

Snow at Schiphol

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Introduction

The operational snow season at Amsterdam Airport Schiphol runs from mid November until the end of March. In this period all operational partners such as Airport Authorities, Air Traffic Control and airlines, e.g. KLM, have to work closely to prevent delays due to snowfall on runways, taxiways and peers.

In the kick-off meeting on the 14th of November 2011, KNMI presented the meteorological aspects of snow at the airport, varying from climatology to seasonal forecasting. This article describes the main points of this presentation.



Snow at Schiphol, picture Peter de Vries (KNMI)

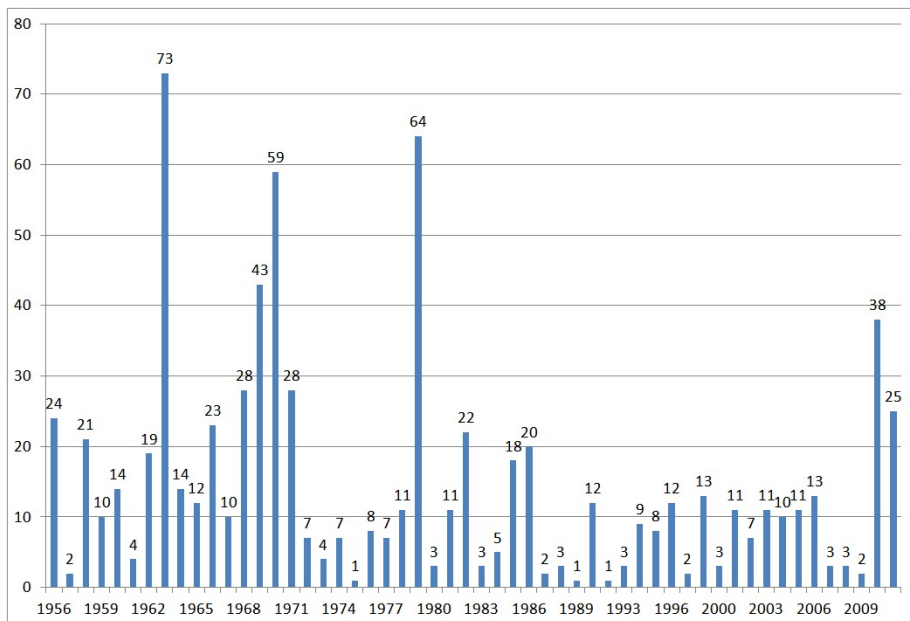
How often do we see a snow covered airport?

We observe a snow covered Schiphol on average 14 days per year (period 1956-2010). The year to year variation is large: in the winter of 1998 (1997-1998) no snow cover was observed, but in the winter of 1963 the airport was white at 73 days.

However, since snow clearing starts immediately, these figures are only valid for areas without aircraft, like the grass area where the meteorological instruments of KNMI are located. Snow falls on more days than there is snow cover, but when looking at operational snow delays, we do not consider light snow showers where the snow melts when it hits the ground.

Heavy snow showers on frost days imply that the snow will lie: for example, do you remember the snow showers on the 6th of January 2010, that produced a 10 cm deep layer to form and caused a traffic jam around Schiphol and Amsterdam.

Frontal systems in freezing conditions are responsible for long periods of persistent snow: for example, the snow front on the 17th of December 2010 led to traffic jams in the Netherlands with a total length of 750 kilometres.



Average number of days per year with snow cover near Schiphol (Hoofddorp) since 1956

Climate atlas

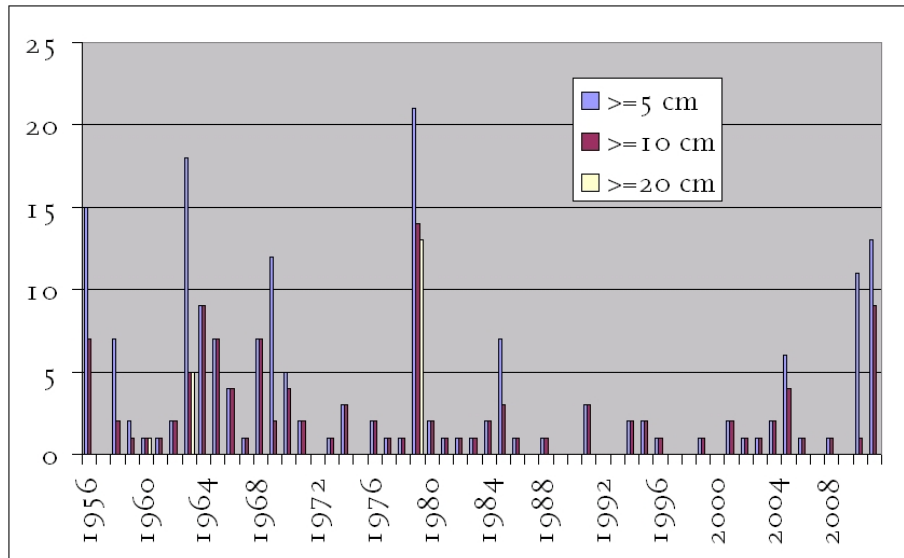
The snow climate for the period 1981-2010 was calculated by KNMI and the results are available in the book, *Bosatlas van het Klimaat* and on the website,

www.klimaatatlas.nl. This climate analysis shows a large regional variation: the average number of days with snow cover varies from less than 10 days in the milder southwest of the Netherlands to more than 20 days in the colder northeast.

The year to year variation is also large: in the winter of 2007 there were no days with snow cover while in the winter of 2010 there were 55 days with a white countryside in the northeast.

The snow cover is observed at more than 300 stations every morning at 9 o'clock (08 UTC) included in the climatological report: type of snow cover and depth.

Station Hoofddorp, is very close to Schiphol and reported in total almost 200 days with snow cover. On most days the depth was less than 2 cm, 48 days had at least 5 cm and 31 days had at least 10 cm. Since 1956 Schiphol experienced 13 days with more than 20 cm of snow, but these were all before 1981.



Number of days with a snow deck of at least 5, 10 and 20 cm in the period 1956-2010 near Schiphol (Hoofddorp)

When does it snow?

Snow reaches the surface when the vertical temperature distribution in the lowest few hundred metres is cold enough to prevent it melting.

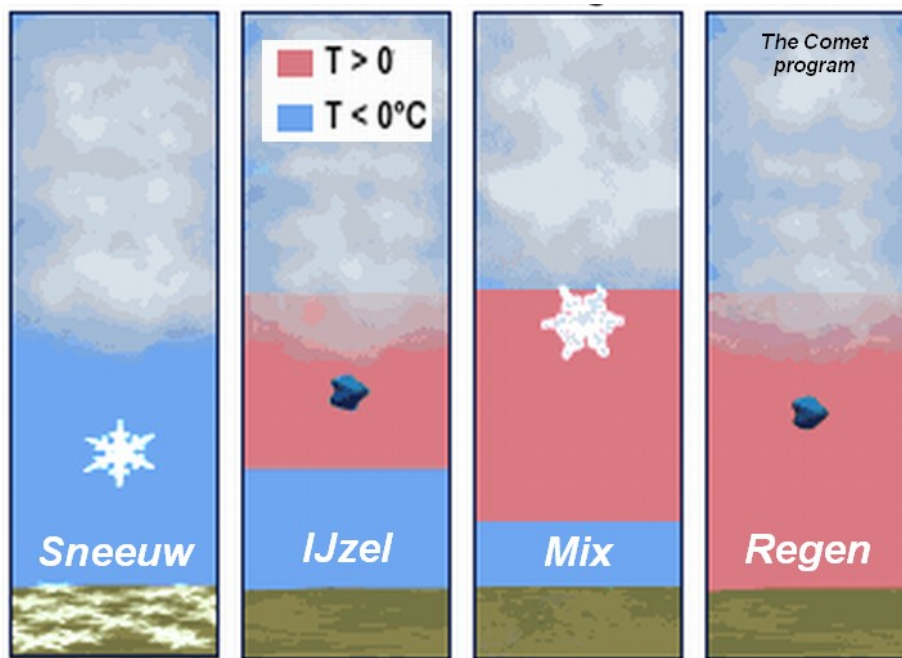
When this layer is warm and deep enough to melt the snow the precipitation will be rain or drizzle and if the layer is not deep enough a mix of frozen and liquid precipitation types will be observed. With frost in a shallow layer near the surface level and a melting layer above freezing rain or freezing drizzle is possible, with the immediate forming of black ice as a consequence.

Snow periods are common in the first two months of the year, but can also occur in other months. The earliest date at which snowfall was observed in the period since 1956 was the 13th of October 1975 and the latest date around mid June. However, the snowfall on these extreme dates does not result in a snow deck.

In winter, the nearby warmer water of the North Sea stimulates convective growth of small scale snow showers, that in a westerly to northerly flow reach the Dutch coast. Larger scale snow events occur mostly when warmer air pushes northward and is forced to rise above colder, and therefore heavier, air north of the large rivers, the Rhine and the Meuse.

The leading edge of this frontal precipitation starts with large scale intensifying snow (Dutch: sneeuw), resulting in a snow covered white world. As the warm air mass pushes northward the melting layer aloft deepens and lowers to near the surface, changing the precipitation type to a mix of rain and snow (sleet, Dutch: natte sneeuw), or freezing rain (Dutch: ijzel) when surface temperatures are below zero degrees Celsius.

Eventually the deepening warm layer results in reports of rain (Dutch: regen) in the warm air at the surface.



Types of precipitation as a function of the vertical temperature distribution: from left to right (in Dutch) snow, freezing rain, mix of snow and (freezing) rain, and rain.

A “horror” winter this year?

In October, some providers told the press and public that, according to experimental seasonal forecasts, the Netherlands would experience a horror winter. However, KNMI concluded that correlations between forecasts for the coming winter and the number of sunspots, the average pressure distribution on the Atlantic and the Siberian snow cover in the preceding autumn were insignificant. The researcher remarked that seasonal forecasting for next winter is pure luck, or in Dutch: ‘Het kan vriezen, het kan dooien’ (it can freeze or it can thaw).

In the KNMI’06 Climate Scenarios severe winters will become rare at the end of this century due to an increasing average temperature, but prolonged periods of snow cover will still occur, as we have experienced in recent winters.

Severe winter weather can be forecasted up to two weeks ahead and the accuracy is gradually improving. The two week forecast is made twice a day by ECMWF. A short range, high resolution forecast ensemble is run several times a day when a snow event is approaching, giving a detailed forecast for the next 48 hours. Additionally, now-casting for the coming hours is done by combining model output with satellite, radar and station observations.

In the operational process, the forecaster discusses the forecast for the next five days with all the relevant aviation partners (AAS, LVNL and KLM) once a day (or more often) to make sure that operational arrangements can start on time.

During snow events, nowcasting is often required and is performed by a meteorological advisor (MAS at LVNL) who supports the operational decision-making at Schiphol with frequent weather updates. In ‘normal weather’ situations, the forecasts and warnings are produced in the main weather centre of KNMI in De Bilt.

Climatology, weather forecasts and warnings are available at the website, www.knmi.nl.