

Noctilucent Clouds



Noctilucent Clouds (NLC) occur at extremely high altitude, about 50 miles (80 to 85 km), and glow at night. They form in the cold (below -200 F), summer polar mesopause and are believed to be microscopic ice crystals.

Noctilucent Clouds are seen to have characteristic shapes or forms:

Type I **Veil**: very tenuous, lacking in structure

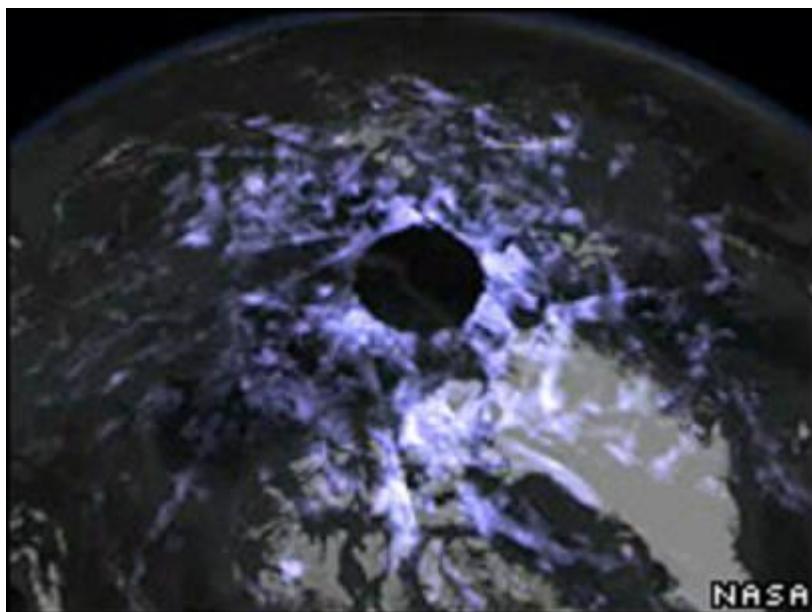
Type II **Bands**: long streaks, parallel or crossing at small angles

Type III Waves: closely spaced herring-bone structure resembling sand ripples on a beach

Type IV Whirls: large-scale looped or twisted structures

[More](#) detail on form classification and diagrams of the four basic forms.

The [twilight](#) conditions which render NLC visible, impose a latitude restriction on their visibility. They are, therefore, most often seen from locations which lie between Latitude 50 and 60 degrees in both hemispheres (though they are occasionally reported beyond this latitude band). Through most of June and July (from the northern hemisphere) these locations never attain true darkness and twilight skies persist all night. The latitude range takes in Canada, Northern Europe and Russia. Very few populated land masses exist at the corresponding latitudes in the southern hemisphere. Noctilucent clouds appear to be an extension of a more or less persistent feature of the summer polar mesosphere which is not visible to the naked eye at higher latitudes due to daylight conditions. These clouds, observed by instruments aboard satellites, are referred to as *polar mesospheric clouds* (PMC's).



A few useful internet resources:

[NLC Observer's Homepage](#)

[Australian Antarctic Division NLC page](#)

[Pekka Parviainen's Polar Image site.](#)

Science@NASA:

*[Strange Clouds](#)

*[Climatology and Climate Change](#)

*[Teleconnections](#)

[Aeronomy of Ice in the Mesosphere](#) (AIM) home page, A current satellite mission launched in 2007

[AIM mission song](#) and [YouTube video with lyrics](#)

Some nice videos on YouTube:

[Denmark](#) (11:25 pm - 4:00 am, July 11/12, 2011; latitude 56.2 degrees North)

[Russia](#) (after sunset)

[British Columbia](#) (before sunrise)

[Norway](#) (after sunset with regular clouds below)

[Scotland](#) (with aurora beginning around the middle of the clip)

[Northern Europe](#) from International Space Station

HISTORY OF NLC Observations and Theories

June 1885	8,	First reported observation (Bad Kissingen, Germany); <u>possible earlier accounts</u>
summer 1885		Several other reports across northern Europe and Russia
late 1880's		Connection with volcanic dust proposed
late 1880's		First <u>photos</u> by Otto Jesse
1906		Foerster proposes clouds are made of cosmic dust
1912		Wegener proposes clouds are made of water ice
1926		Malzev disproves volcanic dust hypothesis
1933		Humphreys proposes ice or ice-covered cosmic dust

- July 20, 1933 First North American photos (Meanook, Alberta)
- 1957 Systematic European observations begin
- 1961 Hesstvedt provides quantitative theory for ice
- 1962 Systematic North American observations begin
- 1962 First rocket launch into a noctilucent cloud
- mid 1960's Observed in Southern Hemisphere
- 1960's Measurements of mesospheric temperatures and water vapor lend support to ice hypothesis
- 1969 Witt proposes formation on ions
- 1972 Orbiting Geophysical Observatory (OGO-6) satellite detects persistent summer daytime clouds over poles
- 1981 Solar Mesospheric Explorer (SME) satellite confirms summer polar mesospheric cloud layer
- 1989 Future increases in frequency/brightness of clouds predicted
- 2001 HALOE (Halogen Occultation Experiment) confirms primary component of PMC's is water ice
- 2012 AIM detects "meteor smoke" in NLC's