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Haarlem's Crown of Clouds

Meteorology in the paintings of Jacob van Ruisdael

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Dutch landscape painting of the 17th century has gained a unique place in art history; for the first time landscape played a role of its own due to its realist naturalistic reproduction. But the "realism" in the paintings of the Dutch "Golden Age" must not be wrongly interpreted that they represent a linear copy of nature (de Vries 1991), as an early form of landscape photography. The paintings have to be understood as compositions, composed of realistically reproduced elements where the whole is much more than a summary of the single parts. Hedinger (2001) has called this an "invented reality" of landscape.

The artistic work of Jacob van Ruisdael is seen as the pinnacle of this painting genre. In his pictures the seemingly realistic aspects of landscape are woven intimately into masterly composed paintings (Sitt/Bisboer 2002). This is particularly true for his views of his hometown Haarlem ⁽¹⁾. Already in the 17th century these paintings were called "*Haarlempjes*"; they represent a perfect combination of near-real topographical views, harmonic composition and a landscape depiction approaching reality (Stechow 1966, p. 45).

In these paintings, as in Dutch landscape painting as a whole, sky and meteorology play an almost overwhelming role. Weather is integrated into the scenery as the fundamental impression that each view into landscape offers.

Clouds and Weather

Weather consists of a multitude of different situations, which – particularly in the mid-latitudes of our planet – express themselves through a broad variety of clouds. The World Meteorological Organization (WMO) has tried to take this fact into account by categorising clouds into a cloud atlas (WMO 1987).

The paintings of the Dutch masters also show an incredible variety of clouds and meteorological phenomena. It is relatively simple to see that certain clouds appear often while others rarely or not at all (Neumann et al. 1996).

In the debate dealing with the extent of realism in Dutch cloud painting a broad spectrum of opinions have become evident in art history circles. The two most extreme positions contradict each other as Rostworowski (1981) finds the complete cloud atlas reproduced in Dutch landscape painting of the 17th century; there seems to be no doubt of the realistic depiction of the sky. Walsh (1991) on the other hand denies almost any realism in the painting of the clouds because cloud forms were distorted to facilitate the painter's motive for the picture composition, and furthermore, he claims certain types of clouds which are typical for Holland do not appear in the paintings. ⁽²⁾

Therefore the question arises whether or not the clouds of the Dutch masters represent meteorological reality. Climatologically speaking an additional question that arises is if "the weather" in Holland of the 17th century is comparable with the weather in present day Holland. This is because in the middle of the 16th century a phase of cooling began which ended just in the 1850s (Flohn 1993). This "Little Ice Age" did not consist of entirely bad weather. However, a measurable decrease in average temperature

⁽¹⁾ There are different citations of number of the Haarlem paintings. Burke (1974) mentions 17 paintings of Haarlem and its surroundings, while Hedinger quotes 9 *Haarlempjes* in a stricter sense. These paintings mostly show Haarlem as seen from the dunes in southwest or northwest of the city.

⁽²⁾ Walsh's argumentation in his essay is that the cloud reproduction in the Dutch master's paintings is meteorologically incorrect: for thermodynamical reasons the co-existence of stratiform and convective clouds is impossible, he claims. Walsh here refers to the American meteorologist G. Siscoe. The existence of stratiform and convective clouds at the same time and location, however, is not so unusual. From the meteorological point of view the mistake in Walsh's argument lies in the fact that stable and unstable atmospheric stratification is seen identically to the formation of stratiform and convective clouds. This remark is made here because the quoted contribution of Walsh has become something like a standard in the discussion of the realism of Dutch cloud painting of the 17th century. The outstanding papers in Freedberg/de Vries (1991), however, were intended as contributions to a [discussion](#). This also is their true value.

during this time has been determined, winters were much colder, water surfaces froze for a longer time. But this climate, though much cooler than today, did not lead to a fundamentally different appearance of cloud patterns. The painters of the Golden Age saw the same clouds as we see them today.

Looked at in relation to the climatic changes, it is only understandable that as a society made up of sailors, dike-builders and farmers, the Dutch used weather as a central theme for their cultural artistic expression.

Production of Linen at Haarlem

The bleaching of linen plays a central role in the Haarlem paintings by Ruisdael. During the 17th century Haarlem was famous for its linen and in the city's direct vicinity were several bleaching grounds that make prominent image contributions to most of the *Haarlempjes*.

Meteorological conditions in Holland were favourable for linen bleaching. In the linen lawn bleaching process the cloth was treated with lye and rinse water and was exposed to the sun and air on large grass fields. The bleaching of a piece of material took five to seven months, depending on weather conditions. The "Dutch Bleaching" bleaching process took place with soap, willow ash, and buttermilk; among other ingredients. Throughout the entire process a proper balance between the moisture content of the cloth, the use of bleaching materials, the rinsing with clear water and again drying was important in combination with exposure to the sun (Stone-Ferrier 1985, p. 419)

The ideal geological conditions of Haarlem for the production of linen can clearly be recognised in the paintings of Ruisdael: at the base of the dunes damp meadows and small ponds formed by natural springs or ground water can be seen. Stone-Ferrier (op. cit.) indicated the important role of the chemical composition of the water near Haarlem. As long as the linen has to be kept humid, the wet meadows of Haarlem were ideal; for drying, the material could be easily brought to the sandy dunes. Here, the precipitation seeps away quickly, so the ground is nearly dry. When the sun shines the sandy dunes also warm more quickly than the meadows at their bases. Moreover, the dunes are exposed to stronger winds, accelerating the drying of the linen. Therefore, the wooden structures to dry the linen were found, on the sandy part of a dune which adequately was called "droogberg" (i.e. "drying mound", Biesboer 1995).

However, if the linen bleaching in the paintings would only be interpreted as an element of composition the iconographic meaning of linen and bleaching would be suppressed (Michalski 1992). This noteworthy aspect is, however, excluded from the discussion at hand.

The Berlin painting

In the 1670 *Haarlempeje* of Berlin, Jacob van Ruisdael portrays his hometown as seen from the dunes near the village of Overveen, northwest of the city. The view is toward the southeast with the St. Bavo church in the centre and the red roofs of the city shining in the sun. The sky is filled with towering clouds, some thin feather clouds can be seen near the southeastern horizon, and single flat midlevel clouds float in the sky. In the centre of the painting, a vast cumulus cloud is situated over the city of Haarlem like a crown. The sun is positioned almost exactly in the west as can be concluded from the shadows and the illumination of St. Bavo church, thus indicating late afternoon. The sails of the windmills are directed to the northwest into the wind. On the meadows near the dunes the linen makers have spread out their canvas for bleaching and periodically spray water on their textiles. The humidity of the meadow additionally helps in smoothing and bleaching the cloth.

Meteorologically this scene can be explained as follows: in the course of the night a cold front passed over Holland from the northwest with showers and thunderstorms pushing away an advancing warm air mass. Near the rear of the front some cirrus clouds as well as a few midlevel altocumuli can be observed. The fresh maritime polar air mass will soon come under further high pressure, but here, close to the cold front, the air is still unstable enough to create medium and tall cumulus clouds. Now, in the late afternoon, some of these clouds have already decayed and their remnants can be seen at the upper rim of the painting. The wind direction has changed from southwest to northwest as two of the seven windmills have their sails still facing to southwest while the other, active mills have turned their sails into the now prevailing wind direction.



Fig. 1: Jacob van Ruisdael: "Haarlem seen from the Dunes near Overveen", (canvas, 52 x 65 cm, c. 1670, SMB, Painting Gallery Berlin, Cat.Nr. 885C, Photo: J.P. Anders)

The weather situation is characterised by a low pressure zone over southern Scandinavia that brings fresh maritime air from northwest (Fig.2). The cold front of this low has already passed over Holland and has moved further east; a high with its centre over Ireland supports this air mass flow. The pressure gradient is not too high, otherwise such a weather pattern would cause strong wind. In the rear of the cold front a high pressure ridge builds up. Thus, over Holland, the weather of an early summer can develop which is depicted in the painting. Fig. 3 shows cumulus clouds with a thin veil of feather clouds near the horizon; the photo was taken in such a weather situation.

The situation in the painting fits coherently into the depicted meteorological pattern. Pieces of linen are exposed to the ultraviolet radiation of the sun for bleaching. This kind of radiation is strong in a blue sky, which in turn shimmers through from in between the clouds in Ruisdael's painting. The weather is perfect for keeping the linen humid because the soil is wet from the rain that fell with the passage of the cold front. Showers developing in this weather from the larger cumulus clouds are not too heavy so that this meteorological process supports the fact that the women in white may attend to their work.

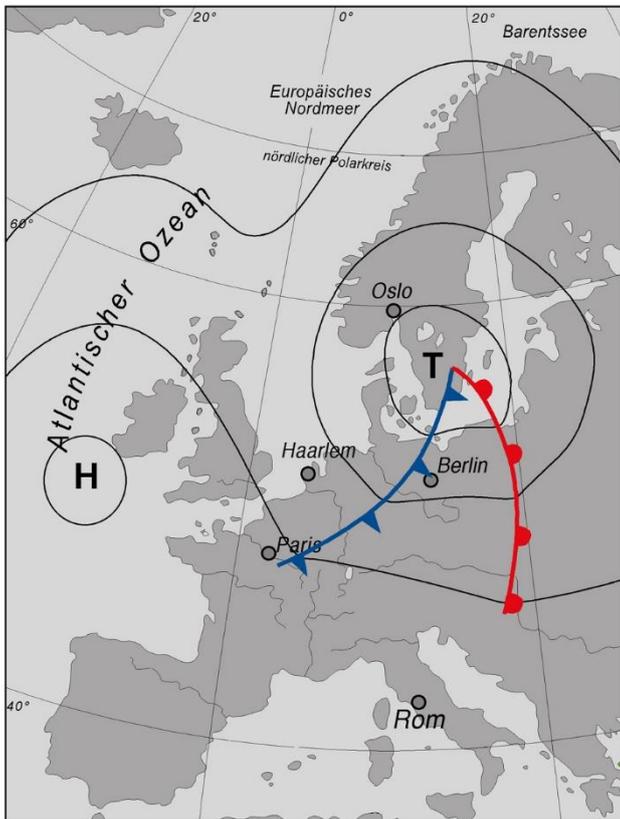


Fig. 2 (left): A low over Scandinavia causes a flow of fresh maritime air from northwest in Holland (Graphics: F. Ossing/O. Grabe, GFZ)

Fig. 3 (right): Cumulus and cirrus clouds in northwesterly wind, Aug. 16, 1981, Enkhuizen/NL, 14:20 CET (Photo: F. Ossing, GFZ)

The Zurich Painting

The *Haarlem* of the "Kunsthau" Zurich is based on a completely different weather situation.

Formally, the painting's structure is very similar to the Berlin painting. Painted between 1670 and 1675, the vertical format once more shows Haarlem seen from northwest, directed southeast and again long stretches of linen are spread out on the humid lawns and women are busy with the bleaching work (Fig. 4).

The sky again covers more than two thirds of the painting, with cumulus clouds towering high. In the cloud gaps one can detect some high level clouds.

The sun's position is a bit higher than in the Berlin *Haarlem*. Here again, the time is afternoon as the St. Bavo church can serve as a sundial.

The wind direction, however, has turned by 180°; most of the windmill sails are directed to southeast into the wind. The cumulus clouds, above all the dominating cloud in the centre and the cloud at the left rim of the picture, are tilted slightly to the right, i.e. to the west which indicates an increase of wind speed with height (wind shear). This is in accordance with the assumed wind direction from southeast.

Low level wind from an easterly direction in our latitude usually is connected with high pressure over northern Central Europe. High pressure zones are areas with a stable vertical stratification in which high-towering convective clouds like the cumulus in the Zurich painting are rarely found. Therefore it can be asked if Ruisdael has composed a sky into the painting that fits to the picture situation, in particular to bleaching.



Fig. 4: Jacob van Ruisdael: "View of Haarlem with Bleaching Grounds", (Canvas, 62 x 55 cm, c. 1670/75, Kunsthau Zürich, Ruzicka-Stiftung, Inv.Nr. R32)

Powerful cumulus clouds mostly appear in connection with low pressure zones because in these the vertical stratification of the atmosphere is sufficiently unstable. In mid-latitudes lows move from west to east in a westerly flow and have westerly wind directions. But in the Zurich painting we deal with low wind speed from southeast and well developed cumulus clouds.

This type of weather can be explained with a low over Ireland/South England that has reached the mature stage. A shallow high-level low with a weak surface-level low causes only a small pressure gradient. In Holland wind is from southeast in unstable cold air (Fig. 5) with low wind speeds and

convective clouds. An occluded cold front is found along a line of approx. Hamburg-Aberdeen and turns in into the direction of Ireland.



Fig. 5 (left): An occluded low over South England causes southwesterly wind over Holland (Graphic: F. Ossing/ O. Grabe, GFZ)

Fig. 6 (right): Strong Cumulus clouds in unstable cold air (Mingerode, Mai 23, 1974, ca. 18:00 CET, Photo: F. Ossing, GFZ)

In summary it can be established that although the two Haarlem paintings of Ruisdael in Berlin and Zurich formally have a great deal in common they portray two completely different meteorological situations. In both cases however it can be shown that they depict a typical European weather situation with a high degree of accuracy.

Painted clouds

Using the example of Ruisdael's "Winter Landscape"(c. 1670, Philadelphia Museum of Arts), John Constable already in 1836 showed in his lectures on landscape painting, that from Ruisdael's painting a real weather situation can be deduced (Badt 1960, Gedzelman 1991). Much more recently the masters of the Golden Age have seen an increased following from climatologists due to the current climatic change (Negendank et al. 2001, Flohn 1993). In 1982 Lamb indicated the influence of the Little Ice Age on the socio-economic development of Holland and the art closely connected to it (Lamb 1987).

Keeping in mind the meteorological exactness of Dutch masters, it is astounding that there has been such a long lasting discussion about the realism of Dutch landscape painting. Despite of the extensive debate, there is very little material with meteorological validity, which can found in art history literature dealing with this.

The statement that the skies in Dutch landscape painting do not give a complete picture of weather needs to be differentiated. First, one has to agree with Rostworowski (op. cit.): the painted skies of the

Dutch masters show all the ten main cloud types of the WMO catalogue, though with different weightings. On the other hand it has to be claimed that the phenomenon "cloud" is not depicted in its meteorological completeness (Ossing 2001).

Walsh (1991) expresses the opinion that the most common kinds of Dutch weather consist of a heavy deck of clouds, intermittent drizzle and heavy rain, and a veil of fog which hardly appear in paintings. A meteorological view on the paintings, however, shows an incredible variety of different weather elements that are typical for mid-latitudes. A wide span of weather is well employed by Dutch painters in their landscape pictures, even though different types of weather appear more rarely, others more often.

The sky is included consciously by the painters to create a specific mood much like this was ordered by the contemporary "schilderboeken" (i.e. painting instructions). Without the sky a landscape painting would be poor of expression, the sky is "*the soul of all scenery*" (S.D.Gedzelman, n.i.).

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