



# Digitalization between environmental activism and counter-activism: The case of satellite data on deforestation in the Brazilian Amazon

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## ARTICLE INFO

### Keywords:

Amazon  
Satellite  
Transparency  
Truth regimes  
Counter-activism  
Alethurgy  
Forest digitalization

## ABSTRACT

This paper analyzes the uses of digital satellite data on deforestation in the Amazon region, drawing on post-structuralist studies of scientific knowledge practices and Science and Technology Studies (STS). Focusing on changes under the government of President Jair Bolsonaro, we argue that populist right-wing rhetoric, policies, and practices towards deforestation in the Amazon must be understood in the context of a broad and sophisticated effort to discredit and dismantle pre-existing knowledge infrastructures and *transparency* regime. These structures had developed over time with the aim of making deforestation visible and manageable. The dismantling of these structures is part of the effort to establish a competing *alethurgy*, i.e. an assemblage of procedures and rituals that claim to manifest the “truth” about the Amazon. This new alethurgy depends, crucially, on a regime of *hypertransparency* which enables practices of environmental *counter-activism*. This new alethurgy promotes an extractivist use of the Amazon in which deforestation is an acceptable price to pay for economic development.

## 1. Introduction

Since taking office in January 2019, Brazilian right-wing president Jair Bolsonaro has faced international criticism and increasing political pressure for rising deforestation rates in the Amazon region. In response, Bolsonaro claimed that “the statistics, as I understand it, were inflated, in order, it seems, to malign Brazil and the government” (Bolsonaro, 2019). Furthermore, he slashed the budget of the National Institute for Space Research (INPE), the federal agency traditionally charged with monitoring deforestation in the Amazon, by 33% (Narciso, 2021). Contradictorily, the Brazilian Ministry of Defense later acquired a radar<sup>1</sup> satellite, worth \$35.8 million USD, with the declared purpose of monitoring deforestation in the Amazon region in order to support the armed forces in combating environmental crime (Padilha, 2020). The director of the intergovernmental Group on Earth Observations (GEO), scientist Gilberto Câmara, stated that “the only possible explanation is that the military wants to replace monitoring [...] and produce statistics that are not clear to civil society” (apud Borges, 2020). Câmara called the

satellite “space chloroquine” (Borges, 2020), referring to the drug that was not scientifically proven to be effective against Covid-19, yet was still distributed to the Brazilian population by Bolsonaro’s government.

Just like advertising chloroquine as a cure for Covid-19, Bolsonaro’s statements on deforestation in the Brazilian Amazon have been dismissed as populist rhetoric, disinformation or simply “lies” about the actual situation on the ground (Escobar, 2019). This view, however, is too reductive. In this paper, we use a Foucaultian framework to argue that populist, right-wing rhetoric, policies and practices towards deforestation in the Amazon must be understood in the context of a broader and more sophisticated effort to discredit and dismantle pre-existing knowledge infrastructures and *transparency* regimes that make deforestation “visible” and “manageable”, and to establish a competing *alethurgy* (Foucault, 2014), i.e. an assemblage of procedures and rituals that claim to manifest the “truth” about the Amazon.

This new alethurgy depends on what Edwards (2019) has termed *hypertransparency*, i.e., practices of producing, analyzing, and publishing new digital data on the Amazon. The proliferation of such data sources

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<sup>1</sup> Pereira Andrade (2020) argues that the lack of organicity of the party that elected Bolsonaro (the PSL), and the lack of technical conservation staff meant the government started using military officials from the reserve to fill gaps in public federal administration. At the same time, the military was interested in obtaining extra pay to complement its pensions. According to the author, the military reserve force is the main group in government and occupy around 130 ministerial posts in various ministries, federal banks, autarchies, institutes and state companies, including Petrobras.

leads to an excess of information and visibility, thus obfuscating the public's view of deforestation. The regime of hypertransparency, we argue, enables practices of environmental *counter-activism*. Counter-activism draws on modes of environmental activism and governance developed during the 1990s and 2000s but directs them to different purposes, namely towards legitimizing an extractivist political-economic use of the Amazon in which deforestation is the price to pay for development.

In this genealogical study, we conclude that what is at stake in case of the data conflict surrounding the Amazon rainforest is not a simple contest between populist fake-news and disinformation on the one hand, and an earlier "truth" about deforestation associated with sustainable and democratic governance on the other hand. Rather, we observe the construction of two knowledge infrastructures, both inserted in the assembling of credibility processes (Aradau and Huysmans, 2019).

To elaborate these arguments, the paper proceeds in four steps. Part two sets out the conceptual framework and methodological approach of this paper, specifying our notions of knowledge infrastructure, alethurgy, and hypertransparency and situating them in the extant literature and conceptual landscape. Part three then turns to a genealogical analysis of performative uses of digital satellite data in distinct alethurgies of deforestation in the Brazilian Amazon. We distinguish between two phases of digitalization in the Amazon: first, transparency and environmental activism; second, hypertransparency and counter-activism. Part four discusses the findings, and part five concludes with suggestions for further research.

## 2. Conceptual framework and methods

The overall approach of our paper is poststructuralist. We are not directly interested in positivist explanations of the causal relationships between digital satellite imagery, transparency, and the quality of environmental governance, especially in regard to deforestation rates. Rather, the aim is to understand how digital satellite imagery forms part of the knowledge infrastructure related to the Amazon rainforest, and how this knowledge infrastructure is politically used, modified and contested to establish truth regimes that condition exercises of power. In this perspective, transparency appears not as a normative principle to be optimized by means of satellite technology and digital data, but rather as a social practice that supports claims to truth. This practice can be employed for various purposes – not only for improving sustainable forest governance, but also, crucially, for populist-authoritarian and developmentalist uses of the Amazon.

The digital data resulting from the proliferation of satellite remote sensing technology has been used for an increasing range of political and administrative purposes, including environmental governance. In this context, satellite data is often understood as a technological means to enhance transparency in environmental governance, which in turn is conceived as improving opportunities for participation in environmental decision-making and management (see generally Gupta and Mason, 2016; Mason, 2019; Gupta et al., 2020). In this perspective, transparency consists of the adoption of practices that allow public and private actors access to governmental information, making it possible to "see", and thus participate in and contest governmental exercises of power (Pinho, 2019; Georgiadou et al. 2014; Florini, 2007). In forest management, transparency is understood as making objective and impartial data accessible for the purpose of combating deforestation as a source of greenhouse gas emissions contributing to climate change. This approach seeks to make deforestation visible so that it can be managed not just by governments but also by civil society activists and international institutions. Advocates of environmental transparency have thus sought to identify intervening variables that affect whether transparency can improve political participation and environmental governance (Rajão and Jarke, 2018).

A more critical strand of literature questions the technological determinism of these management-oriented approaches that associate

environmental monitoring devices with transparency (Hoppe, 2011; Venturini et al., 2014). Following the pioneering study by Litfin (2002) on remote sensing satellite technology and transparency, critical approaches drawing on poststructuralism and STS analyze the role of digital satellite imagery in the social construction of knowledge about the environment, and the resulting effects on the production and distribution of power. They discuss, namely, the challenges involved in the use of space technology by social movements and NGOs to denounce environmental destruction and campaign for environmental policies (Baker and Williamson, 2006; Rothe, 2017) and the limited counter-hegemonic potential of activism arising from the availability of this type of imagery (Rothe and Shin, 2018; Perkins and Dodge, 2009). In this way, Witjes and Olbrich (2017) critically question celebrations of "global transparency" and describe "fragile transparency" as uncertain, limited and dependent on specific contexts for the political potential of the satellite imagery to be realized.

Our article builds on these critical approaches and elaborates on them further. We argue that digital satellite data not only has its limitations, but that remote sensing is actively used by a populist, right-wing government in an effort to not only dismantle existing knowledge infrastructures, but also to produce a hypertransparency regime that enables environmental counter-activism. Ultimately, this enables the establishment of a new alethurgy of the Amazon that facilitates authoritarian exercises of power.

The analytical framework which informs this argument builds on, firstly, the concept of "knowledge infrastructure", defined by Edwards (2010) as an apparatus designed to "generate, share, and maintain specific knowledge about the human and natural world" (Edwards, 2010). Satellite remote sensing technology and resulting databases are components of the Brazilian Amazon knowledge infrastructure. As satellite imagery and deforestation data were made publicly available during the 1990s and 2000s to enhance "transparency," they were incorporated into both governmental policies and civil society activism and invoked as representations of the "reality," or "truth" about the forest.

We expand upon this analysis by developing the concept of alethurgy, drawing on poststructuralist analyses of socio-political knowledge practices and truth regimes pioneered by Michel Foucault. Foucault conceptualized combinations of knowledge infrastructures and related socio-political practices as a "regime of truth," a corpus of knowledge, techniques and scientific discourses that become entangled with the practice of power (Foucault, 1975, p. 30, p. 23; Lorenzini, 2015). As Foucault later elaborated, regimes of truth are not solid and immutable, but can be observed beyond the notion power/knowledge as "government by the truth" (Foucault, 2014, p.7) His interest was to "develop the notion of knowledge in the direction of the problem of the truth" (Idem) in relation to the exercise of power as "government." In this perspective, science and objective knowledge are contemporary forms of alethurgies, one of the possible ways of manifesting the truth by society (Foucault, 2014, p.7). Foucault defined "alethurgy" as "the manifestation of truth as the set of possible verbal or non-verbal procedures by which one brings to light what is laid down as true as opposed to false, hidden, inexpressible, unforeseeable, or forgotten" (Foucault, 2014, p. 9). In addition, he considered two elements connected to alethurgy. First, every system of government operates an excess related to the manifestation of truth "which accompanies the exercise of power, goes far beyond knowledge useful for government" (Foucault, 2014, p.5). Second, procedures of truth are performative in that they surpass objective knowledge.

The added value of the notion of alethurgy is that it makes possible to problematize the performativity of satellite and digital imagery as 1) *knowledge* directed towards the production and "manifestation" of truth about the Amazon, and as 2) *government* directed towards reducing deforestation or enabling it for development purposes. Digitalization of the forest by satellite can be defined as a mechanism of implementation of a specific alethurgy of the forest, which gives credibility to the

exercise of environmental governance or not. There is no construction of credibility without a truth being shared and performed by the subjects. With the notion of assembling credibility, [Aradau and Huysmans \(2019\)](#) move the issue of production and validation of scientific knowledge out of the epistemological field. Here, we are particularly interested in problematizing the validation of scientific knowledge to broaden the question of truth construction. [Aradau and Huysmans \(2019\)](#) emphasize that the construction of credibility of knowledge is a transversal practice, which does not only take place in one scientific field, but in multiple epistemic arenas, where “negotiations, disputes, decisions and routines shape and distribute credits” (p.50).

The conceptual frameworks of knowledge infrastructures and alethurgies also enable analysis of how right-wing populists destabilize existing knowledge infrastructures related to the environment and climate change. This question has been analyzed in particular with regard to Donald Trump ([van Dyk, 2017](#); [Aradau and Huysmans, 2019](#); [Edwards 2020](#)). Recently, it has been extended to other populist leaders in Brazil and the Philippines ([Marquardt et al., 2022](#)). [Edwards \(2020\)](#) in particular has developed the concept of hypertransparency with a view to Donald Trump’s approach to climate policy. According to Edwards, the partial success of climate change denialism is based on *hypertransparency*: “open data, open code, commodity software tools, and alternative publication venues have quite suddenly upended truces painstakingly built over multiple centuries” with regards to climate knowledge ([Edwards, 2020](#)).

From a poststructuralist perspective, hypertransparency is a crucial strategy used to manifest competing truths, and construct competing alethurgies, about the Amazon. In this perspective, populist rhetoric about deforestation and climate change goes beyond “lies,” “disinformation” or “opinions” that seek to destabilize existing truth regimes. Rather, this rhetoric is accompanied, at least in the case of Bolsonaro, by policies and practices that re-engineer existing knowledge infrastructures about the Amazon, re-organize the production and publication of remote sensing data, multiply data sources and create competition between different data publication channels. This regime of hypertransparency, in turn, is used by governmental and non-governmental actors for purposes of counter-activism. By counter-activism, we mean social practices that mimic the form of pre-existing environmental activism but reject its substance and objectives related to sustainable forest management and enables knowledge production and new technologies of government aimed at increased military control and developmentalist resource extraction in the Amazon.

In our case study, counter-activism is associated with a right-wing government that is often labelled as “populist.” As explained further below, one difference is that Trump employs populist rhetoric to destabilize existing regimes of truth which are characterized as “elite” and therefore corrupt. While typical forms of populism may rely on strong “opinions” that dismiss the reality of elites and do not purport to establish alternative procedures for making truth claims ([van Dyk, 2017](#)), Bolsonaro’s government invests considerable resources into building up “alternative” knowledge infrastructures and organizational capacities. This actual strengthening of technocratic capacities and governmental surveillance apparatuses controlled by military elite echoes practices from the period of the Brazilian civil-military dictatorship and thus have a (neo)liberal authoritarian genealogy. While the concept of authoritarianism might also provide a standard for a genealogical critique of hypertransparency and counter-activism, the development of such a standard goes beyond the purpose of this paper and remains a next step in this line of research, as discussed in the conclusion.

To investigate the emergence of the hypertransparency regime, we begin with a genealogical study of satellite remote sensing in the Amazon. Following [Foucault’s \(1976, 1985\)](#) genealogical method, we “isolate the different scenes where” satellites and deforestation data “engage in different roles” and manifest different truths ([Foucault, 1976, p.140](#)). We trace how satellites became a strategic device to localize and

govern deforestation and how they contributed to the creation of the knowledge infrastructure of the Amazon through a qualitative analysis of official documents, decrees, and media material. In a second step, we collect policy documents, public announcements, newspaper and social media publications and federal institutional policies concerning the Amazon after Bolsonaro took office to find evidence of practices of hypertransparency and counter-activism. Finally, we analyze two enunciations of truth – transparency and hypertransparency – by comparing them along four dimensions: the knowledge produced/used, the resulting visibilities, the enabled technologies of government and the subject positions created.

### 3. Digitalization of the forest, activism and counter-activism: operationalising regimes of truth

A genealogical analysis of the digitalization of the Amazon dispels “the chimeras of origins” [Foucault \(1984, p.144\)](#), or of absolute truth, to explore the entanglements and emergence of two socio-technical assemblages. These assemblages help us identify different enunciations of truth about the Amazon: one characterized by practices of digital transparency and activism, the other by practices of hypertransparency and counter-activism. In this section, we will explore the alethurgies of the Amazon that compose the potential fields where power can be exercised.

The “manifestation of truth” of the Amazon has always been accompanied by alethurgic dynamics: The myths and fantasies printed in the first cartographic maps or voyage reports of the 16th century, the scientific expeditions of natural scientists, philanthropists and explorers, or satellite imagery – they all attempt to convey and circulate an original truth of the forest. All these archives or images are part of the excess related to the alethurgies of the Amazon represented by maps, photography, monitoring, myths, images, cartographies, and their respective performative uses, rituals, representations, technologies.

#### 3.1. Activism and the digitalization of the Amazon

The starting point for a genealogy of the digitalization of the Amazon is a socio-technical analysis of the subjection of the forest to satellite monitoring. The transparency regime is directly related to the ability of NGOs and environmental movements to access data and position themselves in Amazon policy and decision-making. The monitoring was, on the one hand, needed so that a knowledge infrastructure of the Amazon could be built up. On the other hand, it was helped along by the development of environmental governance that, within the Brazilian political scene of the last two decades of the 20th century, was mixed up in the country’s final attempts to re-democratize.

Before Brazilian NGOs started using satellite imagery to defend and protect the Amazon, the Brazilian government was monitoring the forest. This was made possible by using the scientific excellence of the National Institute for Space Research (INPE), recognized for its state-of-the-art technology and advanced space research centers which had early access to US Landsat imagery ([Siqueira, 2015](#)).

The first studies on deforestation based on satellite images were carried out as one-off studies by the INPE as early as the 1970s. As the main Brazilian institution involved in developing space technology, it was in the interests of the INPE to test the potential of satellites in sensory imaging of the territory. At the same time, the INPE was able to use the data to support the plans of the Superintendency for the Development of the Amazon Region (SUDAM) to expand public infrastructure and agribusiness and mining in the Amazon region ([Hall, 1991](#)). The bureaucratic military government wanted to use these first satellite images of the Amazon to check if credits given for forest occupation projects were being used appropriately. The settlers were required to remove half the forest cover from private properties to create plantations and pasture ([Costa, 1992](#); [Prates and Bacha, 2011](#); [Câmara, 2019](#)).

This expansionist application of satellite imagery of the Amazon stands in stark contrast to the way the Brazilian government said it wanted to use its forest monitoring programmes at the end of the 1980s. Under pressure at home and abroad, the first civil government to lead the country after the dictatorship redirected the use of satellite monitoring of the Amazon towards environmental protection and combating deforestation. The objective was to use detailed data to protect itself from accusations of neglecting environmental issues at a time when the environment was high on the international political agenda.

In 1989, a World Bank report put the Brazilian government in the spotlight by estimating that 12% of the Amazon's forests had been destroyed (compared to 1978) and raised the alarm about the increase in deforestation in the region (Mahar, 1989). In response, President José Sarney's government (1985–1990) claimed that the multilateral body's estimate was exaggerated. At the same time, the government asked the INPE to calculate, using satellite imagery, the real extent of the Amazon deforestation. That estimate was given to be 5.12% (INPE, 1989). Into the crossfire of estimates on deforestation came the Project for Monitoring Deforestation in the Legal Amazon (PRODES). According to Rajão and Georgiadou (2014, p.104), PRODES allowed the Brazilian government to publicly distance itself from its previous image of negligence and relabel itself as the "competent and rational manager of the rainforest," taking advantage, above all, of the prestige from the satellite technology to produce data that was hard to argue against. The creation of PRODES in 1989 marked the implementation of an Amazon transparency regime. It enabled a permanent flow of data that quantified the problem of deforestation, so that it could then be managed by environmental policies.

Far from bringing harmony to the situation, the Amazon transparency regime created conflict, arguments, accusations, demands and a series of games played by different empowered groups involved in combating Amazon deforestation, namely the Brazilian government, scientists and environmental NGOs.

The more Amazon monitoring systems were improved by the INPE, the more they allowed for environmental governance, which was effective for a long time in controlling and managing deforestation. In the first 14 years of its existence, PRODES only published aggregated data, restricted figures that at most gave estimates for each state, with few details on deforestation. For example, mapping and measuring of deforestation were done analogically, using printed satellite images on paper (Kokubo, 2013).

The published reports were also very simple, with graphical data or at the most illustrated maps. Yet, aggregated data from PRODES gave environmentalists the information they needed to pressure the federal government into adopting public policies to combat deforestation of the Amazon. This advocacy can be clearly seen when observing two mass deforestation events in Brazil. In 1995, deforestation of the Amazon reached a record high of 29.2 thousand km of forest destroyed. The figure caused so much embarrassment for Fernando Henrique Cardoso's government (1994–2002) that the INPE postponed the publication of the figures, alleging technical problems, and they were not published until 1998 (INPE, 1998). Knowing that these figures detailing the high levels of forest devastation would attract harsh criticism, Cardoso's government decided to increase legal restrictions on deforestation prior to their publication; notable, the obligatory preservation area on private property in the Amazon increased from 50% to 80% (Prates and Bacha, 2011). That measure could perhaps be interpreted as a strategy used by the public authorities to avoid being accused of environmental negligence and of not protecting the forest. In 2004, under the government of Luiz Inácio Lula da Silva (2003–2011), the INPE recorded the second highest Amazon deforestation figure, with over 27.7 thousand km of forest destroyed. In response to the worrying result and criticism from environmentalists, in 2004 the federal government instituted its Plan for the Prevention and Combating of Deforestation in the Amazon (PPCDAM), including coordinated action by various ministries (Mello and Artaxo, 2017). With the Amazon environmental policy of Lula's

government, Brazil managed to maintain a significant and prolonged decrease in deforestation in the Legal Amazon, a decrease of 80% compared to estimates for 2004 (27.77 thousand km) and 2012 (4.57 thousand km) (INPE, 2021).

Different factors contributed to this successful control of deforestation, but here we emphasize the strengthening of the Amazon transparency regime under Lula's government. The federal government successfully brought together social and environmental movements. Many activists left the opposition and supported the government, even taking on advisory roles and occupying high posts in government. This was the case of the environmental leader Marina Silva, who became the Minister of the Environment.

Heading up environmental policy, Marina Silva supported the monitoring of the forest by the INPE and actively contributed to making satellite imagery available to NGOs and environmental movements. Her arrival in government coincided with PRODES moving to a digital platform. PRODES started to convert, semi-automatically, satellite images of the Amazon into georeferencing data on deforestation (Rajão and Hayes, 2007; Kokubo, 2013).

This technical advance meant PRODES data could be made available in disaggregated form, which environmental movements had pushed for but which had been vetoed by the federal government in the interests of national security. From inside government, Marina Silva played a leading role in making INPE data on Amazon deforestation public. In 2003, Brazil went through a phase of opening up much of its government data, the Minister authorized the online publication of PRODES disaggregated data, making it possible for civil society to directly access records on destruction of the forest (Rajão and Georgiadou, 2014). The publication of disaggregated data immediately brought an explosion of collaborative activities between the INPE, the Ministry of the Environment and environmental NGOs like Greenpeace, Instituto de Pesquisa Ambiental da Amazônia [the Institute for Environmental Research on the Amazon] (IPAM), Instituto Socioambiental [the Socioenvironmental Institute] (ISA) and the World Wildlife Fund (WWF). These collaborations, in turn, allowed for the increase and diversification of analyses on deforestation of the Amazon which had direct repercussions on the elaboration of environmental policies. A special issue by the Instituto Socioambiental, ISA, 2003, for example, praised the availability of government data on the Amazon and used the data to show that conservation areas and indigenous reserves were a barrier to deforestation (ISA 2003; AE, 2003). Other papers confirmed the important role of these protected areas to the Amazon's preservation (Soares-Filho et al., 2010). Based on these studies, the PPCDAM suggested that protected areas be set up along roads built in the Amazon and around deforested areas to prevent further deforestation. While the creation of protected areas was a project of the previous government, the PPCDAM, launched in 2002, expanded its application. It defined over 50 million hectares as federal and state conservation units, and registered 10 million hectares of indigenous lands, mainly located in areas under pressure from deforestation (Mello and Artaxo, 2017).

The Amazon transparency regime was reinforced by the implementation of the Real Time System for Detection of Deforestation (DETER) in 2004. Supervisory bodies such as IBAMA and environmental NGOs had consistently complained about how slow PRODES data was to be published, taking an average of two years to be released (Rajão and Jarke, 2018). To try to overcome this obstacle, the DETER system alerts to deforestation almost in real time. Alerts are issued every 15 days, meaning that IBAMA, state environmental agencies and the Federal Police can punish deforestation almost instantaneously. Assunção et al. (2019) believe that DETER made processes faster and, consequently, made it easier to apply sanctions. Thus, it contributed to decreased deforestation in the Amazon. Speeding up the publication of data on deforestation also allowed the Ministry of the Environment to create instruments to increase the demands for concession of rural credits to those on the list of priority municipalities for preventive action and control of deforestation (Lima et al., 2009).

Since the 1980s, an infrastructure of scientific knowledge has been developed to digitalize the Amazon in response to deforestation (Edwards, 2010). This digitalization is connected to and reinforced by the “vast machine” that on a global level provides data for the production of climate models and provides information for stimulating consensus on environmental issues facing the planet that need to be mitigated, managed or governed (Monteiro et al., 2014).

In the case of the Brazilian Amazon, the State was instrumental in setting up an infrastructure of scientific knowledge about the forest. This infrastructure was reinforced by the actions of numerous NGOs and environmental movements, once they had access to government data on deforestation. Thus, as far as the Amazon is concerned, there was a direct relationship between the availability of government data on deforestation and increased activism related to protecting the forest.

Data from PRODES and DETER are widely used by organizations from various sectors, from banks and companies to environmental movements and NGOs involved in combating Amazon deforestation. A survey by the Brazilian NGO Imaflora shows that of the 11 initiatives analyzed, all use images and data provided by the INPE in their Amazon forest conservation activities (Velho et al., 2020). These activities are varied but are all related to environmental conservation. They include building of public data platforms, credit analysis, journalistic reports, technical standard reports, bulletins, academic texts, a variety visual resources, and tracking services for agricultural commodities. All the activities surveyed use data from PRODES. Of the 11 initiatives analyzed by Imaflora, nine use data from DETER. Just one of the initiatives said it uses images provided by private companies.

These results reinforce the fact that at the beginning of the 2020s, the Brazilian government is still the main provider of satellite images and data for environmental monitoring of the Amazon.

After three decades of the construction of a regime of truth about the Amazon based on digitalization and transparency, we see a picture emerging in which different activist groups use satellite images and data in their activities to combat deforestation. However, despite having an enviable knowledge infrastructure of the forest, Brazil is still seeing increased deforestation and fires in the Amazon and the INPE is going through one of its worst crises. This has been exacerbated by the arrival of an extreme right representative in Brazilian government, who is encouraging counter-activism in order to demand hypertransparency of the knowledge infrastructure of the Amazon.

### 3.2. Counter-activism and hypertransparency

The second socio-technical assemblage to be problematized on the digitalization of the forest is related to a time when the regime of truth about the Amazon was at an impasse because of the ascension of extreme right groups. Even in his campaign period, then presidential candidate Jair Bolsonaro promised the electorate that he would eliminate “Shiite environmental activism” and other matters that were part of Bolsonaro’s conservative thought (Seto, 2018). Since he came to power in the beginning of 2019, Bolsonaro has kept his promise. The environment is one of the areas most threatened by Bolsonaro’s conservative agenda and his official policy of denialism (Miguel, 2020).

The first two years of Bolsonaro’s government (2019–2020) were marked by successive actions to dismantle Brazilian environmental policy, especially with respect to the Amazon region. We identify in the actions of Bolsonaro’s government a general confrontational strategy which aims to go as far as ruining the transparency regime set up by the Amazon knowledge infrastructures, whose emergence we problematized in the previous section. These actions by Bolsonaro’s government embody an environmental counter-activism that clashes with the transparency regime initially optimized by digitalization of the forest and that, consequently, clashes with environmental governance of the Amazon.

Bolsonaro’s environmental counter-activism has targeted the INPE’s deforestation monitoring systems. In particular, he has publicly

questioned the credibility of the scientific data obtained from satellite images. The disparagement of the reputations of individual scientists and the institute itself were part of this strategy. We will now briefly mention three episodes of environmental counter-activism, which are directly or indirectly related to satellite images and data.

Firstly, we will talk about “the INPE under siege”, one of the first attacks by Bolsonaro’s government on Amazon governance. Then we will mention the attempts by the current government to privatize Amazon monitoring systems. Finally, we will discuss the militarization of mechanisms against deforestation, a process that is still happening and will soon give the military the capacity to produce data on Amazon deforestation.

These episodes express conflicts and disputes for the construction and establishment of “truth” about the Amazon, which are inseparable from its deforestation. In the Bolsonaro government, deforestation is seen as a positive practice, indicative of an index of economic development and political sovereignty. Supported by the belief that Brazil is one of the “world champions in environmental conservation,” Bolsonaro argues that the Amazon region should be explored by agribusiness, mining and logging. In this way, the discourse reactivates the developmental project motto of the civil-military dictatorship in relation to the Amazon: “integrate so as not to surrender” (Esteves, 2021).

#### 3.2.1. INPE under siege

In the first two years of his mandate, Bolsonaro and his ministerial team mounted a demoralization campaign against the INPE. The scale of the credibility attacks was in proportion to the publishing of alerts which indicated a huge upsurge in deforestation of the Amazon. In the spotlight of criticism was the Real Time Deforestation Detection System (DETER). Bolsonaro’s government questioned DETER’s technical processes, claiming that images used by DETER were of low resolution and, furthermore, that alerts were slow in being sent (Maisonnave, 2019). The government’s attack sought to undermine the whole data infrastructure of the Amazon, discrediting it using media channels.

After being announced as the new Minister of the Environment, the lawyer Ricardo Salles’ first statements to the press harshly criticized the INPE. He stated that the institute’s data on deforestation were “very generic” and “unqualified” and that they did not point out the location of deforestation. Therefore, it was impossible to tell whether logging was legal or illegal (CBN São Paulo, 2018). After May 2019, DETER issued alerts warning that Amazon deforestation could reach alarming levels, higher than had been seen since 2008 (INPE, 2021). Up until September of that year, the alerts continued to show a high level of deforestation. For 2019, PRODES estimated deforestation of an area measuring 10,129 km<sup>2</sup>, a Fig. 34.4% higher than that recorded in 2018 (7536 km<sup>2</sup>).

Whilst DETER was warning of the sudden advancement of deforestation in the Amazon, other ministers were joining Salles in publicly discrediting the INPE. The Chief Minister of the Cabinet of Institutional Security, General Augusto Heleno, told BBC News Brazil that the institute’s deforestation figures had been “manipulated” (Carmo, 2019). The Minister for Agriculture, Tereza Cristina, questioned the “solidity” of the INPE’s data, repeating the argument that the institute did not distinguish between legal and illegal deforestation (Coletta, 2019). The institute has continued to defend itself against these kinds of accusations, reaffirming the scientific credibility of methods used by DETER (Folha de S.Paulo, 2019).

The battle over scientific credibility reached a peak when President Bolsonaro himself accused the INPE of altering the “truth” about deforestation. In a press conference to foreign correspondents, Bolsonaro attempt to link the supposed deviance in figures to a “political” intention:

What happens with a lot of INPE reports like, for example, yesterday’s [18 July], is that they just copy the previous year’s reports. I even asked to be informed about who is managing the INPE. He will have to come and explain in person here in Brasília about this data

that the global press has been publishing, because I don't feel it is correct. I wonder if he is even working with some NGO, which is quite common here (Bolsonaro *apud* Bragança, 2019).

Those constant government disputes against the INPE lasted for almost two weeks, until the director of the institute, Ricardo Galvão, was forced to resign in August 2019. Minister Salles loudly affirmed that DETER's deforestation figures "did not reflect reality" and that the system was not up to calculating deforestation because it was designed to issue monitoring alerts. He also alleged that data was altered to create "media controversy" (Uribe and Brant, 2019).

To refute the significant increase in deforestation levels in June 2019 which had been alerted by DETER, the Minister of the Environment stated that the INPE statistics had been reviewed and found to contain many inconsistencies, but did not present what the alternative statistics on deforestation were.

With the exit of physicist Ricardo Galvão, the INPE was handed over to the military. Under the interim directorship of Airforce Colonel Darcton Damião, a "restructuring" of the institute led to the forced resignation of the Earth Observation Coordinator (OBT), Lúbia Vinhas, responsible for the PRODES and DETER programs (Girardi, 2020).

In addition, the INPE's 2021 budget for monitoring Amazon deforestation was reduced by 17.5% compared to total spending in 2020, which was R\$ 2.6 million. Specialists said it was the lowest budget figure for such programs in a decade (Prizibiszki, 2021).

### 3.2.2. Privatization of monitoring the amazon

In the midst of the orchestrated public demoralization of the INPE, Bolsonaro's government proposed the hiring of a new Amazon monitoring system. In July 2019, Minister Salles reported on negotiations with a geoprocessing company, Santiago & Cintra Consultoria, for the acquisition of access to high-resolution satellite images provided by the monitoring service of the US company Planet Labs.

Salles justified contracting the services of Planet based on technical matters. He said it would be a "real time system" that gave daily high-resolution images with a precision of 3 m, fed by "just over 100 satellites" (Schreiber and Fellet, 2019). He also stated that the Planet system would be used to validate the DETER data.

Although the name of Santiago & Cintra Consultoria was mentioned at that time, Salles had been toying with the idea of hiring a remote sensing service for the Amazon since he became Minister (Wenzel, 2018). Planet's office in Brazil was not unknown. A "free sample" of its services had been offered to IBAMA when, at the end of July 2019, the Minister used its images to contest data from DETER (Prazeres, 2019). The states of Mato Grosso and Pará had also tested their services, with the latter deciding not to hire those services because it considered INPE's systems sufficient to monitor and control deforestation (Borges, 2019).

Besides the Ministry of the Environment, other federal agencies were interested in Planet's services. Even if IBAMA did not hire its services, the Ministry of Justice and Public Security signed a service provision agreement for satellite images to the value of R\$ 49.7 million with Santiago & Cintra Consultoria. The Federal Police intends to use the satellite images to monitor illegal environmental activity in the Amazon, because it believes that the images provided by the INPE are not agile enough and are not of a sufficiently high-resolution to be used in police operations (Prizibiszki, 2020a).

The contract is under investigation in the Court of Auditors of the Union and has been widely contested by specialists in detection of deforestation, even more so because immediately after the negotiations, the government of Norway announced universal access, free of charge, to high-resolution satellite images produced by the companies Kongsberg Satellite Services (KSAT), Airbus and Planet to support the fight against deforestation of tropical forests (Prizibiszki, 2020a,; 2020b).

A study carried out by INPE's Laboratory for Investigation into Socioenvironmental Services (LiSS) compared the services provided by

the institute, using the DETER system, to that of a private company (SCC/Planet) using the DFLORA system. The year 2018 was used as a basis for the comparison, when the two systems were used by the state of Pará to monitor deforestation (LiSS, 2020). The authors sought to find which system was the most effective in informing alerts for control actions and which was the most cost-effective. In the comparison, DETER (INPE) system showed itself to be almost 30 times cheaper and three times more effective than the DFLORA (SCC/Planet) system.

### 3.2.3. Militarization of the protection of the amazon

The Amazon has always seen a high concentration of military personnel. However, since Brazil was re-democratized, environmental protection duties have been progressively passed over to civil institutions such as IBAMA, ICMBio and the Federal Police. With Bolsonaro's government, this process has gone into reverse. The overall strategy of filling empty federal administrative technical and specialist posts with officials from the military reserve force has been extended to protection of the Amazon.

This "remilitarization" of the Amazon has increased alongside the dismantling of environmental supervisory and control bodies. Management of environmental policy, previously the responsibility of the Ministry of the Environment, has been passed over to other bodies. At the beginning of 2020, the National Council of the Legal Amazon (CNAL) was created, presided over by the Vice-President, Reserve General Hamilton Mourão, who took over responsibility for government action against deforestation.

In its effort to militarize the protection of the Amazon, the Bolsonaro government has armed the military with more resources to use in forest monitoring. This includes the production of data on deforestation of the generated from images produced by their own satellites as presented in the introduction of this paper. To this end, in December 2020 the Ministry of the Defense purchased a microsatellite-radar from the Finnish company Iceye Oy. Since 2016, the Ministry of the Defense has had its own deforestation monitoring system, the Integrated Deforestation Alerting System (SipamSar). Initially, the system was intended to complement monitoring by INPE's DETER system, providing data obtained by radar satellites. These satellites allow the ground to be scanned even when there is cloud cover. The system is operated by the Amazon Protection System Management and Operation Centre (Censipan), which processes data generated by a technological infrastructure made up of orbital sensing, meteorological radars and the collection of data *in loco* to support the armed forces in protecting the Amazon and combating environmental crime in the region (Padilha, 2020).

The purchase of the micro satellite involved obscuring costs, false reports of budget cuts and dispensing with bidding for purchases, which all caught the eye of the press (Salomon, 2020). Specialists were highly critical of the satellite. As quoted in the introduction, one possible explanation is that the military seeks to replace monitoring by the INPE with its own Censipan system and to produce statistics that are not clear to civil society (Borges, 2020). The considerable investment on the satellite in this operation seems to corroborate this view: the satellite was bought for R\$ 179 million (US\$ 35.8 million), at the same time as the cuts to the INPE's budget.

## 4. Discussion: truth, government and subjects

In the previous section, we presented the Amazon digitalization process, triggered in the second half of the 20th century through satellite data that monitors deforestation. We associate the emergence and intensification of digitalization of the forest with two truth regimes: transparency and hypertransparency. In order to make the government of the Amazon effective, transparency and hypertransparency affirm and manifest specific truth about the forest in the consciousness of the subjects.

In the following discussion, we systematize and compare the features of these two regimes along four dimensions, as indicated in the

conceptual part and summarized below in Table 1. These dimensions are: the type of knowledge produced/used, the enabled technologies of government, the subjectivities or subject positions created and the visibilities resulting from the truth manifested. We elaborate that the “truth” about the Amazon forest constructed by remote sensing technology on deforestation is a contemporary form of alethurgy because technosciences and scientific knowledge act directly on the construction and expression of what has been held to be true opposed to the “invisible” or “unknowable” facts about the forest.

Foucault (2014) points out that there is no exercise of power without alethurgies. This is because the manifestations of truth, regardless of the forms they may take, are indispensable for the government of individuals. Alethurgies function as regimes of truth, as a background, as an attempt to affirm a world order. These orders assumptions provide references for the conducts through which “individuals are forced to perform under certain conditions and with certain effects, well-defined acts of truth” (Idem, p.86). On that basis, we observe in the conduct of deforesting or not deforesting a *truth act*, performed by the subjects aligned with a specific alethurgy of the forest.

Satellite remote sensing mediates a game of truth that makes “visible” what the human eye cannot or is unable to see. Satellite images are coated with the aura of scientific objectivity and neutrality, they are seen as decals of reality or “a kind of official pipeline to something happening half a world away” (Parks, 2005, p.95). These images navigate multiple circuits and they offer materiality for complex processes such as deforestation dynamics.

Foucault highlighted that alethurgy provides an “excess of truth” as complement to the utilitarian and calculating dimension of government (Foucault, 2014, p.5). Following Foucault’s thinking, we show that satellite remote sensing provides useful information for forest governance and in addition offers a “supplementary” or “surplus” attribute capable of affirming a “true” nature of the forest. Moreover, technoscience and remote sensing provide the indispensable “excess” for Amazon deforestation alethurgies.

The transparency regime emerged with the configuration of the knowledge infrastructure in the Amazon, thus marking the beginning of the digitalization of the forest. It was created in the context of mobilizations for the preservation of the forest, which were added to demands for social participation in environmental policy, stimulated by the redemocratization of Brazil (1985–1989). Anchored in satellite data produced by INPE, the transparency regime pursued the rationale that monitoring, combined with inspection, reduces deforestation in the Amazon. In this context, satellite images and data are taken as common goods, public and open data. The more public and open data produced by INPE became, the more transparency gained momentum and stimulated environmental activism. This served to further incorporate NGOs

and environmental movements into the knowledge infrastructure.

The immediate effect on technologies of government was the expansion of remote sensing combined to activism in practices of advocacy and enforcement in the Amazon by environmentalists, scientists, forest peoples and private companies. In this respect, the intensification of these groups’ activities increased efforts towards real time intervention for forest preservation and pressure against the state to stop illegal deforestation. In particular, pressure was placed on the armed forces, who have historically been present in the forest’s management.

The groups involved in the activism reinforce the view that the 80% reduction in deforestation rates observed in the period from 2004 to 2014 (Viola and Franchini, 2018) attests to the truth asserted by the alethurgy of transparency: a broad environmental governance guided by satellite data is the most effective management model for the Amazon forest, capable of preserving it, in compliance with the global sustainable development agenda. The truth manifested or resulting visibility is of the Amazon as a natural sanctuary, on whose preservation also depends on the salvation of the planet (Oliveira, 2020). For this alethurgy, the modulation of governance aims at democratization processes based on the expansion of participation in forest governance through data sharing. This process of participation through digitalization has become a validation mechanism for the production of knowledge on deforestation, as NGOs and movements have been incorporated into the infrastructure.

The transparency regime came under siege when far-right constituencies, opposed to environmentalism and sustainable development, came to power with the Bolsonaro government and began to construct an alternative regime of hypertransparency aimed at affirming an alternative truth about deforestation. Each truth regime frames a specific visibility. According to Rothe and Shin (2018), remote sensing always deals with produced visibilities. Companies treat satellite images as private goods, scientists and researchers reinforce environmental security discourses (Rothe, 2017). What the Brazilian military see in the images is likely to differ from what NGOs see.

In this sense we analyze the second alethurgy from the table involving the data presented in section 3.2 on the attacks by Bolsonaro’s government on environmental governance of the forest.

With the encouragement of a hypertransparency regime, we see a “new” truth, - a new “alethurgic circle that turns around it and accompanies it” (Foucault, 2014, p.17) - about the forest gaining ground. It is a truth that intends to perpetuate and recover principles of a national developmentalist attitude strongly promoted by authoritarian governments in Brazil during the 20th century. This includes the civil-military dictatorship that lasted until 1985 but whose structures were not fully discarded during the democratization period. The military apparatuses validate practices that see the forest as a means of encouraging economic

**Table 1**  
Amazon alethurgies.

| Truth Regime   | Knowledge produced/used  | Enabled technologies of government  | Subject positions created  | Truth manifested (resulting visibilities)   |
|--|--|---|--|---|
| <b>Transparency</b><br><i>Emergence of the knowledge infrastructure of the Amazon</i><br><i>Increase of social participation in environmental protection policies</i>            | <b>Public and open data</b><br><i>Data produced by public institutions</i><br><i>Disaggregated data shared with environmental enforcement institutions and civil society</i> | <b>Environmental governance</b><br><i>Broad participation</i><br><i>Real time intervention against deforestation</i><br><i>Alignment towards sustainable development principles</i> | <b>Environmental activism</b><br><i>Conduct towards forest protection and advocacy</i><br><i>Groups empowered: NGO’s, environmentalists</i><br><i>Scientists forest peoples, sustainable companies; activists, public managers</i> | <i>* Image of the Amazon as sanctuary, with limited areas to be sustainably developed</i> |
| <b>Hypertransparency</b><br><i>Emergence after Bolsonaro’s far-right government</i><br><i>Environmental policy over-complies legislation, which stifles economic development</i> | <b>Restricted Data</b><br><i>Data produced by private enterprise or the military</i><br><i>Restrict civil society access to data</i>   | <b>Development governance</b><br><i>Restricted participation of civil society</i><br><i>Tolerance towards deforestation</i><br><i>Defense of development and economic growth</i>    | <b>Counter- activism</b><br><i>Conduct towards constant auditing of science and deforestation data</i><br><i>Groups empowered: military, denialists, extreme right activists, agribusiness and extractivist private companies</i>  | <i>* Image of the Amazon as a strategic extractive resource</i>                           |

and social development in the Amazon. This mindset reflects the “long-standing nationalist rhetoric and sovereigntist discourses” that construct the Amazon region as an important site of national integration and identity (Oliveira, 2020).

Bolsonaro’s administration affirms that national legislation for deforestation is already substantial, for this reason, the law and the entire monitoring system are under permanent revision, and should not harm economic interests.

Since 2019, public debate has multiplied a series of claims to “audit” Amazon deforestation monitoring systems. This environmental conduct for a counter-activism sought to refute the scientific validity of the images and satellite data produced by INPE. The counter-activism questions the data quality, accuracy and veracity. In addition, Bolsonaro’s administration accused scientists of allying themselves with environmental NGOs to harm Brazil’s economic development. Although it is an argument promoted by Bolsonaro and his supporters, it found great resonance among the military, denialist specialists, extreme right activists, agribusiness companies, mining and logging companies, and entrepreneurs (e.g. small agricultural producers and wildcat gold miners).

For these groups, hypertransparency involves, paradoxically, restricted data and reduced participation. This is because of the strategic value of the Amazon for national interests. The purpose is to create jobs, privatize land, and incorporate traditional groups by expanding agribusiness and the extractive economic sectors. At the same time, hypertransparency reactivates authoritarian modes in order to favor military control and participation for the governance of the forest territory. Deforestation is a reality to be tolerated and managed. The resulting visibility affirmed is of the Amazon rainforest as a profitable arena to be liberated for wealth and economic emancipation.

## 5. Conclusion

Our study analyzed the shift in political uses of satellite data for the creation of knowledge infrastructures and alethurgies of the Amazon. These competing uses are associated with competing transparency and hypertransparency regimes and have fueled the contemporary struggle between activists and counter-activists over the truth constructed about the forest. Alethurgies of the Amazon use practices of transparency and hypertransparency, either to promote a global sustainability agenda or a nationalist developmentalist agenda based on the forest as an exploitable natural resource.

Our study has also identified conceptual and empirical specificities of the Brazilian case that lend themselves to cross-country comparison, with a view to differentiating the conceptual frameworks used to analyze knowledge infrastructures, alethurgies and their political uses by democratic, populist and authoritarian leaders. Another avenue for future research would be to develop a more explicit, normative position for poststructuralist critiques of populist or authoritarian truth regimes. While poststructuralists seek to de-construct what counts as truth, they should not be misunderstood as implicitly endorsing Bolsonaro’s and Trump’s attempts at destabilizing existing truth regimes upon which progressive claims concerning climate change or other rights are based. At the same time, poststructuralists must avoid the temptation to turn to positivism and realism in defense of climate change policies. Rather, the task for critique now is to destabilize and deconstruct populist and authoritarian truth regimes. While the approach adopted in this paper treats all truth regimes as social constructions, this does not necessarily mean that they are the same and deserve the same form of critique. In this article, we aim to lay the basis for a poststructuralist critique of authoritarian alethurgies by providing a conceptual apparatus for their analysis and, thus, destabilization. Elaborating this critique is the next step in this line of research.

## Authors contributions

M. Cecilia Oliveira: writing original draft, conceptualization, methodology, investigation, writing review and editing, translation, project administration, funding. Leandro Siqueira: writing original draft, conceptualization, methodology, inputs for review, data curation, visualization, investigation.

## Declaration of competing interest

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

## Acknowledgment

We would like to thank the editor and the two anonymous peer reviewers for the generous comments, thoughts, and guidance to review our early draft of this paper. We also thank the Ecopol team from IASS for valuable feedback and assistance. This research benefited from financial support of the Institute for Advanced Sustainability Studies, Potsdam.

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