Article

The Anthropocene and History: The Orbis hypothesis in the construction of a Latin American Environmental History

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Abstract

The article that follows aims to present, in general, some possibilities and limitations of the use of the Anthropocene concept by Environmental History, highlighting some epistemological disputes that still surround the term, such as the definition of a timeframe or its transdisciplinary use. And, more specifically, to explore the possibilities of using the *orbis hypothesis*, proposed as a timeframe for the Anthropocene in the construction of a Latin American Environmental History, highlighting the way in which it would enable the interdisciplinary epistemological convergence of biophysical parameters and indicators of ecosystem anthropization with the founding colonial socio-historical processes of modernity.

Keywords: epistemology; colonialism; interdisciplinarity; Latin America.

Antropoceno e História: *Orbis hypothesis* na construção de uma História Ambiental latino-americana

Resumo

O artigo que segue tem por finalidade apresentar, de forma geral, algumas possibilidades e limitações da utilização do conceito de Antropoceno pela História Ambiental, destacando algumas disputas epistemológicas que ainda circundam o termo, como a definição de um marco temporal ou seu emprego transdisciplinar. E, de modo mais específico, explorar as possibilidades de uso da *orbis hypothesis*, proposta de marco temporal para o Antropoceno, na construção de uma História Ambiental Latinoamericana, destacando o modo como este possibilitaria a convergência interdisciplinar epistemológica de parâmetros e indicadores biofísicos de antropização ecossistêmica com os processos sócio-históricos coloniais fundantes da modernidade.

Palavras-chave: epistemologia; colonialismo; interdisciplinaridade; América Latina.

Antropoceno e Historia: *Orbis hypothesis* en la construcción de una Historia Ambiental latinoamericana

Resumen

El artículo que sigue pretende presentar, en general, algunas posibilidades y limitaciones del uso del concepto Antropoceno por parte de la Historia Ambiental, destacando algunas disputas epistemológicas que aún rodean al término, como la definición de un marco temporal o su uso transdisciplinario. Y, más específicamente, explorar las posibilidades de utilizar la *orbis hipothesys*, propuesta como marco temporal del Antropoceno, en la construcción de una Historia Ambiental Latinoamericana, destacando la forma en que permitiría la convergencia epistemológica interdisciplinaria de parámetros e indicadores biofísicos. de la antropización de los ecosistemas con los procesos sociohistóricos coloniales fundantes de la modernidad.

Palabras-clave: epistemología; colonialismo; interdisciplinariedad; America Latina.

Before the consolidation of environmental history in the 1970s, manifest history, a historiographic practice that addressed major happenings and the "main events of its own time," dominated the historiographic debate from the late 19th century to the mid-20th century. In general, problems related to the natural environment were hardly ever mentioned, with historians remaining "purblind in considering environmental matters" (CROSBY, 1995, p. 1177-1181).

From the 20th century onwards, the development and evolution of subjects such as Archaeology, Ecology and Geography provided important contributions to History and to a nascent and still undefined Environmental History, contributing to the formation—initially in the United States—of this new field. Marc Bloch (2001 [1953]), heir to the *Annales* and the New History, stated as early as the 1940s that "without a doubt, human destinies are inserted in the physical world and suffer its influence" (p. 157). In the same period in Brazil, nature is also considered by a few historians (MARTINEZ, 2006; DUARTE, 2013).

The emergence of a public debate and the growing concern with environmental issues in the latter half of the 20th century sensitized some historians who, being chroniclers of their own time or, as Duarte (2013) would say, "unconditional lovers of the present" (DUARTE, 2013, p. 31), seek to respond historically to the latent questions of their life context.

Environmental history then starts taking on more defined contours with the rise of environmentalist movements and the new environmentalists (CROSBY, 1995), in the context of the Great Acceleration (PÁDUA, 2017; ACKER; FISCHER, 2018; ROBERTS; BOIVIN; KAPLAN, 2018), characterized by the striking and unprecedented increase in technological and industrial development, concentration of wealth, socio-environmental inequalities and exploitation of natural resources, as well as pollution and destruction of habitats, ecosystems and biomes.

Therefore, to some extent, environmental history is founded on the contemporary environmental crisis, when the latter took over the public debate more intensely in the late 20th century, becoming something very close to "a widespread concern of society" (CARVALHO, 2006, p. 254), contributing to the construction of an environmental rationality (LEFF, 2007).

Going on "to situate human institutions in a dialectic with natural contexts" (TURKEL, 2006, p. 267), environmental history would play an important role in political and management decision-making regarding environmental issues. Duarte (2013), a Brazilian environmental historian, states in this regard that "understanding the historicity of the relationships between society and nature can certainly provide us with tools to take a more critical stance towards debates about the environment" (DUARTE, 2013, p. 32).

Verena Winiwarter (2003), an Austrian chemical engineer and environmental historian, in turn, argues that

> […] humans are part of nature as much as they are apart from it. I am sure that the elucidation of their interaction over time produces necessary and relevant information for modern society attempts to develop a less unsustainable livelihood. (WINIWARTER, 2003, p. 4).

For Guldi and Armitage (2018), it "opens up new possibilities for the future, and […] clarifies the past with its clamor, its contradictions and its lies" (GULDI; ARMITAGE, 2018, p. 23). Worster (1991; 2012), for whom environmental history arises from strong ethical and political commitments, morally engaged, also ends up concluding that is has a potential educational role regarding environmental and climate issues and that the study of human relations with nature in the past has shown us, in different historical contexts, "models of successful adaptation" of societies to the environment (WORSTER, 2012, p. 381) which are less destructive to their natural surroundings.

As it naturally matured academically, the field increasingly expanded its agenda to include scientific commitment, rigorous analyses and interpretations and the construction of a solid theoretical and methodological framework, since "external legitimation, which arises from concrete social demands, despite being necessary and welcome, is not enough to give meaning and validity to the historian's work" (MARTINEZ, 2006, p. 13).

Challenged and stimulated by the interdisciplinary dialogue between natural and social sciences (SANTOS, 2010; LEFF, 2011; MORIN, 2014, 2015) and by the perception of the importance of the biophysical dimension in historical processes—called the *principle of interdependence* (WORSTER, 2012)—environmental history has aimed to enhance the understanding of the interrelationships between human societies and their natural environment over time, dealing with "the role and place of nature in human life" (WORSTER, 1991, p. 201) while breaking with a certain *paradigm of human immunity* (DRUMMOND, 1991) and with the idea of *human exemptionalism* (WINIWARTER, 2003), according to which the human experience hovers over an inert environment, with the environment around it as a mere backdrop to the unfolding of historical events.

Regarding possible and necessary dialogues with other disciplines such as Geography—less deterministic and more possibilistic, based on La Blache and Sauer—and the development of a more complex and comprehensive spatiotemporal approach, the Brazilian geographer Milton Santos (2006) argued that,

> since the concrete realization of history does set apart the natural and the artificial, the natural and the political, we should propose another way of viewing reality, opposed to this secular work of purification, based on two distinct poles. In today's world, it is often impossible for the common man to clearly distinguish between the works of nature and the works of men. […] (SANTOS, 2006, p. 65).

The *four-dimensional space* approach he proposed (SANTOS, 2004) rightly includes the *time* category in spatial analyses. This view is shared by Ana Carlos (2018), for whom socio-spatial relations can only occur in a space-time conjunction that inseparably interconnects past, present and future, and by Porto-Gonçalves and Quental (2012), according to whom actual geographic designations and demarcations occur, to a large extent, "based on sequential time frames" (PORTO-GONÇALVES; QUENTAL, 2012, p. 3). Environmental history, through its fruitful dialogues with Geography, would be better able to consider both the historicity of geographic space and the spatiality of historical phenomena as facets of the same reality.

Although a theoretical and methodological framework has been built in recent decades around a theory of environmental history, "the problem of finding a consistent theoretical framework encompassing natural sciences […] and the humanities" (WINIWARTER, 2003, p. 3) may continue being a problem for environmental historians as well. Regarding the production of environmental history in Latin America and the methodological possibilities to this end, Gallini (2020), a Colombian environmental historian, recently stated that,

> it still lacks methodological clarity. How is environmental history produced? […] There are few references available regarding the method of investigating, not to mention teaching, environmental history of and for Latin America […].[1] (GALLINI, 2020, p. 207, free translation).

However, these theoretical and methodological challenges can be met by enhancing interdisciplinary practices and multidisciplinary and transdisciplinary studies, and immersion in other areas that directly or indirectly involve environmental knowledge (NICOLESCU, 1999; MORAES, 2005; LEFF, 2007, 2011).

Among such possibilities, the Anthropocene, a transdisciplinary concept that initially emerged as a proposal for a new geological epoch, has become a very productive conceptual tool in environmental studies. It founds a specific historical period, marked by human ability to intervene deeply in the planet's ecological systems on an unprecedented global and temporal scale. In this sense and perspective, this article will present some proposals for the conceptual use of the Anthropocene, this most promising interdisciplinary tool for environmental history.

We will specifically explore the possibilities and limitations of using the Anthropocene in the construction of a Latin American environmental history by drawing on the Orbis hypothesis (LEWIS; MASLIN, 2015), a proposal for dating and understanding the Anthropocene. This hypothesis potentially enables the interdisciplinary epistemological convergence of biophysical parameters and indicators of ecosystem anthropization with the Latin American and colonial sociohistorical processes that founded modernity.[2]

Environmental history in Latin America

In addition to political and social movements related to environmental issues, some important epistemological changes regarding human knowledge are observed in the 20th century which, despite being previously created (PÁDUA, 2012), drive the emergence of this new environmental focus in historical research.

1 Original text: "a esta le sigue faltando claridad metodológica. ¿Cómo se hace historia ambiental? […] Son pocas las referencias acerca del método para investigar y menos aún para enseñar historia ambiental desde y para América Latina […]".

2 Methodologically, history usually calls *modern period* or *modernity* the period that follows the great Western events of the 16th century, such as the Age of Discovery, the rise of capitalism, the colonial systems and transatlantic slavery, up to the French Revolution in 1789, when the *contemporary period* begins.

Such changes consist especially in an altered perception and attitude towards the natural world (THOMAS, 2010) and in the terrifying realization of the human potential to intervene in the planet's natural processes, from the most basic degree to the deepest levels of geology and climate change across the globe, calling into question our very existence and that of other forms of life.

Also part of these epistemological changes are the crisis of the dominant paradigm of knowledge (SANTOS, 2010; MORIN, 2015) and its determinist and mechanistic pillars; the attribution of historicity to the concept of nature and to nature itself; the break with old chronological patterns with the rise of Geological Sciences; and the advancement of natural history, evolutionary theories, and natural sciences as a whole from the 19th century onwards (CROSBY, 2011; WORSTER, 2012).

In Latin America, environmental history has been expanding and establishing itself in recent decades, mainly around *Sociedad Latinoamericana y Caribeña de Historia Ambiental* (SOLCHA), which has been operating effectively since 2006 and whose growing publications largely originate from Mexico, Brazil, and Colombia (SÁNCHEZ-CALDERÓN; BLANC, 2019).

Simon Schama (1996), for whom environmental historians are overly catastrophist, stated that,

> although environmental history is one of the most original and thought-provoking histories being written today, it inevitably paints the same bleak picture: land seized, exploited, exhausted; traditional cultures that have always had a relationship of sacred reverence with the soil and were displaced by the careless individualist, the capitalist aggressor. (SCHAMA, 1996, p. 23)

In fact, although this cataclysmic character has been a general trend in Environmental History—considering that its main subject of research is a clearly devastated nature almost everywhere—in Latin American studies, a deeper view is taken of this environmentally tragic historical approach (SÁNCHEZ-CALDERÓN; BLANC, 2019).

Latin America bears the ills and bitterness of its subordinate entry into the global capitalist circuit of modernity from the 16th century. Its condition as a source of primary and natural resources and its colonialist past of socio-environmental overexploitation provided the modern world and global metropolises with inputs, land, servile labor and consumer markets for centuries.

This "generally negative narrative"[3] (GALLINI, 2020, p. 186, free translation), which is understandable, can be attributed to the "catastrophic trauma of the conquest"[4] (ALIMONDA, 2011, p. 21, free translation) and the historical subordination of the continent. For Todorov (2019), from his Eurocentric perspective, "it is the conquest of America that announces and founds our present identity" (TORODOV, 2019, p. 7)—although he does not make it clear who this "our" refers to.

3 Original text: "narrativa por lo general negativa".
4 Original text: "el trauma catastrófico de la conquista".

However, the colonial narrative of America as a kind of 'declensionist'[5] teleological history would be rooted in Latin American environmental historiography with a "likely physiological trend"[6] (GALLINI, 2020, p. 196, free translation), often disregarding that ecological and environmental issues are much more complex and multifaceted (LEFF, 2007).

Bearing in mind these and other epistemological issues in the construction of Latin American environmental history, we can consider some approaches and strategies that help go beyond Manichaean, simplifying and exclusively negativist analyses, revealing the historical complexity inherent to socio-environmental relationships (DIEGUES, 2008; ELLIS; RAMMANKUTTY, 2008; LEWIS; EDWARDS; GALBRAITH, 2015).

Taking Brazil as an example, this giant in people and land, considered the largest tropical country in the world and one of the largest consumers and holders of natural resources, is also a storehouse of socio-biodiversity thanks to its various tropical and subtropical biomes and ecosystems, and its many ecotones and vast swathes of tropical forest (although fairly devastated, like the Atlantic Forest).

According to Drummond (2002), these and other characteristics make Brazil—and Latin America—a field of research that is privileged and "highly suitable for environmental history studies" (DRUMMOND, 2002, p. 14). Recent human land settlement in Latin America is also highlighted as a special factor (ETCHEVARNE, 2016; BARRETO; DRUMMOND, 2017), given that anthropization was more recent and, in theory, generally less disrupting than in the rest of the world.

In addition to its natural traits, other factors derived from its colonial past make Latin America a distinct space for research in environmental history. The massive arrival of people from other parts of the world and the cultural, ethnic and also biological miscegenation, with the insertion of exotic and invasive species (CROSBY, 2011), the technical syncretism of land management and use and multiple environmental rationalities (LEFF, 2007) profoundly transformed these tropical ecosystems, making them unique. In this regard, Alimonda (2011) states that,

> in fact, the land that came to be known as "America" was the scene of what may have been the greatest succession of environmental catastrophes in human history: invasions of people, animals, plant species and diseases that devastated and subjugated its original populations[7] (ALIMONDA, 2011, p. 29, free translation).

Even before environmental history was institutionalized, according to Martinez (2006), "in Brazil, nature was an unavoidable subject and presence in historiography" (MARTINEZ, 2006, p. 27), since almost all economic activity was closely linked to the natural environment and primary resources, as were the organization and social dynamics of the inhabitants and

5 One that considers that the socio-environmental conditions of a space always tend towards degradation.

6 Original: "su probablemente fisiológica tendencia".

7 Original text: "en efecto, el territorio que vino a ser conocido como 'América' fue escenario de lo que quizás haya sido la mayor sucesión de catástrofes ambientales de la historia humana: invasión de humanos, de animales, de especies vegetales, de enfermedades que arrasaron y sometieron a sus poblaciones originarias".

the actual development of the identity of society and country. Over the centuries, everything somehow orbited the tropical nature.

These same distinct and unique characteristics that make Latin America a fascinating, creative and challenging field for environmental history also enable—and require—the construction of an original epistemology, adapted to this reality, reasonably detached and independent from other environmental historiographic trends that would normally dominate the theoretical and methodological field, like those of the global North in relation to the global South (FERNANDEZ; LAUXMANN; TREVIGNANI, 2014).

We must avoid what Alimonda (2011, p. 25) called the "globalocentric perspective" or the "Giddens effect."[8] Without us even realizing it, they end up reviving "the discursive devices of colonialism" by adopting a homogenizing perspective of modernity as a single, linear, teleological and progressive path. A modernity with a single narrative, as stressed by Porto-Gonçalves and Quental (2012), in which, according to Escobar (2005), "all cultures and societies in the world are reduced to a manifestation of European history and culture"[9] (ESCOBAR, 2005, p. 68 apud ALIMONDA, 2011, p. 25, free translation), or of the US.

In no way would it make sense to exclude the valuable theoretical contributions of these intellectual poles, which, by the way, are founders of an institutionalized environmental history. However, we cannot lose sight of the importance of building native methodologies and epistemologies that are distinctive and coherent with the historical and ecological specificities of Latin America and Brazil.

In any case, these Latin American particularities and possibilities "immediately eliminate the risks of an 'imitation historiography' or academic mimicry of European and US intellectual fashions" (MARTINEZ, 2006, p. 26). Brazilian historiographical practice has always welcomed the diverse contributions of these knowledge-producing centers. But we are certainly capable, for the reasons explained above, "within the scope of environmental history, of offering more than what we receive" (MARTINEZ, 2006, p. 37).

The Anthropocene as a Historical Period

At the core of the concept of the Anthropocene lies the debate on the role of humans in nature. Paul Crutzen and Eugene Stoermer (2000), who coined the term, in evaluating some global indices such as demographic growth, resource exploitation, urbanization and several other anthropic impacts, observed that humans might be the major cause of climate change, impacts on ecosystems and profound changes in global natural systems. At that time, they concluded that:

8 He refers to the theses on modernity and globalization of the British sociologist Anthony Giddens (GIDDENS, 2012).

9 Original text: "todas las culturas y sociedades del mundo son reducidas a la manifestación de la historia y la cultura europeas".

> Considering these and many other major and still growing impacts of human activities on earth and atmosphere, and at all, including global, scales, it seems to us more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to use the term 'anthropocene' for the current geological epoch (CRUTZEN; STOERMER, 2000, p. 17).

This supposed new geological epoch, characterized by the acceleration and intensity of anthropic impacts and changes on ecosystems and the planet as a whole, was initially proposed based on the alarming atmospheric CO_2 and CH_4 concentrations that appeared on charts as of the 18th century (CRUTZEN, 2002).

The period coincides with an Industrial Revolution experienced in that century, and although it has not been officially approved as a geological epoch by the International Commission on Stratigraphy (ICS), the Anthropocene has become much more than a stratigraphy proposal. Stratigraphic markers imprinted on rock are not necessarily the only possible signs of the emergence of a new phase in world history. And the term has also been used extensively in environmental history and other sciences. According to Erle Ellis (2018), "the significance of the Anthropocene resides in its role as a new lens through which age-old narratives and philosophical questions are being revisited and rewritten." (ELLIS, 2018, p. 4).

The Anthropocene is today a conceptual tool used by different areas of knowledge, not only in natural sciences but also, and especially, in socio-environmental studies. It is proposed as a new benchmark for narratives of the relationships between societies and natures and as a new scientific paradigm. For Ailton Krenak (2020, p. 58), an indigenous intellectual, the concept has also "an incisive meaning" about the existence and self-perception of being human.

To a certain extent, and perhaps contradictorily, the adoption of the Anthropocene may seem to reinforce old anthropocentric conceptions. Even after the dissolution of religious paradigms of human supremacy by Enlightenment thought and evolutionary theories (DUARTE, 2009) and the consequent realization that we are really just another species in a complex and interdependent global ecological system, this would convince us even more that we are not a species like all the others.

We have the formidable ability not only to modify our ecological niches, but to build them ourselves in a process that Roberts, Boivin and Kaplan (2018) call niche construction. These are skills that we share with no other species, performed by means of the incredible human tool that is culture. We are equally capable of altering planetary biogeochemical cycles, the ecological dynamics of other species and climate itself, forcing the global system beyond its natural variations (LEWIS; MASLIN, 2015).

According to Ellis and Ramankutty (2008), "Homo sapiens has emerged as a force of nature rivaling climatic and geologic forces in shaping the terrestrial biosphere and its processes" (ELLIS; RAMANKUTTY, 2008, p. 439). For Chakrabarty (2009), an Indian historian, the confirmation of human interference in climate change causes another fundamental epistemological

reversal in history in the 20th century. These findings, by generating the Anthropocene paradigm, lead to the collapse of the "age-old humanist distinction between natural history and human history" (CHAKRABARTY, 2009, p. 201), giving more momentum to and further promoting production in environmental history.

The multiple time frames of the Anthropocene and the Orbis hypothesis

However, the periodization of the Anthropocene—as well as several other matters concerning this concept—remains unresolved among the scientific community and there are many proposals for its dating. Some scholars propose time frames based on different parameter from those of Crutzen and Stoermer (2000), but none of them seems to meet the geologic and stratigraphic requirements needed to be approved as a new geologic epoch according to the criteria of the ICS and of the International Union of Geological Sciences (IUGS).

Nonetheless, like Ellis (2018), many people argue that the evidence of human influence on natural systems is not limited to atmospheric markers or fossil records, since "anthropogenic global environmental change was a multidimensional process" (ELLIS, 2018, p. 55). The importance of the Anthropocene would reside much more in its adoption as a key concept in the analysis of human impacts on the natural world than in the formalization of a geological epoch (ROBERTS; BOIVIN; KAPLAN, 2018).

The choice of formal dating for the Anthropocene, therefore, is not merely a geological convention whose influence is restricted to its respective academic niches. The Anthropocene reveals the unprecedented impacts of humans on the planet, affecting all life on it and raising very important questions in different fields of knowledge, such as the role of humans in the world and the relationships between cultures and nature.

According to Lewis and Maslin (2015), in addition to affecting certain social and philosophical issues, the time frames chosen might influence the global economy and geopolitics, with potential, for example, both to trivialize climate change and to attribute historical responsibilities for carbon dioxide emissions. The authors highlight the potential of the concept far beyond the field of geology:

> More widespread recognition that human actions are driving far-reaching changes to the life-supporting infrastructure of Earth may well have increasing philosophical, social, economic and political implications over the coming decades (LEWIS; MASLIN, 2015, p. 178).

There are many proposals for dating and establishing a GSSP[10] for the Anthropocene: the advent of agriculture and the domestication of species, around 10 thousand years ago (THOMAS, 2010); the megafauna extinctions, around 14 thousand years ago (LEWIS; EDWARDS; GALBRAITH, 2015); the formation of anthropogenic soils, between 3 thousand and 500 years ago; or even the atomic bomb of 1945 (ROBERTS; BOIVIN; KAPLAN, 2018).

Simon Lewis and Mark Maslin (2015), researchers at the Department of Geography at University College London, in a study published in *Nature* magazine, discard some dating proposals, among them the proposition of the study group indicated by the ICS, for whom the beginning of the Anthropocene is the Industrial Revolution (18th century). For the authors, that event was not global, but rather localized, diachronic and Eurocentric, "not derived from a globally synchronous marker" (LEWIS; MASLIN, 2015, p. 177).

They defend, in turn, dating it from the 17th century, with the year 1610 as the formal beginning of the Anthropocene. According to their Orbis hypothesis, as they called it, that year there was—based on independent records of Antarctic ice—a sudden drop in atmospheric CO_2 levels, a peak they called the Orbis spike. Between 1570 and 1620, concentrations of the gas fell by 7 to 10 p.p.m. (ROBERTS; BOIVIN; KAPLAN, 2018) and, from then on, showed a sharp and constant rise.

This variation was attributed to the "largest genocide in the history of humanity" (TODOROV, 2019, p. 5), with the consequent rapid and sharp decrease in the native populations of the Americas in the first decades of contact with Europeans. An event that, according to Denevan (1992), was "probably the greatest demographic disaster ever" (DENEVAN, 1992, p. 370). For Krenak (2020), the Anthropocene is marked "as the event that brought captured worlds into contact" (KRENAK, 2020, p. 71) with the Old World, during its "cycle of explorations."

The extermination of the original peoples of the Americas during their invasion by European navigators was a direct result of the "most surprising encounter" (TODOROV, 2019, p. 5) in human history: the "collision of the Old and New Worlds" (LEWIS; MASLIN, 2015, p. 175). For Ellis (2018), it was "the first substantial two-way exchange of culture and biology between Europe and the Americas" (ELLIS, 2018, p. 95).

Roberts, Boivin and Kaplan (2018) mention that pre-Columbian tropical management, transformations and deforestation were so intense that, following the sudden reduction of the Amerindian population (DENEVAN, 1992; LEWIS; MASLIN, 2015) through wars, diseases, enslavement or eviction from the land, the agriculture of native peoples almost ceased, followed by a short period of spontaneous recovery of the ancient tropical forest anthromes[11] (ELLIS; RAMANKUTTY, 2008), resulting in the regeneration of more than 50 million hectares of vegetation (LEWIS; MASLIN, 2015).

10 Global Boundary Stratotype Section and Point (GSSP). A reference point at a stratigraphic level defining the beginning or lower limit of a period of geological time.

11 Anthropogenic biomes and forests managed by pre-Columbian American peoples.

The great explorations of the 16th century—the start of the Anthropocene, according to the Orbis hypothesis—and the subsequent colonial system, "the first global trade networks linking Europe, China, Africa and the Americas" (LEWIS; MASLIN, 2015, p. 174), which also came to include two large communication and exchange networks hitherto isolated from the Old World, the Anáhuac and the Tawantinsuyu (PORTO-GONÇALVES; QUENTAL, 2012), impacted the earth system as a whole. By displacing the largest number of human and non-human populations in the previous 13 thousand years, they caused the most impressive intercontinental biological exchanges ever seen until then, such as the profound change of affected ecosystems, the promotion of biota homogenization (CROSBY, 2011) and the foundation of this new configuration of the modern-colonial world system based on the conquest and invention of America (O'GORMAN, 1992; PORTO-GONÇALVES; QUENTAL, 2012).

Considering that it is common practice in environmental history to adopt "an Anthropocene" that best reflects the research subject in question (MCNEIL, 2019), the Orbis hypothesis is a coherent theoretical option for Latin America, synchronizing important chemicals markers of ecosystem impacts on the Earth's system with the colonial historical phenomena at the origin of modernity and the degradation of Latin American tropical ecosystems.

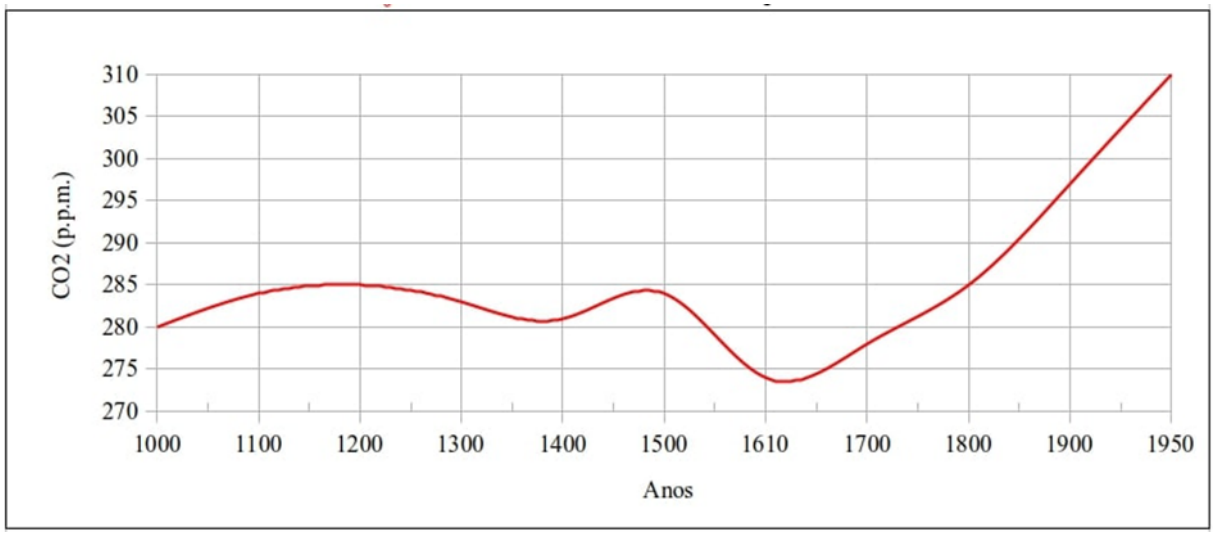
Starting with the colonial collapse, the proposed dating of an Anthropocene harmonizes in an interdisciplinary manner (NICOLESCU, 1999; MORAES, 2005; LEFF, 2011) the physical-chemical evidence of ecosystem anthropization with the socio-historical processes of global and synchronic colonialist dynamics in the Americas and the rest of the world.

Among the proposed dates analyzed in the studies by Lewis and Maslin (2015), only the Orbis spike (1610) and the Bomb spike (1964) "appear to fulfil the criteria for a GSSP to define the inception of the Anthropocene" (LEWIS; MASLIN , 2015, p. 177), presenting not only geological but also historical relevance. The Bomb spike coincides with the period of the Great Acceleration (STEFFEN et al., 2015), an equally important concept in the context of Latin America, as it also marks with quantifiable indicators a developmental period, historically situated and relevant, around 1950.[12]

In Graph 1 below, according to the Orbis hypothesis, we see a sharp drop in atmospheric CO_2 concentration (red line) around the beginning of the 17th century (Orbis spike), caused by forest regeneration after the Amerindian hecatomb a century earlier and followed by the progressive increase of this same index in the following centuries, with the constant forest degradation caused by the colonial venture. The beginning of the Anthropocene would represent this moment of the first impacts of colonial invasions and the beginning of the process of biotic homogenization.

12 Some proposals suggest it as the starting point of the actual Anthropocene, this being the moment in which radioactive isotopes from the first nuclear bomb detonated in 1945 spread, entering the sedimentary record and becoming an anthropogenic marker. (LEWIS; MASLIN, 2015).

Graph 1 – Atmospheric CO_2 concentration and the beginning of the Latin American Anthropocene.



Source: Lewis and Maslin (2015).

Acker and Fischer (2018, p. 310) consider the inclusion of the global South and Latin America in the research agenda on the Anthropocene to be an imperative in the "anthropocenic narrative." Thus, a conception of the Anthropocene that is guided by relevant biophysical markers and focuses on the maritime expansion, the colonial issue—key aspects to the construction of modernity—and the great ecological collapses in the Americas (Abya Yala) is a coherent theoretical choice in research in Latin American environmental history.

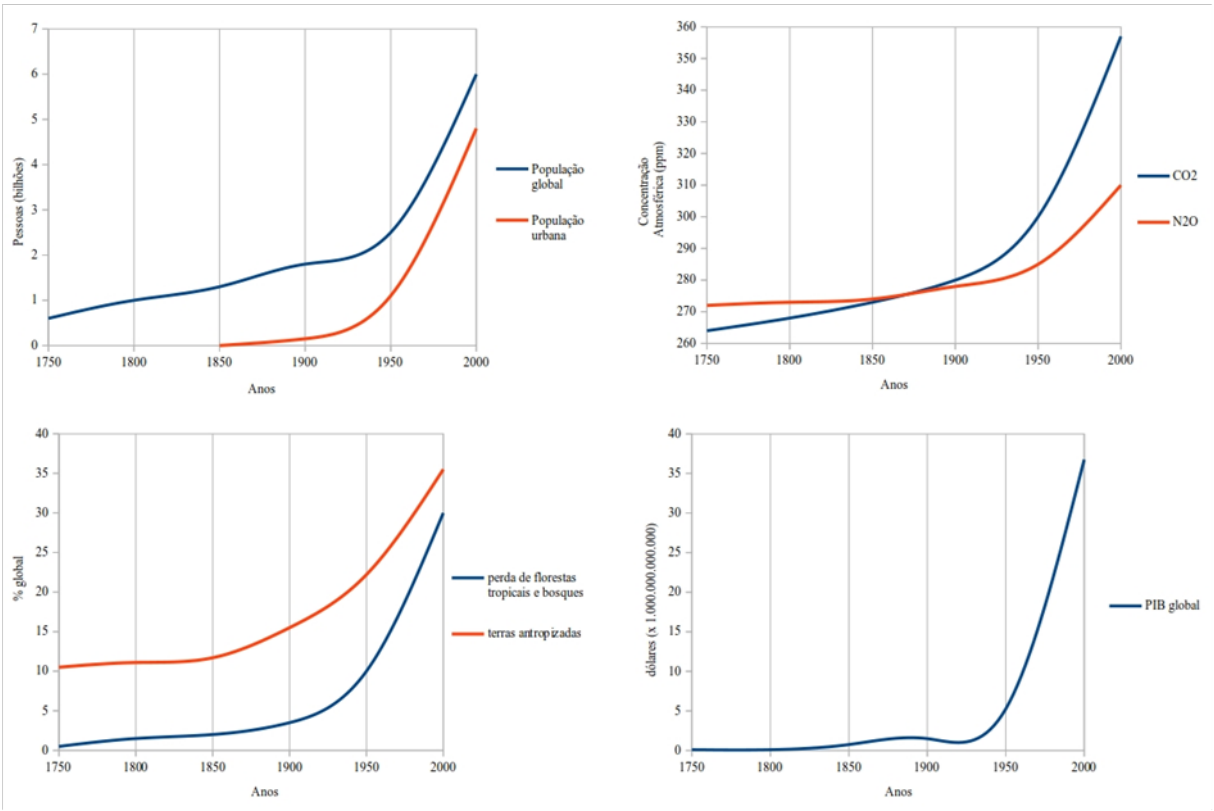
The subdivision of the Anthropocene conventionally called the Great Acceleration (STEFFEN et al., 2015) is also an interesting conceptual tool in Latin American studies. It relates to the period spanning from the mid-20th century to the present and is marked by the exponential growth in the consumption of fossil fuels and the sharp increase in several indicators of human activities[13] that coincide with other ecosystem indices[14] (ELLIS, 2018).

All these indicators show progressive increase from the 18th century. However, in the mid-1950s, most of them suddenly display an ever sharper rise (LEWIS; MASLIN, 2015; STEFFEN et al., 2015), as seen in the graph below (Graph 2).

13 Population growth, GDP, industrialization, foreign investment, dammed rivers and water use, fertilizer consumption, overall consumption, structural interventions in ecosystems, urbanization, number of motor vehicles, consumption of fossil fuels, among others.

14 Concentration of atmospheric gases (NH_4, CO_2 and N_2O), depletion of the ozone layer, average temperature, floods, decreased biodiversity, ocean fishing, nitrogen flow, cultivated land, deforestation, loss of tropical forests, etc.

Graph 2 – Some global changes, characteristic of the Great Acceleration period.



Source: Steffen et al. (2015).

Acker and Fischer (2018) argue that the Great Acceleration was more pronounced in the global South, an underdeveloped region of sudden industrialization. In Brazil, a few specific aspects of this process can be highlighted, such as the construction of hydro power plants; the blind and intense adoption of the principles and models of the Green Revolution; mining and other extraction activities; and consumption of fossil fuels, especially oil. Other large infrastructure projects, industrialization and disorderly urban growth can also be mentioned (PÁDUA, 2017; ACKER; FISCHER, 2018).

Brazil—and other countries in Latin America—would thus have "a peculiar, double-edged position in the Anthropocene" (ACKER; FISCHER, 2018, p. 310), since it is one of the largest global producers of commodities and natural resources and, recently, also one of the largest consumers. For Pádua (2017), the Great Acceleration is the world of social democracy, in which consumption levels and unequal accumulation of wealth also exploded. All of this accompanied by an outbreak of developmental optimism, supported by a discourse of abundance (and waste) in the form of "dreams of state-led industrialization" (ACKER; FISCHER, 2018, p. 312) and by a clear significant increase in the degradation of natural ecosystems and forest exploitation.

Like the Anthropocene proposed by Lewis and Maslin (2015), the Great Acceleration is an important conceptual and periodization tool for environmental history research in Latin America, as it delimitates with quantifiable and verifiable indicators a historically situated period, also perceptible in historical sources, characterized by urban, industrial and population growth, generating in turn a number of conflicting socio-environmental processes.

Therefore, in the Great Acceleration period (approx. 1950), quantitative indicators converge conceptually and methodologically—as demonstrated by the Orbis hypothesis thesis and the socio-environmental indicators presented above (LEWIS; MASLIN, 2015; STEFFEN et al., 2015)—with the socioeconomic and environmental conditions of that region, in the historical context in question.

A few essential remarks about the Anthropocene

Regarding the Anthropocene, Chakrabarty (2018) states that "the Anthropocene is the perhaps the only term of geological periodization that has been widely debated among humanists" (CHAKRABARTY, 2018, p. 5), while Lewis and Maslin (2015), when referring to the debate about dating and formal indicators for the Anthropocene, state that these "definitions will probably have effects beyond geology" (LEWIS; MASLIN, 2015, p. 171).

From the moment the term Anthropocene goes beyond the field of geology to be appropriated by other areas of knowledge, it is natural that it will suffer some criticism—which in no way invalidates its theoretical potential (BAER, 2017). However, two caveats regarding its use are relevant and should be mentioned.

The first relates to the anxious search for IUGS approval of the concept by some researchers as a means of legitimizing it. John McNeil (2019), an American environmental historian and member of the Anthropocene Working Group (AWG), a body of the IUGS, reminds us that, for geology, "no matter how much evidence there may be to suggest a given slice of recent time is distinctive in the history of the Earth, without a GSSP there can be no Anthropocene" (MCNEIL, 2019, p. 204). Which is understandable within the scope of geological sciences, given the importance and consequences of the consolidation of a new stratigraphic epoch based on the conception of geological time.

However, as a historical period whose striking characteristic is the unprecedented human potential for intervention in the environment, the Anthropocene is a perfectly reasonable concept and does not require the approval protocols of any bureaucratic technical committee (ELLIS, 2018; MCNEIL, 2019). Historical time is theoretically and methodologically different from geological time (BRAUDEL 2015 [1949], 1958; DRUMMOND, 1991; CADIOU et al., 2007; GULDI; ARMITAGE, 2018). *World* time, therefore, is different from *Earth* time (CHAKRABARTY, 2018).

Historical time is complex, discontinuous, socially differentiated, ecologically connected, contingent and contextualized. It is constructed dynamically and dialectically in academic practice rather than through criteria and protocol quantifications fixed by convention and consensus. McNeil (2019) discusses the different views of these two conceptions of time:

> Historians are uncomfortable as well as unfamiliar with such rules about periodization. We are more anarchic. No official body claims jurisdiction over periodization. There are no votes. And we don't care about synchronicity […]. So it is hard for historians to accept an Anthropocene that corresponds to the formal requirements of geology. (MCNEIL, 2019, p. 205).

The same author states that he does not believe that the term will be formally approved by geology, based on his years of participation in the AWG. However, he attests that the concept, particularly among the humanities, will continue to be used regardless of approval by the IUGS:

> But in any case, the Anthropocene of the humanists is immortal. They do not need geologists to recognize the Anthropocene formally and will continue to use the term freely, with no fixed definition, for the indefinite future. Many environmental historians will do so as well. (MCNEIL, 2019, p. 205).

Gallini (2020), in reflecting on the perception of historians about periodization and the debate around the legitimation of the Anthropocene concept, takes an equally firm stance:

> The decision on the "existence" of the Anthropocene is hierarchical, bureaucratic and based on specific empirical evidence, validated by a handful of experts from one of the branches of geology. This is evidently inconceivable to any historian in his right mind. […] Stratigraphers don't care why they measure; they only care about the measurement itself[15] (GALLINI, 2020, p. 214, free translation).

The second consideration, and perhaps the most important and central, is the claim that the Anthropocene homogenizes the human experience in its relationships with the environment—which seems to have occurred in the idealization of the Holocene (BAER, 2017; PÁDUA, 2017). This would result, epistemologically, in the construction of a reductionist, naturalistic and biologizing history of the human species (CHAKRABARTY, 2018; ELLIS, 2018).

15 Original text: "La decisión sobre la 'existencia' del Antropoceno, además, es jerárquica, burocrática y basada en una evidencia empírica específica, validada por un puñado de especialistas en una de las ramas de la Geología. Esto es evidentemente inconcebible para cualquier historiador en su sano juicio. […] a los estatigrafistas no importa el porqué de lo que miden, sino la medición".

In addition to the above, from a sociological point of view, this would annul the idea of distinct accountability for anthropic impacts on ecosystems, derived from ecologically unequal exchanges (MONTIBELLER FILHO, 2004; MARTINEZ-ALIER, 2011), and for the production of the global crisis. It would be, as Gallini (2020, p. 214) states, "the univocal accountability of humans"[16] for the environmental crisis and global change.

According to Pádua (2017), social scientists have been asking: "who does "anthropos" refer to in Anthropocene?" (PÁDUA, 2017, p. 3). In response to attempts to simplify and reduce sociocultural complexities and diversities in favor of a human species, we ask: who and where is this subject, man or human being, this generic being that is so ecologically the same everywhere? Krenak (2020), who believes we must oppose this "molded idea of homogeneous humanity" (KRENAK, 2020, p. 24), argues that this monolithic perception of humanity and nature would be the "deepest mark of the Anthropocene" (KRENAK, 2020, p. 58).

The environmental impacts on the world are not uniform and not all human beings are equally responsible for them. Countries have different responsibilities, as have specific social classes within each nation. Regarding diachronic accountability for the climate crisis, Guldi and Armitage (2018) state that "thinking in terms of species" (GULDI; ARMITAGE, 2018, p. 112), supporting a biology-based approach, is nothing more than a "comfortable excuse" for the West.

The anthropization of natural systems is a social phenomenon. Its consequences are also biological and biophysical, but it is a human phenomenon with human causes and therefore, above all, a socio-environmental issue. The very idea of stratigraphic markers of geological scales tends to homogenize human experiences, as if such changes occurred everywhere in the same way and at the same time, in a synchronous and omnipresent manner (ELLIS, 2018; MCNEIL, 2019).

The anthropogenic phenomena of exploitation and consumption of natural resources, industrial and agricultural production, pollution and atmospheric emissions are quite unequal between and within nations. Equally unbalanced are the scientific contributions and intellectual efforts in the construction of knowledge and ideologies that constitute what might be called Anthropocene Culture (PÁDUA, 2017).

If the social and ecological consequences of the global crisis and climate change apparently do not recognize national borders (GIDDENS, 2012; CHAKRABARTY, 2018), certainly the generation and origin of the impacts and responsibilities of the crisis have very clear definitions and geopolitical boundaries (LEFF, 2007; ALIMONDA, 2011).

16 Original text: "la responsabilización unívoca del ser humano".

Conclusions

Environmental history, as a branch of institutionalized and consolidated knowledge, started to establish itself in the 1970s when it emerged as a "self-conscious historiographic field" (PÁDUA, 2012, p. 17) in response to the contemporary environmental crisis that took over the public debate.

The birth of this field of knowledge was only possible due to a number of sociocultural and geopolitical changes happening up to the 20th century, which in turn brought about significant epistemological changes in knowledge and modern science. This was undoubtedly reflected in the field of history, which began to indicate an internal reorganization, theoretically and methodologically.

As in other academic and scientific fields of knowledge, historians of their own times, attentive to the present and challenged by new environmentalisms and the debates on the global crisis then in evidence, strive to respond historically to current latent issues. However, as environmental history is a relatively new and eminently interdisciplinary knowledge, it still faces theoretical and methodological challenges.

Regarding the environmental history of Latin America, its colonial historic condition, added to its tropical nature, resulted in a unique case full of particularities for historical environmental studies. Along with the recognition of its historical, ecological and socio-environmental specificities, other epistemological challenges are added to the production of this knowledge.

The Anthropocene, this intrinsically transdisciplinary conceptual tool, offers a wealth of possibilities in environmental studies and especially in environmental history by suggesting the emergence of a new historical period marked by human ability to intervene in the dynamics of global ecosystems, as never before. Despite being fairly consolidated in various fields of knowledge by now, the concept is still burdened with limitations and disagreements, including its time frame, the search for technical legitimation, the trends towards biology-based approaches or the search for a reductionist and homogenizing history of the human species.

Among the many starting dates proposed for the Anthropocene, the Orbis spike (1610) and the Bomb spike (1964) (LEWIS; MASLIN, 2015) stand out for their contribution to the historical understanding of Latin America. Both are suggested by the Orbis hypothesis, based on anomalies in atmospheric CO_2 concentrations, reflecting significant global historic events, especially for Latin America: American colonialism and 21st century developmentalism, marked by the Great Acceleration, respectively.

We therefore defend, for the reasons explained above, the convenience of adopting the Anthropocene as a conceptual tool in environmental history studies—albeit recognizing and emphasizing its limitations and main criticisms—as well as the possibilities and coherence in using the Orbis hypothesis in the construction of a Latin American environmental history, in tune with its historical and ecological peculiarities.

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