Weather *and* Cloud Symbols

The Heritage of Hand-Plotted Weather Maps

Adapted from “Cloud and Weather Symbols in the Historic Language of Weather Map Plotters,” by **Robert A. Houze, Jr.** (University of Washington) and **Rebecca Houze** (Northern Illinois University). Published online in BAMS, December 2019. For the full, citable article, see DOI:10.1175/BAMS-D-19-0071.1.

Those little symbols on AMS ties, umbrellas, and scarves may seem enigmatic: they are somewhat reminiscent of cattle brands. But during the first 50–75 years of the twentieth century they were an important shorthand for the state of the weather and sky.

In those days, plotters in weather offices would use the symbols to prepare maps of station observations. The weather map plotter had to work under pressure, with skill and efficiency, for the maps to stay current. Their maps laid the foundation for analysts and forecasters whose interpolated, interpretive markings showed broad atmospheric circulation patterns. The fully analyzed weather map was fundamental to meteorology’s progress as a science. From about the mid-1940s to the end of the 1960s, hand-crafted weather mapping using symbols reached a pinnacle of skill and expertise, then digital technology began replacing them.

By representing the observers’ description of the clouds and weather at every station, the symbols on the map told what conditions looked and felt like to people. With the advent of automated stations and computerized mapping, a human experiential element

◁* The mark of meteorology: for science, not just for fashion.

△* In *Wivenhoe Park* (1816), John Constable depicts cumulus clouds with attention to accuracy based on his own observations. The English pastoral foreground suggests how clouds are experienced as part of everyday life. Courtesy of the National Gallery of Art, Washington, D.C.

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◀* Luke Howard's symbols, in 1803.

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of the weather map has been lost. So, as part of the retrospective look at meteorology for the AMS centennial, we focus on how meteorologists represented weather phenomena and clouds symbolically, how the symbols formed and evolved, and how the loss of this representation of human experience in the digital age might have consequences.

Cloud Symbols: Beauty and meaning in simple strokes

Clouds have long dominated the human perception of the sky and were thus at the center of an early nineteenth century convergence of art and science. In 1839, the London Meteorological Society's *Transactions* published remarks by the modern art critic John Ruskin on observations of weather and nature. John Constable and William Turner were two British painters especially well known for naturalistic representations of atmospheric phenomena. Ruskin was drawn to the experiential aspects of landscape painting, propounding a preference for Turner's dramatic renderings of violent thunderstorms and fiery sunsets to Constable's careful depictions of the tidy English countryside in pleasant weather.

Johann Wolfgang von Goethe's poem, *In Honor of Howard*, muses about how human imaginations roam free when looking at clouds in the sky:

*Here lions threat, there elephants will range,
And camel-necks to vapoury dragons change.*

Goethe's title refers to the English pharmacist and amateur meteorologist Luke Howard, who in 1803 suggested a set of basic yet evocative symbols to signify cloud forms: a diagonal line for cirrus, a semicircular curve for cumulus, and a horizontal bar for stratus. Howard's simple, quickly penned line drawings convey efficiently the complexities

that Turner and Constable painted and that Goethe sought to describe in words.

Later in the nineteenth century, three other key scientific figures emerged to identify the types of clouds seen from the ground and decks of ships. All three—the Scottish meteorologist Ralph Abercromby, the Swedish physicist Hugo Hildebrand Hildebrandsson, and the English clergyman and meteorologist William Clement Ley—realized the importance of connecting pictures of clouds with their naming and their symbolic representation. It was becoming obvious that clouds took so many fundamentally different forms that Howard's three symbols were insufficient. In an 1894 treatise called *Cloudland*, Ley elaborated on Howard's three basic cloud-form symbols. For example, three quick strokes of the pen created a cloud symbol in the unmistakable form of a turreted medieval castle or city wall—to indicate what we now call altocumulus castellanus.

Photography was in its infancy in the late 1800s, but Ley, Abercromby, and Hildebrandsson saw its potential and became advocates of using photographs of clouds to relate to nomenclature and symbols. Photography could capture ephemeral clouds much more efficiently than sketching and painting. Abercromby's travels around the world documenting clouds led him to the

Clement Ley's *▷
1894 symbols (here in a 1916 reproduction) extended the reach of what could be observed by a single set of eyes in one location at a given moment.

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Scientific name.	English name.
≡ Nebula.	Fog.
≡≡ Nebula pulverea.	Dust fog.
≡≡ Nebula stillans.	Wet fog.
= Nubes informis.	Soud.
= Stratus quietus.	Quiet cloud.
○ Stratus lenticularis.	Lenticular cloud.
≡ Stratus maculosus.	Mackerel cloud.
≡≡ Stratus castellatus.	Turret cloud.
≡ Stratus precipitans.	Plane shower.
○ Cumulo-rudimentum.	Rudiment.
○ Cumulus.	Heap cloud.
≡ Cumulo-stratus.	Anvil cloud.
≡ Cumulo-nimbus.	Shower cloud.
≡ Nimbus.	Rainfall cloud.
≡ Cumulo-stratus mammatus.	Tubercled anvil cloud.
≡ Cumulo-nimbus grandineus.	Hail shower.
≡ Cumulo-nimbus nivosus.	Snow shower.
≡ Cumulo-nimbus mammatus.	Festooned shower cloud.
≡ Nimbus grandineus.	Hail-fall.
≡ Nimbus nivosus.	Snow-fall.
≡ Nubes fulgens.	Luminous cloud.
≡ Cirrus.	Curl cloud.
≡ Cirro-filum.	Gossamer cloud.
≡ Cirro-velum.	Veil cloud.
≡ Cirro-macula.	Speckle cloud.
≡ Cirro-velum mammatum.	Draped veil cloud.

△
* **Stratocumulus**
in Hildebrandsson's
Wolken-Atlas of
1890, a portfolio of
full-page paintings
evoking the human
experience of
basic cloud types.
Without the experi-
ential perspective,
cloudscapes are
often rendered
uninteresting.

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conclusion in 1887 that an international system of cloud identification was essential because “cloud forms are the same all over the world”—a fact we now take for granted, but which was not known at that time. In his travels, Abercromby found that “especially the lower clouds—received a different name from nearly every” meteorological service director he met. He declared, “The question of an International Nomenclature of Clouds becomes of the highest importance.” Along with Wladimir Köppen and Georg Balthazar von Neumayer, Hildebrandsson published an early pictorial atlas of cloud types in 1890. In 1896, Hildebrandsson, Swiss meteorologist Albert Riggenbach, and French meteorologist Léon Teisserenc de Bort produced the first mostly photographic *International Cloud Atlas*.

The pictorial cloud atlases in the 1890s coincided with a movement by scientists to standardize

meteorological observations. The *International Cloud Atlas* established 10 basic cloud types still in use today, albeit with somewhat different names, even after the atlas has been revised many times (the 2017 revision is online at <https://cloudatlas.wmo.int/>). The WMO *Manual of Codes* integrates the 10 basic types into 27 specific and frequently observed combinations, each to be indicated on maps by a specific symbol. These symbols are clearly descendants of those of Howard and Ley.

The compositions of the cloudscape paintings used by Hildebrandsson and Ley are profoundly influenced by the landscape artists. Like Constable’s pastoral scenes, the foregrounds emphasize human experience—how the scene felt. A sky of gray stratocumulus hovers over a snow-covered farmhouse. A man and his dog look out over a vast scrubland with a sky of flat-based cumulus clouds reaching into the distance.

Cumulonimbus and nimbostratus may reach great heights, but in the WMO *Manual of Clouds* they remain classified as low clouds, according to the height of their base, which is more relevant to surface weather reports and maps that convey the experience of a person on the ground or on a ship, or the needs of a pilot landing or taking off. Satellite-based nomenclature, by contrast, distinguishes such types by cloud top height.

One reason cloud types and corresponding symbols have had a stable history is that an observer need only be trained to recognize shapes, not to interpret how the clouds are being formed. And yet these types, based solely on appearance, have turned out to have crucially distinct physical interpretations. Books on the physics and dynamics of clouds have been organized around these types,

which add physical meaning to reports on a map as well as subjective impression of the observer. This dual value is a testament to the cleverness of their nineteenth century advocates of cloud study.

Weather symbols: Related to writing

Weather symbols, like cloud symbols, have undergone an evolution. Interestingly, while cloud iconography was influenced by visual art, weather symbols—for rain, snow, haze, fog, and so on—were built on nonalphabetic elements, such as punctuation marks, which are used in writing and which were becoming increasingly standardized in printing. Much like emoticons of the early computer age, weather symbols make extensive use of commas, periods, hyphens, apostrophes, brackets, asterisks, and tildes. Three

From Ralph Abercromby's *►
decade-long, round-the-world
tour photographing clouds:
stratocumulus at Tenerife, Canary
Islands. Courtesy UK Meteorologi-
cal Office Library Archives.

◄* The frontispiece of Ley's *Cloudland* (1894)—typical of picture compositions in cloud books of the time—shows the profound influence of Constable and other landscape painters. The monograph attempts to explain cloud formation processes and their relation to larger atmospheric circulations.

"Many of the skylscapes due to the occurrence of Stratus Maculosus are of very great beauty," writes Ley of certain altocumulus. "The minute rounded masses, compared by some authors to a flock of sheep lying down, produce in perspective an impression of quiet grandeur, and delicate colouring and elegant mottled appearance, which cannot fail to excite admiration in an artistic mind." Elongated altocumulus evoke a school of fish, expressed colloquially and in literature as "mackerel sky"—a usage Latinized by Ley. *△

Photo by Arthur W. Clayden, Esq.

London: Stanford's Geog. Estab.

decades before Luke Howard introduced his cloud symbols, the Swiss scientist Johann Heinrich Lambert suggested the basic elements of weather symbols: simple lines, apostrophes, x marks, dots, and a zigzag for clouds, rain, snow, fog, and thunder. Modern symbols evolved from these minimalist marks, but the dominant features remain largely the same. The x's representing snow and the zigzag thunder are clear progenitors of the modern asterisk for snow and various zigzags for thunder and lightning. These elements are pictorially suggestive, yet are largely derived from systems of writing. The shorthand expresses not only handwriting but, through printing, the increasingly industrial processes of reproduction and transmission of information.

Lambert was somewhat ahead of his time. Weather mapping and forecasting did not develop

Symbols made * more comprehensible maps. The Franklin Institute wrote out data, as seen in this portion of a map for 16–18 March 1838, whereas Francis Galton's map for England at 9:00 a.m. 16 January 1861 (here reproduced in 1926) used symbols.

BAMS: What would you like readers to learn from this article?

Rebecca Houze: *I would like for readers to think about the close historical relationship between representation, classification, art, and science, especially as new methods for visualizing data were developed in the nineteenth century. We tend to separate art from science and technology in education today, but of course those areas have always been closely intertwined.*

BAMS: How did you connect these themes to your research in art history?

RH: *My research might at first seem unrelated—I am a specialist in the history of decorative arts in Austria-Hungary. However, as a design history professor, I teach*

my students about visual signs and symbols for international communication, such as the pictograms developed in the 1920s by Austrian sociologist Otto Neurath and his colleagues, which they called ISOTYPE (International System of Typographic Picture Education), and the ones designed by Otl Aicher for the 1972 Summer Olympic Games in Munich. Unlike these famous examples, international weather symbols are less familiar to graphic designers. I wanted to learn more about their origins and their relationship to other symbol sign systems.

BAMS: This seems to have led to unexpected paths, beyond just symbols.

RH: *What surprised me the most was the difficulty in pinning down how changes in technology—specifically*

photography and photographic reproduction—influenced the representation of atmospheric phenomena in meteorology. Printmaking was very experimental in the late nineteenth century. The need for clear systems of international communication coincided with innovations in mechanical reproduction. Whereas cloud symbols derived from naturalistic representations of the sky in art, weather symbols were more often derived from written representations of language (punctuation marks, for example).

BAMS: How will you follow up?

RH: *We would like to do more research into early cloud photography and the methods that were used to reproduce those images accurately and compellingly for a wider audience.*

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* The key of an 1860s surface map for the British Isles, published by Daily Weather Map Co.

rapidly until the introduction of the telegraph. Printing of maps by agencies and commercial enterprises began in the early 1800s. But the ways in which weather conditions were represented varied from one mapmaker to the next. In the 1830s, the Franklin Institute wrote out the weather conditions at each station—in English—but in “synchronous weather charts” for England in the 1860s Francis Galton of the Royal Geographical Society used graphical symbols. Rain was a field of circles and snow a field of asterisks. In this same period, a

commercially produced British Daily Weather Map used a field of little circles to indicate “showers” and a field of small dots to indicate rain—a first attempt to distinguish these phenomena, as is done today.

With the explosion of weather information available by telegraph in the mid-to-late 1800s, many countries and institutions issued weather maps, each according to its own linguistic and cultural traditions. Weather mapping proceeded without international coordination or standard—making for inefficiency in the advance of meteorology.

As a result, the International Meteorological Conference in Vienna in 1873 sought to standardize the recording of weather observations. Sometimes standardization can be as important as discovery in science, setting the stage for the next discovery by getting everyone speaking the same language! The letter R (or r, Rg, etc.) was commonly used to indicate rain—particularly in countries whose word for rain begins with the letter. However, Italy and Russia used the letters pl (from the Latin *pluviam*). Nonalphabetic symbols were thus an understandable choice for standardized recording of data, especially since countries such as France, Austria, and Russia had sprawling empires encompassing many languages.

The largely abstract or pictorial symbols adopted at the conference in Vienna—almost exactly 100 years after Lambert’s suggestions—have evolved through usage and subsequent international agreements into a set of 100 now-standard symbols. Along the way many other symbols were suggested, but to this day only a few standard symbols (e.g., smoke, tornado) do not have origins in writing. The modern weather and cloud symbols and the standard station model in which

Cloud	== ==
Rain	///
Snow	x x x
Fog	: : :
Thunder	⚡

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* Lambert’s symbols, 1771.

they are used on maps came into common usage sometime in the 1920s, while the Bergen School led by Vilhelm Bjerknes was developing the polar front theory. At this time, analysts begin to add fronts to the maps. The map itself, with its symbols neatly plotted by hand, not only told the story of an oncoming storm, but also did so with visual elegance and the human touch.

The disappearance of cloud and weather symbols

The delightful, artistic, and clever symbols for the clouds celebrated on AMS accessories have not been printed on NOAA’s Daily Weather Map since 2000. One motivation might be that satellites provide global cloud images. However, weather and cloud symbols document a fundamentally different and no less important perspective—how the sky looks from below. Despite their very different evolutions, cloud and weather symbols depict this human experience of the atmosphere. In losing these symbols on the march of technology—to automated weather stations, advancing models, satellite data, and more—weather maps may have lost some ability to convey an important part of the human experience, and losing the art of weather map plotting has implications that affect our ongoing understanding of the human condition. Whether cloud and weather symbols can or should be revitalized in our hypertechnological age is unclear, though it may be beneficial to restore the human element that these symbols represent. ☼

Rain	●
Snow	✱
Thunderstorm	⚡
Hail	▲
Graupel	△
Fog	≡
Rime	┌
Dew	⤵

◁* Fig. 20:
Weather symbols put forth by the First International Meteorology Congress in Vienna in 1873 for common usage across Europe and North America.
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