



Unspoken crisis: the absence of climate change communication in U.S. Catholic churches

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Abstract

Climate change, as a topic, is virtually absent from discourse in the U.S. Catholic Masses. This is despite Pope Francis's strong emphasis on environmental stewardship in his two encyclicals *Laudato Si'* (2015) and *Laudate Deum* (2023). Leveraging the increased online presence of churches since the COVID-19 pandemic, we employed automated text analysis to examine the transcripts of more than 700,000 services from Roman Catholic churches. For comparison, we also analyzed services from the Southern Baptist Convention, Presbyterian Church (USA), United Church of Christ, and the Association of Related Churches. Mentions of "climate change" occurred in 0.40% of the analyzed Catholic videos. Similar patterns were observed across other denominations, with higher engagement in the United Church of Christ and Presbyterian Church (USA), both liberal Protestant denominations, particularly around Earth Day. The observed lack of climate change communication at the parish level suggests that Pope Francis's messages did not reach or resonate with local clergy and congregations in the U.S. This disconnect has significant implications, given the potential influence of religious messaging on public opinion and policy—especially in a country where Catholics hold a disproportionate number of political offices. Our study suggests that scientists' expectations that Pope Francis's messaging on climate change would have a major impact on the climate conversation among American Catholics, and therefore on broader American climate discourse, have not been fulfilled, in part because American Catholic priests have not reinforced his message.

Keywords Climate change · Catholic church · Communication · Environmental engagement · Faith-based initiatives · Climate action · Religious institutions

1 Introduction

Scientists played a significant role in the Vatican meetings that laid the groundwork for Pope Francis's encyclical on the environment, *Laudato Si'*, and held high hopes that its issuance would make a meaningful difference in climate discourse (Dasgupta et al. 2014). Other prominent commentators have expressed similar optimism. Amitav Ghosh, for example,

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observed that “Pope Francis speaks directly to more than a billion people and has already done more, perhaps, to awaken the world to the planetary crisis than any other person on Earth” (Ghosh 2021). United Nations Secretary-General Ban Ki-moon praised the Pope for highlighting climate change as “one of the principal challenges facing humanity,” while UNFCCC Executive Secretary Christina Figueres called it a “clarion call [that] should guide the world towards a strong and durable universal climate agreement” (UN Environment 2015). Environmentalists, broadly, welcomed the encyclical, suggesting in various ways that it could help move Catholics and the world towards meaningful climate action.

Pope Francis emphasized environmental stewardship in his encyclicals *Laudato Si'* in 2015 and *Laudate Deum* in 2023, and most U.S. Catholics hold positive views toward the Pope (Tevington 2024). His reach and popularity suggest that his words might have found a receptive audience in Catholic houses of worship, reinforced by parish priests who influence the Catholic laity. The centralized discursive messaging within Catholicism, especially as compared to Protestantism, further suggests that papal attention to climate change might have a strong influence on discourse within Catholic congregations. Some also expected that it “might influence not only the environmental views of Church members but the collection of beliefs and values within the larger culture through which we process environmental concerns” (Cannon and Cushman 2017). Indeed, this was the expectation of the scientists who participated in the 2014 Vatican meeting Dasgupta et al. 2014).

However, messaging from Pope Francis is only one of many drivers of attitudes and behavior for American Catholics. The papal statement competes with messages from an increasingly conservative, science-rejecting, and climate-denying Republican Party (Dunlap and McCright 2008; Oreskes and Conway 2022), with which Catholic leaders and congregations frequently align (Vermurlen et al. 2023). Since the 1960s, religiously committed American Catholics have voted based on their own political and moral views over solidarity and “belonging” as Catholics (Wilson 2007). Conservative ideology or Republican Party affiliation thus may compete with the encyclical, either because US Catholic priests disagree with Pope Francis’s view of global warming or because priests want to avoid alienating their congregants who disagree (Wilkins 2022). *Laudato Si'* may have positively increased public concern and support for climate policies (e.g., Myers et al. 2017), as scientists and environmentalists hoped, but *Laudato Si'* also may have increased polarization, with both liberal and conservative Catholics strengthening their opposing views (Li et al. 2016; Landrum et al. 2017).

These cross-pressures raise the questions: Did Pope Francis’s message reach the members of the Catholic Church? How much did American Catholic priests discuss the message of the encyclicals, or climate change generally, in their homilies? And if so, how?

The presence or absence of climate change discourse in Catholic services is especially important in light of the fact that U.S. Senators, Members of the House of Representatives, and Supreme Court Justices are disproportionately Catholic compared to the general population (Newport 2022; Diamant 2023). If local Catholic clergy were heeding Pope Francis’s guidance, and influencing their congregations to care about the issue, perhaps elected and appointed Catholic political officials might be more motivated to legislate or rule in favor of stabilizing the climate.

While hearing religious leaders’ views is by no means the only way active Catholics may formulate their opinions, the homily is likely to be an important influence (Fleck 2008). (In Protestantism, a homily is typically called a sermon.) The homily is the most likely part

of the service where the faith is connected to contemporary social issues. Moreover, most Catholics tend to be at least somewhat satisfied with the homilies they hear (Blazina 2020), which suggests that they may be influenced by them. So what do U.S. Catholics hear from their local Church leaders on the issue of climate change when they attend Church?

In the past, this question would have been impossible to answer on a large scale. Traditionally, studies that investigate religious beliefs and communications have been mostly ethnographic and, by necessity, limited in scale (Carr et al. 2012; Veldman et al. 2019). However, following the declaration of a national emergency on March 13, 2020, and subsequent lockdowns, the COVID-19 pandemic led many organizations, including U.S. churches, to greatly expand their online presences. This digital shift resulted in an unprecedented increase in the volume of religious communications available online, frequently in the form of video-recorded services. This made a massive corpus of religious communications accessible for analytical examination on a scale previously unfeasible.

In this study, we analyze transcripts of more than seven hundred thousand online videos published by Catholic parishes covering the time period from March 2020 to August 2024. For comparison, we also analyze transcripts from four other Christian denominations: the Southern Baptist Convention, the Presbyterian Church (USA), and the United Church of Christ and the Association of Related Churches (ARC). Our focus, however, remains the Catholic Church, because only here can we test whether Pope Francis's encyclicals—issued within a uniquely centralized hierarchy—influence parish discourse. The four Protestant traditions are therefore used chiefly as a contextual baseline: they allow us to see whether any silence we detect is peculiarly Catholic or simply characteristic of U.S. church discourse more broadly. Results for these denominations are presented to calibrate expectations, not to construct a full comparative study.

Our overall finding is not that local priests reinforce or explicitly contradict Pope Francis's message on climate change. Rather, it is that they barely discuss the topic at all. This lack of discussion is not unique to Catholic congregations; other denominations also show minimal engagement with climate change, with the issue largely absent from American church services. Several constraints may impede discussing climate change in a homily or a sermon in US congregations, including a concern with raising politically controversial issues, clergy feeling unqualified to address scientific claims, or a desire to keep to more transcendent themes. We return to these issues in the Discussion section, situating our finding within the broader literature on climate-change silence and religious communication.

2 Methods

Historically, social scientists have utilized methods such as grounded theory and content analysis to explore religious texts to uncover themes and patterns. Grounded theory allows researchers to make inductive generalizations from sermons, while content analysis uses a predefined codebook to systematically analyze content (Pieterse 2020). While these methods offer detailed insights, they have traditionally been limited in scale, and they are difficult to apply to large datasets.

In recent decades some social scientists have moved toward greater automation of text analysis. The methods range from word search counts to more sophisticated techniques, such as topic modeling. These methods allow researchers to process much larger sets of texts

than was previously possible with strictly manual methods. Several studies have analyzed data similar to ours, although not for the purpose of analyzing climate communications. Mitchell (2019), for example, used word counts to analyze 50,000 sermons from different Christian traditions in the U.S. Boussalis and colleagues (Boussalis et al. 2021) analyzed 110,000 sermons for political content. Agersnap and Nielbo (2022) used various computational methods to analyze 11,955 Danish sermons to determine the thematic content of the corpus. In this study, we analyzed more than seven hundred thousand transcripts of online videos published by Catholic churches, and more than four hundred thousand by four other American churches: the Southern Baptist Convention, the Presbyterian Church (USA), the United Church of Christ, and the Association of Related Churches (ARC). Below we detail how we computationally obtained those videos and analyzed them.

Our data are not representative of all congregations in the traditions we examine. The data set includes only churches with the resources to systematically record and upload their services on the internet. Given that smaller churches with fewer resources may also be different in other ways, this bias could affect the generalizability of our findings. On the other hand, we might reasonably expect that congregations with the capacity to record and upload their services are overall likely to be larger—and perhaps also in wealthier urban areas where political views tend to be more liberal—than congregations without that capacity. Therefore, our findings may be considered *a fortiori*: if climate change is not widely discussed, even in large, urban, well-resourced congregations, then it seems unlikely that it is being widely discussed elsewhere.

2.1 Data acquisition

Our study focuses on the U.S. Roman Catholic Church (RCC). For comparison, we also studied services from three other denominational groups: the Southern Baptist Convention, the Presbyterian Church (USA), and the United Church of Christ. We chose the Southern Baptist Convention (SBC) as the largest Protestant denomination in the country, important because it represents a significant segment of the traditional evangelical community and is known for its conservative theological stance and alignment with political conservatism and the Republican Party (Hollinger 2025). We chose the Presbyterian Church (USA) (PC USA) as an example of “mainline” U.S. Protestantism, and the United Church of Christ (UCC), as a church known for being on the most liberal end of mainline Protestantism and therefore likely to have more progressive views on climate change (Moody et al. 2002).

We also studied the Association of Related Churches (ARC). This is not technically a denomination but an association of non-denominational churches, which are on the rise in the United States (Grammich et al. 2020) and are highly engaged online (Table 1). Non-denominational churches are typically politically conservative. While previous studies focus on comparisons across denominations (Veldman et al. 2013; Zaleha and Szasz 2015), our study centers on the RCC while using the SBC, PC USA, UCC and ARC as churches that are positioned further to the right and left of the RCC politically, and therefore serve as points of comparison.

Our method begins by compiling a comprehensive database of churches affiliated with the five selected denominations by examining official and semi-official online lists of congregations. We gather relevant information about each church and from this pool, we consider only churches with listed webpages. Next, we use a computer program to scan each

Table 1 Summary table of collected data for various denominations

	Roman Catholic Church (RCC)	Southern Baptist Convention (SBC)	Presbyterian Church (USA) (PC USA)	United Church of Christ (UCC)	Association of Related Churches (ARC)
Directory website	http://www.gcatholic.org/dioceses/country/US.htm	https://churches.sbc.net/	https://church-trends.pcusa.org	https://www.ucc.org/church-finder/	https://www.archchurches.com
Total number of churches (as of November 16th, 2022)	19925	50833	6689	4643	1134
<i>Northeast</i>	4903 (24.5%)	1794 (26.6%)	1793 (38.6%)	1314 (2.6%)	110 (9.6%)
<i>Midwest</i>	6748 (33.8%)	2296 (34.1%)	1697 (36.5%)	5198 (10.2%)	182 (15.9%)
<i>South</i>	4699 (23.5%)	1446 (21.5%)	529 (11.4%)	39163 (77.0%)	659 (57.6%)
<i>West</i>	3508 (17.6%)	1171 (17.4%)	600 (12.9%)	5034 (9.9%)	187 (16.3%)
<i>Unmatched</i>	127 (0.6%)	25 (0.4%)	26 (0.6%)	129 (0.3%)	6 (0.5%)
Churches with websites (N/%)	13035/65.5%	21802/42.9%	4255/63.5%	3301/71.1%	1134/100%
Churches with YouTube channel (N/%)	1967/9.9%	315/0.6%	775/11.6%	573/12.3%	596/52.6%
Churches with active YouTube channels (N/%)	1903/9.6%	295/0.6%	739/11.0%	555/12.0%	155/13.7%
Total number of videos collected (as of August 2024)	1013724	114377	254078	170909	148104
Total number of videos with English closed captions (N/%)	707584/69.8%	80396/70.3%	171457/67.5%	124507/72.8%	102716/69.4%

webpage for YouTube links, which can take various forms, including embedded videos, links to YouTube playlists, user pages, or channel pages. If a channel URL is not readily available, we attempt to deduce it from individual embedded videos. Once we obtain a channel URL, it enables us to access all public videos ever uploaded by a given church. In this way we access only videos that were made public; we cannot and do not intend to access videos that were made private at the moment of upload or before we have tried to access them. These steps are carried out programmatically using the YouTube Data API (“YouTube Data API,” (n.d.)) for obtaining YouTube channels IDs—unique to each church—and the Python module *youtube_subtitles* for retrieving closed captions that are generated automatically by YouTube. Given the substantial size of video files compared to the relatively small size of closed captions stored as text, downloading and storing the actual video files was not feasible for us. However, because we save the time codes of closed captions, we can retrieve any fragment of interest as long as the video has not been taken down by the owner.

We confine our research to YouTube, which is recognized as the predominant social media platform in the United States across a broad spectrum of demographics, according to a recent survey by the Pew Research Center (Gottfried 2024). This choice is further justified by YouTube’s automatic transcription generation and the availability of tools that simplify the download process, which differentiates it from other platforms utilized by some churches, such as Vimeo, Facebook, Spotify, and various podcast hosting platforms. The integration of these platforms would necessitate the development of a more complex data analysis pipeline for effective data collection and transcription. It is important to note, however, that while Gottfried’s (2024) survey reports inherent viewership biases across all social networks, these biases might not directly correlate with the video content analyzed in our study.

A Pew Research Center study (Mitchell 2019) adapted an analogous approach to ours by collecting a large dataset of services from public resources and employing computational methods to analyze them. However, their research objectives were more general, examining trends in service duration and frequently used words; our study focuses specifically on climate change communication. Our data collection methods also differ. The Pew team used Google Maps to scan for churches across the United States, selecting those with listed websites without considering denomination, and collected recordings from all available sources, not just YouTube. This arguably allowed them to achieve a higher completeness rate, but also required an additional process for denomination detection. In contrast, we limited our scope to a few denominations with established church directories, achieving higher completeness for each denomination. Additionally, unlike the Pew study, which collected data from a few pre-pandemic weeks (April 7, 2019– June 1, 2019), we gathered all available data from churches without restricting the timeframe. Consequently, our dataset encompasses over an order of magnitude more services (~1,000,000 versus ~50,000).

The pandemic onset dramatically increased the number of videos published by the churches as shown in Fig. 1. The videos represent a variety of different content, most of which are longer than 30 minutes and often represent large portions of the services, not just sermons or homilies. Sometimes channels include community announcements, discussions, podcast-style interviews. They often include hymns, prayers and various liturgical elements. Since it is challenging to categorize the videos robustly, we analyze them all together and consider them more generally as parish communication. Thus, a strength of this study is that we can identify communication about climate change wherever it may appear in a service.

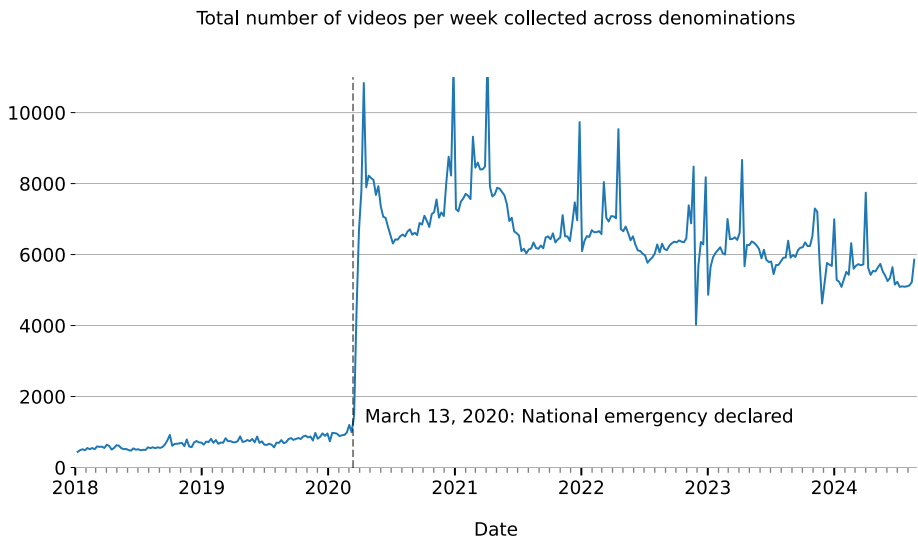


Fig. 1 The total number of uploaded videos per week across all observed YouTube channels. The dramatic increase of the video uploads coincides with the nationwide COVID-19 emergency that was declared on March 13, 2020

2.2 Data analysis

Since Christian church services mostly occur weekly, most of the YouTube channels we consider also post videos roughly on a weekly basis. Therefore, we average out all our calculations on a weekly timescale. To confirm that our measurement method can observe content and time accurately, we examine what percentage of videos contain words such as "Christmas", and in Fig. 2, we observe seasonal spikes as expected. The pandemic caused a shift in the frequency of some of the keywords. For instance, the term "virus" has seen an increase in usage at the beginning of the pandemic, but it has since declined. The impact of the COVID-19 pandemic is not visible in Fig. 2, since the plotted quantity is the fraction of videos, not their total number.

As a confirmation of the sensitivity of our method to observe discursive differences between traditions, as well as a second check on our ability to associate themes with time, we look at the frequency of the use of the word 'abortion'. The RCC and the SBC are opponents of legal abortion, and would be expected to mention abortion in services, whereas the UCC and PC USA are officially pro-choice but, with a range of views in their congregations and a lack of powerful central authority in the denomination, would not be expected to talk about abortion as much (Evans 1997; Wuthnow and Evans 2002). This is shown in Fig. 3. As a conservative Protestant tradition, the ARC would be expected to be more like the SBC. Figure 3 illustrates the fluctuating occurrence of the word 'abortion' in the expected rates by denomination. There is a spike for Roman Catholic congregations every January before the fall of Roe, presumably aligned with the annual Catholic March for Life that was held every January near the anniversary of the original 1973 Roe decision. Following the 2022 U.S. Supreme Court decision in *Dobbs v. Jackson Women's Health Organization*, which overturned the landmark *Roe v. Wade* decision, all denominations increased discussion of

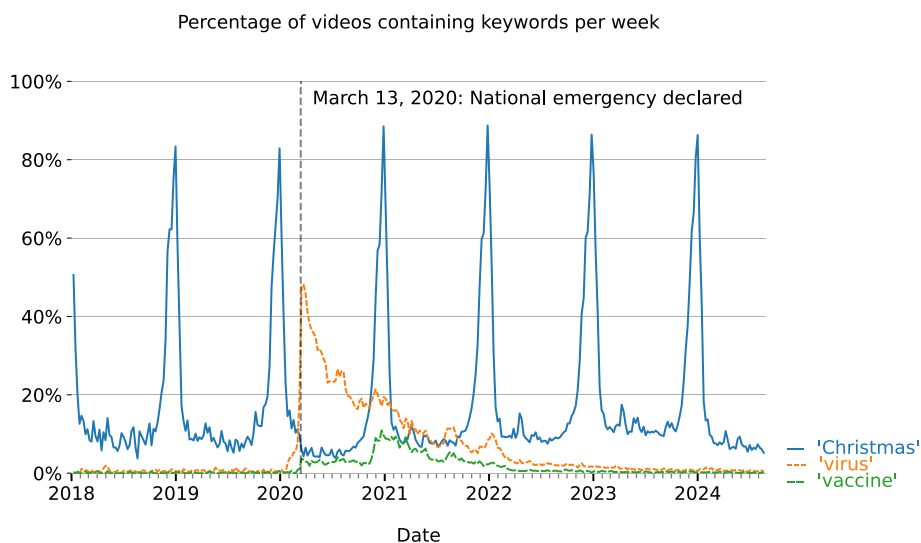


Fig. 2 The percentage of videos mentioning the keywords 'Christmas,' 'virus,' and 'vaccine.' The curve for 'Christmas' follows the expected seasonal pattern. The peak mentions of 'virus' coincide with the U.S. National Emergency declaration on March 13, 2020, and the onset of lockdowns. Discussion of 'vaccine' becomes more prevalent toward the end of 2020, when vaccinations became available in the United States

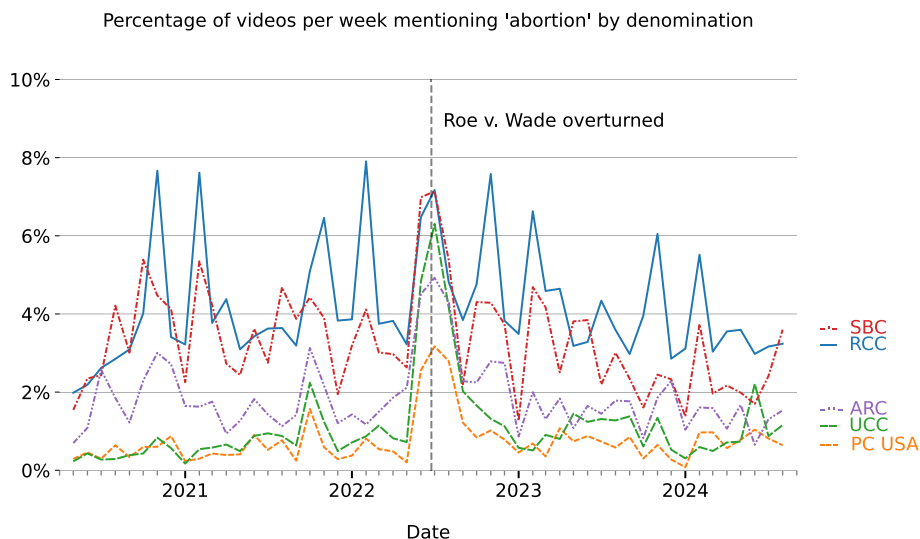


Fig. 3 The percentage of videos mentioning the keyword 'abortion' across different denominations. All curves show a peak in the summer of 2022, when Roe v. Wade was overturned by the Supreme Court's decision in Dobbs v. Jackson Women's Health Organization

this topic in their videos. These analyses of abortion discourse confirm that our method is able to observe changes in discourse, and therefore likely to be able to observe discourse about climate change.

For our main analysis, we examined the frequency of direct references to climate change in church communications. Since climate change has several commonly used synonyms in public discourse, we scanned for these related terms and considered them equivalent in our analysis. The specific terms we tracked were "climate change" (appearing in 9,990 videos, 0.84% of total), "global warming" (2,369 videos, 0.20%), "climate crisis" (1,622 videos, 0.14%), "climate emergency" (113 videos, 0.01%), "greenhouse effect" (62 videos, 0.005%), and "climatic change" (36 videos, 0.003%).

We deliberately excluded broader or potentially ambiguous terms that might capture unrelated discussions. For instance, the word "environment" could refer to social environment or community settings, while the term "future generations" in Catholic contexts may relate to passing down religious traditions rather than environmental concerns. Similarly, terms like "nature" frequently appear in theological discussions (e.g., "the nature of the trinity") unrelated to environmental topics. Some terms, like "sustainability," "environmental stewardship," "ecological conversion," and "our common home," do have potential relevance to climate change, but were excluded because the terms address broader environmental concerns beyond climate change.¹ We also chose not to track weather-related terms like "heatwave" or "snowstorm," as these may appear in immediate practical contexts (e.g., "please drive carefully in today's snowstorm") rather than in discussions of long-term climate change or papal environmental teachings. While additional search terms might prove valuable for addressing other research questions about religious discourse on various environmental and social topics, we have deliberately limited the scope of this work to direct communications about climate change. This focused approach allows us to answer our question of how Catholic parishes and other denominations have engaged with—or failed to engage with—the specific issue that Pope Francis highlighted in his encyclicals. In addition, the release of Pope Francis's apostolic exhortation *Laudate Deum* on 4 October 2023 offers a natural 'shock' to top-down Catholic climate messaging. We treat this event as a test of responsiveness by comparing the fraction of videos containing climate-related keywords in the month following its publication with the preceding 24-month baseline.

3 Results: an almost complete absence of climate change discourse

We focus on the descriptive question of whether communication about climate change is occurring in U.S. Catholic services because that is most important to debates about climate change activism. The results of our analysis are striking: despite Papal advocacy on the issue, climate change is almost never mentioned in RCC services. Of the 707,584 videos analyzed, 'climate change' or other related keywords appear in only 2824 videos (0.40%), with only 3804 total mentions, and most of these are only in passing. When we focus on videos where the topic is mentioned at least twice, suggesting some form of discussion, we

¹ *Laudato Si'*'s subtitle is "On Care for Our Common Home," so mentions of "our common home" in homilies could plausibly signal climate concern in addition to broader environmental concerns. However, even "our common home" is referenced infrequently and, if included in our final analysis, would mean total references to climate and climate-adjacent terminology in less than 1% of videos.

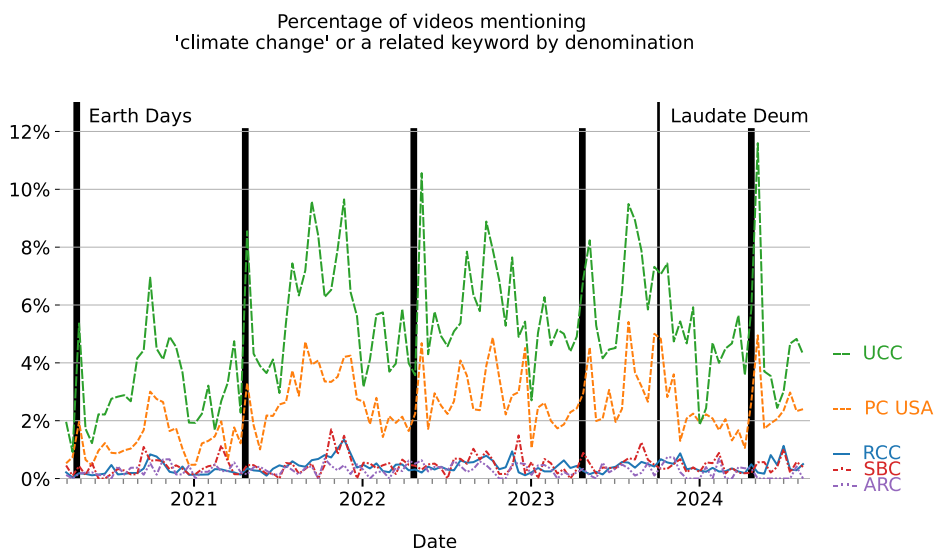


Fig. 4 The fraction of videos from different denominations mentioning 'climate change' or a related keyword (see Data Analysis section for details), grouped in two-week periods. The values for the Roman Catholic Church (RCC) are quite low, with *Laudate Deum*, released on October 4, 2023 (black vertical line), showing no visible effect. Similarly low levels of discussion are observed among the Southern Baptist Convention (SBC) and the Association of Related Churches (ARC). In contrast, the United Church of Christ (UCC) and the Presbyterian Church (USA) (PC USA) show more substantial mentions, with peaks around Earth Day (April 22), indicated by gray vertical lines. In addition, both denominations exhibit other peaks that are not closely related to a particular time of year, suggesting they are reacting to additional episodic events. Pinpointing the drivers of these other peaks would require qualitative coding of the underlying sermons beyond the scope of this study

Table 2 Percentages of videos mentioning 'climate change' or a related keyword (see data analysis section for details) across denominations in our dataset

Church Name	Videos with at least a single mention	Videos with two or more mentions
United Church of Christ	4.63% (5768)	1.224% (1524)
Presbyterian Church (USA)	2.16% (3702)	0.454% (778)
Southern Baptist Convention	0.43% (348)	0.118% (95)
Roman Catholic Church	0.40% (2824)	0.060% (428)
Association of Related Churches	0.28% (287)	0.068% (70)

find just 428, representing less than 0.06% of the total. This suggests the topic is essentially absent from RCC parish communications.

RCC services are *less* likely to include discussion of climate change than services in other denominations, despite there being a clear position of concern with climate change in the RCC leadership. This silence is true even after a year of record breaking heat (2023), and even after the Pope implored his faithful to take the issue seriously.

In Fig. 4, we confirm that our method is observing discourse across time by noting that the relatively liberal mainline Protestants (and particularly the UCC) have a spike in discourse about climate change near Earth Day each year. Breaking down the data by denomination reveals significant variations. As we show in Table 2, the UCC and the PC USA account

for the majority of the videos discussing climate change. In contrast, the RCC, the SBC and the ARC barely touch this topic. However, even within the UCC and PC USA, the topic overall receives minimal attention and is often addressed only in passing. This indicates that while denominational culture and leadership influence the likelihood of environmental issues being discussed, climate change remains a marginal topic across all U.S. churches.

It is noteworthy that resistance to acknowledging scientific evidence on this critical issue has been found to be significantly higher among white evangelical Protestants compared to other religious denominations or the unaffiliated (Leiserowitz et al. 2015). Veldman et al. (2019) highlights that while numerous hypotheses have been proposed to explain this phenomenon, there remains a dearth of empirical evidence to test them.

Despite Pope Francis's encyclical *Laudato Si'* in 2015 emphasizing environmental stewardship, there is a notable lack of engagement with climate change at the parish level. This encyclical predates the bulk of our dataset, but one might nevertheless expect to see some discussion of the issues raised in the years that followed. However, as Fig. 4 illustrates, we do not see that. The apostolic exhortation *Laudate Deum*, which is a direct follow-up to the encyclical and directly addressed the climate crisis, was released on October 4, 2023, when we do have data. Despite the strength of its message, it had no noticeable effect on the overall frequency of this topic being discussed in Catholic churches. Similarly low levels of discussion are observed among SBC and ARC. In contrast, UCC and PC (USA) show more substantial mentions, with peaks around Earth Day (April 22).

To test whether *Laudate Deum* produced a genuine spike in discussion, we compared the fraction of climate-related videos in the month immediately after its release (October 2023) with the same fraction for each of the preceding 24 months. October's share was 0.64%, whereas the pre-event median was 0.45%; indeed, eight earlier months met or exceeded October's level, suggesting the increase was not unique.

Because the monthly series shows clear, irregular peaks (e.g., the Earth-Day surges in UCC and PC USA), it would be inappropriate to assume any specific continuous distribution such as normality. We therefore used the Kolmogorov–Smirnov (KS) test—a fully non-parametric procedure that compares two empirical cumulative distribution functions without relying on distributional assumptions (Massey 1951). One “sample” is October 2023 ($n=1$); the other is the 24-month baseline ($n=24$). The KS test returns $p=0.38$, implying that a month as extreme as October would arise roughly 38% of the time under the historical distribution; October is therefore not an outlier.

Put differently, with about 15 000 Catholic-church videos uploaded each month and a typical climate-mention rate of only ~0.45%, October's uptick to 0.64% lies well within ordinary month-to-month variation. Figure 4 conveys the same message visually: several pre-2023 peaks match or surpass the post-*Laudate Deum* level. Thus, even a formal, distribution-free test confirms that the Pope Francis's exhortation left parish-level discourse essentially unchanged.

Visual inspection of Fig. 4 also reinforces the pattern already evident in Table 2: climate discourse varies sharply by denomination. Both—UCC and PC USA—stand well above the tightly clustered lines of RCC, SBC, and ARC, whose trajectories nearly coincide.

To formalise this impression, we applied all ten pairwise two-sample Kolmogorov–Smirnov tests to the 24 monthly percentages of climate-related videos spanning October 2021–September 2023. The comparison between UCC and PC USA yields a very small p -value, $p = 5.4 \times 10^{-12}$. Comparisons of either UCC or PC USA with any of the remain-

ing three groups produce even smaller p -values ($p \leq 2.1 \times 10^{-13}$), mirroring their clear visual separation. By contrast, pairings among RCC, SBC, and ARC return p -values between 0.09 and 0.73, providing no evidence of distributional differences and corroborating their overlapping curves in Fig. 4. Thus, the KS tests confirm what the eye suggests: UCC and PC USA chart elevated and mutually distinct patterns of climate discourse, whereas RCC, SBC, and ARC share statistically similar low rates.

To gauge practical significance, we computed Cohen's h (Cohen 1988) for the percentages of transcripts with at least one mention (Table 2). All pairings within the RCC–SBC–ARC cluster yield $h \leq 0.03$, firmly in the “small” range ($h < 0.2$). By contrast, every comparison between UCC and the three lower-frequency groups produces $h \geq 0.30$ —a small-to-medium effect ($0.2 < h < 0.5$). Thus, although the UCC mentions climate change roughly ten times more often than the SBC, RCC, or ARC, the magnitude of the difference remains modest on this conventional effect-size scale. PC (USA) falls between the two extremes, with $h \approx 0.14$ when contrasted with UCC and $h = 0.16$ – 0.19 when compared with the lower-frequency cluster; both are “small” effects.

The RCC's lack of engagement, despite Pope Francis's encyclicals, suggests that the Pope's messages have not permeated down to the parish level in the U.S., as it is also seen in other clergy communications (Danielsen et al. 2021). This disconnect could be due to various factors, including local leadership priorities, political affiliations and partisanship, and broader cultural attitudes within the RCC in the U.S. (Lewis 2022). The videos that do discuss climate change frequently come from the same handful of churches. Among the top twenty churches from our dataset discussing climate change (based on the number of videos with at least two mentions of climate change related keywords), only two are RCC, with the rest being UCC and PC USA. The church that we have identified as the most outspoken about climate change among other RCC churches, the All Saints Catholic Church of Syracuse, New York, has been recognized as an outlier: it won the 2024 Cool Congregations Challenge in the “Community Inspiration” category for their climate change activism (Barone 2024) and for the All Saints Church Care For Our Common Home (COCH) Task Force, formed in 2021 (Cool Congregations 2024). Notably, 2021 is the year the *Laudato Si' Action Platform*, an initiative of the Vatican Dicastery for Promoting Integral Human Development, was launched.

4 Discussion

Our study set out to examine discourse on climate change in U.S. Roman Catholic churches to determine how Pope Francis's statements on the topic had influenced parish priests' Sunday sermons. For comparison, we also analyzed discourse in four other denominations: the Southern Baptist Convention (SBC), the Presbyterian Church (USA) (PC USA), the United Church of Christ (UCC), and the Association of Related Churches (ARC), to explore the types of conversations occurring and differences across denominations. However, we found startlingly little to analyze. Even in the more liberal UCC and PC USA, only a tiny fraction of services mentioned climate change. This widespread lack of engagement aligns with other findings that U.S. bishops have largely overlooked Pope Francis's apostolic exhortation; for instance, fewer than 1% of the more than 12,000 columns by U.S. bishops in official publications since 2014 have addressed climate change (Danielsen et al. 2021).

The widespread lack of engagement echoes a large body of scholarship showing that psychological and cultural mechanisms routinely suppress climate action even among the concerned (Gifford 2011; Norgaard 2011; Stoknes 2015) and that organized counter-movements and other systemic obstacles reinforce this inertia (Brulle 2014; Steg 2023). Thus, an attitude–behavior gap develops and persists. Among lay Catholics, many who worry about climate change engage only in the lowest effort forms of activism (Myers et al. 2017). Among more than 2,400 U.S. Christian clergy, nine in ten privately accept anthropogenic climate change, but 89% seldom or never address it from the pulpit, a silence that stifles congregational engagement (Syropoulos et al. 2025). Indeed, as of March 2024, only one third of U.S. Catholics had even heard of *Laudato Si'* (Kramarek et al. 2024).

Clergy silence on climate change has implications at the level of the U.S. church-going public and the highest levels of political leadership. Christian constituents who go to the polls are not compelled by their most proximate religious leaders to prioritize climate change or even to factor in a candidate's position on climate change. Plausibly, they could take their clergies' silence to mean that they should oppose a candidate who prioritizes or simply favors action on climate change. Senators, Representatives, and Supreme Court justices, who are disproportionately Catholic, as well as other church-going elected and appointed political officials (Newport 2022; Diamant 2023), are part of these congregations, are therefore also probably not compelled by their local religious leaders to legislate or rule in favor of stabilizing the climate.

Scholarship on religion and politics suggests that, in the absence of church discussion about climate change, much less the need for climate action, religious Christians are likely to oppose such action or be indifferent. One reason is the increasing overlap between religious and partisan identity, with positions on climate change being part of this identity (Kahan 2015). Evangelical senators who identify as Republican are largely opposed to action on climate change (McTague and Pearson-Merkowitz 2013). Among Catholics, Church teaching is often seen as less relevant to social issues than moral ones (Oldmixon and Hudson 2008). Despite Pope Francis's call to action, Catholics may put climate change in the less-relevant social issues category, however immoral such a categorization may seem to those concerned about the climate's existential threat to humanity. As of this writing, the Republican Party platform—the one that many Christian clergy might find appealing—is unabashedly opposed to climate action.

Protestant groups such as the Southern Baptists have historically shown resistance to acknowledging climate change, aligning more closely with conservative political ideologies that question the science behind global warming (Zaleha and Szasz 2015). The 2008 “A Southern Baptist Declaration on the Environment and Climate Change” (Baptist Press 2008) can be understood as a call for addressing climate change, yet it also could be interpreted as a view compatible with climate skepticism (Robin Globus Veldman 2016). Conversely, other Protestant denominations, including the Presbyterian Church (USA), recognize climate change as an urgent crisis, which suggests a denomination-dependent approach to environmental issues (Zaleha and Szasz 2015). Recent studies, however, have begun to highlight a shift, particularly among the next generation of evangelicals. Younger members are increasingly recognizing the realities of climate change and the human activities contributing to it (Lowe et al. 2022).

Given the impact of Christian votes on United States politics, it is important to explore ways of meaningful engagement with those communities (McCammack 2007). Studies

suggest that engaging Christians through their social identity might be an effective way to involve them in climate action (Goldberg et al. 2019). Evidence suggests that Protestants who attend services more frequently are more concerned about the impacts of climate change (Whitt Kilburn 2014), indicating a link between religious activity and environmental concern.

Should Christian clergy want to discuss climate change from the pulpit, they could frame climate change in ways that resonate with theological values and beliefs (Bullitt-Jonas 2021). These communication strategies are recognized by at least some part of the Catholic community and are addressed at dedicated conferences of bishops, theologians and Catholic leaders (White 2024). All Saints Catholic Church in Syracuse, New York, provides a rare example of a Catholic church actively implementing the *Laudato Si'* plan locally. This church has begun incorporating climate change discussions into its services, aligning the issue with Christian principles of caring for creation. This suggests, at minimum, that engaging Church leaders is not impossible, but perhaps has only occasionally been attempted.

Scientists communicated actively with Pope Francis during key Vatican events, including the Pontifical Academy of Sciences' meeting, "Sustainable Humanity, Sustainable Nature: Our Responsibility," in May 2014, and the Vatican's "Protect the Earth, Dignify Humanity" meeting on April 28, 2015. Both events preceded the 2015 Paris Climate Conference (COP21) and contributed to *Laudato Si'*, released on May 24, 2015. Scientists anticipated a top-down communication model, assuming that the papal encyclical would spread through the Catholic hierarchy to parishioners. Given the hierarchical structure of the Catholic Church, this could have been a reasonable expectation. However, as our findings show, propagation of the Papal message to parishioners did not occur, at least in the United States. This raises the question of what alternative strategies might be more effective. One possibility involves complementing Pope Francis's efforts with a bottom-up approach, encouraging scientists and/or climate-concerned church-goers to engage directly with local Catholic communities. Such localized engagement could potentially foster a deeper and more impactful response to climate change from within the Church.

Author contributions Alexander A. Kaurov: Ideation, Data Collection, Data Analysis, Manuscript Writing—Original Draft.

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Data availability The datasets generated and analyzed during the study are not publicly available due to their size but are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate Not applicable. Only public data has been used.

Competing interests The authors declare no conflicts of interest related to this study.

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