



Year: 2023

The Glacier Views of Jean-Antoine Linck – A Milestone for the Mont Blanc Glacier History from the 18th to the 19

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Abstract: Interdisciplinary approaches are needed to reconstruct the behaviour of glaciers beyond the beginning of systematic measurements. For example, historical documents have been used to reconstruct former glacier extents successfully at different sites, including in the well-documented Mont Blanc area that became popular since the mid-18th century among artists, scientists, and travellers. Jean-Antoine Linck from Geneva is probably the artist to whom we owe the greatest number of unique glacier views. Linck's special preference were the ice regions, which he discovered and drew with alpinistic daring and naturalistic correctness, preferably by gouache, although many pencil sketches are preserved. Linck subtly used the etching technique to create easily reproducible plates in large format, which are then hand-coloured with gouache and watercolour. This technique allowed him to create numerous reproductions of the same view, while still giving them a unique and original aspect, views that are remarkable for their serenity and silence, while offering luminous atmospheres. These illustrations introduced the realistic representation of the high mountains into the iconography of Genevese painting and thus led to a new kind of landscape painting with a permanent character. From a perspective of glacier history and although many of his artworks are not exactly dated by the author, the work of Jean-Antoine Linck is indispensable since it represents the whole development, specifically of the Mer de Glace and the Glacier des Bossons, but also other glaciers during the period from the end of the 18th century until the 19th century glacier maximum around 1820. Linck's work has the same importance for the Mont Blanc area as that of Caspar Wolf and Samuel Birman for the central Swiss Alps or Thomas Ender for the Austrian Alps in terms of glacier iconography. Therefore, Linck was both an artist and a glacier historian. // Des approches interdisciplinaires sont nécessaires pour reconstruire les fluctuations des glaciers au xix^e siècle, au-delà du début des mesures systématiques. Par exemple, des documents historiques ont été appliqués pour reconstituer d'anciennes étendues des glaciers sur différents sites, notamment dans la région du Mont-Blanc, qui sont très bien documentés et devenus populaires parmi les artistes, les scientifiques et les voyageurs depuis le milieu du xviii^e siècle. Le Genevois Jean-Antoine Linck est probablement l'artiste à qui l'on doit le plus de vues glaciaires exceptionnelles. La préférence particulière de Linck était les régions des glaciers, qu'il a découvertes et dessinées avec une audace d'alpiniste et une exactitude de naturaliste, principalement à la gouache, bien que de nombreux croquis au crayon aient été conservés. Linck a subtilement utilisé la technique de la gravure pour créer des planches de grand format facilement reproductibles, qui ont été ensuite coloriées à la gouache et à l'aquarelle. Cette technique lui a permis de créer de nombreuses reproductions d'une même vue, tout en leur donnant un aspect unique et original. Elles sont remarquables de sérénité et de silence, tout en offrant des ambiances lumineuses. Ces illustrations introduisent la représentation réaliste de la haute montagne dans l'iconographie de la peinture genevoise et conduisent ainsi à une nouvelle forme de peinture de paysage à caractère permanent. D'un point de vue de l'histoire des glaciers, et bien que nombre de ses œuvres ne soient pas exactement datées par l'auteur, l'ouvrage de Jean-Antoine Linck est indispensable. Il représente l'ensemble de l'évolution de la mer de Glace et du glacier des Bossons, mais également d'autres glaciers, pendant la période allant de la fin du xviii^e siècle jusqu'au maximum glaciaire du xix^e siècle vers 1820. L'œuvre de Linck accorde au territoire du Mont-Blanc la même importance, en termes d'iconographie des glaciers, que celle de Caspar Wolf et Samuel Birman pour les Alpes centrales suisses, ou de Thomas Ender pour les Alpes autrichiennes. Linck était donc à la fois artiste et historien des glaciers.

Other titles: Les vues glaciaires de Jean-Antoine Linck – un jalon de l’histoire des glaciers du Mont Blanc du xviii^e au xix^e siècle

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ZORA URL: <https://doi.org/10.5167/uzh-252870>

Journal Article

Published Version



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Originally published at:

Nussbaumer, Samuel U; Zumbühl, Heinz J (2023). The Glacier Views of Jean-Antoine Linck – A Milestone for the Mont Blanc Glacier History from the 18th to the 19. *Revue de Géographie Alpine*, 111(2):12235.

DOI: <https://doi.org/10.4000/rga.12235>

The Glacier Views of Jean-Antoine Linck – A Milestone for the Mont Blanc Glacier History from the 18th to the 19th Century

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The authors would like to express their special thanks to Alexander Hermann (Institute of Geography, University of Bern) for his help in creating the overview figure on the glacier views of Jean-Antoine Linck (Figure 8). We also thank the two reviewers and the editor for their valuable comments.

Introduction

- 1 Improved understanding of long-term, natural climate variability on different spatial and temporal scales is crucial in order to place the recent climate change in a longer-term context (IPCC 2021). In this regard, the determination and reconstruction of glacier changes on different time scales have proven to be very useful, not only as a visual expression, but also as a quantitatively detectable signal of a change in the surrounding climate (e.g., Oerlemans, 2001; Marzeion *et al.*, 2017). To reconstruct the behaviour of glaciers further back in time, interdisciplinary approaches that use both historical and physical methods are needed.
- 2 In this context, historical documents such as written accounts, old maps, paintings, drawings, prints, and photographs have been used to successfully reconstruct former glacier extents at different sites (Zumbühl, 1980; Nussbaumer *et al.*, 2011; Solomina *et al.*, 2016). Together with geomorphological and geo-archaeological evidence, this material provides a detailed view into glacier behaviour during the Little Ice Age (LIA), the latest cold phase of the Neoglacial, lasting a few centuries between the Late Middle Ages and the warming of the first half of the 20th century (Grove, 2004; Wanner *et al.*, 2022). Repeated glacier advances far down into several Alpine valley bottoms are

typical for the LIA. Those glacier advances were an aesthetically attractive phenomenon for early travellers since the 18th century, but also an existential threat to people living in the close vicinity of glacier tongues, who were not aware of the imminent danger until the end of the 16th century (Pfister & Wanner, 2021). This behaviour stands in strong contrast to today's glacier behaviour with its dramatic retreat in many places all over the world (WGMS, 2023).

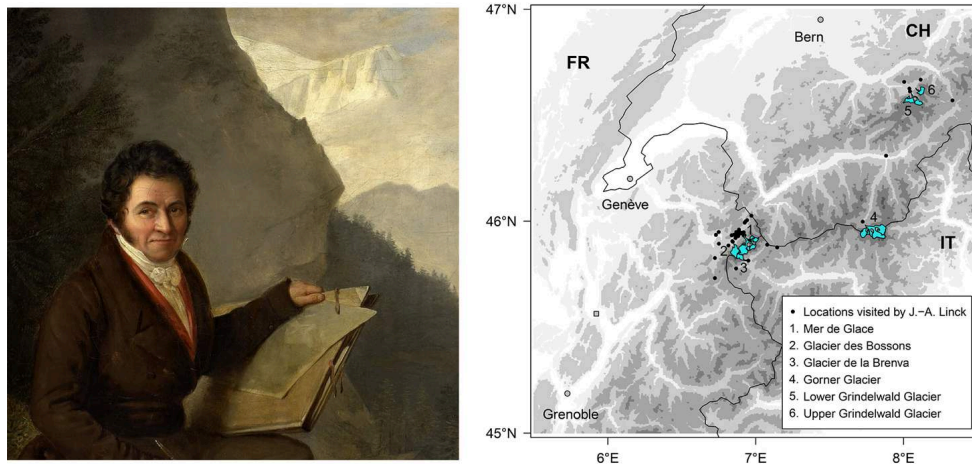
- 3 Where sufficient in quality and quantity, pictorial documents (drawings, paintings, prints, and photographs), cartographical documents (maps, cadastral plans, and reliefs), and written accounts (chronicles, church registers, land sale contracts, travel descriptions, early scientific works on Alpine research, etc.) can provide a detailed picture of glacier fluctuations, in particular frontal length changes. The methodology of evaluating historical sources to reconstruct past glacier changes was pioneered by Zumbühl (1980). Using these data, we can achieve a resolution of decades or in some cases even individual years of ice margin positions (Zumbühl & Holzhauser, 1988). To reconstruct past glacier movements, historical data must be handled carefully taking local circumstances into account. In particular, the evaluation of pictorial sources has to fulfil certain conditions in order to obtain reliable results concerning the former extents of glaciers:
 - First, the date of the document has to be known or reconstructed (i.e., the exact date when the artist was visiting the glacier and making sketches or drawings). Oil paintings might have been done on site, but they were quite often finished later, usually in the artist's studio. Prints of artworks often bear a different date than their originals. Since the 1850s, an emerging number of photographs are available, though the dating of those early glacier photographs can be especially difficult and often includes time-consuming archival work including the study of the artist's biography and/or travel itinerary.
 - Second, the glacier and its surroundings have to be represented in a manner that is realistic and topographically correct, something that requires particular skills of the artist. Some artists liked to compose motifs of their own in the foreground or omit unaesthetic frontal moraines, features that could obscure the true position of glaciers.
 - Third, the artist's topographic position should be known. The presence of distinctive elements in the glacier's surroundings such as rock steps, hills, or mountain peaks can facilitate the evaluation of historical documentary data. For pictorial documents of high quality, this allows an exact location (georeferencing) of the artist's position. The location of the glacier front is ideally deduced using a geographic information system considering the angle of view and correct proportions (Nussbaumer & Zumbühl, 2012).
- 4 The Lower Grindelwald Glacier (Bernese Oberland, Switzerland) shows the world's most detailed and best-documented curve of glacier length changes (Oerlemans, 2005), due to the comprehensive archive of about 400 historical sources and artworks evaluated by Zumbühl (1980) and Zumbühl *et al.* (1983). Another region exceptionally well documented is the Mont Blanc area, where there exist abundant historical documents revealing the fluctuations of glaciers such as the Mer de Glace, Glacier des Bossons, Glacier d'Argentière, and others. The Genevan Jean-Antoine Linck (1766–1843) is probably the artist to whom we owe the greatest number of views of glaciers, in particular of the Mer de Glace (or Glacier des Bois, as the glacier tongue was also known), the most prominent glacier of the area due to its appeal and easy accessibility. In fact, our knowledge on the glacier history in that region would not be complete without his unique artworks. Despite the importance of his work, Linck is still rather

unexplored, and an art history access is widely lacking. In the following, we place these works by Jean-Antoine Linck in a broader art history context and discuss the importance of Linck for modern glacier reconstructions.

Geneva Art School and Jean-Antoine Linck

- 5 The interest for the glaciers in Savoy started in Genevese society after the visits of the said first English travellers, William Windham and Richard Pococke, and the subsequent repetition by Pierre Martel from Geneva. Parallel to the scientific studies hereby influenced by Marc Théodore Bourrit and Horace-Bénédict de Saussure, also poets, writers, artists, and other scientists found new sources of inspiration in those mountains. Among these, a very prominent artist was Jean-Antoine Linck, born in Geneva on 14 December 1766. Jean-Antoine Linck (Figure 1, left) was the son but also student of the enamel painter and copper engraver Jean-Conrad Linck, with whom he worked from the age of twelve. Also, his brother, Jean-Philippe Linck (dit le Jeune) (1770–1812) was a collaborator in the father's workshop situated in a neighbourhood that brought together watchmakers, jewellers, and enamel painters. The relationship between the works of Jean-Antoine and Philippe Linck is therefore obvious, even if the engraving by Jean-Philippe show that he was less attentive than his brother to the topographical representation of the mountains. It was in this dynamic artistic environment of the second half of the 18th century that the first engravers appeared, making the Chamonix and other valleys known thanks to the emerging “industry” of landscape engraving. Jean-Antoine Linck was one of the greatest representatives of this artistic movement linked to a new enthusiasm for the landscape as well as the development of Alpine tourism.
- 6 Since 1789, Jean-Antoine Linck drew mainly Alpine landscapes from Savoy to St Gotthard, as far as we know from the preserved works of art. His special preference were the ice regions, which he drew with alpinistic daring and naturalistic correctness. This makes him not only the artistically most important practitioner of mountain painting in the Genevese school at that time, but also a pioneering artist of the scientifically verifiable representation of high mountain areas (Weber *et al.*, 1981, p. 78). Figure 1 (right) gives a geographical overview of the glacier artworks by Jean-Antoine Linck.

Figure 1



Left: Portrait of painter and engraver Jean-Antoine Linck from Geneva, by Joseph Hornung (cut from oil painting; 51.0 x 44.5 cm; Bibliothèque de Genève).

Right: Overview of sites visited by Jean-Antoine Linck. The overview does not claim to be exhaustive. The localities of six glaciers are shown where Linck's works were used for glacier length reconstructions.

- 7 Jean-Antoine Linck was clearly inspired and influenced by Carl Ludwig Hackert, who was a friend of his father and living in Geneva since 1778 (and also co-working in the workshop of the Linck family). Several works by the two artists show similarities such as for example scenery with the view on the tongue of the Mer de Glace and the source of the Arveyron River (see next section and Figure 2, lower). Linck's fame was quickly established and spread far and wide; at the end of the 18th and the beginning of the 19th century, his atelier in Montbrillant, at the gateway to Geneva and where tourists heading out for the Alps of Savoy used to pass by, was visited by many of the great personalities passing through and each one took home a souvenir of the great artist, a drawing, a gouache, an etching or a watercolour. Quite astonishingly, his work is still rather unexplored and lacking the art history access. Regarding glacier history, it has to be said and considered that many of his works are unfortunately not exactly dated by the author.
- 8 In order to create his works, Linck used to travel through the Alpine valleys during the summer season to bring back sketches to add to his visual repertoire. Sketches were drawn quickly and served as a working tool, with the compositions structured around the main elements, while details such as e.g., trees in the foreground were better worked out. Linck often used white chalk that allowed him to locate shadows and ice and snow. Contemporary reports attest to the high quality of Linck's work:
- Monsieur Linck, très bon graveur, travaille d'après ses propres dessins, et passe une partie de la belle saison à parcourir les montagnes pour y chercher de beaux sujets. Il a séjourné plusieurs semaines cette année (1810) dans la vallée de Chamouni. (Leschevin, 1812, p. 58)
- 9 Also, the contemporary geologist Johann Gottfried Ebel (1764–1830) gives reference to the artworks by Linck in his guidebook and advises travellers to find the best artists, such as Jean-Antoine Linck (Ebel, 1818, p. 275). Although Linck's preferred medium was gouache, many pencil sketches are preserved (Bouchardy, 1986). Linck subtly used the etching technique to create easily reproducible plates in large format, which are then hand-coloured with gouache and watercolour. This technique allowed him to create

numerous reproductions of the same view (much cheaper than a painting), while still giving them a unique and original aspect. He was thus able to meet the demands of a growing number of customers who wished to take home the memory and views of the regions they visited.

- 10 Jean-Antoine Linck exhibited very regularly in Geneva, in particular at the Société des Arts de Genève, and his Montbrillant studio became very popular. His clientele, both local and foreign, was distinguished by great personalities, such as Joséphine Bonaparte, Empress of the French. An exhibition on the works of Jean-Antoine Linck was organised in Geneva in 1918 and included a major part of Linck's studies in pencil, pen, charcoal, pen-and-ink drawing, watercolours, black and coloured contour etchings, and some oil paintings. All the sites depicted by Linck could be found there, such as views of Geneva and its surroundings, the Salève, the Chamonix Valley and the Mont Blanc, the mountains of the Valais and the Bernese Oberland, the course of the Orbe, the Vallée de Joux, and the Perte du Rhône at Bellegarde; in addition, a few typical costumes from Geneva, studies of animals, and studies of trees. It was said at that time that Linck's coloured contour etchings were still quite easy to find a few years ago, but they were becoming increasingly rare, being highly sought after not only by Swiss enthusiasts, but also abroad, especially in England and North America, where they had always been very popular.
- 11 His work of drawings, studies in the nature (very often with chalk and charcoal, or watercolour) is very important and distinguished by precision, aesthetics, and harmony. In that sense, Linck discovered the mountains and the glaciers in particular in a holistic way. On many artworks by Linck, the smallness of the characters in the foreground accentuates the immensity of the peaks and glaciers. The presence of the characters, with their distinguished appearance, testifies to the new attraction for the Alps, the curiosity of the European elite for the high mountains and glaciers. Linck's drawings are thus both precise and following the reality, but also very personal and appealing. As a consequence, Linck was one of the most appreciated Geneva artists of the first half of the 19th century and he was notably one of the first artists to give access, through images, to the high mountains. His graphic works became very famous, especially (watercolour and/or gouache) contour etchings beautifully coloured are highly sought by art collectors. It seems that Linck did not make a lot of oil paintings and then mostly in his early years (1790s), but all paintings are very attractive.

Jean-Antoine Linck and the Glacier Development from c. 1790 to 1820/1822

- 12 From a perspective of glacier history, in particular for the Mont Blanc area, the work of Jean-Antoine Linck is indispensable since it provides a differentiated view of glacier development of the Mer de Glace and other glaciers (cf. Figure 8) from the end of the 18th century until around 1820. From around 1790 to 1820, Jean-Antoine Linck produced a large number of drawings and paintings, which provide excellent examples of glacier representations. Towards 1780, a remarkable glacier advance is well documented by various sources, especially on the north side of Mont Blanc (de Saussure, 1786; Bourrit, 1785; Forel, 1901; Nussbaumer & Zumbühl, 2022). The subsequent glacier retreat is less well documented, but it can be quantified thanks to the works of Jean-Antoine Linck.

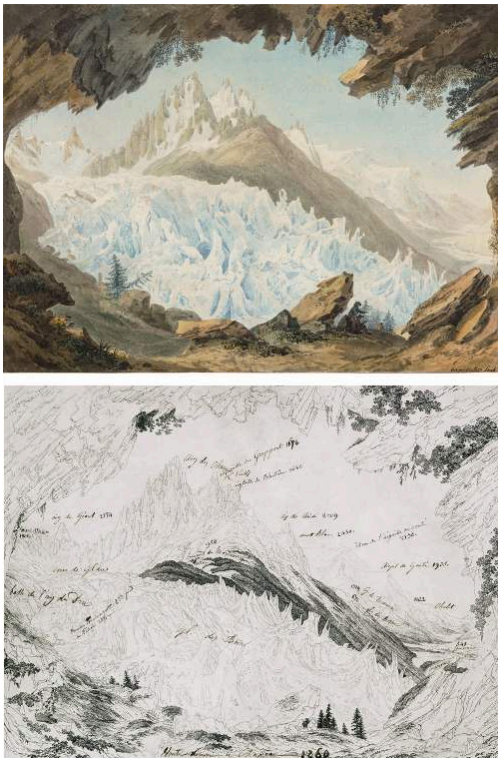
- 13 A very important document of this retreat is Linck's watercolour showing the retreated Glacier des Bois very likely before 1800 (Figure 2, upper). It shows the terminus of the Mer de Glace highly debris-covered and seriously melted back, nearly 600 m behind the LIA maximum extent, but still reaching down to the plain. Dead ice and ponds are formed in front of the snout. The glacier is exactly drawn with white, blue and green colours that set a contrast to the surrounding terrain. On the left side of the picture, the Côte du Piget hill and parts of the moraine can be seen. Sheltered by this hill, trees are growing on the glacier-distal side of the hill. Coarse blocks indicate a frontal moraine that is burst by the Arveyron River. Interestingly, dead tree stumps are also depicted; they were probably felled by the people in view of the imminent glacier advance. The exact dating of this artwork by Linck, and notably one of the few pictures showing the retreat of the Mer de Glace, is not known. One of the few dated paintings by Linck is taken from a cave-like position at Le Chapeau and dates from 1799 (Durand *et al.*, 1992, p. 68). It shows the upper part of the tail of the Glacier des Bois, and exactly the same view was published by Linck as coloured contour etchings (Figure 3). The watercolour by Linck was probably made around 1795, but surely earlier than 1802, when a drawing by William Turner clearly shows a more advanced glacier front position (Nussbaumer *et al.*, 2007).
- 14 Another work by Linck, very likely from the beginning of the 19th century, is the watercolour and gouache drawing showing the front of the Glacier des Bois (Figure 2, lower). The detailed drawing reveals the glacier highly crevassed, with the snout partly caved in. It is signed by the author, and on the back, it is noted that Linck made the work of art at Montbrillant. It is known that Linck made three gouache views in his atelier at Montbrillant in 1804 (Bouchardy, 1986, p. 59), and it is likely that the drawing discussed is part of them, as also the glacier extent shown suggests that the picture was made at that time period. This work by Linck is very objective and shows, compared to the watercolour of the glacier being retreated, a completely different view of the glacier. The Glacier des Bois is advancing and disintegrated by crevasses, and the glacier snout has caved in. The moraine foreland that has been overridden by the glacier in the 1770s advance is drawn in great detail, showing young trees growing again in front of the glacier, but at some distance to the old-growth forest (at the right of the picture). The background with the imposing Aiguille Verte with Les Drus gives the picture a very realistic style. The structure and nature of the ice and the rocks are represented with an astonishing exactitude which surely is in the scientific spirit of de Saussure. Moreover, the glacier snout with the outflow of the Arveyron River is perfectly integrated into the surrounding rocks and mountains. This is in contrast to a very similar and well-known view by Carl Ludwig Hackert, where the glacier snout seems to be arranged by coincidence. Linck published this view also as a coloured contour etching, which is more idealised, and it is interesting to note that the etching shows the glacier snout still in its entirety existing, having the typical arch shape.

Figure 2



Upper: The Glacier des Bois is retreating and reveals the fact that the glacier has quite a small extent at the turn from the 18th to the 19th century (“Vue du Glacier des Bois en retraite.”; signed bottom right “Jn. Ante Linck.”; pencil, watercolour, gouache; 24.7 x 33.2 cm [sheet 33.7 x 42.4 cm]; Musée d’ethnographie, Genève, Collection Georges Amoudruz, 303 109; photograph by S. U. Nussbaumer). Lower figure: Very fine watercolour drawing showing the advance of the Glacier des Bois at the beginning of the 19th century, with the Aiguille à Bochard, the Aiguille Verte, and Les Drus in the background (“Vue de la Source du Glacier des Bois.”; signed bottom left “fait par Jn. Ante Linck”, marked on the back “fait par J. Ant Linck a Montbrillant près la porte de Suisse a Genève”; pencil, watercolour, and gouache, on grey mount; 35.0 x 46.7 cm [sheet 42.3 x 54.0 cm]; private collection; photograph by H. J. Zumbühl).

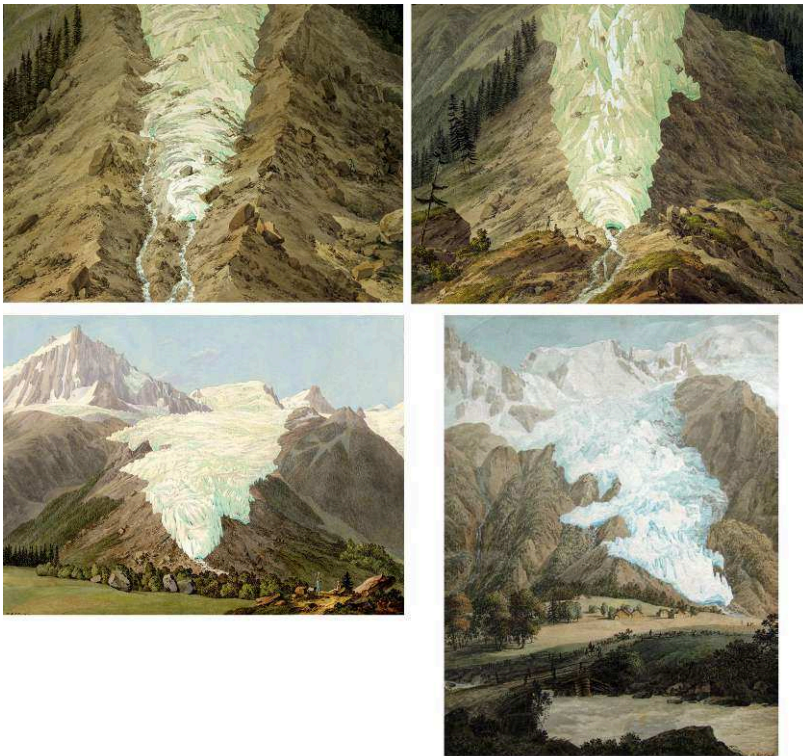
Figure 3



Jean-Antoine Linck's masterpiece of glacier and landscape representation showing the Mer de Glace in 1799 seen from Le Chapeau. This perfect scenery with foreground and background was taken from the cave-like position where the old Chapeau had been (upper figure: "Artiste dessinant depuis la voûte nommée le Chapeau, le glacier des Bois et les aiguilles du Charmoz"; watercolour on paper; 33.2 × 45.0 cm; signed bottom right "fait par Jn. Ante. Linck"; private collection, Beurret & Bailly Auktionen; lower figure: "Voute nommée le Chapeau—1260"; contour etching, with pen and brown ink; 36.4 × 48.4 cm; Musée d'art et d'histoire, Cabinet des estampes, Genève, Acq N°341).

- 15 A stunning novelty shows the Glacier des Bossons at two points in time: As a keen observer of glaciers, Jean-Antoine Linck is probably the first artist to show a glacier advance with the help of two realistic and accurate views from the same position; one as the glacier retreats and the other as it advances (Figure 4, upper). A similar view by Linck, but from a wider perspective and including the Aiguille du Midi, Mont Blanc du Tacul, Mont Maudit, and Mont Blanc in the background (Figure 4, lower left), leaves no doubt that the mentioned study represents the Glacier des Bossons. This quasi-scientific approach by Linck, far ahead of the times, would not be taken up again until much later with the worldwide movement of glacier observations that emerged in the second half of the 19th century (Forel, 1881; Allison *et al.*, 2019). The subsequent advance of the Glacier des Bossons is well documented by several other drawings by Linck (dated between 1813 and 1817/1818; Nussbaumer & Zumbühl, 2012), among these we can find a watercolour showing the maximum position (or shortly before, probably in 1817), with the glacier protruding into the forest at its upper right lobe and forming an impressive glacier tongue (Figure 4, lower right). At the same time, Linck depicts on a sketch drawing the devastation by the glacier at the right-hand side moraine, where a cross was erected in 1818 in order to stop the glacier advance (Mougin, 1912, p. 49; Nussbaumer & Zumbühl, 2012).

Figure 4



Upper: Stunning representation of the retreating and advancing tongues of the Glacier des Bossons by Jean-Antoine Linck, one of the first ever glacier comparisons ("Parties de glacier avec des randonneurs"; convolute, two sheets; both signed bottom right "J: Ant: Linck. Fec"; watercolour; 25.0 x 34.0 cm, 24.7 x 33.0 cm; private collection; photograph by H. J. Zumbühl).

Lower left: Glacier des Bossons from a wider perspective ("Glacier des Bossons"; signed bottom left "Ant. Linck fec."; watercolour; 28.7 x 38.3 cm; British Museum).

Lower right: Glacier des Bossons around its 19th century maximum ("Vue de Glacier de Bossons de l'Aiguille du Midi et du Tacul"; signed bottom right; watercolour; 44.5 x 33.7 cm; private collection, Dobiaschofsky Auktionen; photograph by S. U. Nussbaumer).

- 16 Two impressive close-up views also exist for the front of the Glacier des Bois (Mer de Glace), depicting both sides of the glacier tongue and its interference with the surroundings (Figure 5). These views clearly document the final advance of the Mer de Glace, which was particularly noticeable between 1810 and 1820. For the maximum position of the Mer de Glace in the 19th century (in 1821, according to Birmann, 1826, but occupying nearly the same extent for the following few years), several sketches by Linck show the threatening advance. These drawings are fine and subtle, the pencil stroke is quick and light. The artist uses white chalk to mark the presence of ice, and the tongue of the Glacier des Bois can be clearly delimited. High and sharp seracs are next to a farm from the hamlet of Les Bois, only a few metres away as well as some trees broken by the advancing ice. Although these artworks are not dated, the sketches show a lot of details of the impressive glacier advance. As there was no destruction reported for that advance, the glacier must very soon have reached the maximum extent, and the sketches possibly date from about 1820. This cohabitation between the threatening natural elements and the daily life of the inhabitants is one of the characteristics of the Chamonix Valley. Another artwork by Linck in a Romantic style portrays the Glacier des Bois under moonlight and shows how much Linck was

interested and fascinated by glaciers. In the foreground, a fire and the presence of humans give an impression of scale and thus of the size and grandeur of the glacier.

Figure 5



Left: Detail of the Mer de Glace (orographic left side of the tongue) ending in the valley bottom in 1803 ("Vue d'une partie d'Arviron, du glacier des Bouis & du Montanvert"; signed "J. Ant. Linck fec. 1803"; lithograph with coloured chalk and wash; 44.8 x 58.0 cm; British Museum).

Right: Close-up view of the orographic right side of the glacier tongue around 1820 by Jean-Antoine Linck, with the glacier reaching the Côte du Piget hill, on which it is overturning and overthrowing trees ("Vue du Mont Blanc"; black and white chalk on grey paper; 42.7 x 56.0 cm; National Gallery of Art).

- 17 Interesting glaciers and mountain views by Jean-Antoine Linck are also available from the western and south-eastern flank of the Mont Blanc, for example the drawing by Linck from around 1795 (Orombelli & Porter, 1982) showing the Brenva Glacier in a clear distance from the path to the Val Vény (Figure 6, left). High up on the rock, the old chapel that would be destroyed in the advance culminating in 1818 is depicted. The glacier itself is highly crevassed and swelled over the whole extent. In addition, the Pierre à Moulin, an important landmark, is very small and nearly swallowed by the ice masses. The analysis of the drawing suggests that the apparently advancing glacier was much more voluminous compared to 1767 (when an etching by François Jalabert, published in de Saussure [1786] allows a direct comparison), but in a similar position as in 2000 (Imhof, 2010). The advanced position of the Brenva Glacier during the 20th century, however, is due to the 1920 and 1997 rock avalanches that caused a non-climatically driven advance of the glacier tongue (Deline *et al.*, 2015). A few views by Linck are also known from the Monte Rosa area, including a view of the strongly advancing tongue of the Gorner Glacier near Zermatt in the 1820s (Figure 6, right). The technique used and the manner of depiction suggest that Jean-Antoine Linck is the author of this drawing, and also match other illustrations from this period. The bulged and jagged tongue is an unambiguous indication of the strong and rapid advance of the glacier at that time (Holzhauser, 2010).

Figure 6



Left: The Brenva Glacier as seen on the way to Notre Dame de la Guérison around 1795 by Jean-Antoine Linck (“Le glacier de la Brenva et l’arête de Peuterey”; signed bottom right; pencil, white chalk on beige paper; 41.0 x 56.0 cm; Annecy, Collection Paul Payot; Vellozzi, 1990:45).

Right: Frontal view of Gorner Glacier seen from Hermetje, presumably by Linck (signed bottom right “Zermatt”; pencil and charcoal, with white chalk; Alpine Club Library, London; photograph by H. J. Zumbühl).

- 18 Jean-Antoine Linck also visited other mountain regions, such as the Bernese Oberland (Swiss Alps), from where a journey to Grimsel, Meiringen, and Grindelwald is documented through several precise landscape artworks. For the Lower Grindelwald Glacier, a high-quality chalk and charcoal drawing by Linck, presumably made between 1820 and 1822, depicts the glacier and represents a more precise complement to another etching from 1820 by Gabriel Matthias Lory, Son. In the view by Linck (Figure 7, right), the end of the tongue of the Lower Grindelwald Glacier dominates the middle ground, while the prominent Wetterhorn and Mettenberg form the horizon in the back. The steep front of the glacier, broken up into blocky floes, a characteristic feature of the advance, overruns and destroys the tree vegetation on the valley floor. The front lies about 150–175 m south-east of the LIA maximum extent; behind it, the white ice masses pushing forward are recorded. If we enlarge the section with the elliptical glacier snout from Linck’s chalk and charcoal drawing and compare it with the etching by G. Lory Son, we see an astonishing similarity. Whereas the Linck drawing differentiates the structures of the glacier surface, the Lory etching schematises them.
- 19 Presumably at the same time in 1820/1822, Linck also drew a panorama view of the Grindelwald Valley and surrounding peaks on a large-format sheet. Here again, on the valley floor, highlighted with white chalk, the impressive tongue of the Lower Grindelwald Glacier extends between two landmarks, the so-called Burgbühlschopf to the left and the Nellenbalm to the right. The forested zone immediately in front of the glacier tongue, drawn in pencil and charcoal, proves that the glacier, although of great extent, had not yet reached the moraines from the maximum advance in 1600 (Zumbühl *et al.*, 2016).
- 20 Next to the Grindelwald Glaciers in the neighbouring valley to the north, the charming Schwarzwaldalp (Rosenloui) attracted the observer eye of Linck as well. An interesting view (Figure 7, left) shows the Schwarzwald Glacier, a regenerated glacier fed by ice avalanches from the high-altitude accumulation area between Wellhorn and Wetterhorn (today known as Hengsteren Glacier). The Alpine meadow in the foreground with mountain hut and cattle to the left and an alphorn musician, playing kids, and goats to the right stand in contrast to the frightening glacier hanging over the

rock cliffs in the back, with its meltwater falls and debris and avalanche cones in the valley bottom.

Figure 7



Left: View of Schwarzwaldalp by Jean-Antoine Linck, published by Johann Peter Lamy ("Vue de la vallée, et des glaciers, du Schwarzwald Alp. Passant de Grindelwald le Grand Scheidek pour aller à Meyringen Canton de Berne"; coloured contour etching [aquatint]; 20.9 x 30.0 cm; Schweizerische Nationalbibliothek, GS-GRAF-ANSI-BE-311).

Right: Advancing front of the Lower Grindelwald Glacier in the valley bottom, with Wetterhorn in the background, seen by Jean-Antoine Linck in 1820/1822 (?). The glacier tongue is still c. 150–175 m from the maximum extent the glacier would reach afterwards ("Glacier Inférieur de Grindelwald."; signed "J Ant Linck"; pencil, charcoal, and chalk; 42.6 x 57.7 cm; Schweizer Alpen-Club, Sektion Bern, Bibliothek; photograph by H. J. Zumbühl).

- 21 In Figure 8, an overview of the known glacier artworks by Jean-Antoine Linck is presented. These artworks were used for the reconstruction of the fluctuations of selected well-documented Alpine glaciers (Figure 9). Thanks to the artworks by Linck, it was possible to quantitatively determine the glacier retreat at the turn of the 18th to the 19th century. For the subsequent advance towards 1820, Linck's works provide a valuable estimate of the dimension of the most prominent glacier advance in the 19th century. This glacier advance was lasting until the 1850s; for several glaciers, a distinct second maximum peak between 1850 and 1860 can be discerned.

Figure 8

Glacier views of Jean-Antoine Linck 1790 – 1820/22

GLACIER	YEAR	NATURAL STUDIES	OIL PAINTING	GRAPHICAL STUDIES	GLACIER ACTIVITY
Mer de Glace Glacier des Bois	1795 ?	■		■ □ □	---
	1799	■	■	■ □ □	(-)
	1796	■	■	■ □ □	(-)
	1796	■	■	■ □ □	(-)
	?	■			
	1800 ?	■			?
	1803	■		■ □	
	1804	■		■ □	(?) → +
	1810	■		■ □	→ +
	1813	■			
	?	■			
	?	■			
	1820	■			→ +
	1820	■			+
1820	■			→ +	
Glacier des Bossons (Glacier de Tacconnaz)	1796	■	■	■ □ □	-
	1798	■	■	■ □ □	
	1799	■	■	■ □ □	
	1810 ?	■			→ +
	1804 ? / 10	■			→ +
	?	■			
	?	■			
	?	■		■ □ □	
	?	■		■ □ □	
	?	■		■ □ □	
Unterer (Lower) Grindelwald Glacier Oberer (Upper) Grindelwald Glacier Schwarzwald Glacier	1820/22	■			→ +
	1820/22	■		■ □	+
	?	■		■ □	+
Gorner Glacier	?	■			→ +
	?	■			
	?	■			
	?	■			
	?	■			
	?	■			
	?	■			
Glacier du Tour Glacier d'Argentière Glacier de Biomassay Glaciers de Miège / Covagnet / Armanette / Tête-la-Tête Glacier de la Lex Blanche Glacier de la Brevna Glacier de Triolet	?	■			
	?	■			
	?	■			
	?	■			
	?	■			
	1795 (?)	■			
	?	■			

LEGEND

■ Natural studies, watercolour (front view)
 □ Natural studies, watercolour (glacier tongue)
 ■ Natural studies, watercolour (higher areas)
 □ Natural studies, watercolour (detail, e.g. sérac)
 ▲ Natural studies, gouache (mostly with glacier tongue)
 ■ Natural studies, oil painting
 □ Drawing chalk / charcoal (valley area)
 ■ Drawing chalk / charcoal (topographic higher areas, side views)
 □ Drawing pencil

GRAPHIC PRINTS/STUDIES
 ■ Coloured contour etching (valley area)
 ■ Coloured contour etching (topographic higher areas)
 □ Contour etching
 □ Lithograph (?)

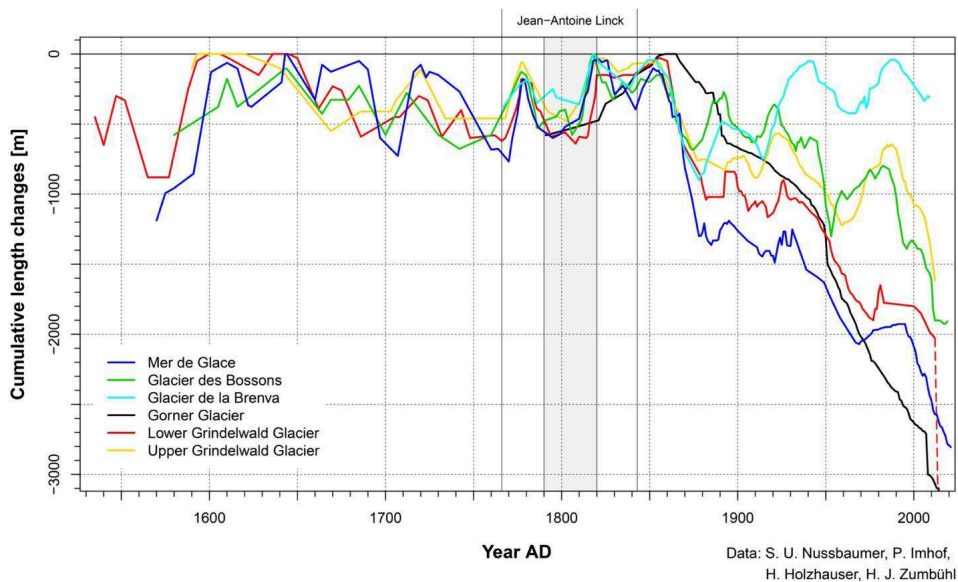
→ Glacier advance
 ← Glacier retreat
 + Glacial extension of the tongue
 - Glacial reduction of the tongue

The figure has no aspiration of sufficiency of views.
 We selected only views of Linck which could give results for the glacier history.
 © Zumbühl, Nussbaumer 2023

Overview of glacier representations by Jean-Antoine Linck, made between c. 1790 and 1820/1822. The table distinguishes between different types of artworks; in a few cases, a complete set of drawing (sketch), oil painting, and coloured contour etchings are known. No claim is made that this is a complete listing, since many artworks are privately owned.

Figure 9

Cumulative length changes for selected Alpine glaciers 1535–2021 with a special view on J.-A. Linck 1790–1820/22



Cumulative length changes of selected glaciers that were depicted by Jean-Antoine Linck. Note that the 1920 and 1997 rock avalanches on Brevna Glacier are responsible for the unusually large expansion of that glacier (data sources: Nussbaumer *et al.*, 2007; Nussbaumer & Zumbühl, 2012; Holzhauser, 2010; Imhof, 2010; Zumbühl, 1980; Zumbühl *et al.*, 2016; WGMS, 2023).

Alpine Glacier Landscapes from Idealistic-Realistic to Romantic-Realistic and Photorealistic

- 22 We owe our knowledge of the appearance of LIA glaciers with their advancing, paw-like ice fronts, steep ice cliffs and glacier snouts above all to four outstanding landscape artists who created a large number of high-quality glacier views within about 70 years from the time of the late Enlightenment through the Romantic period to the middle of the 19th century. Glacier landscapes are particularly “real natural landscapes” (Figure 10).
- 23 Idealised-realistic glacier landscapes were created by the Swiss Caspar Wolf (1735–1783), who is probably the most important pioneer of the depiction of Alpine high mountains in the late 18th century. This is because of the following reasons: On a trip to Paris, Wolf was decisively influenced by the French landscape painter Joseph Vernet. Especially Vernet’s recommendation “do as much as you can from nature, nature is the first of all masters” was appropriated by Wolf. On probably eight journeys from 1774 to 1778/79, he made about 200 oil paintings and other studies, especially of the Bernese Alps (61 of them are glacier views). Wolf was accompanied by the naturalist Jakob Samuel Wyttenbach and the publisher Abraham Wagner (Zumbühl, 2009).
- 24 From the end of the 18th century, romantic-realistic glacier landscapes were created by Jean-Antoine Linck, who was highly interested in natural phenomena, and hence depicted glacier changes in great detail. Like his contemporaries, he was imbued with the desire for topographical precision but also for the poetry that emanates from the Alpine landscape at that time. Far from any Romantic emphasis, his drawings place the jagged peaks, the glittering glaciers, the fat meadows of the plateaus in a subtle play of light and shadow, always imbued with naturalness, sometimes exaggerating the bristling of the peaks and seracs. With his great virtuosity, he drew in pencil, charcoal and chalk (whiting), gouache, and mainly then water-coloured contour etchings to sell to interested people (tourists), views that are remarkable for their serenity, even silence, while offering luminous atmospheres and calm skies.
- 25 The drawings representing landscapes show the most personal aspect of the work of Jean-Antoine Linck. The works show very precisely and in an objective way the structures and the nature of objects. Linck studied nature as it is and renewed in some way the approach by Caspar Wolf. These illustrations introduced the realistic representation of the high mountains into the iconography of Genevese painting and thus led to a new kind of landscape painting. However, his drawings, which reveal the real artistic personality of Linck, have been neglected until nowadays. Linck succeeded in translating a poetical world in a realistic style. Freed from all convention, all standard mode, and all human feelings, his work consists of a permanent character over all time (Bouchardy, 1986).
- 26 Samuel Birmann (1793–1847), the great master of topographical landscape art from Basel, is a second artist to whom we owe a wealth of romantic-realistic views. His 100 glacier views created between 1814 and 1835, mostly water-coloured pencil-pen nature studies, represent the culmination of landscape depictions of the Romantic period. The accuracy and richness of detail are unique and of eminent importance for the history of

glaciers. Territorially, the Bernese Oberland (Swiss Alps) and Mont Blanc region around Chamonix were at the centre of Birmann's work (Zumbühl, 1997).

- 27 Finally, almost photorealistic glacier landscapes were produced by the Austrian Thomas Ender (1793–1875), probably the most important landscape painter and great master of his time in the Eastern Alps. It was a reality that Ender sought as a true teacher, the infinite variety of free nature and its forms and beauties, which he studied in every detail. The choice of subject and the appropriate vantage point became crucial; this meant wandering and travelling to seek out the most beautiful views in nature. Moreover, it was decisive that Ender was accepted into the circle of Archduke Johann Baptist of Austria as a “Kammermaler” (personal painter to the Duke). Ender first visited the Grossvenediger area in 1829, where he had to prove his skills on the impressive snowy mountains and ice cliffs. This laid the foundation for a large number of glacier views in the Eastern Alps. On later journeys, e.g., in 1854 to Switzerland and Savoy, he also created views of the Grindelwald Glaciers and the Mer de Glace, among others (Patzelt, 2019).
- 28 The work of these four artists is a unique stroke of luck for the glacier history. All four created the most precise studies of nature, profiting from the new knowledge provided by the naturalists who accompanied them. Thanks to interested patrons (such as Wagner and Archduke Johann), not only important works of art were created, but also unique pictorial sources in terms of landscape history.

Figure 10



Alpine glacier landscapes from the 18th to the 19th centuries, from left to right (cut-outs): steep front of the Lower Grindelwald Glacier by Caspar Wolf (1774 and/or 1776/77; oil on canvas; 53.5 x 81.0 cm; Museum Oskar Reinhart, Winterthur, Inv. 478; photograph by H. J. Zumbühl); advancing tongue of the Glacier des Bossons by Jean-Antoine Linck (early 19th century; watercolour; 24.7 x 33.0 cm; private collection; photograph by H. J. Zumbühl); upper part of the tail of the Glacier des Bois seen from the trail to Le Chapeau by Samuel Birmann (1823; pen, pencil, watercolour, opaque white, on blue-grey paper; 19.1 x 17.1 cm; Kunstmuseum Basel, Kupferstichkabinett, Inv. Bi.30.124; photograph by H. J. Zumbühl); Upper Grindelwald Glacier with Wetterhorn by Thomas Ender (probably 1854; watercolour on paper; 33.0 x 48.0 cm; private collection, Dorotheum).

Conclusions

- 29 With his watercolours, drawings, and paintings the artist and engraver Jean-Antoine Linck (1766–1843) from Geneva has shown, first of all, the beauty of many glaciers

particularly in the Mont Blanc area, but, moreover, his artworks also made it possible to reconstruct very precisely the history of these glaciers:

- Linck's work has the same importance for the Mont Blanc area as that of Caspar Wolf and Samuel Birnmann for the Bernese Oberland or Thomas Ender for the Austrian Alps in terms of glacier iconography. The artworks by these four artists are unique pictorial sources for modern glacier reconstructions.
- The artworks by Linck are characterised by an almost photographic precision. The artist faithfully depicts the mountain range and carefully notes on the back the names of the mountains and places depicted on many of his artworks.
- Both a document and an artistic work, Linck's drawings and paintings bear witness to the enthusiasm of his time for Alpine paintings. These illustrations hence introduced the realistic representation of the high mountains into the iconography of Genevese painting and thus led to a new kind of landscape painting.
- The work of Linck represents the whole course of the Mer de Glace retreat period from the end of the 18th century until the 19th century glacier advance and maximum around 1821. Other glaciers of the Mont Blanc area and some glaciers in other regions in the Swiss Alps are documented as well.
- Regarding the glacier history, the only disadvantage is that Linck's artworks are mostly not exactly dated by the artist and the determination of the temporal origin often remains difficult, which challenges the reconstruction of glaciers and needs solid archive work in order to obtain the reliable date of the artworks. More views by Linck to be discovered in the future might reveal more information. Nevertheless, his artworks became invaluable for the glacier history thanks to the details depicted and the context that could be reconstructed in many cases.
- In summary, Linck was both an artist and a glacier historian.

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RÉSUMÉS

Interdisciplinary approaches are needed to reconstruct the behaviour of glaciers beyond the beginning of systematic measurements. For example, historical documents have been used to reconstruct former glacier extents successfully at different sites, including in the well-documented Mont Blanc area that became popular since the mid-18th century among artists, scientists, and travellers. Jean-Antoine Linck from Geneva is probably the artist to whom we owe

the greatest number of unique glacier views. Linck's special preference were the ice regions, which he discovered and drew with alpinistic daring and naturalistic correctness, preferably by gouache, although many pencil sketches are preserved. Linck subtly used the etching technique to create easily reproducible plates in large format, which are then hand-coloured with gouache and watercolour. This technique allowed him to create numerous reproductions of the same view, while still giving them a unique and original aspect, views that are remarkable for their serenity and silence, while offering luminous atmospheres. These illustrations introduced the realistic representation of the high mountains into the iconography of Genevise painting and thus led to a new kind of landscape painting with a permanent character. From a perspective of glacier history and although many of his artworks are not exactly dated by the author, the work of Jean-Antoine Linck is indispensable since it represents the whole development, specifically of the Mer de Glace and the Glacier des Bossons, but also other glaciers during the period from the end of the 18th century until the 19th century glacier maximum around 1820. Linck's work has the same importance for the Mont Blanc area as that of Caspar Wolf and Samuel Birmann for the central Swiss Alps or Thomas Ender for the Austrian Alps in terms of glacier iconography. Therefore, Linck was both an artist and a glacier historian.

INDEX

Keywords : glacier reconstructions, iconography, Jean-Antoine Linck, Mont Blanc area, Little Ice Age

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