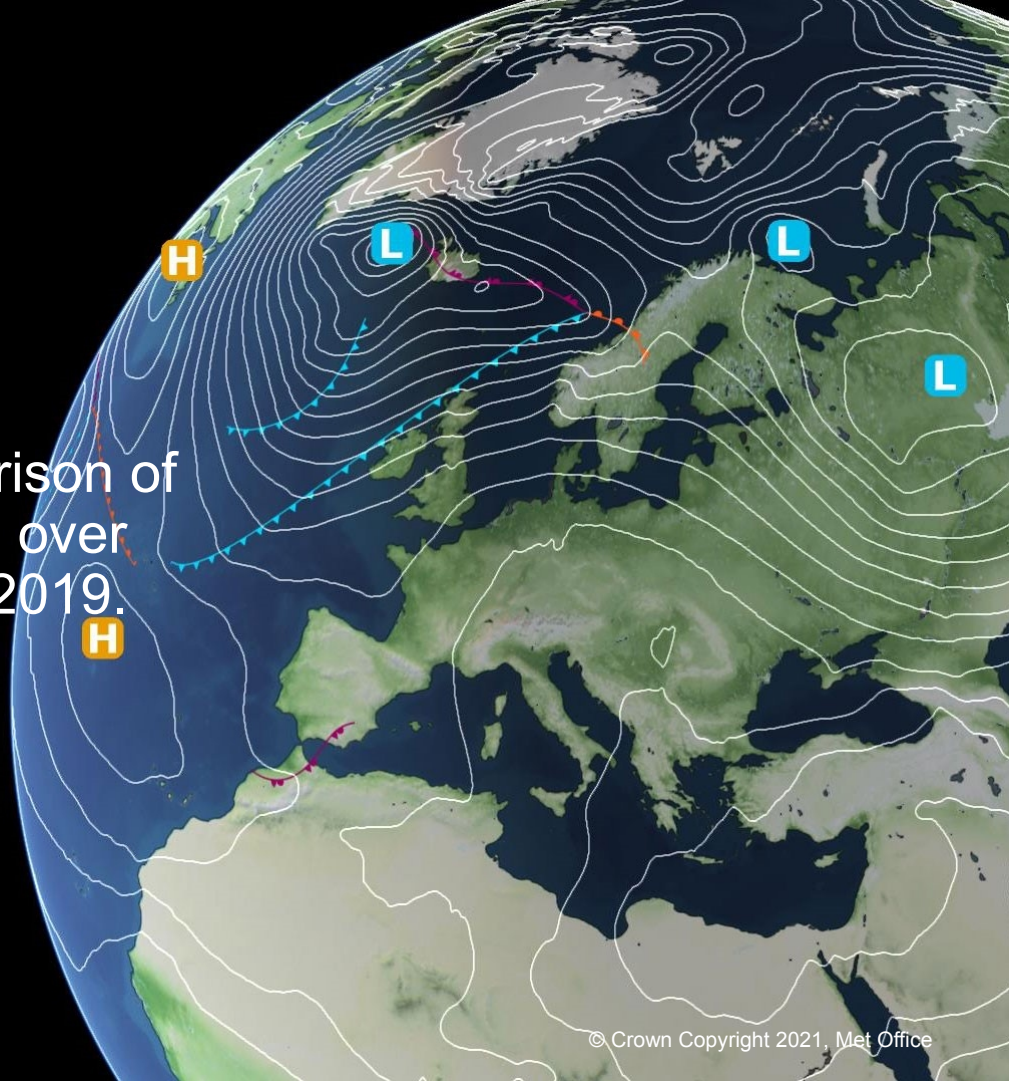


SOFOG3D – UK Met Office comparison of observations at two 50m-mast sites over two radiation fog cases in October 2019.

Jenna Thornton, et al.

7th June 2022

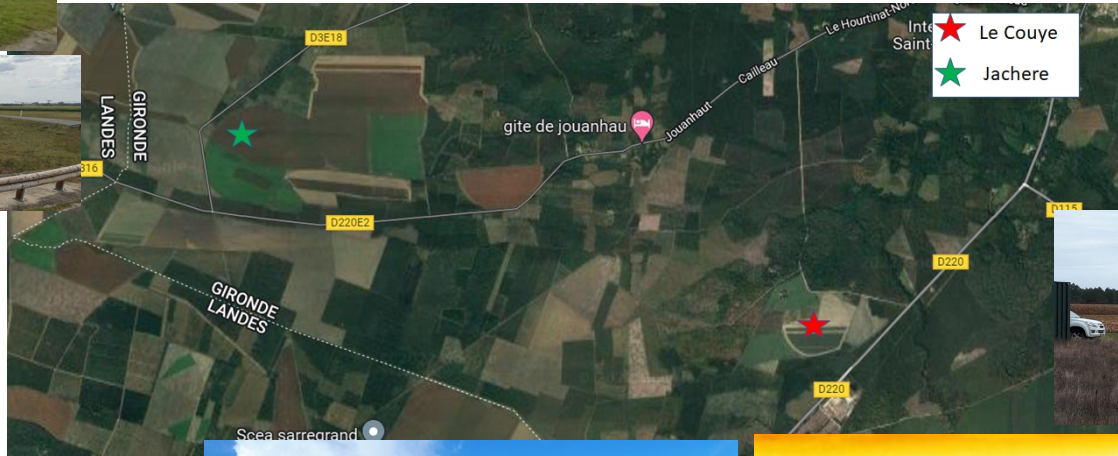


Outline

- (1) Overview of the two 50m-mast sites
- (2) Overview of the two radiation fog cases
- (3) Differences and similarities between measurements at the two sites
- (4) Additional cases – radiation fog (up to 10m)
- (5) Conclusions and Further work



Jachere - MeteoFrance site – field within an open area



Le Couye – UKMO site – field surrounded by forested area



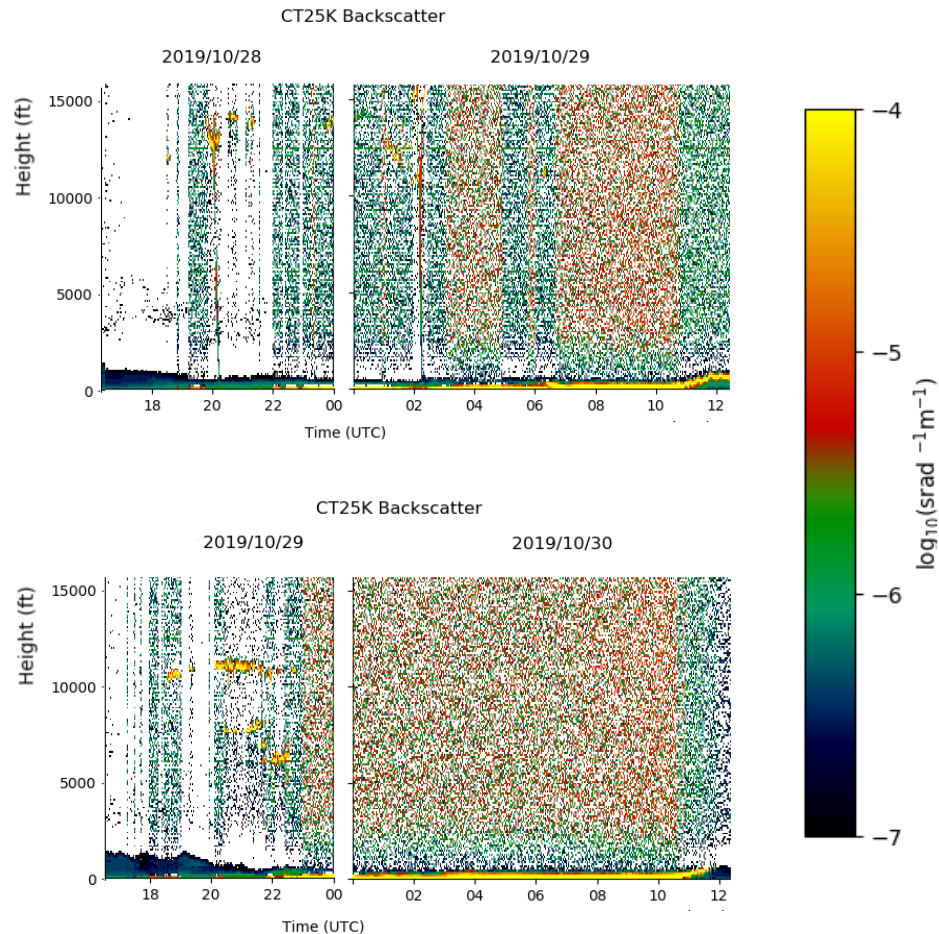
IR camera at UKMO site – surrounding trees warmer than surface

28th to 29th October 2019

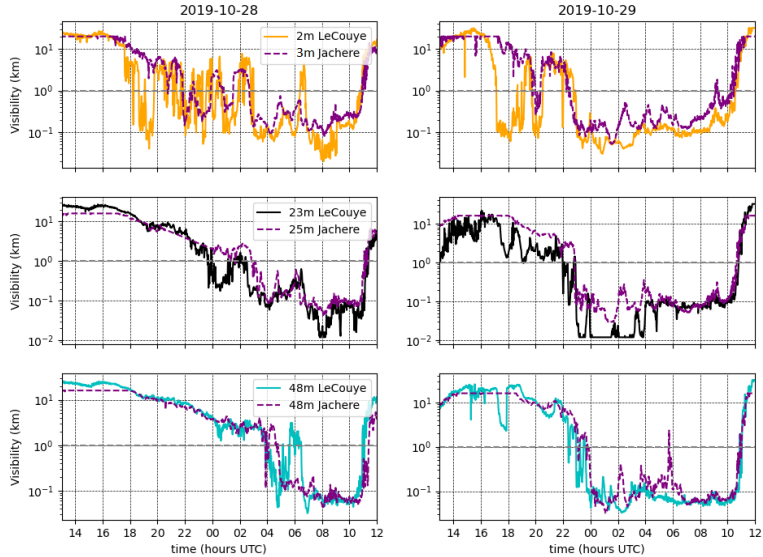
- Radiation fog formed (18:00)
- Dissipated due to cloud over-head (20:00)
- Re-formed – but inhomogeneous (22:00)
- Stratus fog moved over existing fog (06:00)
- Deep-adiabatic (06:00)

29th to 30th October 2019

- Radiation fog formed (17:00)
- Dissipated by cloud over-head (19:00)
- Fog re-formed (20:00)
- Dissipated by cloud over-head (20:30)
- Fog re-formed (22:00)
- Became deep-adiabatic rapidly (01:00)

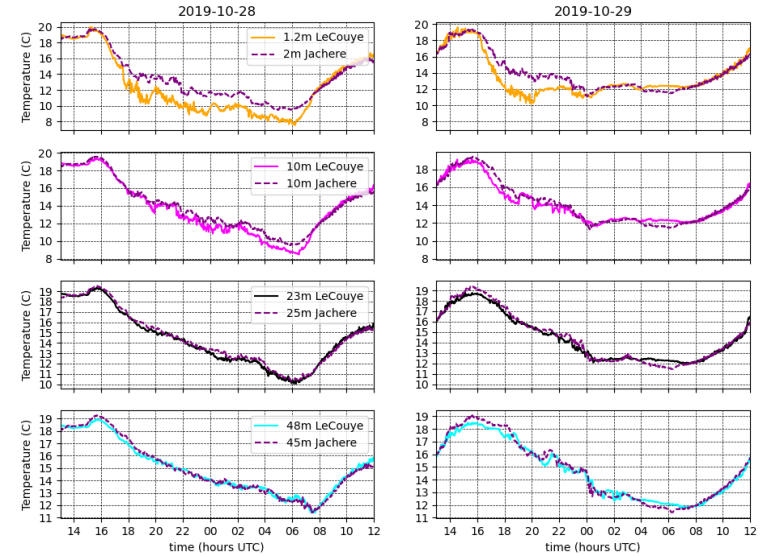


Early shallow-fog formation occurred at Le Couye only...



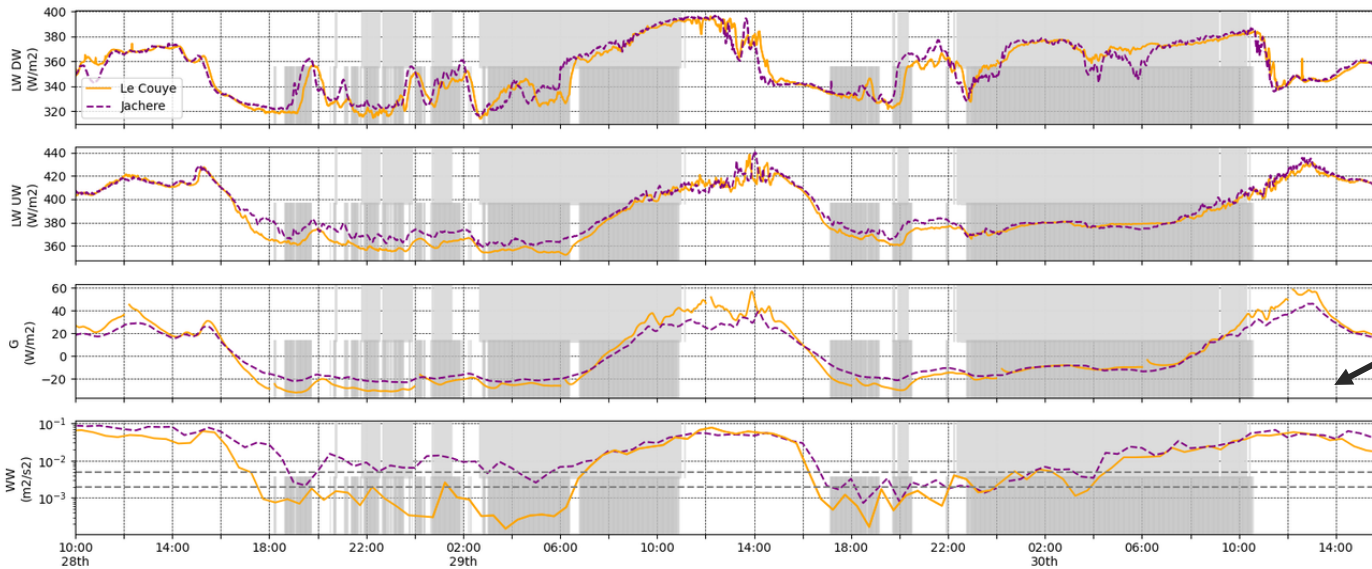
...Otherwise start and finish time of fog events are comparable at the two sites

Early fog - due to enhanced cooling near the surface at Le Couye?



Temperatures at greater heights are similar between the sites

Near Surface Radiation Measurements



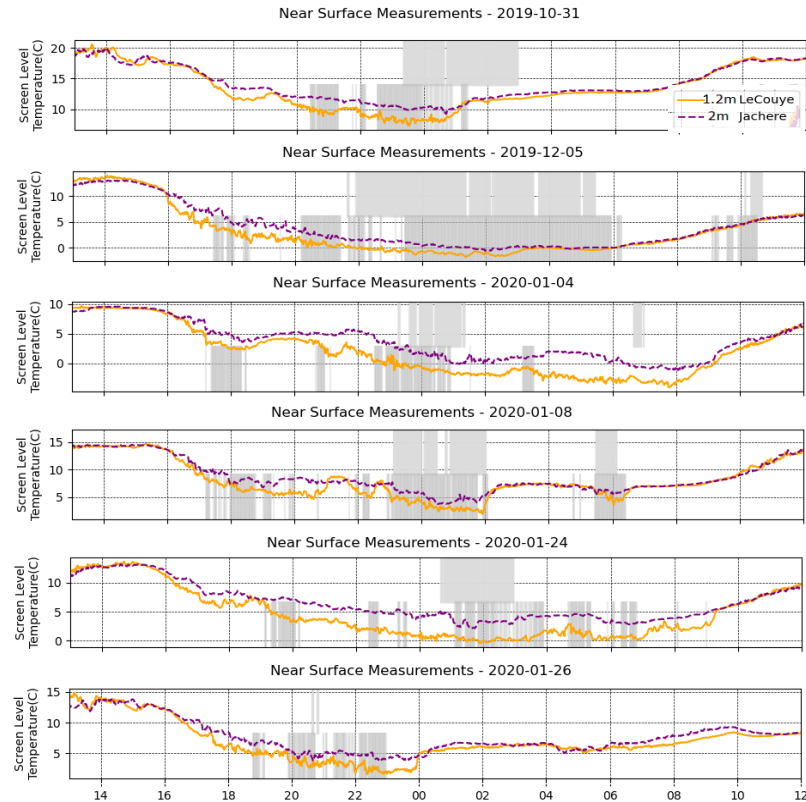
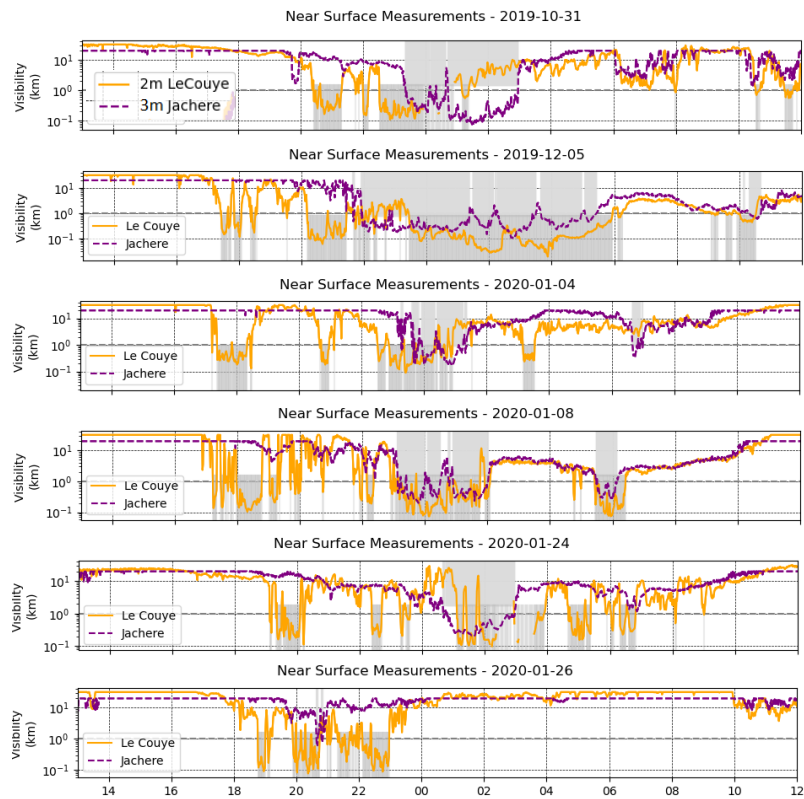
Similar **LWDW (2m, 1m)** (any differences within measurement uncertainties)

LWUW (2m, 1m) – lower at Le Couye due to cooler temperatures

Soil heat flux (G) (~-2cm) - driven by soil temperature gradient so more negative at Le Couye due to cooler skin temperatures

Vertical velocity variance (WW) (turbulence) (2m, 3m) - drops more rapidly at Le Couye in late afternoon/early evening – limiting the transfer of warmer air downwards & allowing more cooling.

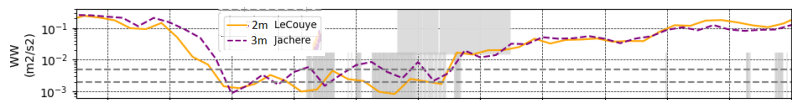
Six other radiation fog events – early fog formation at Le Couye & generally lower temperatures from late afternoon



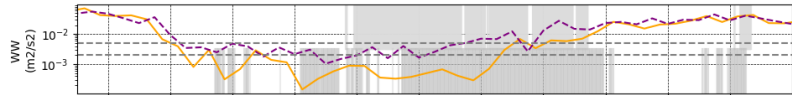
Additional cases – radiation fog

Six other radiation fog events – generally lower WW and wind speed from late afternoon – is this due to a sheltering affect from the forested area surrounding Le Couye?

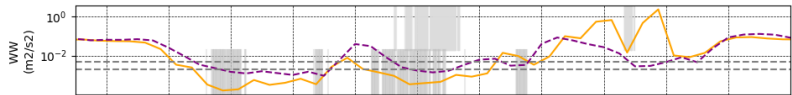
Near Surface Measurements - 2019-10-31



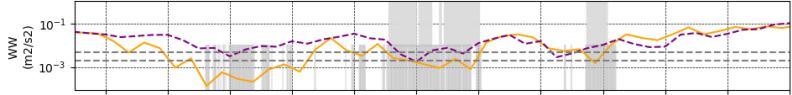
Near Surface Measurements - 2019-12-05



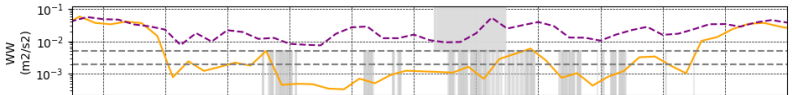
Near Surface Measurements - 2020-01-04



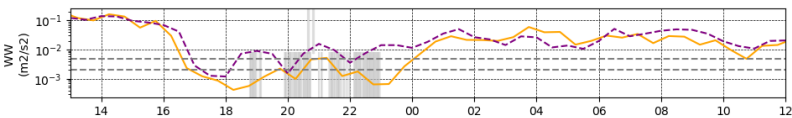
Near Surface Measurements - 2020-01-08



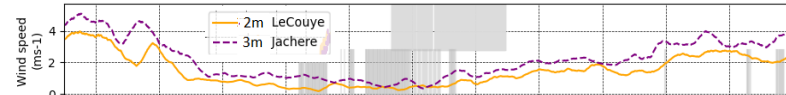
Near Surface Measurements - 2020-01-24



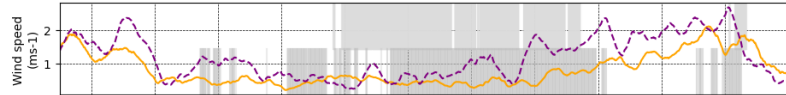
Near Surface Measurements - 2020-01-26



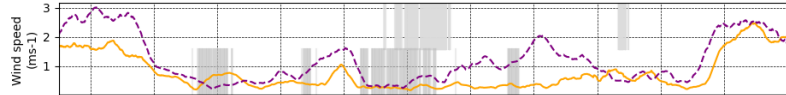
Near Surface Measurements - 2019-10-31



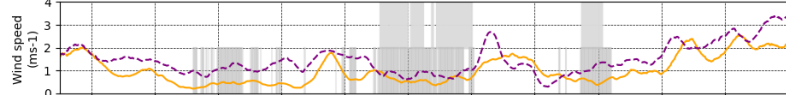
Near Surface Measurements - 2019-12-05



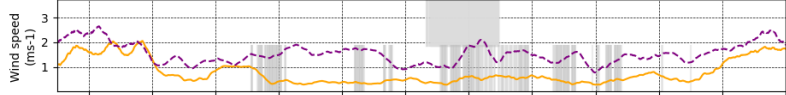
Near Surface Measurements - 2020-01-04



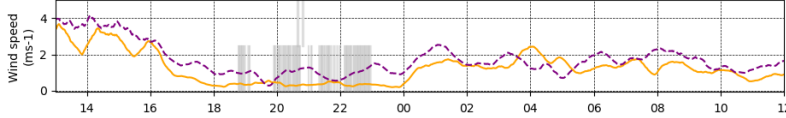
Near Surface Measurements - 2020-01-08



Near Surface Measurements - 2020-01-24



Near Surface Measurements - 2020-01-26



Summary

- Analysis has been carried on two radiation fog events that occurred whilst both 50m-mast were operational
- Fog at both sites became deep-adiabatic at around the same time
- Fog formed earlier at Le Couye – this then dissipated due to cloud passing over the site
- Earlier fog formation is suspected to be enabled by enhanced cooling in the late afternoon/early evening at the near surface at Le Couye
- One cause of this may be linked to the reduced turbulent mixing near the surface – a possible effect of sheltering by the forested area surrounding Le Couye
- These findings are common amongst other radiation fog events.

Further Work

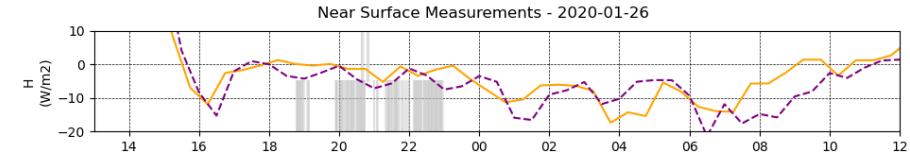
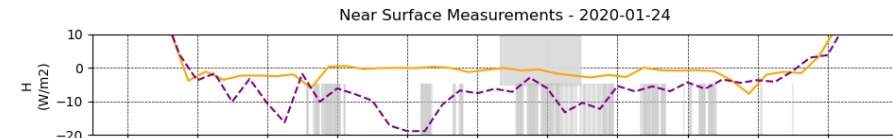
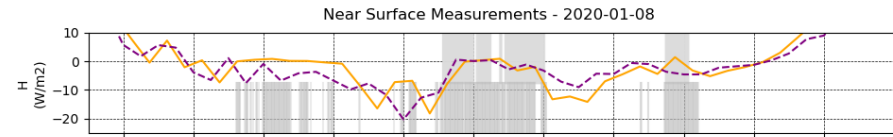
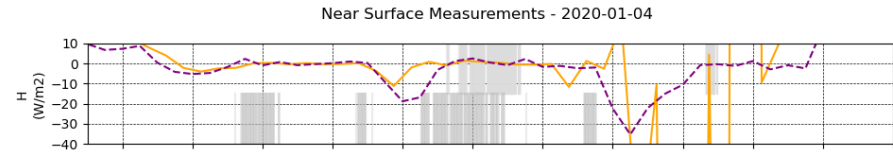
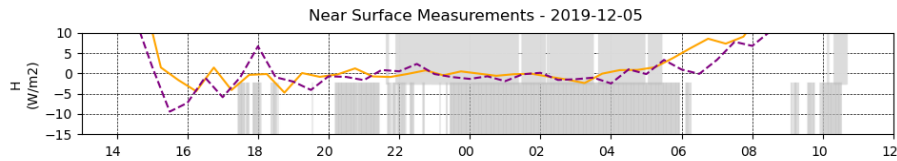
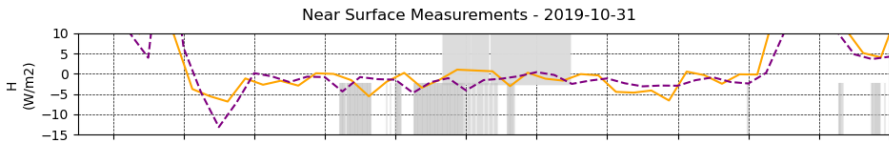
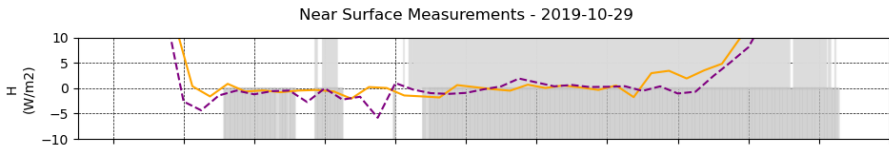
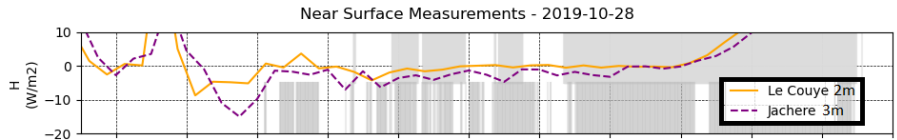
- Examine whether enhanced cooling is also common during evenings where fog events do not occur
- Introduce data from other field sites that are more/less sheltered than Le Couye – e.g. Le Houzins
- Upload UKMO data to Aeris database – final checks in progress
- Examine droplet deposition/fog microphysics in the observations - relate dew-meter data to observed fog spectra to elucidate fog droplet deposition during SOFOG (in progress).



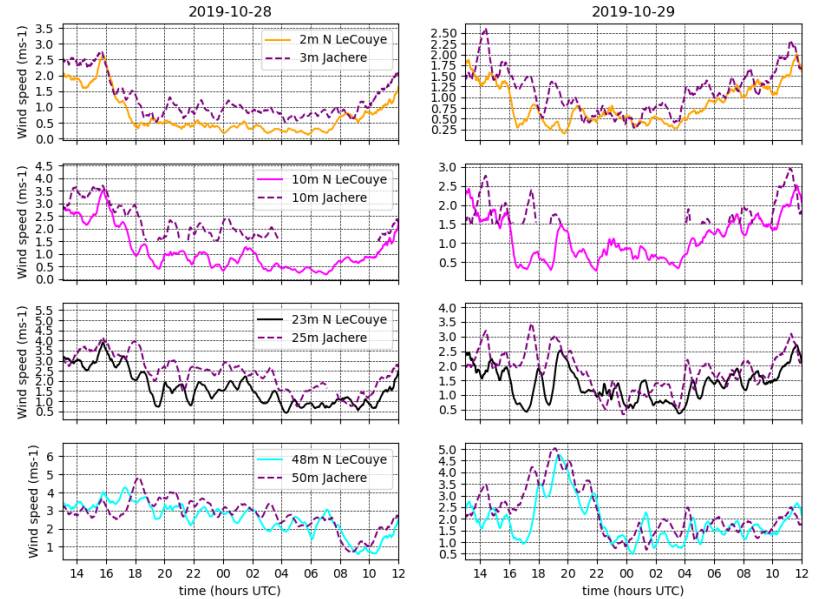
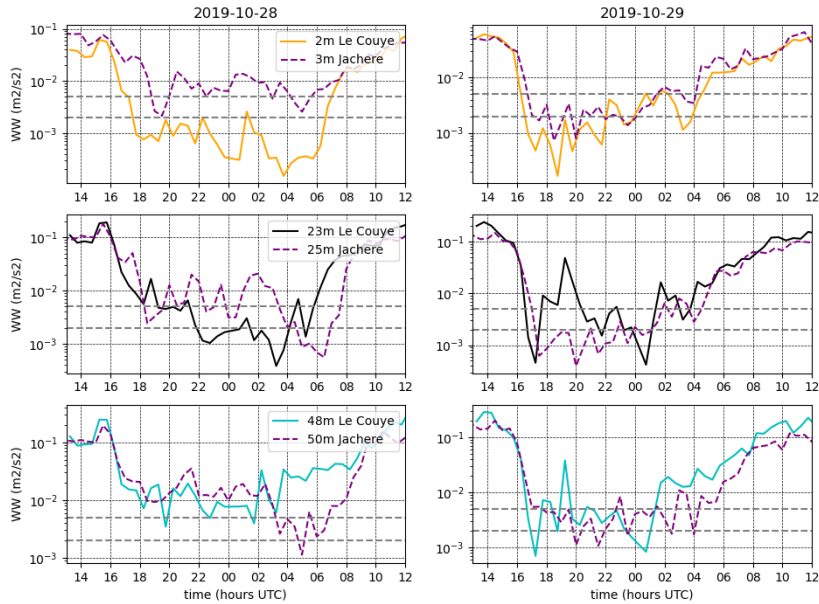
Acknowledgement: Merci beaucoup to all who have been involved in the collection and provision of data at the Jachere site... and at other sites which may be used to progress this work!

Any Questions?

Sensible Heat Flux – near to surface



WW and wind speed at various heights



RH and (10 minute-averaged) wind directions at various heights

