

About NLCs, Polar Mesospheric Clouds



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Noctilucent clouds are also called Polar Mesospheric Clouds, PMCs. They are 80-85 km high (50-53 mile) a few km below the [mesopause](#), the coldest part of the atmosphere.

NLCs are comprised of extremely small ice crystals some 0.1 micron (1/10,000 mm) diameter.

We see them by sunlight scattered by the crystals which are not large enough to show [iridescent](#) effects. Their bluish coloration is likely a result of absorption of red light by the stratospheric [ozone layer](#). Occasionally they show reds and golds from the colour of low sunlight illuminating them.

NLC formation requires a combination of very low temperatures, a source of water vapour, and nuclei on which ice can grow.

Low Temperatures

Ice does not form at the low pressures of the mesopause unless the temperature is below -123°C . These low temperatures only occur during a few weeks around the *summer* solstice and the surprising combination of summer and low temperatures is a consequence of global circulation in the middle atmosphere. The very lowest temperatures (down to $\sim -160^{\circ}\text{C}$) occur a few km above the cloud level and it is surmised that the ice crystals initially form there.

Water Vapour

The water vapour source is not known with certainty. The mesosphere is extremely dry but some water might be carried and across [gaps](#) in the tropopause and lofted upwards by atmospheric [gravity waves](#). Another potential source is methane. This reacts in the stratosphere with hydroxyl radicals, OH, to form water molecules. Rocket exhausts deposit water into the mesosphere and some have been associated with specific later cloud formation but this is not considered a major effect.

Crystal Growth Nuclei

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The source of nuclei is equally problematic. Extraterrestrial meteoric dust has been proposed. Volcanic and tropospheric dust is another possibility and the first recorded sighting of NLCs in 1884 was shortly after the Krakatoa eruption.

NLCs displays are thought to be becoming more frequent, brighter and visible at lower latitudes. Human activities might be contributing. The summer mesopause is getting colder, possibly because of the cooling effect of increased atmospheric carbon dioxide concentrations. Methane concentrations and mesosphere humidity are also increasing. The AIM spacecraft was launched in 2007 specifically to investigate NLCs, their formation and possible links to global climate.