Andean Geology 51 (2): 271-295. May, 2024
doi: 10.5027/andgeoV51n2-3676

Andean Geology
www.andeangeology.cl

Intertwining volcanoes and society in Chile through arts and interdisciplinary connections

Valentina Acuña[1, 2], *Matías Clunes[3, 4], Sebastián Riffo Valdebenito[5], John Browning[4]

[1] *Instituto de Sociología, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Macul, Santiago, Chile.*
vmacuna@uc.cl

[2] *Centro de Investigación para la Gestión Integrada del Riesgo de Desastres (Cigiden), Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Macul, Santiago, Chile.*

[3] *Rock Mechanics Laboratory, School of the Environment, Geography and Geosciences, University of Portsmouth, PO1 3QL, Portsmouth, United Kingdom.*
matias.clunes@port.ac.uk

[4] *Departamento de Ingeniería Estructural y Geotécnica y Departamento de Ingeniería de Minería, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Macul, Santiago, Chile.*
jbrowning@uc.cl

[5] *Centro de Investigación para la Gestión Integrada del Riesgo de Desastres (Cigiden), Unidad de Artes y Desastres (Desartes), Av. Vicuña Mackenna 4860, Macul, Santiago, Chile*
sebastianriffo1987@gmail.com

** Corresponding author: matias.clunes@port.ac.uk*

ABSTRACT. The conceptual distance between nature and society has been a concern within social sciences and interdisciplinary debates. We contribute to this discussion illustrating how arts have played an important role in demonstrating the entanglement of Earth and society through their ability to frame and shape the dynamics of the Earth across sensations. Through an examination of artistic representations in Chile, we seek to show how the proximity of Chilean society to the presence of volcanoes has been eloquently conveyed through various artistic styles across different historical epochs. Our study extends from the birth of the Chilean nation in 1818 to the year 2021, and examines a wide range of artistic representations, that encompass national symbols, image-making techniques, sculpture, art installations, poetry, music, and audiovisual works. Our research represents a pioneering effort to explore the diverse representations of volcanoes in Chile and has uncovered a remarkable diversity of artistic expressions that reflects the deep connection between Chilean society and volcanic processes and landscapes. Ever-present and often breathtaking, volcanoes have served as enduring symbols of national identity and as sources of inspiration for artists of diverse disciplines and aesthetic sensibilities. We illustrate how the arts reveal the relationship between volcanoes and social life and provide the basis for a detailed analysis that explores the temporal and spatial contexts in the representation of volcanoes and the human perception of geological phenomena in Chilean culture.

Keywords: Volcanoes, Arts, Interdisciplinarity, Geology.

RESUMEN. Entrelazando volcanes y sociedad en Chile a través de las artes y conexiones interdisciplinarias. La distancia conceptual entre naturaleza y sociedad ha sido una preocupación dentro de las ciencias sociales y los debates interdisciplinarios. En este trabajo, contribuimos a esta discusión ilustrando cómo las artes han jugado un rol importante en demostrar la interconexión entre la Tierra y la sociedad mediante su capacidad para enmarcar y moldear las dinámicas terrestres con las sensaciones. Por medio de la examinación de representaciones artísticas en Chile, este trabajo busca mostrar cómo la proximidad de la sociedad chilena a la presencia de volcanes ha sido elocuentemente transmitida a través de diversos estilos artísticos a lo largo de diferentes épocas históricas. Este estudio se extiende desde el nacimiento de la nación chilena en 1818 hasta el año 2021, e investiga una amplia gama de representaciones artísticas

que abarcan símbolos nacionales, técnicas de creación de imágenes, esculturas, instalaciones artísticas, poesía, música y obras audiovisuales. Esta investigación representa un esfuerzo pionero para explorar las diversas representaciones de volcanes en Chile y descubre una variada diversidad de expresiones artísticas que reflejan la profunda conexión entre la sociedad chilena y los procesos y paisajes volcánicos. Los volcanes, siempre presentes y a menudo impresionantes, han sido símbolos perdurables de la identidad nacional y fuentes de inspiración para artistas de diversas disciplinas y sensibilidades estéticas a lo largo del periodo analizado. Este trabajo ilustra cómo las artes revelan la relación entre los volcanes y la vida social, y proporciona la base tanto para un análisis detallado que explora los contextos temporales y espaciales en la representación de los volcanes como también la percepción humana frente a los fenómenos geológicos en la cultura chilena.

Palabras clave: Volcanes, Artes, Interdisciplina, Geología.

1. Introduction

1.1. The journey to interdisciplinary connections

The question we seek to answer in this study is: how are Chilean society and volcanoes intertwined? The main point of this manuscript is to show how the arts have played a key role in expressing the relationship between Earth, especially volcanoes, and society from an interdisciplinary perspective. This question emerged from a collaboration that began in 2022 among us, young researchers in volcanology, visual arts, sociology, and history. Our first goal was to create what we called *"Volcanoteca"* (from the Spanish words *volcán*=volcano and *biblioteca*= library), a neologism to capture the physical space of a volcanic library open to the public that was going to be located in Pinto, in the surroundings of the Nevados de Chillán Volcanic Complex, in south-central Chile. The idea was to build a bridge that connects different disciplines and civil society through various materials in order to create, discuss, and reflect upon our volcanic heritage as inhabitants of a country crossed by the Andean Cordillera and 87 active volcanoes (Sernageomin, 2023[1]). Our main objective was to integrate and connect different visions of volcanoes, geology, and society. During the design of this project, we realized that volcanoes are represented in different ways in Chilean culture, and we wanted to start learning more about them.

Previously, each of us had worked separately within our own disciplines, an all-too-common practice. Matías had been trying to understand volcanic processes and risk communication; Sebastián by making aesthetics out of the ruins of disasters, where formal discontinuities, material fractures, and traces of the passage of time are key aspects of his artistic work. From a different perspective, Valentina, had been researching critical disaster studies and thinking about the relationships between the Earth and socio-political processes in order to bring 'geo-social formations' (Clark and Yusoff, 2017), disruptions, and transdisciplinary experiences into conversation.

In this journey, we attended our first scientific conference together, organized by the Geological Society of Chile in Temuco, southern Chile, where we presented the preliminary results of our research (Riffo Valdebenito *et al*., 2023). From there, we began to think more systematically about potential interdisciplinary connections. Both virtual and face-to-face meetings were necessary to continue the journey and to facilitate and streamline communication about what we were reading and thinking. Here we are, more than a year after the *Volcanoteca* experiment, writing together about our conversations and feelings about volcanoes and geology. Starting from our moments of sharing, we began to realize that although we come from very different disciplines, we also share methodological similarities: observation, drawing, and writing are analytical tools in our daily work as starting points for our interdisciplinary connections. We also share a common goal: to show how volcanoes are intertwined with social life in Chilean culture.

1.2. Nature and society dissociated?

The distance between nature and society has been of concern within the social sciences and interdisciplinary discussions. Latour (2012), for example, suggested that the constitution of modernity has dissociated nature and society. Scientific practices were likely protagonists in this dissociation, as they have become means to regulate what nature is on the one hand and what society is on the other. This dissociation is also

[1] Sernageomin. 2023. *Ranking* de riesgo específico de volcanes activos de Chile (available at https://rnvv.sernageomin.cl/wp-content/uploads/sites/2/2023/10/Ranking-2023_tabloide_20231012.pdf).

present in the tension between sociocultural theory and 'settler geology' (Schmidt, 2020), a division that has suppressed liveliness and attributed to material things (Palsson and Swanson, 2016). And political geology has recently joined this concern proposing that Earth and society are co-determined rather than dissociated. The main point is that Earth is not just a backdrop for socio-political processes and vice versa (Bobbette and Donovan, 2021).

In regions with active volcanism volcanoes provide a valuable means to explore how humans perceive the planet and the interaction between human existence and the Earth system (Holmberg, 2020). These interactions have been increasingly explored through interdisciplinary work with the aim of developing effective disaster risk reduction strategies, for example, in southern Chile by understanding the geographic imaginaries of community members living near active volcanoes (*e.g*., Vergara-Pinto and Romero, 2023; Walshe *et al*., 2023; Alegría and Vergara-Pinto, 2024).

From a broader context, and in order to make more visible, meaningful, and predictable relationships between social life and volcanic processes, we have to navigate in one interface where both volcanoes and society are present: the arts. To investigate this question, we ask ourselves whether or not this capacity of the arts was truncated with the constitution of modernity, since we are aware of the importance of arts in observing and communicating environmental phenomena since prehistoric times, as demonstrated by art rock and oral memory (*e.g*., Grebe *et al*., 1972; Isasmendi and López Campeny, 2022) or later with examples from early modern science, such as the illustrations of volcanoes and volcanic eruptions by William Hamilton in Campi Flegrei and Alexander von Humboldt in Chimborazo.

Volcanic processes are present in ornaments, coins and banknotes, murals, paintings, songs, novels, and poems. Hamilton (2012) emphasizes this by investigating artistic expressions worldwide that captured volcanoes and their processes, deepening into the emotions that volcanoes evoked in the authors and the historical context in which these works of art were created. As Sigurdsson (2015) affirms, volcanic eruptions have been an important motif for artists, and these works preserve an important history of how different cultures around the world have viewed these catastrophic phenomena.

Despite the above, there has been no significant reflection in Chile on the capacity of arts to express how social life and volcanoes are entangled, although this has been done in other Andean countries, such as Colombia, where different representations of volcanoes have been found (Sánchez and Calvache, 2018; Calvache and Sánchez, 2022; Sánchez and Posada, 2024). We emphasize the entanglement as a way of expressing a closer relationality between Earth and society, which can be mediated by an artistic sensibility to capture the Earth dynamics and excess. Where the proximity between the two implies a pragmatic material affection with Earth that is often not represented explicitly in scientific research. In this paper, we investigate the essential role that arts have played in capturing the entanglement of Earth and society. We explore how visual and audiovisual arts, music, literature, sculpture, and art installations, have captured a special sensitivity to expressing how volcanoes are intertwined with social life in Chilean history between 1818 and 2021.

2. Geo-social background

2.1. Volcanoes and human social life

Volcanoes have been of interest since classical or ancient history. In particular, in Western philosophy, Greek and Roman thinkers devoted their time to explaining the behavior of volcanoes from a realistic point of view. Empedocles, for example, saw the world divided into four elements with volcanoes associated with fire. Plato and Aristotle devised underground channels or rivers of fire. Later, Roman philosophers such as Lucretius or Pliny the Elder paid attention to the relationship between volcanoes and earthquakes. With the advent of Christianity, during the following centuries, rational explanations gave way to religious understandings of volcanoes (Kozák and Čermák, 2010).

Non-Western societies present many examples of deep and well-considered connections between volcanoes and social life, as expressed through the intimate connection between indigenous Andean societies and Earth. In the Andean worlds, "Mother Earth" becomes relevant through the *Pachamama*, which refers to the giving quality of the Earth in the sense of fertility (Mariscotti de Görlitz, 1978). In Andean philosophical terms, *Pachamama* is also the universe as an interrelated cosmos (Estermann, 2015). It encompasses the Andean feeling of an Earth inhabited by natural forces of which human beings are only a tiny part, where *Pachamama* behaves

like a sacred whole to be worshiped and even feared (Castro and Aldunate, 2003).

Among the central sacred forces of *Pachamama* are the mountains, volcanoes, and water, all of which are considered as living material beings with agency capacities (Salas Carreño, 2017; Pazzarelli and Lema, 2018; Vilca, 2020). Mountains are deemed as sacred in Andean cosmovision because they have multiple levels of meaning. First, they are providers of fertility and wealth; second, they are sacred dwellings; and third, they are ceremonial (Castro and Aldunate, 2003).

Relationships between cultures and volcanoes can be found in different contexts. For example, in the use of volcanic materials for the production of *moai* in Rapa Nui (Gioncada *et al*., 2010), in the integration of volcanic features in mobility networks and social dynamics in the Andean highlands (Loyola *et al*., 2022, 2023), in the Atacameño or Likan Antai cosmovision of the world, where volcanoes are important agents that connect the world below with the world above (Ramos Chocobar and Tironi, 2022), and are related to meteorological phenomena and ritual centers (Moyano and Uribe, 2012). Several examples of this deep connection between ancient cultures and volcanic activity and volcanic landscapes can be found in different parts of the world (*e.g*., Holmberg, 2007; Donovan, 2019; Ulusoy *et al*., 2019; Reyes-Guzmán *et al.*, 2023).

Indigenous worlds in South America have also constructed different levels of meaning around volcanoes. Stories are told about couples, marriages and/or love affairs, fights, frictions and/or wars; volcanoes as seen as taboo, forbidden and/or cursed places; or as prisons, dwellings and/or residences of gods or mythical men. Volcanoes can also be inhabited by spirits who have the agency to trigger eruptions, tremors, or thermal waters as a way to show that they are there (Petit-Breuilh, 2006).

This entangled relationship between society and volcanoes has attracted the attention of social sciences in the fields of political geology and critical Anthropocene studies. For example, Bobbette (2019) questions the ways in which volcanoes are understood and how the geological space is always contested. Through the idea of 'speculative volcanology', Clark *et al*. (2018) raise interesting questions about the temporization of Earth and its destructive and generative sociopolitical capacities. New materialists have also sought to connect the geological and human social life through the concept of 'geosocialities', defined as 'the entangled relations of the Earth and biologic beings' (Palsson and Swanson, 2016, p. 150).

While we acknowledge these conceptual and theoretical contributions as a way to make visible the intertwined nature or proximity between geological forms and processes and everyday life experiences, we also see that arts have not been a conceptual and pragmatic concern beyond a provocation to elaborate geosocial conceptualizations. In the next section, we move from provocation to conceptualization of the arts, deepening into the arts as a bonding or sensitive mediation between the geological and the social, facilitating aspects that could be otherwise invisible.

2.2. Volcanoes and arts: framing Earth's chaos

The most direct connection between volcanoes and art is their ability to evoke emotions. When eruptions occur, human fragility appears in the midst of chaos, and if we have the time, we become aware of our death. From this point of view, the Earth is an incomprehensible entity beyond its catastrophic and existential qualities: it behaves as something indomitable, unpredictable, and inapprehensible for humans. But the arts, through their colorful palettes and safe spaces (museums, galleries, or schools), process through the human sense what is incomprehensible about nature or Earth. Safe spaces allow us to be moved, to feel, to be touched, because art captures part of the chaos of Earth.

In this regard, Grosz (2008) elaborated an analytical key to our understanding of art in the context of volcanic processes. She argued that art has the capacity to elaborate, feel, and think about chaos. Here, the notion of Earth's chaos behaves as an excess of nature or as the real external forces of terrestrial matter, behaves as a disruptive and unpredictable quality of the cosmos that can only be directly grasped by human beings through the sensations that art frames and shapes.

Framing or stabilizing the Earth's chaos by extracting its qualities (*e.g*., color organization or composition) is what art can do through sensations and affections. As Deleuze and Guattari (1994) proposed: 'art takes a bit of chaos in a frame to form a composed chaos that becomes sensory, or from which it extracts a chaoid sensation as variety' (p. 206). In this way, the arts are the quintessential

catalysts of the forces of the Earth, since through them chaos can be elaborated, felt, and thought.

In order to visualize how arts capture and comprehend the geological processes in Chile, the representations of volcanoes in the history of Chilean art are exposed and then analyzed. More specifically, it is first traced the presence of volcanoes in art form as part of the conformation of the nation-state; then, volcanoes as a source of autonomous inspiration for various artists, analyzing their styles and historical-political contexts.

3. Methods

The methodology used in this work was based on exploratory research of artistic and cultural expressions, through the collection and identification of primary and secondary data sources that included any form of representation of volcanoes in Chile between 1818 to 2021. The works of art found were described by combining the knowledge of three disciplines: art, geology, and social sciences.

Primary sources were used to obtain additional and complementary information. For this purpose, the virtual databases of the institutions of the Biblioteca Nacional Digital were used: Memoria Chilena, Centro de Documentación de las Artes Visuales del Centro Nacional de Arte Contemporáneo (CEDOC-CNAC), Música Popular, Cinechile, Centro de Documentación de Bienes Patrimoniales para los museos del Servicio Nacional del Patrimonio Cultural, among others.

Secondary data sources were collected by reviewing the Chilean classical arts bibliography. Only edited sources such as books, catalogs, and archived documents were consulted. All works of art and/or cultural expressions that were not previously documented in books or virtual dissemination platforms were not included in this study.

The works are presented according to the artistic disciplines and grouped in chronological order: traditional image-making practices (including drawing, graphics, and painting), sculpture and art installations, music and poetry, and film and audiovisual.

The descriptions of the artworks were enriched by an interdisciplinary dialogue that allowed for a broader and deeper analysis of the different representations. Interdisciplinary approaches were also used to contextualize and discuss the artworks in relation to their time, their influence on art and society, and their cultural relevance. Where possible, physical characteristics of volcanoes and/or volcanic processes were described and linked to the corresponding eruptive records available on the website of the Chilean volcanic monitoring network (https://rnvv.sernageomin.cl/).

For a structured understanding of the provided photo captions in this document, a uniform format is followed, which includes the following elements: The name of the artwork in Spanish, followed by its English translation in parentheses, the year of creation in parentheses, the technique used, the size of the artwork, the location where the artwork is situated along with its corresponding translation, if necessary, in parentheses as well, specific identification, the author of the artwork, and, if applicable, the author of the photograph or record. It is noted that in cases where the information is unavailable, it will be indicated as 'N/A', denoting 'not available'. This arrangement facilitates clarity and coherence in presenting the visual and contextual information associated with each image.

Given that the art world is vast (including not only the production of artworks, but also the entire system itself, official, alternative, and independent modes of circulation), and that it does not need to be validated by peers (like scientific publications), its proliferation is always unexpected and can emerge from the less expected territories. In this sense, we acknowledge that in doing so we are giving visibility to works to which the art system itself (museums, galleries, and specialized publications) has already bestowed value and meaning upon. Therefore, this publication is an initial attempt to document what has the potential to be understood as something much greater.

4. Results and discussion

4.1. Volcanoes as symbols of power, freedom, and national identity in Chile

Volcanoes have long been a central element in the construction Chilean identity. Since the early years of independence (early 19th century), volcanoes have been used as symbols of power and freedom, appearing on various decorations, flags, and coins. For example, in 1817, the Order of Merit was created with the image of an erupting volcano in recognition of the bravery and sacrifice of the soldiers who fought for Chilean independence (Fig. 1A). The importance of volcanoes as national

FIG. 1. **A.** Condecoración de Legión al Mérito (Legion of Merit decoration), (1817). Chilean Silver Medal. 4,9x2,9 cm. Museo Histórico Nacional, Chile (National History Museum of Chile). ID 3-4406. Individuals associated with its creation: Manuel Esquivel and Francisco Borja Venegas (Francisco Borja Benegas). N/A. **B.** Flag with which the independence of Chile was sworn on February 12, 1818, (1817). Silk textile. 143x240 cm. Museo Histórico Nacional, Chile (National History Museum of Chile). ID 3-35215. Individuals associated with its creation: Antonio Arcos (designer), José Ignacio Zenteno (designer), and Dolores Prats de Huici (embroiderer). N/A. **C.** Un peso, Duro o Real de a ocho (A peso, Duro or Real de a ocho), First coin minted in independent Chile, (1817) Chilean coin. Diameter 4 cm. (Museo Histórico Nacional, Chile). National History Museum of Chile. ID 3-4447. Designer: Francisco Borja Venegas (Francisco Borja Benegas). N/A. **D.** Don Bernardo O'Higgins, Director Supremo (Don Bernardo O'Higgins, Supreme Director), (1821). Oil painting on canvas. 78x87 cm. Museo Nacional de Bellas Artes, Chile (National Museum of Fine Arts of Chile). ID 2-12. Author: José Gil de Castro y Morales. N/A. **E.** Reverse of the 2,000 Chilean peso banknote, (2010-present). Chilean polymer banknote. 12,7x7 cm. Chile. ID N/A. Design and print: Central Bank of Chile, with the collaboration of De La Rue Currency & Security Printing. N/A. **F.** Reverse of the 20,000 Chilean peso banknote, (2010-present). Chilean cotton paper banknote. 14,8x7 cm. Chile. ID N/A. Design and print: Central Bank of Chile, with the collaboration of De La Rue Currency & Security Printing. N/A.

symbols was also reflected in the flag of Chilean independence, designed by Antonio Arcos and José Ignacio Zenteno in 1817 and produced by Dolores Prats de Huici, with an active volcano in the center of the flag (Fig. 1B). Volcanoes also appeared on the early coins of the Republic of Chile, further emphasizing their role as symbols of the Chilean nation, this time on a pocket-sized, widely circulated coin (Fig. 1C): '…an erupting volcano alluding to the seismic force of the new nation' (Martínez, 2013, p. 56). Money was assigned a pedagogical attribute of social cohesion, capable of fostering a sense of belonging to the territory of the new republic (Cruz de Amenábar, 2016).

In the same period, the Chilean coat of arms, which preceded the current one, was created after the independence of Chile by order of Bernardo O'Higgins, the former Supreme Director. This coat of arms was official between 1819 and 1834, and included the volcanic arc, with several volcanoes erupting simultaneously (Fig. 1D). The chain of volcanoes on the coat of arms represented the *pillanes*, spirits of ancient political and spiritual authorities who, according to Mapuche worldview, live inside volcanoes (MNBA, 2019[2]). Among the various elements that represent the strength and freedom of the Chilean people and the Chilean territory, it is also possible to find symbols of military and civil power. Ignacio Andía y Varela (1757-1822), for example, engraved this coat of arms in wood in the front of the Palace of Independence (now the National History Museum). He added an indigenous person representing Chile sitting on an alligator that is biting a dragon, a scene symbolizing the Americas eating the Lion of Castilla (Cartes Montory, 2013). The coat of arms appears in an 1821 portrait of Bernardo O'Higgins by the famous Peruvian painter José Gil de Castro (1785-1841) (Fig. 1D).

Almost 200 years later, in 2010, volcanoes were once again part of everyday life when the current banknotes came into circulation in 2010. The back of the 2,000 Chilean peso banknote shows the Nalcas National Reserve, with a representation of Lonquimay volcano (Fig. 1E), while the back of the 20,000 Chilean peso shows the Surire salt flat surrounded by volcanoes (Fig. 1F). Since 2013, the Chilean passport also features images of the volcanoes Parinacota, Licancabur, Ojos del Salado, Maipo, Nevados de Chillán, Villarrica and Osorno.

4.2. Volcanoes in traditional image-making practices in Chile

Several Chilean and international artists have explored and reflected on the presence of volcanoes in Chile through the creation and dissemination of artistic images. This exploration has taken place in drawing, graphics, and painting. Among the earliest painters to depict Chilean volcanoes as central figures is the German artist Johann Moritz Rugendas (1802-1858) (Diener, 2012) (Fig. 2A-E). Between 1834 and 1842, Rugendas embarked on various

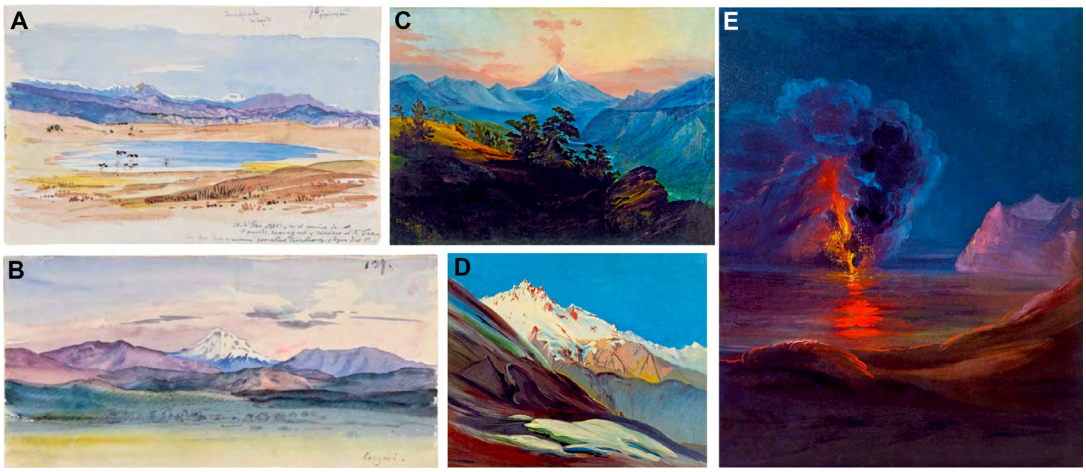

FIG. 2. **A.** Vista del volcán El Descabezado desde las colinas de Teno (View of Descabezado Volcano from the hills of Teno), (1835). Pencil and watercolor on paper. 11.2x17.8 cm. Staatliche Graphische Sammlung München, Germany. ID N/A. Author: Johann Moritz Rugendas. N/A. **B.** El Nevado de Longavi (The Nevado de Longaví), (1835). Pencil and watercolor on paper. 8.6x17,8 cm. Staatliche Graphische Sammlung München, Germany. ID N/A. Author: Johann Moritz Rugendas. N/A. **C.** Volcán Antuco (The Antuco Volcano), (1835). Oil on cardboard. 30.3x41.8 cm. Staatliche Graphische Sammlung München, Germany. ID N/A. Author: Johann Moritz Rugendas. N/A. **D.** Las cimas de la Sierra Velluda (The Peaks of Sierra Velluda), (1835). Oil on canvas. 30.9x38,9 cm. Staatliche Graphische Sammlung München, Germany. ID N/A. Author: Johann Moritz Rugendas. N/A. **E.** Erupción volcánica en el Archipiélago de Juan Fernández (Volcanic Eruption in the Juan Fernández Archipelago), (*ca.* 1836). Oil on cardboard. 35x27.5 cm. Staatliche Graphische Sammlung München, Germany. ID N/A. Author: Johann Moritz Rugendas. N/A.

[2] Museo Nacional de Bellas Artes (MNBA). 2019. Antúnez Centenario: 77 p. Santiago.

expeditions throughout Chile to capture its diverse natural and cultural scenery. His artistic corpus was extensive, comprising over a thousand drawings, watercolors, and around 150 oil paintings, with the Andes mountain range serving as a profound source of inspiration (Diener, 2012).

In 1848, Pedro José Amado Pissis (1812-1889), a French geologist and geographer, was commissioned by the Ministry of the Interior to conduct a comprehensive study of Chilean geology and mineral resources. His mission was to produce a topographic and geological map of the Republic of Chile. In 1875, he published his most important work titled *Geografía Física de la República de Chile* (Physical Geography of the Republic of Chile; Pissis, 1875), which remains a highly regarded geographical reference in the Americas. This seminal publication includes an atlas showing the physical geography of the Republic of Chile and provides an overview of the geological features of Chile, including its mountains, volcanoes, and rivers. Furthermore, this map served as an important resource for studying valuable mineral resources in Chile.

For the purposes of this study, it is worth mentioning Pissis's watercolors of volcanoes, which "show a high-quality morphological register, but also a personal vision of the monumentality of the landscape, expressed in the color and expressiveness of his technique" (Martínez and Campos, 2022, p. 59). In his work, it is possible to find volcanoes as in *Volcán de Chillán* (Chillán volcano) (1863), a painting of an eruption at the Nevados de Chillán Volcanic Complex (Fig. 3A) where the author registered an explosion during the 1861-1865 Santa Gertrudis eruptive

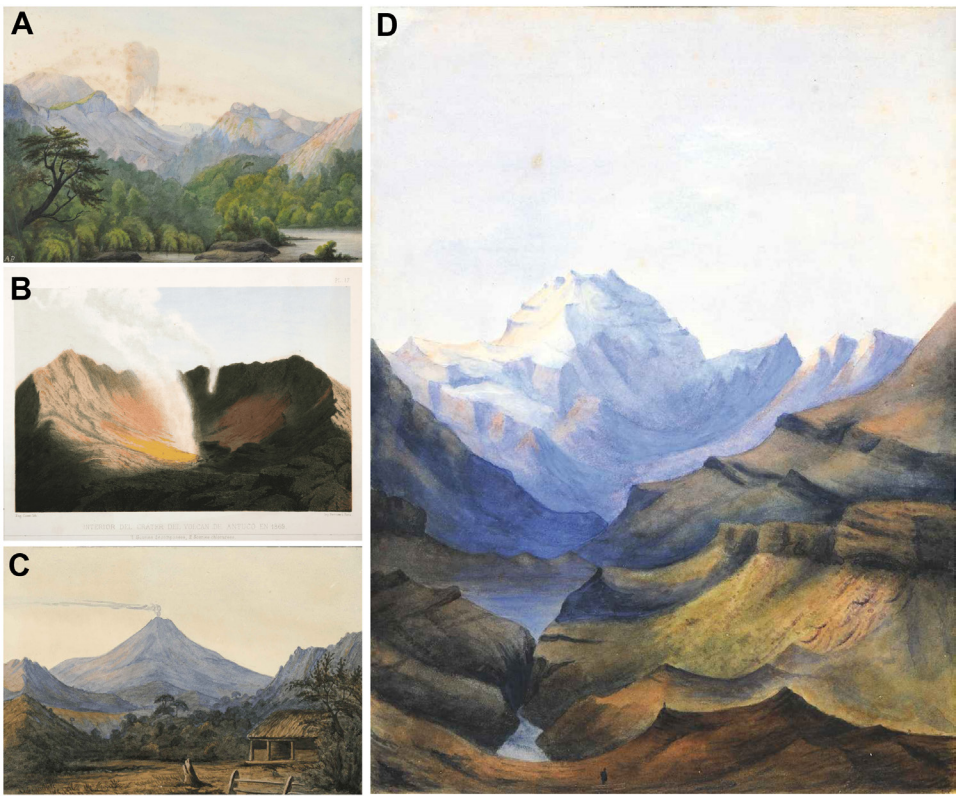

FIG. 3. **A.** Volcán de Chillán (Chillán Volcano), (1863). Watercolor. 30x21,5 cm. Museo Histórico Nacional, Chile (National History Museum of Chile). ID 3-34550. Author: Pedro José Amado Pissis. N/A. **B.** Interior del cráter del volcán de Antuco (Interior of Antuco Volcano's crater), (1869). Engraving. 29,4x41,4 cm. Museo Histórico Nacional, Chile (National History Museum of Chile). ID 3-38590. Pedro José Amado Pissis (Draftsman) and Eugène Ciceri (Engraver). N/A. **C.** Volcán de Antuco (Antuco Volcano), (N/A). Watercolor. 28x19,3 cm. Museo Histórico Nacional, Chile (National History Museum of Chile). ID 3-34549. Author: Pedro José Amado Pissis. N/A. **D.** Volcán de Aconcagua (Aconcagua Volcano), N/A. Watercolor. 28,2x21,1 cm. Museo Histórico Nacional, Chile (National History Museum of Chile). ID 3-34545. Author: Pedro José Amado Pissis. N/A.

cycle (Orozco *et al*., 2016). Volcanoes also appear in *Interior del cráter del volcán de Antuco* (Interior of Antuco volcano crater) (1869) (Fig. 3B) and in *Volcán de Antuco* (Antuco volcano) (n.d.) (Fig. 3C). The first was created during the 1869 eruption (Moreno, 2016), and shows a fumarole slightly dispersed by the wind in a reddish-yellow crater, the colors representing the effect of hydrothermal fluids on the rocks. Of particular interest is the watercolor *Volcán de Aconcagua* (Aconcagua volcano) (n.d.), in which the highest mountain in South America, located in Argentina, is represented (Fig. 3D). It is important to note that although Aconcagua is not active, it was sometime during the Miocene (Godoy *et al*., 1988). Aconcagua is located in a region where the active volcanic arc is currently discontinued due to variations in the dynamics of the subduction zone between the Nazca Plate and the South American Plate (*e.g*., Stern *et al*., 2004). It should be noted that the first published studies on these geologic phenomena date back to the 1980s (*e.g*., Kay *et al*., 1987), more than 100 years after the work of Pissis.

Thomas Somerscales (1842-1927) was an English artist who was one of the most representative in the field of landscape, sea, and naval glory painting in the 19th century in Chile. His realistic representations of rivers, lakes, and especially the Pacific Ocean are a proof of the productive phase that 19th century painting had in Chile (Cinelli, 2020). One of his paintings, *Vista del Volcán Antuco* (View of the Antuco volcano) (1881), introduces the observer to the landscape, including the fauna and the rocks around Antuco volcano (Fig. 4A).

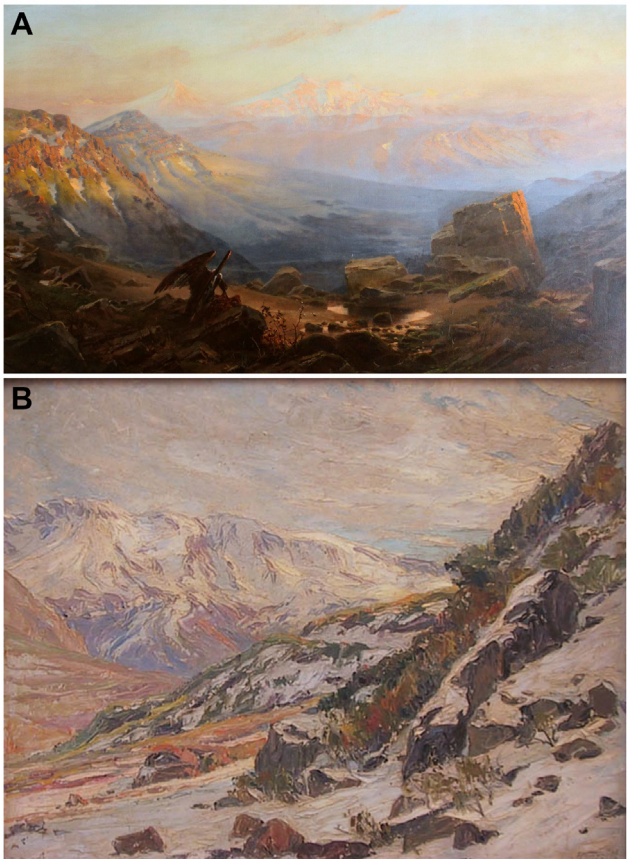

FIG. 4. **A.** Vista del volcán Antuco (View of the Antuco Volcano), (1881). Oil on canvas. 72,5x125,5 cm. Museo Municipal de Bellas Artes de Valparaíso, Palacio Baburizza (Municipal Museum of Fine Arts of Valparaíso, Baburizza Palace). ID 51-208. Author: Thomas Somerscales. Photographer: Javier Muñoz A. **B.** Volcán del Cajón del Maipo (Cajón del Maipo Volcano), (N/A). Oil on canvas. 39,2x50 cm. Museo O'Higginiano y de Bellas Artes de Talca (O'Higginian and Fine Arts Museum of Talca). ID 7-324. Author: Luis Strozzi. N/A.

An apprentice of Thomas Somerscales, the Chilean painter Alfredo Helsby (1862-1933) is referred to as an artist who "turned a country into a landscape" (Muñoz Méndez, 2014, p. 144). He made careful observations of the landscape to extract some of its qualities for representation. Through detailed studies of the environment, Helsby was able to depict specific elements such as soil morphology and capture visual characteristics of leaves and plants. These observations can be seen in the foreground of the painting *Volcán Osorno* (Osorno volcano) (1925) exhibited in the National Library of Chile.

Two decades later, Luis Strozzi (1891-1966), a self-taught Chilean painter, created the work *Volcán del Cajón del Maipo* (Cajón del Maipo volcano) (1946), available in the Museo O'Higginiano y de Bellas Artes de Talca (O'Higginian and Fine Arts Museum of Talca). In this painting, a complex-shaped and snow-capped mountain can be seen between hillsides (Fig. 4B). This mountain probably corresponds to San José volcano, near Santiago. Channel structures resembling viscous lava flows or moraines can be seen on the front slope of the volcano.

Roberto Matta (1911-2002) was a Chilean painter, architect, and poet whose work explored the themes of time and space, as well as nature and death. In this sense, part of Matta's work was dedicated to the power of nature and its exuberance through his attention to volcanic violence and the energy of the Earth. In 1941, he spent time in Mexico, where Earth and volcanoes became protagonists of his artistic inspiration and exploration of consciousness. As he recalled 'I saw everything in flames, but from a metaphysical point of view. I was talking beyond the volcano. The light was not superficial but an inner fire…I painted what was burning inside me, and the best image of my fire was the volcano'. French poet Alain Jouffroy defined this phase in Matta's art as 'geomorphological' and 'geopoetic', while the founder of surrealism, André Breton, also referred to his art as one that 'has Earth as food' (Del Pino Salas, 2015, p. 123).

Matta's paintings of volcanoes, including *La Tierra es un hombre* (The Earth is a Man) (1942), present the viewer with surrealistic images that broke away from traditional artistic language (Fig. 5A), an encounter between humans and the cosmos as the main imaginary act, as he pointed out: 'we are led to believe that the real is seen through a window. One is here and the real is there; this deformation has been transferred to painting. But we are at the center of what is happening: from above, from the front, from the right, from the left, from below, from behind, reality bombards us. To be in four dimensions it is necessary to perform an imaginary act, like that of perspective, which consists in perceiving the events that are at the center of the scene' (Matta, 1991). It is believed that Matta wanted to evoke sensations and images related to the birth of Paricutín volcano (Vargas, 2011[3]), whose activity began with precursory earthquakes in 1941 and started to form the volcanic edifice in 1943 (Yokoyama and De la Cruz-Reyna, 1990), such as those represented in *Invasión Nocturna (*Invasion of the Night) (1941), *Escuchar vivir* (Listen to living) (1941), *Los Desastres del Misticismo* (The Disasters of Mysticism) (1942), and *Volcán en Erupción* (Erupting volcano) (1951).

Mario Carreño (1913-1999) was born in Cuba but became a Chilean citizen in 1985. In the 1960s, his painting shifted to reflect an anguished vision in the face of the devastating forces that threatened the world. Carreño appropriated the Chilean landscape and incorporated it quite naturally into his works. His depictions of volcanoes are 'silent but active, they are neither wild nor provocative, they are a contained force, telluric recipients of the mystery of creation' (MNBA, 2015, p. 21). Volcanoes appear in 3 of his artworks, forming part of the landscape behind human representations (Fig. 5B-D).

Nemesio Antúnez Zañartu (1918-1993), a Chilean architect, painter and engraver, dedicated part of his work to painting the Chilean geography and its cultural identity. In his words (Antúnez, 1988): "Since then (referring to his return to Chile from New York), I have painted mountain ranges, volcanoes, where a piece of blue sky is reflected in the water. I painted the North and the South, a vision of what Chile is. Section of the Andes where lapis lazuli (a metamorphic rock composed of lazurite) appears" (p. 36).

In *Cráter* (Crater) (1959), Antúnez painted a series of nearly rounded volcanic edifices with their eruptive vents aligned (Fig. 6A), while in the 1961 version (Fig. 6B) he painted part of a crater, blue inside and with small black rounded geometries which could be related to the strewn volcanic deposits. As in the work of Matta, Antúnez broke with forms and printed emotions through a distinctly abstract style. This perception of volcanoes was deepened in *Siete volcanes* (Seven volcanoes) (1963), where

[3] Vargas, R. 2011. Matta y México, historia de una relación. Proceso. https://www.proceso.com.mx/cultura/2011/11/23/matta-mexico-historia-de-una-relacion-95244.html

FIG. 5. **A.** La Tierra es un hombre (The Earth Is a Man), (1942). Oil on canvas. 182,9x243,8 cm. Art Institute of Chicago, United States. ID 1992168. Author: Roberto Matta Echaurren. N/A. **B.** Tierra de volcanes (Land of volcanoes), (1974). Oil on canvas. 85x120 cm. Private collection. N/A. Author: Mario Carreño. N/A. **C.** Pareja en el desierto (Couple in the desert), (1974), Oil on canvas. 85x120 cm. Private collection. N/A. Author: Mario Carreño. N/A. **D.** Sueño Fragmento (Dream fragment), (1975). Oil on canvas. 85x120 cm Private collection N/A. Author: Mario Carreño. N/A.

volcanic edifices, lava flows, and volcanic bombs are represented (Fig. 6C). In this work, volcanic edifices are again painted as nearly rounded forms which are cross-cut to show their insides, full of lapis lazuli. The apparition of this blue rock in Antúnez' work was probably related to its designation as "Chilean rock". What is particularly interesting in this work is the connection that Antúnez makes between this rock and the interior of volcanoes, because the origin of lapis lazuli is related to the interaction between magma and calcium-rich sedimentary rocks. Something similar seems to have been represented in his works *Cordillera adentro* (Out of the Cordillera) (1962) and *Corazón de los Andes* (The Heart of the Andes) (1966). The former appears to be an aerial view of several craters (Fig. 6D). In the second, he painted a clear representation of a solidifying river of lava flowing down from the slope of an erupting volcano, in an atmosphere surrounded by volcanic gases and/or ash and blueish pieces of rock (Fig. 6E).

Another clear representation of volcanic processes can be appreciated in *El volcán* (The volcano) (n.d.), a painting in which hot volcanic particles of different sizes fall from an erupting volcano (Fig. 6F). This work is associated with the Casa del Arte José Clemente Orozco, more commonly known as the

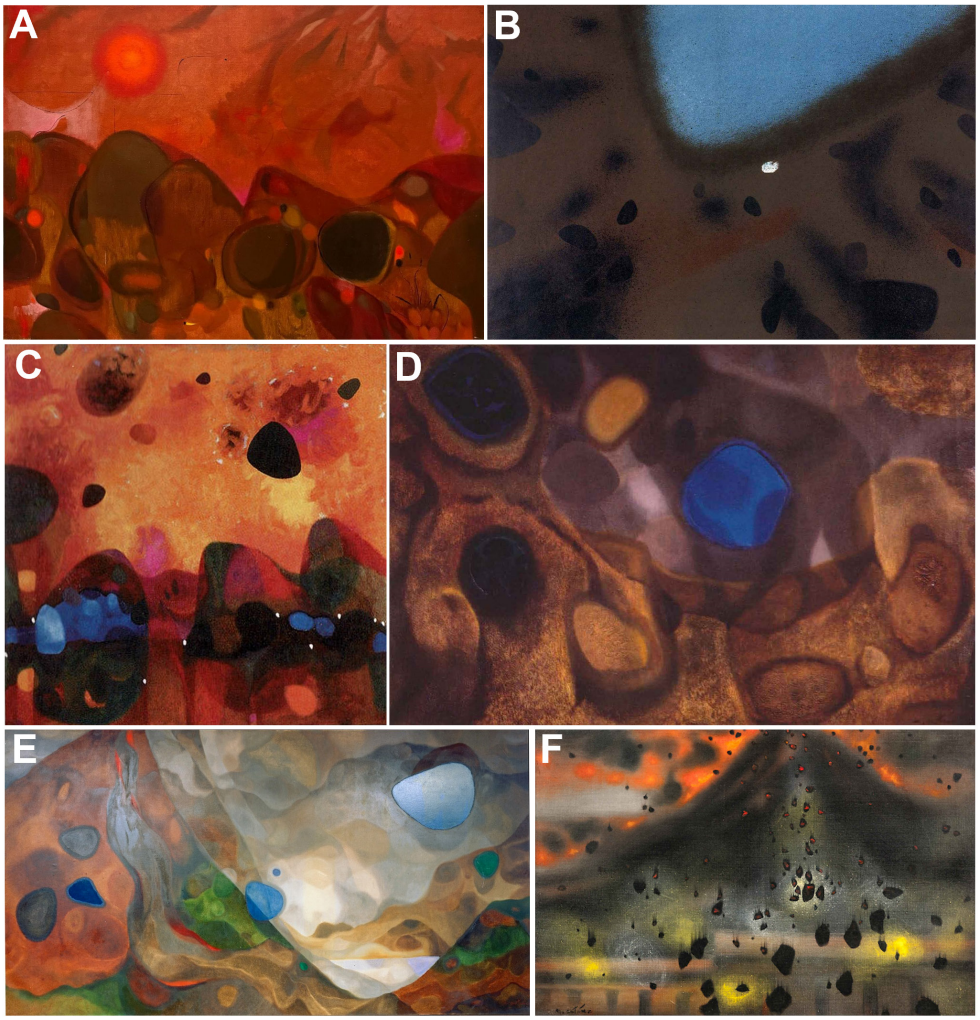

FIG. 6. **A.** Cráter (Crater), (1959). Oil on canvas. 81x116 cm. Author: Nemesio Antúnez. N/A. **B.** Cráter (Crater), (1961). Pencil and Ink. 34,3x50,8 cm. Museo Nacional de Bellas Artes, Chile (National Museum of Fine Arts of Chile) ID 2-2919. Author: Nemesio Antúnez. N/A. **C.** Siete volcanes (Seven volcanoes), (1963). Oil on canvas. 121x121 cm. Colección de Arte del Museo de Arte Contemporáneo (MAC) de la Universidad de Chile (Art Collection of the Museum of Contemporary Art (MAC) of the University of Chile). ID 1075667-7. Author: Nemesio Antúnez. N/A. **D.** Cordillera adentro (Into the mountain range), (1962). Author: Nemesio Antúnez. N/A. **E.** Corazón de Los Andes (the Heart of the Andes), (1966). Oil on canvas. 197x378,1 cm. Naciones Unidas (ONU), Nueva York, Estados Unidos de América (United Nations (UN), New York, United States of America). ID UNNY142G. Author: Nemesio Antúnez. N/A. **F.** El volcán (The volcano), (N/A). Oil on canvas. 66x100 cm. La Casa del Arte José Clemente Orozco, Pinacoteca de la Universidad de Concepción, Chile (The House of Art José Clemente Orozco, Art Gallery of the University of Concepción, Chile). ID 100-1048. Author: Nemesio Antúnez. N/A.

"Pinacoteca", a museum of pictorial and artistic treasures located in the University of Concepción.

José Venturelli Eade (1924-1988) was an Italian-Chilean painter, engraver, stage designer and muralist, whose work was concerned with sociopolitical issues. Despite this, he often incorporated the presence of geological and biological features in his paintings. Volcanoes are present in his work, for example, in *Niña y volcán* (Girl and volcano) (1962), where a young girl sits with her back to an erupting volcano, her head resting on her legs, expressing sorrow but calmness (Fig. 7A). It is interesting to note that in this painting the erupting volcano does not look like a threat to the girl but seems to accompany her. The

FIG. 7. **A.** Niña y volcán (Girl and volcano), (1962). Acrylic. 119x99 cm. N/A. ID N/A. Author: José Venturelli. N/A. **B.** Al transformar la naturaleza el hombre se transforma a sí mismo (By transforming nature, man transforms himself), (1969). Acrylic. 36 m^2. Mural realizado en el Instituto Nacional de Capacitación Profesional (INACAP), sede Renca, Chile (Mural created at the National Institute of Vocational Training (INACAP), Renca campus, Chile). ID N/A. Author: José Venturelli. Assisted by the artists Pedro Miller and Luz Donoso. N/A. **C.** El volcán encendido (The active volcano), (1972). Mixed technique. 93x106 cm. ID N/A. Author: José Venturelli. N/A. **D.** Chile (Chile) (1972). Acrylic. 200x900 cm. Sede del Congreso de las Naciones Unidas para el Comercio y el Desarrollo (UNCTAD), actual Centro Cultural Metropolitano Gabriela Mistral (GAM), Santiago, Chile (United Nations Congress for Trade and Development (UNCTAD), currently the Gabriela Mistral Metropolitan Cultural Center (GAM), Santiago, Chile). ID N/A. Author: José Venturelli. N/A. **E.** Derrumbe (Collapse), (1977). Acrylic. 38x46 cm. N/A. N/A. N/A. Author: José Venturelli. N/A. **F.** El aliento de la tierra (The breath of the Earth), (1978). Acrylic. 46x46 cm. N/A. N/A. ID N/A. Author: José Venturelli. N/A. **G.** Flores en el volcán (Flowers on the Volcano), (1987). Woodcut. N/A. N/A. N/A. ID N/A. Author: Santos Chávez. N/A.

volcanic eruption represented is explosive, with a huge column of ash and smaller spatters of lava or incandescent material. At Inacap (National Institute for Professional Training), Venturelli painted a mural in 1969 in which an erupting volcano is represented between workers, machines, and technology (Fig. 7B). In *Volcán encendido* (Burning volcano) (1972), hot glowing lava erupts from a dark colored volcano with almost vertical slopes (Fig. 7C). In his mural, *Chile* (1972), at the Gabriela Mistral Cultural Centre (GAM), in Santiago, an explosive eruption is painted, with a wind-dispersed eruptive column and a dark lava river flowing down the volcano, which is channeled close to the crater and then spilled out when it reaches the base of the volcano (Fig. 7D). The Venturelli murals share a common characteristic: they were created to be viewed by a wide audience, and their monumental scale fosters a direct engagement

with the viewer's own physical presence. To fully appreciate them, viewers must traverse the artwork, gradually discovering its intricate details.

In *Derrumbe* (Landslide) (1977), Venturelli painted lava flowing down a steep slope of an erupting volcano (Fig. 7E). In this painting, it is possible to note how the lava flow cools, forming blocky fragments down the volcano, which are surrounded by larger, solidified blocky lava fragments that are susceptible to collapse. In the background, a quiet snow-capped volcano can be observed, also with large blocks of old solidified lava flows. A year later, in *El aliento de la tierra* (The breath of Earth) (1978), there is a serene landscape of a sunset (or sunrise), with a sunlit red landform in the foreground (Fig. 7F). To the left side of the painting there is a rocky and fractured volcano, probably representing ancient, solidified lava flows, with a subtle fumarole vertically rising from its crater, which gives the work its name.

Santos Chávez (1934-2001) was a Mapuche artist who depicted indigenous culture in his work through representative vignettes, capturing its religious aspects, worldview, and the people's connection with nature (Martínez, 2015). The presence of volcanoes can be seen in two woodcuts: *Flores en el volcán* (Flowers on the Volcano) (1987) and *Volcán y luna* (Volcano and Moon) (n.d.). The first one shows a lava lake in a conic-shaped volcanic edifice from which a lava river is flowing, losing its reddish color in the darkness of the volcano, which may be due to the cooling and solidification of the lava flow as it descends the slope, or to the formation of a lava tube (Fig. 7G). The mapuche view of volcanoes is observable in one of the paintings of Eduardo Rapimán (1975-), *El encierro de los pillanes* (The *pillanes* confinement), in which these powerful spirits are represented below an erupting volcano and connected to the central conduit from which magma and gases are being erupted. Also depicted are spirits whose tears flow like rivers down the slopes of the volcano.

Francisco Smythe Treuer (1952-1998) was a renowned Chilean artist whose work underwent a transformation from formal and material exploration back to painting, characterized by gestural qualities closely associated with abstract expressionism. In 1983, Nemesio Antúnez described his work, full of expressive, free, and synthetic gestures, as "...the spontaneous graphics of a child with the knowledge of a teacher" (Galería Arte Actual, 1986[4], par. 12). According to Garfias (2006), Smythe believed in the relationship between human beings and nature, and in his work, such relationship was manifested through clear symbols and signs. In line with this concept, the presence of volcanoes can be observed in his work *Vía Láctea* (Milky Way) (1998), a sculptural mural located in the Baquedano metro station in Santiago, which is viewed by thousands of people every day (Fig. 8A). In this work, volcanoes are intertwined with stars, palm trees and both real and fictional constellations. Conical and somewhat rounded shapes represent at least two volcanic edifices in this piece, one of which is erupting.

4.3. Volcanoes in Chilean sculpture and art installations

There are notable volcano-themed works in the field of sculpture, such as *Ojos del Tupungato* (Eyes of Tupungato) (1980) by Chilean sculptor Samuel Román (1907-1990), awarded with the National Art Prize in 1964. This abstract sculpture, carved in granite, a rock formed by the slow cooling of magma deep inside the Earth, seeks to evoke a volcano (Fig. 8B).

In the sculptural playground of Brazil square (Plaza Brasil), in the center of Santiago, there is a concrete volcano-shaped slide. This work was created in 1993 by French-Chilean artist Federica Matta (1955-) and contains representations of a series of lava flows erupting from the central vent of a conical volcanic edifice (Fig. 8C). This work also contains a gray stripe with sinuous edges that can be interpreted as a representation of eruption-related flows or deposits (*e.g.*, lahars, pyroclastic density currents). The volcano slide is accompanied in the center of the square by several other sculptures of her own design, which serve as play elements for children and draw their inspiration from various themes related to national identity, such as the Andes mountains and the Santa Lucía hill. Through the play, the volcano was pointed out as a relevant political symbol, because it has the capacity "to connects us to the center of the Earth and the tectonic memory, where the effects of the trauma of the Pinochet dictatorship are transformed into energies that free us from pain and fear through the movement of magma and bodies; it is our life force" (de la Fuente *et al*., 2023, p. 34).

Sculptor and academic Sergio Castillo (1925-2010), recipient of the National Arts Prize in 1997,

[4] Galería Arte Actual. 1986. Francisco Smythe: de la Geografía Phantàstika e Imaginaria. Galería Arte Actual.

FIG. 8. **A.** Vía Láctea (Milky Way), (1998). Mural, mixed media. Over 225 m^2 of walls in the space connecting with line 5 of the Baquedano metro station, Santiago, Chile. ID N/A. Author: Francisco Smythe Treuer. Photography: Sebastián Riffo Valdebenito. **B.** Ojos del Tupungato (Eyes of Tupungato) (1980). Granite-carved stone. 60x36x77 cm. Museo Nacional de Bellas Artes, Chile (National Museum of Fine Arts of Chile). ID 2-1453. Author: Samuel Román. Illustration: Sebastián Riffo Valdebenito. **C.** Volcano-shaped slide in Plaza Brasil (1993). Acrylic-painted cement. 500x500 cm. Plaza Brasil, Santiago, Chile (Brazil Square, Santiago, Chile). ID N/A. Author: Federica Matta in collaboration with architect Ana María Rodríguez. Photography: Sebastián Riffo Valdebenito. **D.** Erupción (Eruption) (1998). Painted iron with stainless steel tips. 600x900x170 cm. Parque de Las Esculturas, Providencia, Santiago, Chile (Sculpture Park, Providencia, Santiago, Chile). ID N/A. Author: Sergio Castillo. Photography: Silvia Westermann Andrade. **E.** Volcanes (Volcanoes) (2009). Constructed using wood, clay, fiber, and pigment. Each sculpture measures 35x25x25 cm. ID N/A. Author: Hugo Marín. Illustration: Sebastián Riffo Valdebenito.

created the work *Erupción* (Eruption) (1998). This sculpture consists of painted iron tubes and stainless steel tips. As suggested by the title of this artwork, its design represents burst of fire representing the volcanic activity of the country (Fig. 8D). In 2009, Hugo Marín (1929-2018) created a series of seven small, diverse, and experimental sculptures titled *Volcanes* (Volcanoes) (Fig. 8E), constructed using wood, clay, fiber, and pigment. This series was first shown in the exhibition *Los Andes: columna vertebral de América* (The Andes: backbone of the Americas) at the Gasco Contemporaneous Art Room, Santiago, the year after, and later at the 13th Biennial of Medial Arts titled *Temblor* (Quake) at the Museo Nacional de Bellas Artes (National Museum of Fine Arts of Chile) in 2017.

The works of Chilean sculptor Francisco Gazitúa Costabal (1944-) also stand out. He has explored the Andean volcanic universe on numerous occasions, not only from a symbolic perspective but also by utilizing materials derived from volcanic eruptions. Among his noteworthy works are those created in 2015, representing the Peruvian volcanoes *Misti* (Fig. 9A) and *Hualca* (Fig. 9B), as well as *Maipo* (Fig. 9C), the latter located across the Chile-Argentina border in Central Chile. Gazitúa also used volcanic rocks (basaltic andesites) from Tupungato, Maipo and San José volcanoes, all located near to Santiago, in his exhibition *Viaje al corazón de la piedra* (Journey to the heart of the Stone).

Cecilia Vicuña (1948-) is a Chilean painter, poetess, and feminist activist who has also defended nature through various of her interventions in public spaces. Her art has been a response to the threat to the planet or its devastation. She uses multiple procedures: happening, performance, *povera* and environmental art (Galindo, 2013), highlighting the healing and ritual dimension of art to impulse changes in social and affective structures (López, 2019[5]). Her work constantly summons the *quipus*[6] remembering by connecting the body to the Cosmos at the same time. In this way, her art connects with Andean memories and other ways of being in the world in mutual coexistence. Through this relational imprint with the Cosmos, different versions of the *quipu* have traveled the world, one of them is *Quipu de Lava* (https://brooklynrail.org/2020/09/artseen/erotics-towards-a-poetics-of-the-liminal). At the Espacio Escultórico (Sculptural Space) of Mexico, near the MUAC (University Museum of Contemporary Art), Cecilia Vicuña spread red *quipus* with views to Iztaccíhuatl and Popocatépetl volcanoes. In Espacio Escultórico, ecology and art are merged in a large-scale circular structure constructed from 64 triangular prisms atop a field of solidified lava and red tezontle, a pyroclastic scoria used in construction, decoration and as a substrate in México (Lira *et al*., 2013). The importance of this space is that it created a geological experience that merges with a cosmological indigenous world, a perfect space for Cecilia Vicuña's performance ritual to begin (Hinojosa, 2020[7]). All started with a ceremony to call upon the geological consciousness of the place and the volcanic pulse, being the *quipu* an offering to the volcanoes to encourage the social protests in Chile that started in October 2019, as well as to connect with deep time wisdom (Hinojosa, 2020).

The artist Ignacio Bahna (1980-) has explored the realm of science and technology through his artistic work, focusing on natural phenomena and human intervention in them. He uses a wide range of materials as expressive mediums, interacting with rocks, burnt wood, salt, resin, LED lights, among others. In 2017, he presented his artwork *Volver a*

FIG. 9. **A.** Volcán Misti (Misti volcano), (2015). Basaltic volcanic rock. N/A. 58x139x40 cm. ID N/A. Author: Francisco Gazitúa Costabal. Photography: Francisco Gazitúa Costabal. **B.** Volcán Hualca (Hualca volcano), (2015). Basaltic volcanic rock. N/A. 60x114x49 cm. ID N/A. Author: Francisco Gazitúa Costabal. Photography: Francisco Gazitúa Costabal. **C.** Volcán Maipo (Maipo volcano), (2015). Basaltic andesitic volcanic rock. N/A. 80x120x80 cm. ID N/A. Author: Francisco Gazitúa Costabal. Photography: Francisco Gazitúa Costabal.

[5] López, M.A. 2019. Los hilos de la vida. Cecilia Vicuña. Revista de la Universidad de México, Lenguajes, Dossier. https://www.revistadelauniversidad.mx/articles/e8a1b208-4d68-4cbd-9e78-b9fd08fe7829/los-hilos-de-vida-cecilia-vicuna

[6] An ancient Andean system of "writing" or notation using knotted strings, used for keeping accounts and statistics, as well as for telling stories, singing oral poems and/or recording communal rights and responsibilities (http://www.quipumenstrual.cl/).

[7] Hinojosa, L. 2020. Erotics: towards a poetics of the liminal Cecilia Vicuña in Mexico City. The Brooklyn Rail. https://brooklynrail.org/2020/09/artseen/erotics-towards-a-poetics-of-the-liminal

suspender (Back to suspension) (2017) during the 13th Biennial of Medial Arts. This piece involved suspending 3,000 volcanic rocks with transparent nylon thread, accompanied by an audio system (Fig. 10A). According to the exhibition catalog, "the volcanic debris present in his work evokes a direct connection to tectonic layers, orogenesis, and the constant process that takes place within a geological time that is very different from the brief anthropocentric chronology in which humanity lives" (BAM, 2019[8], p. 110).

Finally, the artistic work of Fernando Prats (1967-) is focused on territory, geography, and landscape to reflect on its fractures and traumas. In this regard, his work pays special attention to disasters at different scales, such as volcanic eruptions, geyser bursts or earthquakes. His novel method is to recover traces left by the events. The artist does not intervene directly on the material components of the art piece but leaves climate and natural events to cast their imprints. This has to do with the idea of bringing back authority to matter and extracting from them the inner sense confined (Blanch, 2011). He first worked with dirty matter before moving on to hot matter, as illustrated by his installation *Acción Chaitén* (Chaitén action) (2009) which uses volcanic ash (Fig. 10B). Prat's

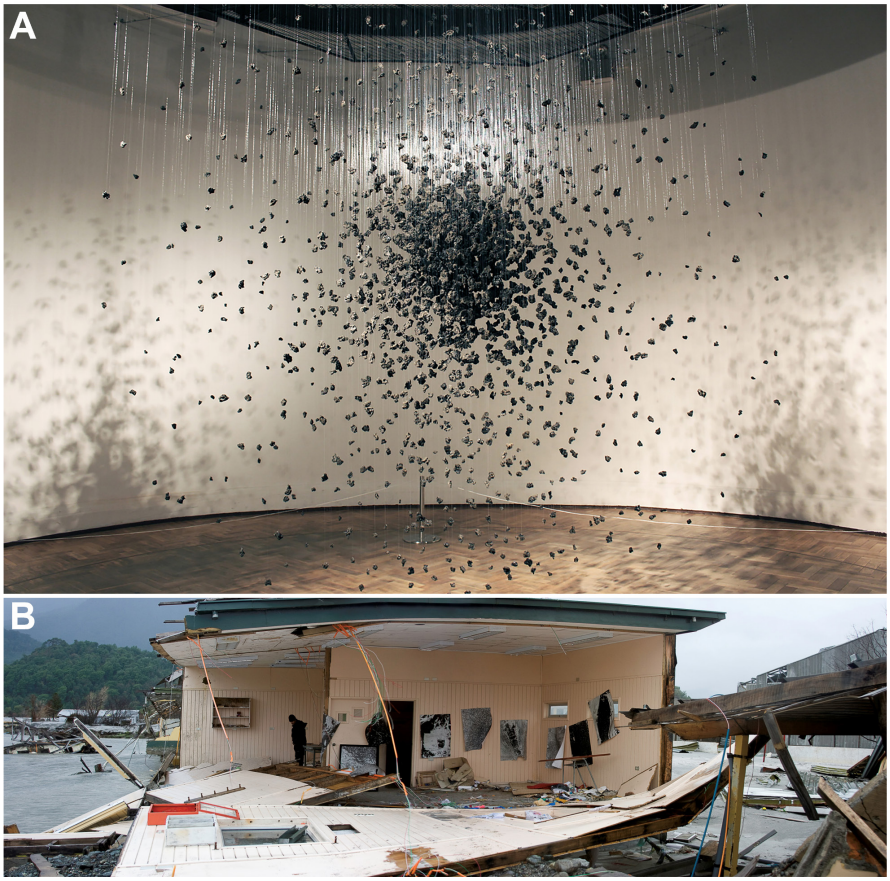

FIG. 10. **A.** Volver a suspender (Back to suspension), (2017). 3,000 volcanic stones, transparent nylon thread, and an audio system with motion sensors (sounds of falling stones and footsteps on stones). Featured at the Museo Nacional de Bellas Artes, Chile (National Museum of Fine Arts of Chile), as part of the 13th Media Arts Biennial (13BAM-Temblor, 2017). ID N/A. Author: Ignacio Bahna, includes original music by Marcelo Peña (MIOPEC). N/A. **B.** Acción Chaitén (Chaitén action), (2009). Smoke on paper. HD video, Blu-ray, approximately 2 hours, 10 minutes, 11 seconds. This work was produced in the city of Chaitén, Palena Province, located in the Los Lagos Region, Chile, where, after centuries of inactivity, on May 2, 2008, the Chaitén volcano erupted, causing massive evacuations of the population. ID N/A. Author: Fernando Prats. Photography: Enrique Stindt.

[8] Bienal de Artes Mediales (BAM). 2019. Catálogo Temblor, 13 Bienal de Artes Mediales.

work recognizes the Earth, as a body that charges and discharges violent energies and whose tectonic liberations are accompanied by destruction. In that vein, his artistic work expresses the excess of the Earth where its surface is not a safe place because matter always overflows.

4.4. Volcanoes in poetry

In the context of literature, it is imperative to acknowledge one of the most significant poets of Chile and the world, who was awarded with the Nobel Prize in Literature in 1945: Gabriela Mistral (1889-1957). We consider important to highlight that Mistral was the first Latin American writer to receive this recognition and, to date, the only woman to do so. Throughout her work, Mistral geographically traverses the national territory, paying special attention to two imposing volcanoes: Villarrica and Osorno. These evocative poetic descriptions can be appreciated in her iconic book *Poema de Chile* (Poem of Chile), published posthumously in 1967 in Barcelona, Spain. In these poems, Mistral not only constructs a unique vision of the majesty and power of these volcanoes, but also intertwines them with mythological and ancestral cultural deities associated with the Mapuche universe, who serve as guides or advisers to the territories. In *Volcán Osorno* (Osorno volcano) (1938), Mistral describes a calm snow-covered volcano surrounded by Lake Llanquihue, and she asks the volcano to leave its state of rest, with whose 'fire' she identifies herself, the inhabitants of the area, and the fertility or abundance of the land: *¡Boyero blanco, tu yugo blanco, / dobla cebadas, provoca trigos! / Da a tu imagen la abundancia, / rebana el hambre con gemido. / ¡Despeña las voluntades, / Hazte carne, vuélvete vivo, / quémanos nuestras derrotas / y apresura lo que no vino!* / (White herdsman, your white yoke, / bend barley, provoke wheat! / Give your image abundance, / cut hunger with a groan. / Tumble the wills, / become flesh, come alive, / burn our defeats / and hasten what did not come!).

Pablo Neruda (1904-1973) was a Chilean writer and poet awarded with the Nobel Prize in Literature in 1971. In one of his poems *El Libro de las Preguntas* (The Book of Questions) (1974), he asks the reader about volcanoes twice without referring to a specific one: *¿Qué cosa irrita a los volcanes que escupen fuego, frío y furia?* (What irritates volcanoes that spew fire, cold and fury?), attributing to them a distant and irascible character. Later in the same book he asks again, but now with pain or melancholy: *¿Caen pensamientos de amor en los volcanes extinguidos? ¿Es un cráter una venganza o es un castigo de la tierra?* (Do thoughts of love fall on extinct volcanoes? Is a crater a revenge or is it a punishment from the Earth?). In *Oda a los trenes del Sur* (Ode to the southern trains) (1959) he vividly mentions volcanoes as prominent topographical features: *Trenes del Sur, pequeños entre los volcanes*… (Southern trains, small among volcanoes…).

Elicura Chihuailaf (1952-), a Mapuche poet who was awarded with the National Prize for Literature in 2020, is mindful of volcanoes in his work. Chihuailaf was born and raised in Quechurehue, near Llaima volcano, third in the Chilean volcanic risk ranking (Sernageomin, 2023). In his writings it is possible to exemplify the permanent presence of volcanoes, home of the *pillanes*, and the geology as living beings, as in *Los signos de la naturaleza* (The signs of nature) (2008), where, during the last eruption of Llaima, the author says:

Mientras transito por la carretera veo levantarse la humareda del Llaima. Parece despertar el volcán, pero ha estado siempre alerta, dialogando con los ríos, con el aire que sostiene sus fumarolas, con las nubes que como botes sobre el cráter nos anuncia la lluvia. Desde mi infancia escucho su diálogo sonoro con el cerro Rucapillan (As I pass along the road, I see the smoke of the Llaima rising. The volcano seems to be waking up, but it has always been alert, in dialogue with the rivers, with the air that holds its fumaroles, with the clouds that announce rain like boats over the crater. Since my childhood I have listened to its sonorous dialogue with the Rucapillan).

Rucapillan in Mapudungun, the language of the Mapuche, means 'house of the guardians' or 'home of the ancestral spirits', and is the local name of the Villarrica volcano, first in the Chilean volcanic risk ranking (Sernageomin, 2023).

More references to volcanoes can be found in the work of Vicente Huidobro (1893-1948), *Temblor de Cielo* (Sky Quake) and in poems from Gonzalo Rojas (1916-2011), such as *Vocales para* Hilda (Vowels for Hilda) and *¿Qué se ama cuando se ama?* (What do you love when you love?), among others.

4.5. Volcanoes in Chilean traditional music and culture

As examples of Chilean popular music, one can find fascinating stories like that of Patricio Manns (1937-2021), who ventured into the mountain range near Antuco volcano in search of inspiration. In his own words, 'In my songs as in my novels, volcanoes naturally appear as elements of the landscape I am describing…'. In his song *Cuando me acuerdo de mi país* (When I remember my country), he said, *Me sangra un volcán* (A volcano bleeds in me) (Manns and Salinas, 2021).

In addition, in the Archive of Oral Literature and Popular Traditions, of the Biblioteca Nacional de Chile (National Library of Chile), there is a song related to a volcano that is mentioned, with slight modifications, in four compilations of popular musical expressions: *La Alegría del hogar*, series I y II (Gallardo, 1913), *Penas del Alma* (Torres, 1913), and *Cancionero amoroso* (1911)[9]. In these compilations, volcanoes become direct symbols of passionate love: *Tú encendiste, tú encendiste en mi pecho, un volcán, un volcán que amor se llama* (You ignited, you ignited in my chest, / a volcano, a volcano called love). Almost a hundred years after, Margot Loyola (1918-2015), a folklorist, composer, guitarist, pianist, collector, and researcher of Chilean folklore, included it in her studio album *Otras voces en mi voz* (Other voices in my voice) (2010). Eight years later, the national artist Gepe (Daniel Riveros Sepúlveda, 1981-) pays tribute to Margot Loyola in his album *Folclor Imaginario* (Imaginary folklore) (2018), in which this song is included.

4.6. Volcanoes in film and audiovisual media in Chile

In the field of Chilean cinematography, to date, there have been six film and/or audiovisual works produced that explore the world of volcanoes. These works, which include both short and feature films, have focused primarily on the documentary genre. Their objective has been to reveal the relationship between humans and volcanoes, highlighting both their aesthetic beauty and tourist potential while addressing the complexities, risks, and potential catastrophes associated with this coexistence.

Of these, five are *actualidades* (newsreels), Chilean film records that proliferated in the first decade of the 20th century and represent the oldest local precursors of documentary cinema (Mouesca, 2005). Thanks to the exhaustive research presented in the book *Sucesos recobrados* (Recovered events) (Vergara *et al*., 2021), we can present details of these five works in chronological order:

1. *Chile, futuro país del turismo* (Chile, future country of tourism) (1926), a production by Andes Film and Chilean photographer and documentarian Gustavo Bussenius (1885-1932), with panoramic views of the lakes, volcanoes, forests, and rivers This film was made as part of the centennial celebrations of Chiloé. It is considered a lost film.
2. *La Suiza Sudamericana* (South American Switzerland) (1926), produced by Imperio Film. This film, with a propaganda focus on tourism, highlights Osorno volcano through images of rivers and harbors. It is also considered a lost film.
3. *Expedición al volcán Quizapu* (Expedition to Quizapu volcano) (1928), produced by Andes Film, is a newsreel from the newspaper La Nación. This work focuses on an expedition to Quizapu volcano, located in the Maule region. With a length of approximately twelve minutes, the film includes explanatory graphics, images of the expedition members, and narration through intertitles that tell the story and route of the expedition.
4. *Ascensión al volcán Aconcagua* (Aconcagua volcano ascent) (1930), produced by Andes Film, is a special edition of the newsreel from the newspaper La Nación, dedicated to the ascent of the highest mountain in the Andes located in Argentina. As mentioned above, the Aconcagua was active more than 10 million years ago (Godoy *et al*., 1988). The movie is also considered a lost film.
5. *La erupción del volcán Quizapu* (Quizapu volcano eruption) (1932), produced by Andes Film, depicts the massive eruption at Quizapu that occurred on April 10, 1932. This volcanic eruption is considered the largest between Andean volcanoes and one of the largest in the world (Tilling, 2009; Rovere *et al*., 2012). The film includes aerial views of the crater, as well as images of nearby towns affected by ashfall (Vergara *et al*., 2021).

Eighty-one years later, *Vecinos del volcán* (Neighbors of the volcano) (2013) emerges, a feature-length documentary directed by Bulgarian filmmaker Iván Tziboulka. The film aims to capture the complexity of the disaster caused by the eruption of Chaitén volcano, which occurred in the late hours

[9] Cancionero amoroso. 1911. Imprenta Aurora: 48 p., ilustraciones 13 cm, Santiago, Chile.

of May 1, 2008 (Castro and Dingwell, 2009). For nearly five years, the documentary follows three families from Chaitén who were forced to leave their town due to the volcanic eruption and subsequent lahar that dissected the town. Through personal dialogues, the film explores the intricacies of what has been called a 'double catastrophe': '...the initial one, caused in 2008 by the eruption of Chaitén volcano on the urban center of the same name, and the subsequent one caused by political and technical decisions, which involved the evacuation of the population and a drastic demographic decline of the town' (Mandujano *et al*., 2015, p. 153).

4.7. Museum response: the first on-site museum about a socio-natural disaster in Chile

Thirteen years after the eruption of Chaitén, an interpretative center was inaugurated amidst the ruins of the disaster. This center, constituted as the first on-site museum of a socio-natural disaster in Chile, was designed with the aim of providing a testimony of the volcanic crisis and the consequences of the many attempts to relocate the city, through volcano science and the emotional perception of the inhabitants, using art as part of the museographic strategy (Holmberg *et al*., 2023[10]).

4.8. Framing art to unveil the intrinsic connection between volcanoes and social life

As we have seen in this interdisciplinary study, which examines artistic and cultural manifestations in Chilean art history between 1818 and 2021, volcanoes have been a source of inspiration and experimentation for many artists since the early founding of the Republic. Volcanoes have accompanied different historical and political processes from naturalistic views of the territory to contemporary political interventions in public spaces. We acknowledge the indescribable capacity of art and artists to frame the chaos of the Earth by extracting volcanic qualities. These are qualities that are otherwise invisible. In this section we discuss how the arts have the potential to reveal the relationship between volcanoes and human social life by showing: (1) the indomitable character of volcanoes linked with science and politics, (2) volcanic materials, (3) volcanic imagination, (4) the catastrophic experiences generated by volcanoes.

First, the indomitable character of volcanoes is represented in national symbols and was used to empower the newly independent nation during the formation of the nation state. This character shows a view of nature as something that can be overwhelming and is beyond human control. If people do not live near a volcano or there is no warning of an eruption, volcanoes tend to disappear from practical consciousness. On the other hand, when volcanoes are present as figures in everyday objects, they could become benchmarks of artistic works and popular imagination, expanding the opportunities of enhancing citizen knowledge about volcanic risk using the arts as a tool (*e.g*., Rouwet *et al*., 2013; Sevilla *et al*., 2023). This is important because low levels of volcanic risk perception are common since volcanic eruptions occur less frequently than other natural hazards (Carlino *et al*., 2008). In addition, volcanoes are often located in tourist areas, where visitors may lack risk awareness and perception (Bird *et al*., 2010; Alegría and Vergara-Pinto, 2024), which can be a significant problem in crisis management (De la Cruz-Reyna *et al*., 2000). Volcanic risk perception can even vary city-wide, depending on whether locals experienced direct consequences of an eruption (Mafuko Nyandwi *et al*., 2023).

The close relationships between art and nature, and art and politics during the early days of Chile as an independent nation, can be clearly glimpsed by the presence of Rugendas in Chile. A fact that cannot be dissociated from a more general phenomenon that occurred throughout the 19th century: "the growing concern for scientific knowledge of nature" (Galaz and Ivelic, 2009, p. 48). According to the national art theorist, Catalina Valdés Echenique, the importance of promoting an approach to nature through the arts and sciences was not limited to the renewal of plastic and literary languages: "...aspired to nourish the identity of the new American nations with local iconography and references. The administrative independence achieved by the revolutions of the second decade of the century now had to be complemented by the cultural and symbolic autonomy that would lead each of these nations to integrate into the West on its own terms and image" (Valdés Echenique, 2014, p. 11). This process of image-making was part of the intentions of the ruling elite to create a national identity based on the geographical specificities of the recently independent country, which contrasted with European

[10] Holmberg, K.; Burbano, A.; Gómez, C.; Letelier, J.; Donovan, A.; Morin, J.; Walshe, R.; Puentes, P.; Dupradou, T. 2023. "Chaitén: Land of Volcanoes". https://able-journal.org/chaiten-land-of-volcanoes.

conceptions of American nature as an inhospitable land (Cid Rodríguez and Vergara, 2011).

The historian Rafael Sagredo explains the link between art and science through his work about naturalists of the 19th century in South America. For him, the influence of Alexander von Humboldt, Romanticism, and the possibility of capturing natural, cultural, and social reality in rapid strokes, as it was usually done by traveling artists, are elements very present in the work of Rugendas, and coincide with the consolidation of landscape painting as a pictorial genre.

Particularly important is the subjectivity present in Rugendas' artistic production, where the scenes emerge from reality but do not truly reflect what reality was (Sagredo, 2012). One of the works of Rugendas, *Erupción Volcánica en el Archipiélago de Juan Fernández* (Volcanic Eruption in the Juan Fernández Archipelago) (*ca*. 1836), for example, was based on the report and lithographs made by Thomas Sutcliffe (1839), the former British governor, who described a submarine volcanic eruption with an eruptive column and lightning is described (Fig. 2E) (Sutcliffe, 1839). This eruption was thought to have occurred in the Cumberland Bay, Robinson Crusoe Island in 1835 and was recently discredited by Lara *et al*. (2021). In this study, an interdisciplinary effort concluded that the information contained in the reports of Sutcliffe and subsequent related works was a misinterpretation of a distant earthquake-triggered tsunami that may have generated rockfalls on the cliffs of the archipelago.

Second, the art installations and sculptures analyzed, used volcanic materials, or emulated volcanic forms in their production. This visible gesture of bringing volcanic materials into public spaces close to citizens is a literal act of bringing volcanic qualities closer to social life. They also offer the possibility of grasping the conceptual categories of volcanology, and through and with the right didactic scaffolding, education about volcanoes could be provided. In this regard, the works of Fernando Prats (Blanch, 2011) and Cecilia Vicuña (Ariz Castillo, 2013) succeed in bringing volcanic material and cosmovisionary qualities to society. The first quality uses the language of matter imprinted in surfaces, while the second, through ritual performance brings the opportunity to connect with the wisdom of Earth.

Third, volcanoes have been used as inspiration for paintings, music, and poetry, teaching us a kind of volcanic imagination. By means of imagination and sensations, arts translate volcanic evocations into representations using colors, figures, and words, conforming another language to express volcanic qualities that emerge from human experience of interaction with volcanoes. This language does not correspond to the scientific language but an imagined aesthetic language that captures multiple subjective ways of volcanic presence in human experience (Dixon and Beech, 2018; Soldati and Illingworth, 2020; Calvache and Sánchez, 2022; Sánchez and Posada, 2024), perhaps not so different from the visions of volcanoes, and of nature in general, in pre-modern times in different cultures (*e.g*., Mariscotti de Görlitz, 1978; Grebe *et al*., 1972; Schlehe, 2008; Holmberg, 2023; Sánchez and Posada, 2024).

Fourth, audiovisual arts, and specifically the genre of documentaries, exhibit disastrous experiences as a volcanic quality with striking realism but also as touristic attractions and geological heritage. Although we presented only six cases, historical films of eruptions and expeditions have the potential to be solid scientific evidence in order to understand volcanic behavior and anthropogenic causes of disasters; in addition, can be keys to intervene in disaster risk reduction, with internationally renowned examples, such as *Fire of Love* (Dosa, 2022[11]). The particular case of Chaitén presented both in the documentary *Vecinos del Volcán* (Neighbours of the volcano) and with the construction of the on-site museum, provides the opportunity to observe and analyze the complexity of public policies on socio-natural disasters and the importance of their adequate design to reduce vulnerability, considering the importance of social, affective, and territorial ties (Doyle *et al*., 2015; Mandujano *et al*., 2015; Maldonado *et al*., 2020).

5. Conclusions

This is the first attempt to explore the diverse artistic representations of volcanoes in Chile. The study has revealed a remarkable diversity of expressions that reflect the deep connection between Chilean society and volcanoes throughout the independent history of the country. Our findings provide the basis for an in-depth analysis, exploring the temporal and spatial contexts that have shaped the emergence and evolution of volcanic representations, and the human perception of geological phenomena. The wide variety of artistic expressions presented in this

[11] Dosa, S. (Director). 2022. Fire of Love. Sandbox Films.

study serves not only as evidence of the diversity of volcanic processes, landforms, and eruptive styles, but also as a testimony that volcanoes, as geological phenomena, are intricately intertwined with human social dynamics in ways that go beyond the immediate physical consequences of a volcanic eruption. We acknowledge that artistic representation of volcanoes in Chile can go further, through the exploration of other arts, such as photography and theater, among others. This study presents artistic representations of volcanoes throughout Chilean history and highlights the central role of art and interdisciplinary approaches in illustrating the profound influence of volcanoes on the cultural and social fabric of Chile. This entanglement is continuous through time and has not been truncated despite separations between nature and society in modern times. These insights have remained largely hidden until this research.

6. Author Contribution Statement

Valentina Acuña: Writing, review and editing, methodology, conceptualization. Matías Clunes: Writing, review and editing, methodology, conceptualization. Sebastián Riffo: Writing, review and editing, methodology, conceptualization. John Browning: Writing, review and editing.

Acknowledgements

We thank the Volcanology Group of the Chilean Geological Society for inviting us to publish our findings. We appreciate the suggestions made by the reviewers K. Holmberg and J.J. Sánchez, and the contributions made from the editor D. Bertin, which substantially improved the quality of this manuscript. V. Acuña acknowledges to the Instituto de Sociología UC, Cigiden and ANID National Doctorate Scholarship N° 21231641. J. Browning acknowledges to Fondecyt Project 1210591. We would like to express our sincere gratitude to Fundación Mario Carreño, Fundación Santos Chávez, Fundación Sergio Castillo, Fundación Nemesio Antúnez, Fundación José Venturelli, Museo Nacional de Bellas Artes, Museo Histórico Nacional, Museo O'Higginiano y de Bellas Artes de Talca, Museo de Bellas Artes de Valparaíso, Palacio Baburizza, Fernando Prats, Francisco Gazitúa and Ignacio Bahna, for their generous support in providing access to the artworks presented in this article. High-resolution versions of each of the images presented in this article can be viewed at https://t.ly/vDBf7.

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Manuscript received: May 30, 2023; revised/accepted: February 27, 2024; available online: March 07, 2024.