

What are the 'nacreous clouds' lighting up the winter skies?

February 3 2016, by Nathan Case, Lancaster University



Stunning streaks of light can be seen in the polar regions during winter. Credit: Perlamutra mākoņi, CC BY-SA

People in the polar regions of the world, such as Scandinavia and



Canada, sometimes get to watch majestic, rainbow-coloured clouds drift across an otherwise grey winter sky. Over the past few days, observers from across the UK and Ireland have also been lucky enough to witness this phenomenon, known as "nacreous" (or polar stratospheric) clouds.

In fact, nacreous clouds are so unusual in Britain that <u>AuroraWatch UK</u>, a service that monitors the likelihood of auroal sightings, received reports that these colourful displays were "aurora borealis", also known as the northern lights, which is caused by collisions of electrically charged particles from the sun colliding with particles in Earth's <u>atmosphere</u>. However, the two phenomena are not related.

Nacreous clouds typically form in the winter polar stratosphere, a layer of our atmosphere around 15,000 to 25,000m in altitude. The stratosphere is generally very dry and so cloud formation is rare, but it seems as though recent storms may have driven moisture high into the atmosphere. Nacreous clouds will also only form when the temperature in the stratosphere is below a chilly -78°C, which turns any moisture in the air into super-cooled liquid or ice crystals. Such temperatures generally only occur in the winter at high latitudes.

During the hours of "civil twilight", when the sun is between 1° and 6° below the horizon, the first or last rays of the day illuminate these high altitude clouds from below. This light is refracted by the ice crystals in the clouds, a process known as <u>cloud iridescence</u>, producing the shimmering rainbow effect.





Polar stratospheric cloud. Credit: wikimedia

Destructive force

As pretty as they may look, nacreous clouds have a darker side too. These clouds enhance the breakdown of the Earth's ozone layer, a vital part of our atmosphere that provides protection from the sun's harmful ultraviolet rays. The <u>ice crystals</u> in the clouds <u>encourage a chemical</u> reaction between the <u>ozone layer</u>, which is made up of a specific type of molecular oxygen (O_3), and gases such as chlorine and bromine. In fact, <u>it is estimated</u> that just one atom of chlorine in the stratosphere can



destroy over 100,000 ozone molecules.

The presence of these ozone-destroying gases in the stratosphere is a problem of our own making. Although phased out after the <u>Montreal</u> <u>Protocol</u> in 1987, the prime reason for their presence is our use of chlorofluorocarbons (CFCs) in products such as refrigerators and aerosol cans. While usage of CFCs has been significantly reduced, it is estimated that it may take another 50-100 years before the effects of CFCs in the atmosphere is diminished.

Current weather predictions suggest that further sightings of nacreous clouds <u>may be possible</u> in the UK until around Saturday. At this time, the polar vortex (which is responsible for the cold conditions currently in the stratosphere above the UK) moves northward to its usual position.



Polar Stratospheric Cloud type I above Cirrus. Credit: François Guerraz /wikimedia, CC BY-SA

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