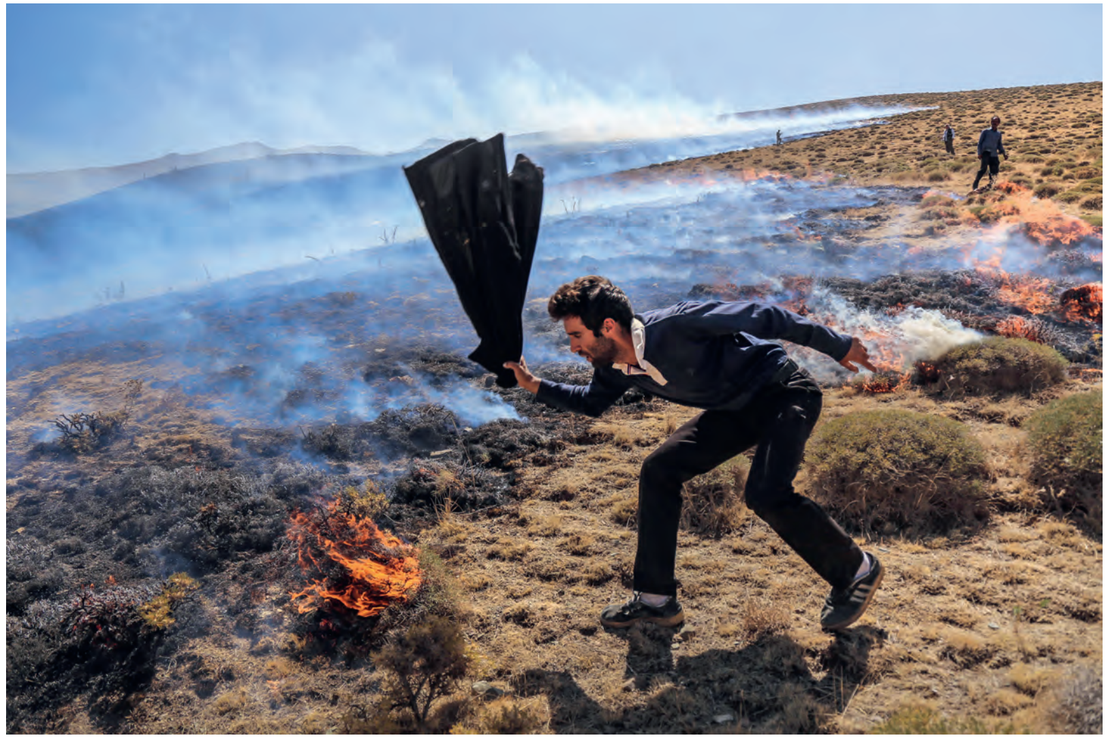
Whirling devil

Hadi Dehghanpour

This photograph captures the moment a powerful dust devil hits a group of tents in a village near Noush Abad in Iran. Dust devils are relatively small, short-lived whirlwinds occurring during sunny conditions when the air in contact with the ground is heated strongly. This heating creates shallow convection currents that tend to organize into small regions, or cells, of ascending and descending air near ground level. Areas of weak rotation, associated with local variations in the wind speed and direction, can be strongly focussed and amplified as air converges in towards the areas of ascending air. This process occasionally results in the development of a well-defined column of strongly rotating air, and a dust devil is born. Although most dust devils are harmless, they occasionally grow large and strong enough to constitute a hazard to outdoor activities, as in this example. Dust devils resemble tornadoes, in so much as they are a strongly rotating column of air. However, they are almost always weaker than tornadoes and tend to be much shallower. Crucially, whilst the rotation in dust devils generally only extends a few tens of metres to perhaps 100–200 m (328–656 ft) above ground level, tornadoes are connected to the base of a convective cloud aloft.

Canon 5D Mark III + Canon 75–300 mm: 1/400 s; *f*/11; 120 mm; ISO-100.



Beating in vain

Tohid Mahdizadeh

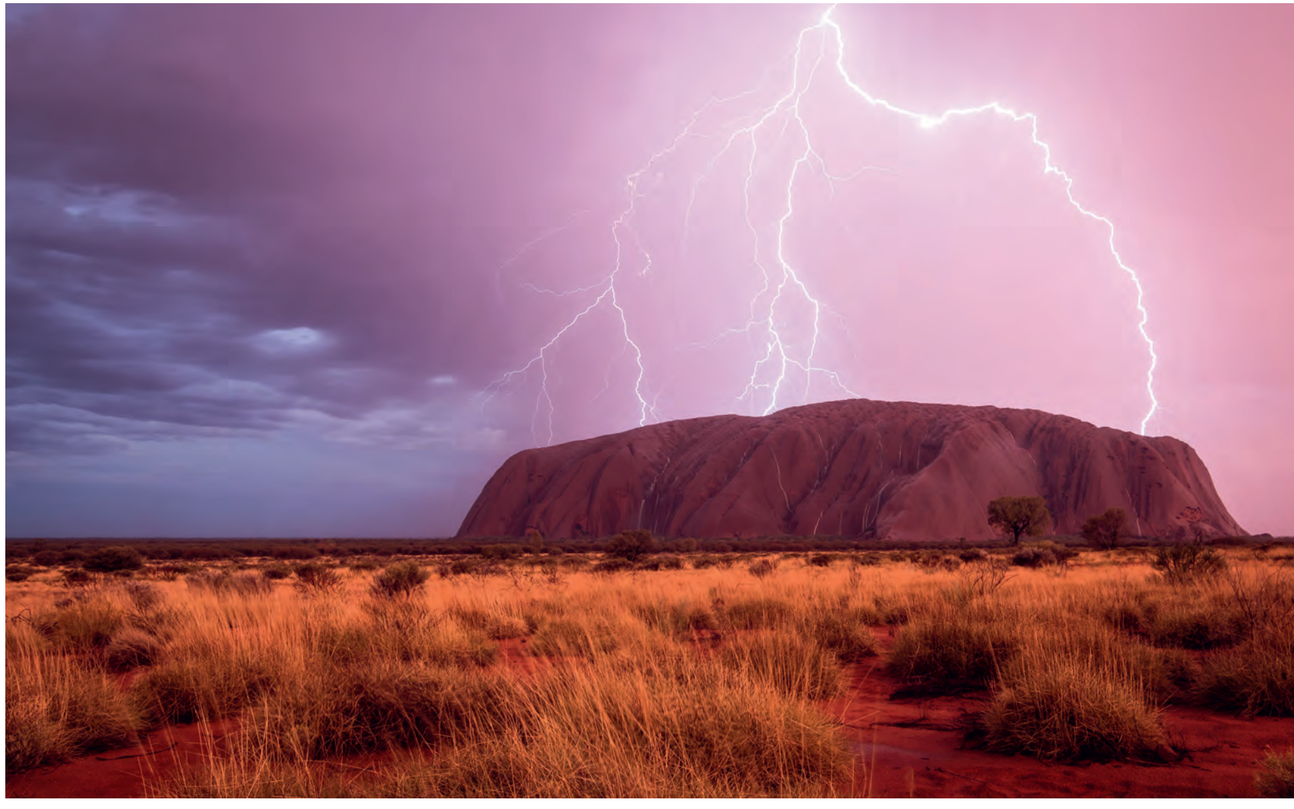
Bush and forest fires, such as this heathland fire in northwest Iran, can be a major hazard in arid and semi-arid regions of the world. Fires may start as a result of human activity, or due to natural processes such as lightning strikes, the latter being especially likely where storms are high-based and relatively little precipitation reaches the ground. The likelihood and severity of wildfires is strongly influenced by the weather conditions. In particular, high surface temperatures and low humidities dry out vegetation and increase the likelihood of ignition, whilst strong winds act to fan the flames, aiding the spread of existing fires.

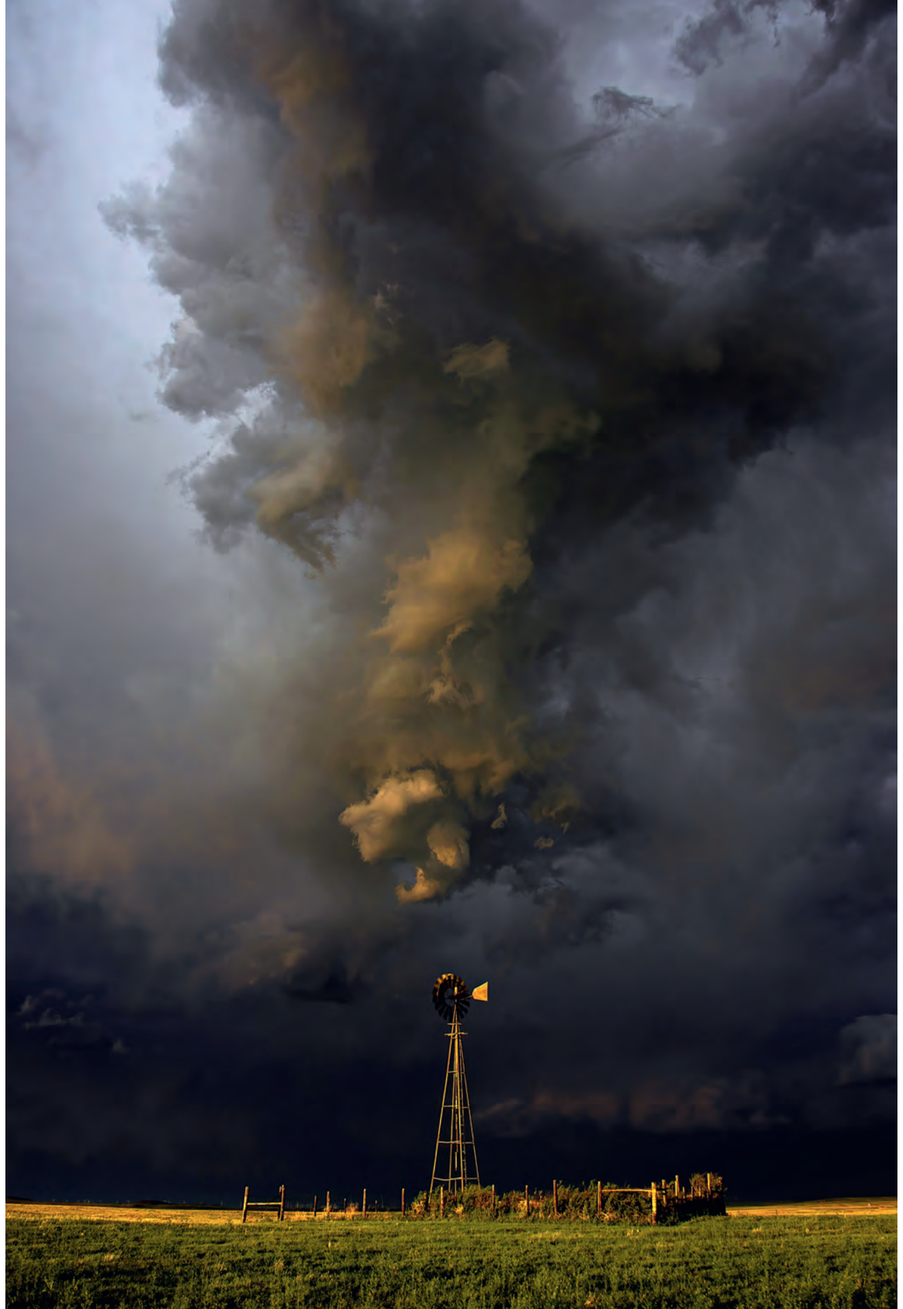
Strikes on Uluru

Christoph Schaarschmidt

Multiple forks of lightning strike as torrents of water cascade down from a rain-soaked Uluru in Australia, during a high-based desert thunderstorm ('high-based' meaning that the main base of the thundercloud is located higher than about 1,500–2,500 m (4,900–9,200 ft) above ground level). Christoph says, 'I'd heard a lot about how beautiful Uluru looks in the rain. This is one of the reasons why Uluru is such a special place for the Anangu – the local Aboriginal clan. I never believed I would see it with my own eyes, given how rare rainfall is in the arid, red centre of Australia'.

Canon EOS 70D + 11–16 mm: 5 s; *f*/13; 16 mm; ISO-100.





Windmill under attack

Tina Wright

Inky black storm clouds contrast brilliantly with sunlit fields in the High Plains of northeastern Colorado, USA. Storm clouds appear to be dark when viewed from below because of the great vertical extent and the high water content of the cloud mass. In a typical summer thunderstorm in the middle latitudes, the cloud tops reach around 12–14 km (7½–8½ miles) above ground level. In tropical regions, thunderstorm cloud tops frequently exceed 20 km (12½ miles). The depth of the thunderstorm is limited by the height of the tropopause – a stable layer at the top of the troposphere, which is the lowest layer of the Earth's atmosphere in which most of our weather occurs. The tropopause acts like a lid to rising air and so the cloud top spreads out horizontally underneath it, creating the thunderstorm's characteristic anvil. The tropopause is highest in the tropics, which is why the storms there tend to be the deepest.

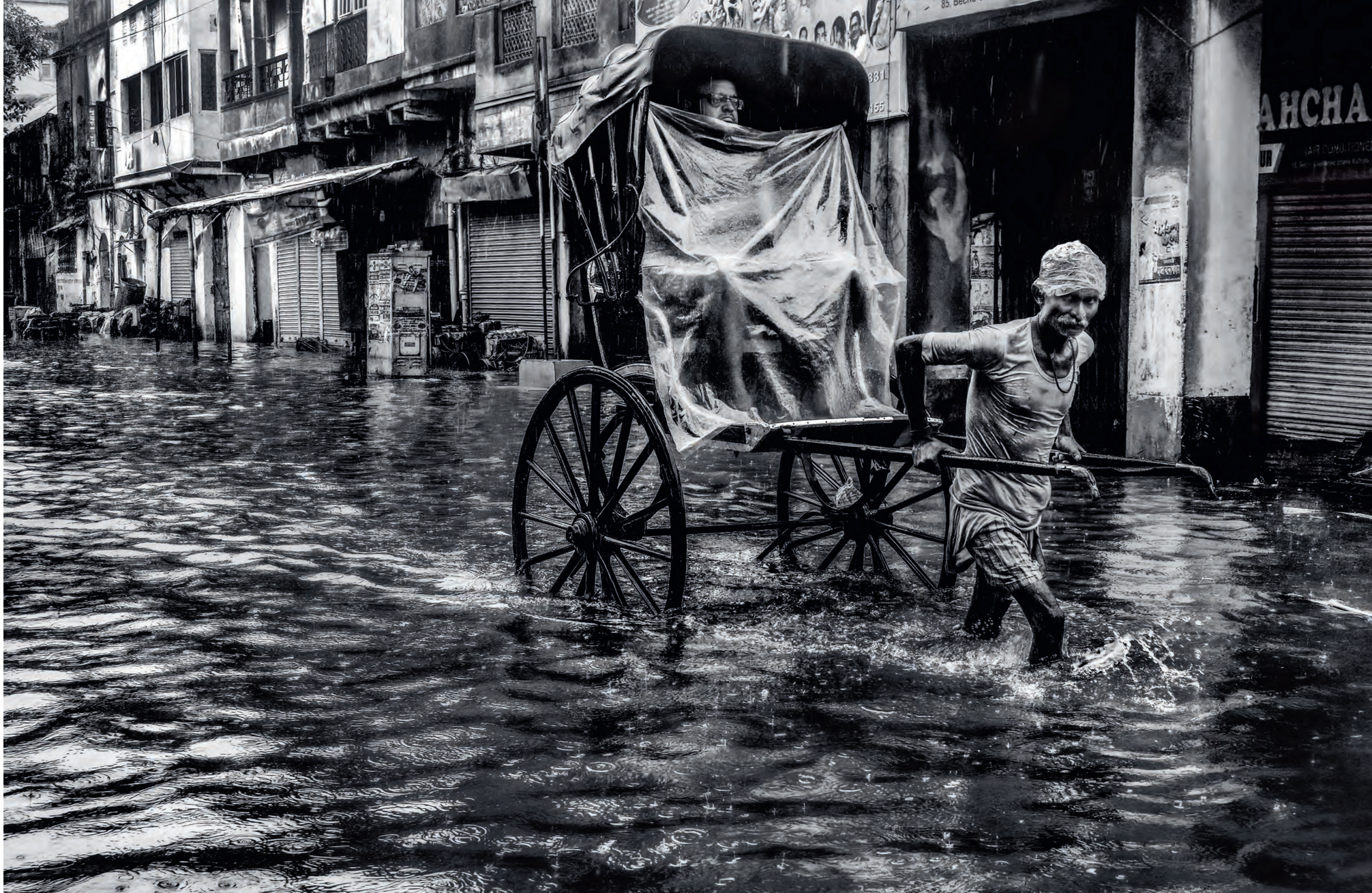
Nikon D750 + 28–300 mm *f*/3.5–5.6: 1/60 s; *f*/8; 28 mm; ISO-100.

A city afloat

Debarshi Mukherjee

A hand-pulled rickshaw struggles through the flooded streets of Kolkata during the monsoon season. Although the Indian Monsoon occurs with a fairly regular seasonal cycle, significant variations can occur in the intensity and timing of the monsoon rains from year to year. Where monsoon rains fail, the results can be catastrophic. Although crops require the monsoon rains in order to grow, excess rainfall can be really problematic, creating widespread flooding that can displace millions of people. The most dangerous flooding events in the region are often associated with landfalling tropical storms in the Bay of Bengal. In May 2020, an exceptionally powerful tropical storm called Cyclone Amphan struck Bangladesh and eastern parts of India, with sustained wind speeds of over 240 kph (150 mph). A storm surge and exceptionally heavy rainfall combined to create widespread flooding. In Kolkata, 240 mm (9 in) of rain was recorded.

Nikon D7000 + Nikkor DX VR 18–55 mm: 1/250 s; *f*/9; ISO-800.

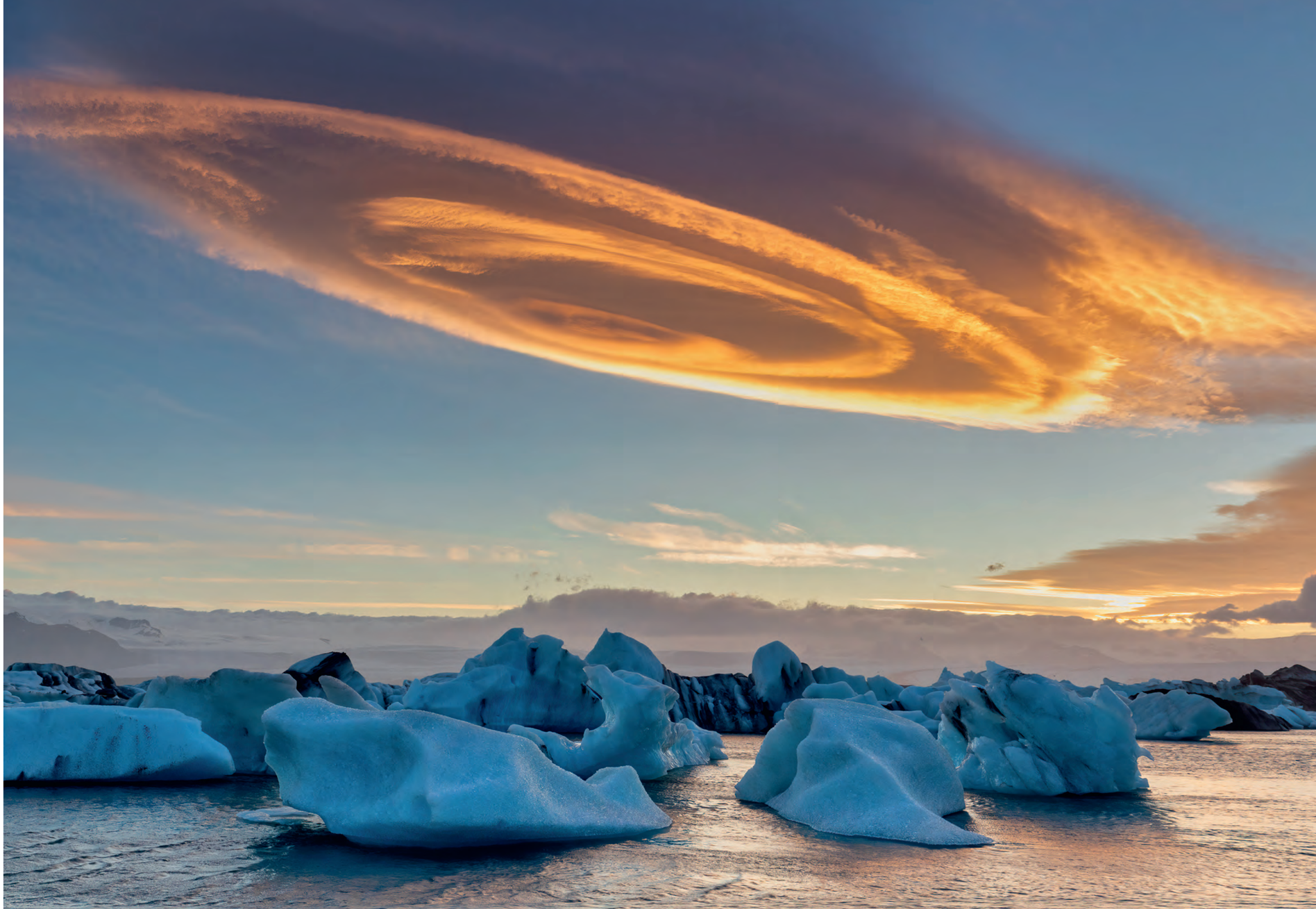


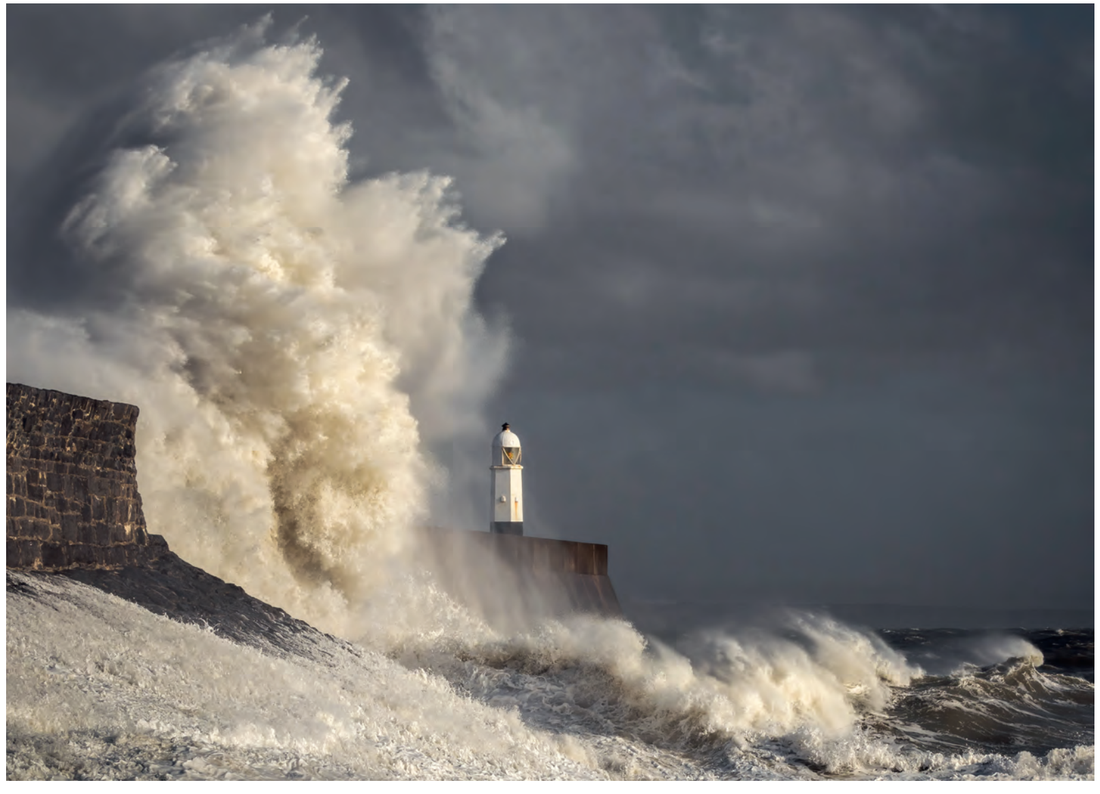
Clouds stacked up

Bingyin Sun

Altocumulus lenticularis clouds often exhibit a spectacular multi-layered structure, best seen around sunrise or sunset when the low-angle sunlight illuminates the cloud bases, as in this beautiful example over the glacial lake Jökulsárlón, in Vatnajökull National Park, Iceland. When the cloud is composed of numerous layers stacked one on top of another, the formation is called 'pile d'assiettes', which translates as 'stack of plates'. These clouds form in stable conditions when strong winds flow across mountain barriers. The air is forced upwards as it meets the mountain and then descends to the lee of the mountains. However, the stable conditions mean that the air may continue to oscillate up and down after the initial displacement over the mountains, creating a series of waves that may extend many tens or even hundreds of kilometres downwind of the mountains.

Canon EOS 5D Mark IV + EF 24–70 mm *f*/2.8L USM: 1/13 s; *f*/11; 42 mm; ISO-400.





Wind and wave power

Jay Birmingham

Huge waves crash into the sea wall at Porthcawl in South Wales. The Beaufort scale is an empirical measure for describing the wind speed that was originally based on the effects of the wind on the sails of ships, but subsequently changed so as to relate to the observed sea conditions. The scale runs from 0 (calm) to 12 (hurricane). At force 4, a moderate breeze, frequent white horses (breaking waves) are seen on the sea surface, whereas at force 9, a severe gale, high waves with dense streaks of foam are blown in the direction of the wind and spray reduces visibility. Land-based descriptors were added later, including 'whole trees in motion; inconvenience felt when walking against the wind' (force 7, near gale) and 'slight structural damage (chimney pots and slates removed)' (force 9, severe gale).

Canon EOS 6D Mark II + EF 70–200 mm *f*/2.8L IS II USM: 1/1000 s; *f*/13; 70 mm; ISO-500.

Wave pile-up

Thomas Rutherford

Huge waves crash against the sea wall at Seaham in County Durham, England, as gale-force north-easterly winds batter the coastline. Coastlines bordering the North Sea, including the east coast of the UK and north-facing coasts of the Netherlands and Belgium, are prone to occasional severe storm surges. These events are associated with a combination of spring high tides and northerly gales as a strong low pressure system originating from the North Atlantic Ocean travels east or southeast through the North Sea. The strong winds cause the waters to 'pile up' as they are driven south across the North Sea, an effect exacerbated by the increasing shallowness of the sea with southward extent. Furthermore, the low atmospheric pressure causes a rise in the sea level, which can be envisaged as a very shallow bulge in the sea surface underneath the area of low pressure, contributing further to the surge.

Canon EOS 5D Mark IV + EF 300 mm *f*/2.8L IS USM: 1/1600 s; *f*/11; 300 mm; ISO-100.