



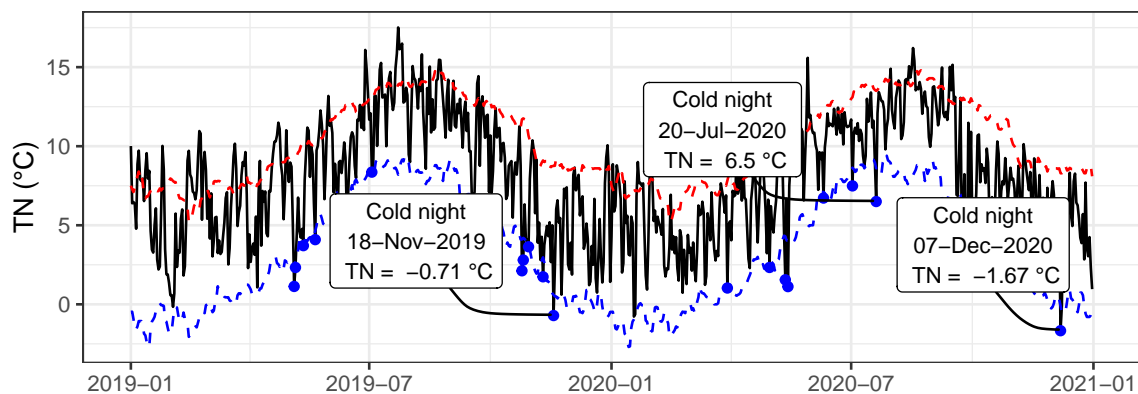
## Cold nights (TN10p)

### Key Message

- “Cold nights”, as defined here, are occurring less frequently than in the past at the majority of weather stations.

### Definition

- Daily minimum temperature (**TN**), based on 09UTC-09UTC observations are used to calculate the index.
- The **TN10p** index is based on the occurrence of “cold night” events, relative to a 1961-1990 climatology.
- The climatological 10th percentiles of **TN** are calculated using a rolling 5-day window for the time period of 1961-1990.
- These percentiles are used as thresholds to calculate the rate of exceedance, which determines the **TN10p** index.
- A bootstrapping method is used to calculate the index within the “base period” (1961-1990) to avoid biases, as outlined in Zhang et al. [2005].

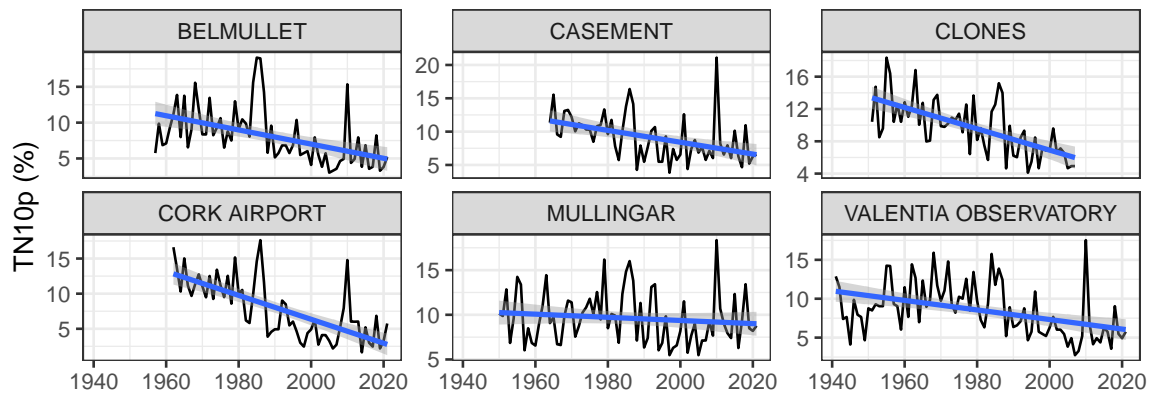


- For example the cold nights that occurred at Belmullet during 2019 and 2020 are shown above (marked by blue dots, when the black line falls below the dashed blue line). The annual values of the **TN10p** index were 3.3% and 3.8% respectively.



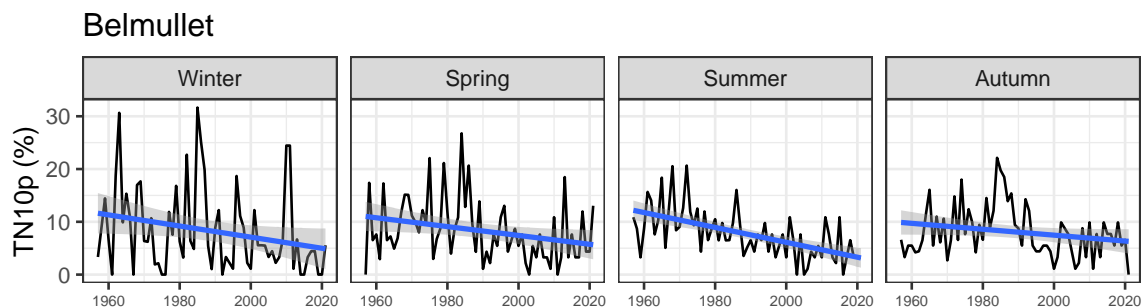
## Trends

- Cold nights are occurring less often at the majority of Met Éireann's synoptic weather stations, when compared to the 1961-1990 climatology.
- These are in agreement with global trends for this index, [Dunn et al., 2020].
- The one notable exception in Ireland is the cold winter of 2010, which produced large values of TN10p.



## Seasonality

- The decreasing frequency of cold nights is present for all seasons, shown below for Belmullet.



## Data Access

Data for this index can be downloaded through the web-page below (or the QR code in the header):

- <https://www.met.ie/climate/climate-change-indices-etccdi/>

For further information contact Met Éireann Climate Enquiries: [enquiries@met.ie](mailto:enquiries@met.ie)



## References

Robert JH Dunn et al. Development of an updated global land in situ-based data set of temperature and precipitation extremes: HadEX3. *Journal of Geophysical Research: Atmospheres*, 125(16):e2019JD032263, 2020. doi: <https://doi.org/10.1029/2019JD032263>.

Xuebin Zhang et al. Avoiding Inhomogeneity in Percentile-Based Indices of Temperature Extremes. *Journal of Climate*, 18(11):1641–1651, 2005. doi: <https://doi.org/10.1175/JCLI3366.1>.