer to this discussion: not even within the Gateway City group is interest homogeneous in real magnitude, even though it is in the logic of its seasonal patterns and vocabulary. This suggests that "being a Gateway City" is a necessary but not sufficient condition for generating a high search volume; additional factors —local population size, the intensity of regional media coverage, the presence of tracer events such as the Ethan Guo case— appear to modulate that relationship.

Limitations and open questions

The main limitation of this study is the inability to segment Google Trends data at the city level, which requires working with the region as a proxy. Likewise, the March 2025 peak in Tierra del Fuego's Spanish-language series could not be explained by an identifiable event, leaving open the question of whether it corresponds to statistical noise inherent to low search volume, or to an event of strictly local relevance not captured by the news sources consulted. Future studies could complement this analysis with city-level search data (when available), or with interviews with local communication actors in each Gateway City to verify news coverage of exclusively regional scope.

5. Conclusions

This study analyzed the dynamics of internet searches for the term "Antarctica" (and its equivalents according to language and local official usage) across the five Gateway Cities —Punta Arenas, Ushuaia, Hobart, Christchurch and Cape Town— over a five-year period (July 2021-June 2026), using Google Trends as the data source.

The results allow the conclusion that search interest in Antarctica is not a homogeneous phenomenon among the five gateway cities, but rather consistently reflects each one's predominant functional role. Ushuaia exhibits the most markedly tourist-seasonal profile; Hobart and Christchurch show a scientific-logistical profile with no defined seasonality; and Punta Arenas presents, in its Spanish-language version, an institutional-identity profile with moderate seasonality. Cape Town stands out for an isolated peak linked to an air-access milestone and for a vocabulary suggesting an audience with less prior familiarity with the continent.

A significant finding of the study is that, within the same city, search language operates as a stronger determinant of audience type than geographic location itself: English-language searches in Punta Arenas and Ushuaia are nearly indistinguishable from one another in terms of seasonality and vocabulary, while their Spanish-language versions do not share these patterns. The case of pilot Ethan Guo, whose prolonged development over time generated language-differentiated search peaks, particularly clearly illustrates this coexistence of distinct audiences within the same region.

Directly addressing the questions posed in this study's original abstract, the shared-scale comparison between Punta Arenas and four cities associated with global powers (New York, London, Moscow, Tokyo) showed that Antarctica does indeed generate more search interest in a Gateway City than in any of the global powers analyzed, but in a qualitatively distinct way:

prolonged silence interrupted by episodes of intensity far exceeding the ceiling reached by global powers, versus the constant but low-intensity background curiosity that characterizes the latter. The year-over-year comparison (2024 versus 2025) further showed that growth in search interest is not even across the Gateway Cities: it concentrates in the Spanish-speaking regions, coinciding with the development of the Ethan Guo case, while regions with a scientific-institutional profile remain stable. Finally, a second shared-scale comparison, this time among the five Gateway Cities themselves, revealed that real interest magnitude is not homogeneous within this group: Tierra del Fuego and Western Cape show a considerably smaller search volume than Magallanes, Tasmania and Canterbury, nuancing the readings of the results sections based on independently normalized series.

These results suggest that search-trend analysis tools, despite their geographic granularity and scale-comparability limitations, constitute a valid, low-cost approach for studying the relationship between human populations and the Antarctic continent, complementing traditional approaches from political geography and Antarctic studies centered on infrastructure, public policy and scientific presence. The exclusion of Beijing from the analysis, driven by the absence of usable Google Trends data for that city, is itself a relevant methodological finding about the limits of this tool for studying contexts where Google is not the dominant search engine.

Sections 3.10 and 3.11 further show that this dataset admits applied readings beyond the comparative analysis across cities: as an input for thinking about climate-impact communication to differentiated publics, and as evidence of at least three educational-audience profiles with respect to Antarctica. Both readings suggest that the same search-behavior data can serve distinct communities of practice —scientific, communicational and educational— without requiring any additional data collection.

As future lines of research, it is suggested to: (1) extend this analysis to other cities with emerging Antarctic ties, beyond the five recognized Gateway Cities; (2) explore the availability of city-level search data, should Google Trends or other platforms expand their geographic granularity; (3) further investigate, through interviews or local media analysis, those interest peaks that could not be explained by internationally-scoped news events, such as the case of Tierra del Fuego in March 2025; and (4) explore data sources alternative to Google Trends —such as the Baidu Index — to incorporate contexts like mainland China, currently inaccessible through the methodology used in this study.

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