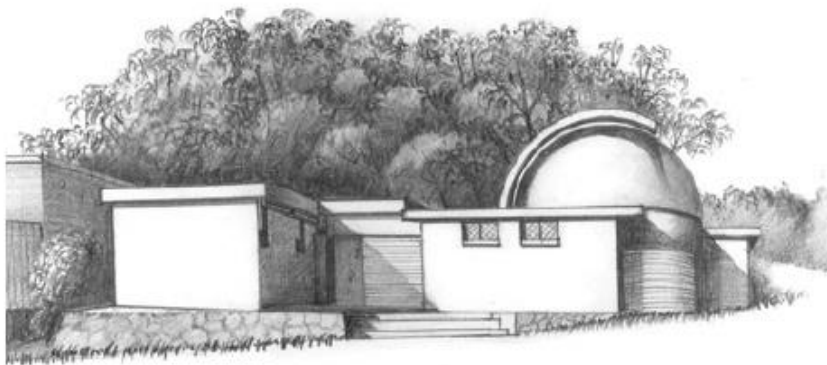


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Observations

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Fascinating Phenomenon In The Atmosphere

In the 2020 winter issue of the SASI journal Lou Pagano and Al Dodge shared an impressive image of iridescent clouds with an explanation of its formation. The column triggered thoughts about the fascinating celestial phenomenon that occur in the Earth's atmosphere - an appreciated side-effect provided by Earth's physics and the neighbouring Sun.

In Iceland, which is located in the North Atlantic Arctic region, nacreous clouds sometimes adorn the winter sky and can be spotted at dawn and dusk in December to early February. Nacreous clouds are formed in the stratosphere at an altitude of 15-30 km, under the extremely cold condition (-70° to -90°C) that consequently follow the sustained dark arctic polar night. They are made out of ice crystals or compounds of ice and nitric acid trihydrate ($\text{HNO}_3 \cdot 3\text{H}_2\text{O}$). The latter is ozone-destructive through chemical reaction. The colors are explained by refraction of same nature as iridescent clouds, but the size of ice crystals or the compounds affect the magnitude and distribution across the clouds. However, due to its high altitude they glow prominently against the dark night sky before sunrise or sunset, making them an irresistible sight most of the time. (see Figure 1 on next page)

In a region with mountains, wind-shaped lenticular clouds (altocumulus lenticularis) can form. This time the lower troposphere provides the "celestial" show. As air mass moves across mountains it can form waves, usually on the lee side. If the temperature in the top part of the wave

is close to or lower than the dew point of streaming air it can become saturated with water vapor and condense to form a lenticular cloud. When moved downward the cloud warms up again and dissipates. As the air moves in waves it can repeatedly form a new cloud. The form of these lenticular clouds can be pretty dramatic, especially when the sun plays along from low angle and colors the display. I remember that in the late 20th century when beliefs in the existence of UFOs was more common than now, some even try to convince ignorants that these clouds were flying saucers. (see Figure 2 on next page)

Another well known phenomenon, Aurora Borealis (Aurora Australis in the southern hemisphere), is persistent from my sub-polar region. The 'polar light' originates at altitude of 80-1000 km (commonly at 100 km altitude), briefly a cause of the Earth-Sun interaction. In the last two decades it has drawn the attention of a huge number of tourists, that are encouraged enough to visit the country in winter and witness one of Earth's most overwhelming phenomenon. Ironically and despite its beauty, when one has his head stuck in different aspects of the starlit nights, like astrophotography or photometry, these lights become annoying; astroimages get hue or even overexposed and photometry is impacted to a level of being useless. Nevertheless under a powerful auroral display you'd better join the "enemy" and enjoy the show, there is no other option. (see Figures 3 & 4 on next page)

When one wonders about the abundance of planets that must exist in the Universe, their physical diversity and the phenomena that can form in its atmosphere, due to star-planet interaction – one can only be in awe of the overwhelming diverse beauty of the Universe.



Figure 1.
Nacreous clouds, seen in
Southeast Iceland on
January 3, 2020.
Photo: Snævarr Guðmundsson.



Figure 2.
Windshaped lenticular clouds
(altocumulus lenticularis)
shaped by a mountain range
near author's residence in
Southeast Iceland, on
December 1, 2017.
Photo: Sigríður G. Björgvins-
dóttir.



Figure 3.
Aurora and lenticular clouds
above Iceland's highest strato-
volcano, Örfajökull. The
meaning of the name is the
glacier of desolation.
Photo: Snævarr Guðmundsson.



Figure 4.
The late comet Hale-Bopp
amidst the green colored Auro-
ra, during its closest approach
in March 1997.
Photo: Snævarr Guðmundsson.