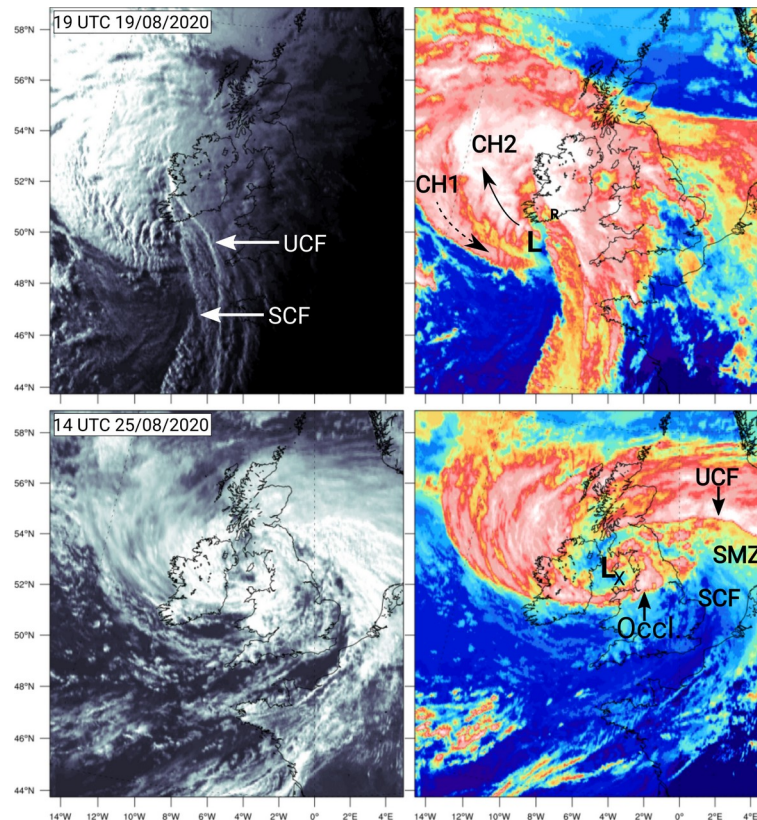


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**Spotlight:** Two severe extratropical cyclones over the UK and Ireland, August 2020



**Caption:**

**Figure 1.** The top two panels show visible imagery (left) and the corresponding enhanced IR imagery (right) over the UK & Ireland at 19 UTC on 19 August 2020. The IR (Infra-Red) 10.8 micron brightness temperature is shaded from warm (blue) to cold (pink/white). The bottom panels show similar at 14 UTC on 25 August 2020. Various features are indicated: L-low pressure centre as determined from ERA5 analysis, UCF- Upper Cold Front, SCF- Surface Cold Front, SMZ- Shallow Moist Zone, Occl.- occlusion and the location of Roches Point (R). In the top panels CH1 and CH2 are cloud heads and the two arrows indicate the relative motion of cloud tops (as determined from animations, dashed indicating downward motion) in the slantwise descending filament associated with CH1 and the slantwise ascending flow forming CH2. The X in the bottom right panel shows the location of a warm area in IR co-located with a cloud free hole in the visible light image. The geostationary satellite Meteosat Second Generation (MSG) data are provided courtesy of EUMETSAT.

**Text:**

The latter half of August 2020 was distinguished by a return to zonal Atlantic flow with the passage of extratropical cyclones over the UK including two named storms. Of these Storm ‘Ellen’ (19-20 August) was a relatively small secondary low that formed south-west of the UK and deepened rapidly as it moved towards Ireland. Figure 1 (top panels) shows the storm at 19 UTC on the 19<sup>th</sup> when the central pressure was 976 hPa (as determined from the ECMWF ERA5T preliminary reanalysis) having fallen from 999 hPa at 00 UTC. The storm produced provisional new August Irish records with a mean wind speed of 60 kn (69 mph) and a maximum gust of 77 kn (89 mph) at 22 UTC at Roches Point, county Cork, and attained a minimum central pressure of 966.4 hPa

over western Ireland (Met Éireann, 2020a). The strong winds and heavy rainfall associated with the storm caused disruption and damage across southern Ireland in the peak of the summer holiday season. The westernmost cloud head (CH1) arcs back towards the surface cold front (SCF) forming a slantwise descending hook-like filament which is the characteristic of cyclones producing a *sting jet* (see *e.g.* Schultz & Browning, 2017), the presence of which is supported by preliminary analysis of a simulation of the system using ERA5T data. The second cloud head (CH2) appears to result from slantwise ascent (best seen in animations) and forms from an ascending warm conveyor belt.

The second named storm, 'Francis' affected the UK & Ireland during 24-25 August attaining a minimum central pressure of 979 hPa over Ireland by 06 UTC on the 25<sup>th</sup>. Again the storm, produced unseasonably strong winds and heavy rainfall with gusts to 52 kn (60 mph) at Malin Head and localised flooding across Ireland (Met Éireann, 2020b). England and Wales were also affected by strong winds and heavy rainfall with 104 mm in 24 hr recorded at Bethesda Quarry, North Wales (source: Met Office Twitter feed) and gusts to 70 kn (81 mph) at the exposed Needles Old Battery site (Isle of Wight) (Kendon, 2020). At 14 UTC on 25 August the maturing low was located over the Celtic Sea with a central pressure of 986 hPa according to the ERA5T reanalysis. At this time a distinct clearance of cloud can be seen south of the Isle of Man. In animations this appears as a persistent ragged eye-like feature with warm brightness temperature (blue shades) in IR. Examination of model output suggests this was a 'warm core' or 'warm seclusion' feature characterised by subsiding air. The exact structural features of both storms and the role played by tropical air masses in their rapid development and the consequent severe weather remain to be elucidated.

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