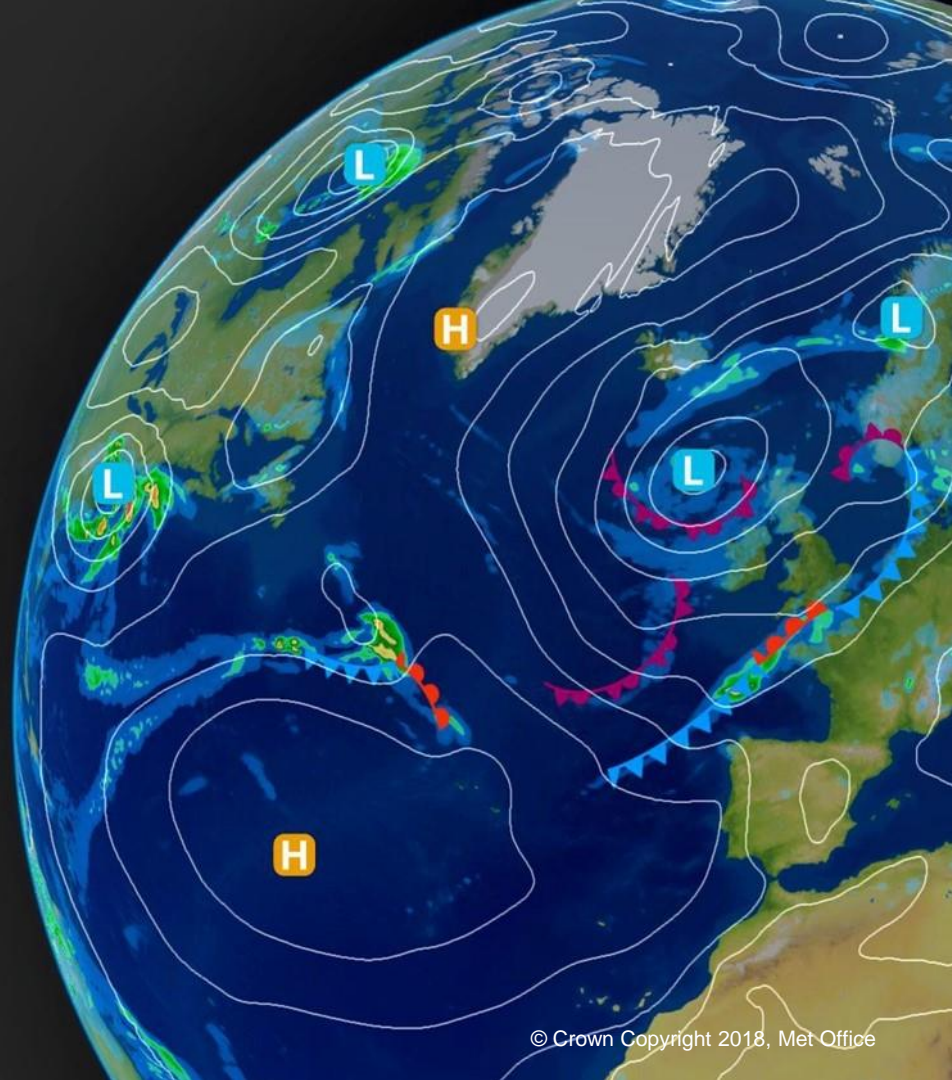


UK Met Office update on SOFOG3D

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McCabe, Paul Field, Steve
Derbyshire, et al.*

9th November 2020



UK MO Update on SOFOG3D

Nov. 2020

This talk will present a short summary on:

Data Collected and status

Some initial results from observational analysis

Initial results from deterministic modelling studies

Initial results from Ensemble model studies

Off to a good start !

Set up week, Sept 2019



Photo: Robert Clark

Met Office Summary of data collected

- Equipment operated continuously with only a few interruptions, mostly due to power loss.
- Data quality are usually good, but:
- RH at 1.2m and 10m overreading at high RH (under investigation)
- Some Dewmeter trays developed leaks (repaired when detected).
- Automatic switching-on of fog spectrometer failed on occasion due to Windows 10 O/S.
- Visiometer at 48m failed early on.

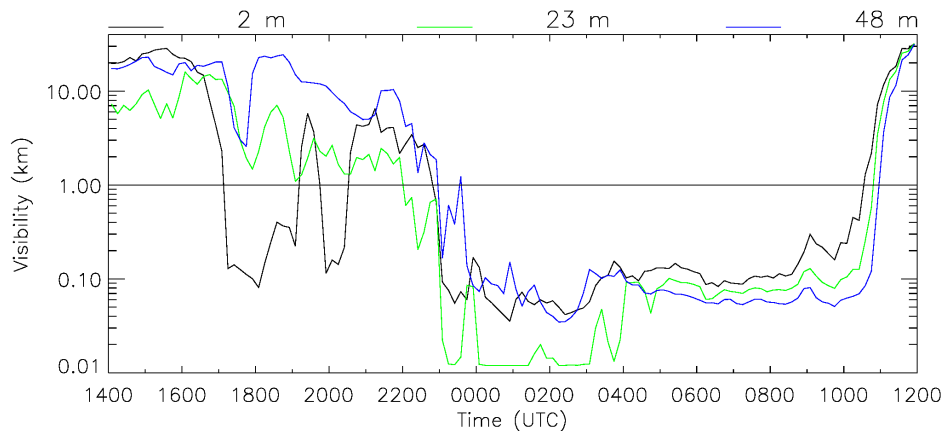
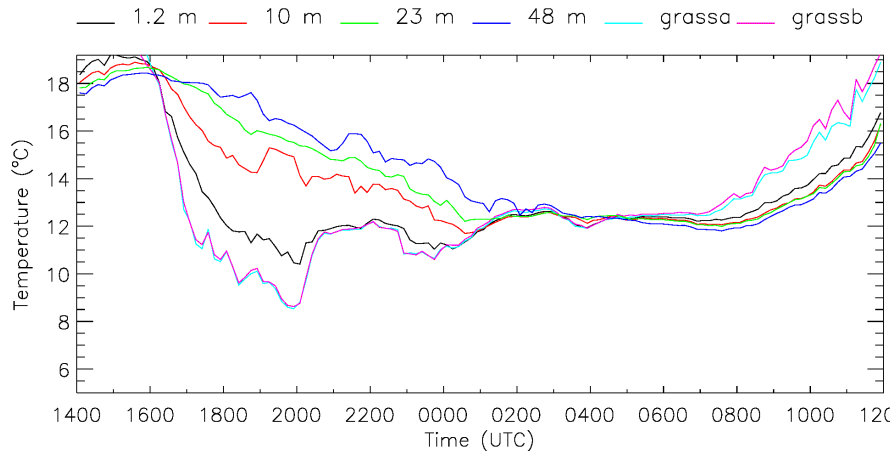
Observational Preliminary findings

- A preliminary sift of UKMO site data was undertaken:
 - Low level stratus cloud was very prevalent
 - Stratus also existed as stratus fog
 - There was a significant amount of radiation fog
 - Radiation fog was mostly shallow and stable
 - Evidence for fog forming in clearings between forest areas
 - Development often limited to tree-top height in sheltered air
 - Deeper fog only occurred when winds above trees were lighter
 - Fog spectra and dewmeter data indicate enhanced deposition of fog droplets in mature fog

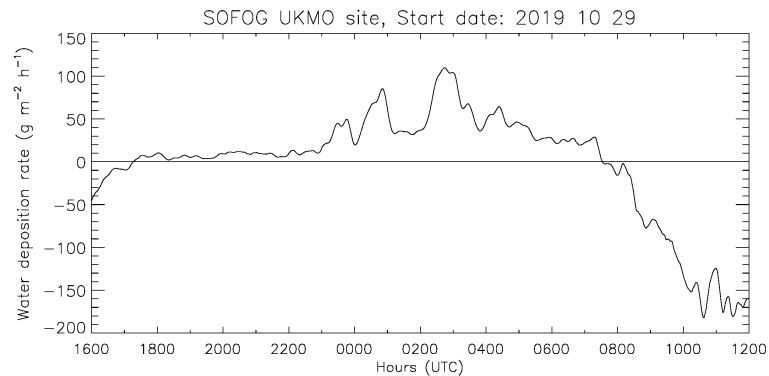
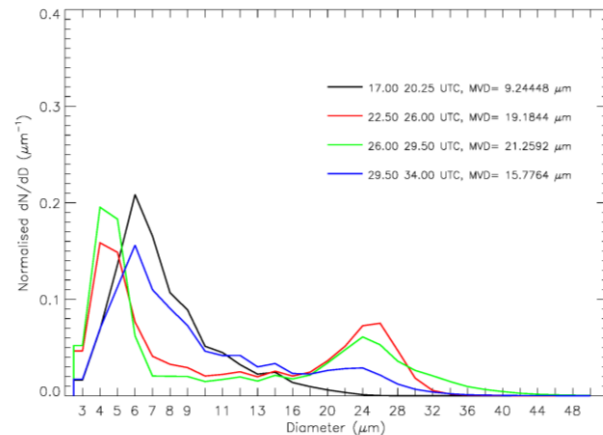
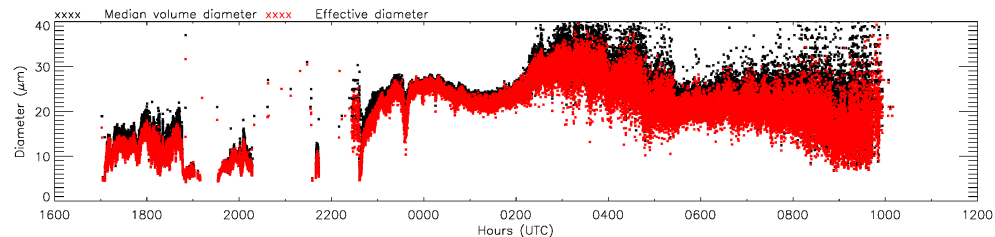
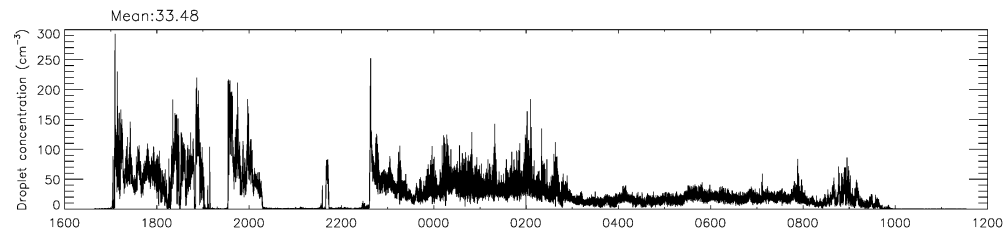
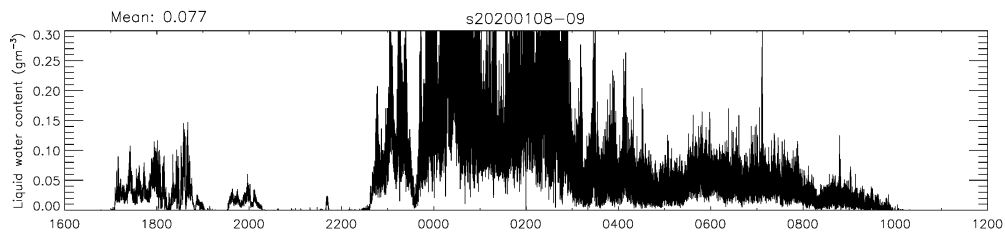
Example analyses

Two dates presented:- 29th-30th October 2019, 5-6th December 2019

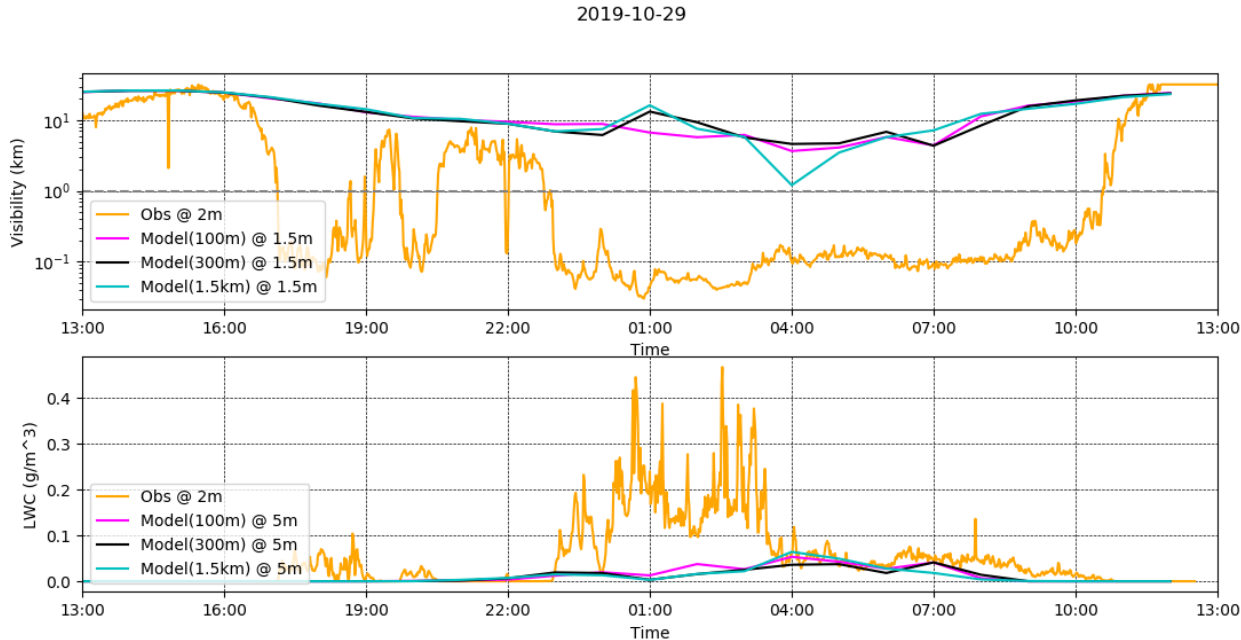
20191029-30 : Humid, initially stable, then deep adiabatic from ~0200UTC



Deposition rates increase with fog occurrence, possibly proportional to drop size.



2019-10-29 Fog Event – UKMO UM results



Disagreement between **Observed visibility** and visibility output by the Deterministic Model (at all resolutions)

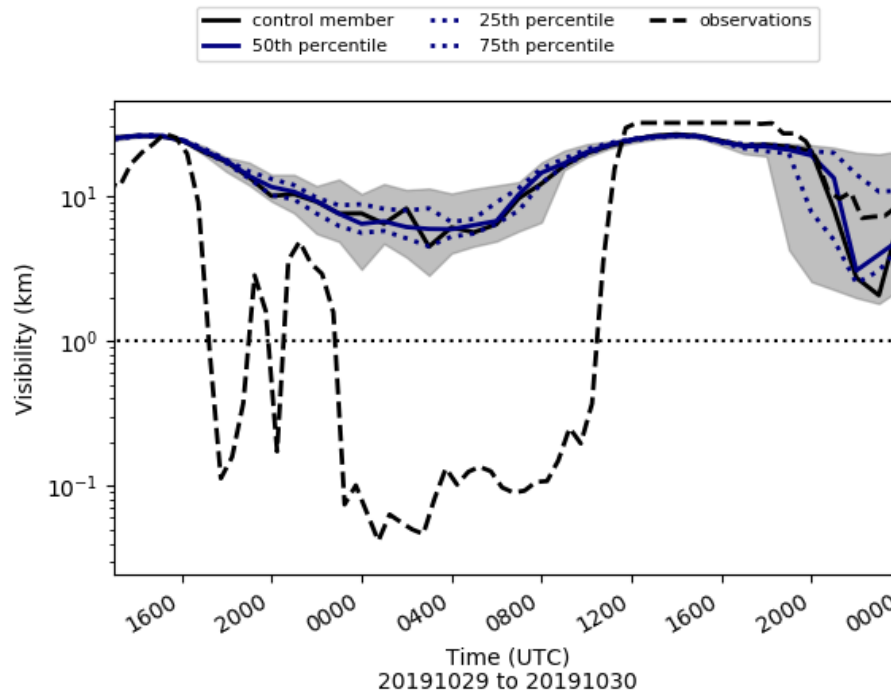
However – The model LWC values at 5m altitude are suggestive of fog...

Why are these LWC values not translated to low visibility at 1.5m altitude??

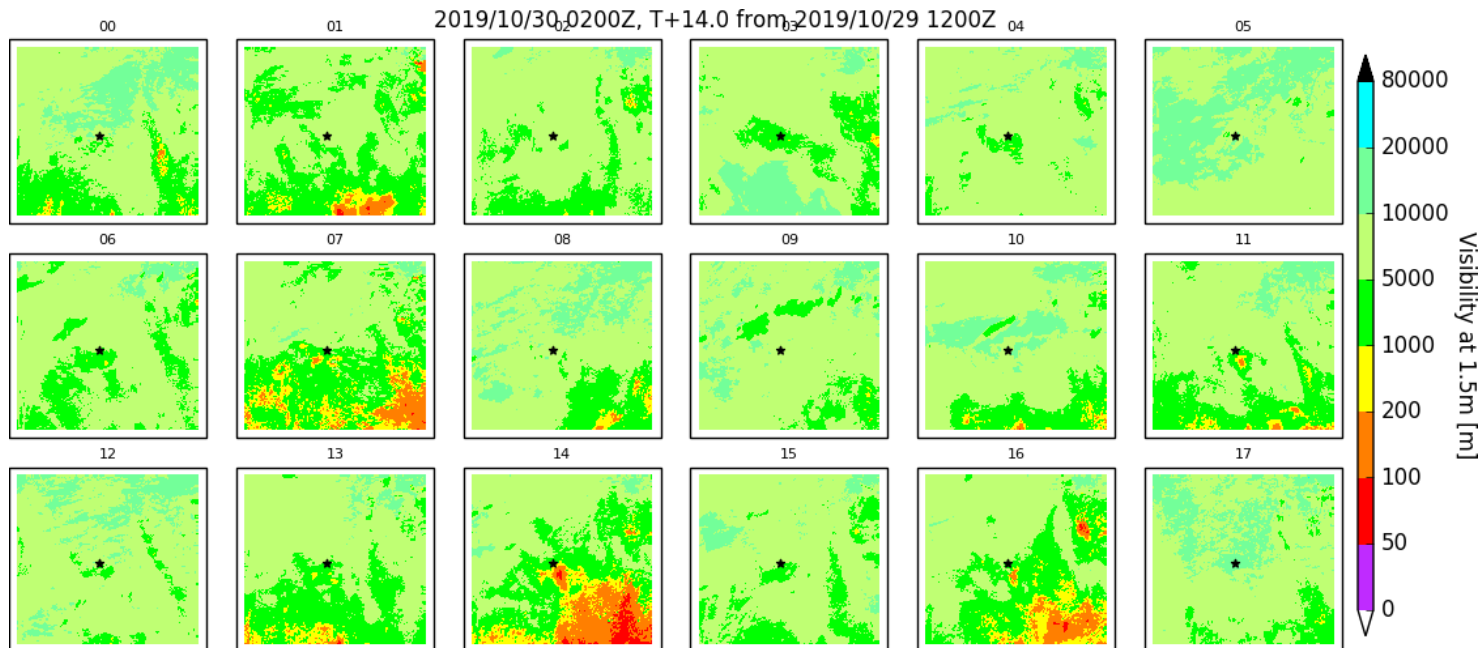
Ensemble Evaluation: 29th October 2019

- 18 member ensemble run at 100m horizontal resolution
- Downscaled from Global Ensemble → 2.2km → 300m → 100m ensemble
- Time series of 1.5m visibility at Le Couye shows the ensemble misses the fog event completely
- There is very little ensemble spread giving false confidence to the deterministic forecast
- BUT

Results at Le Couye



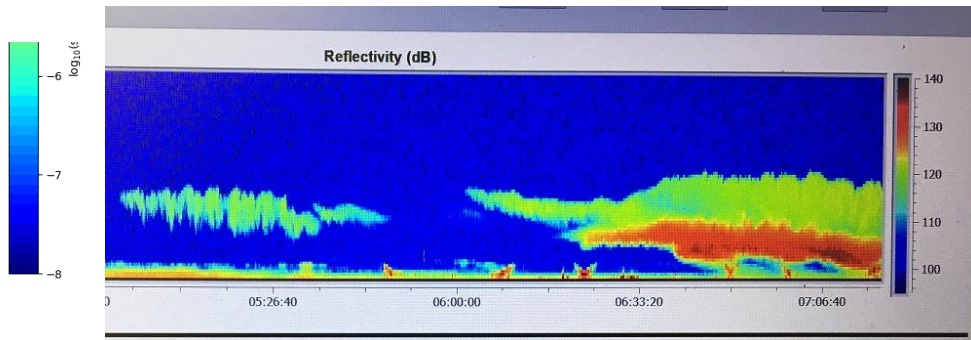
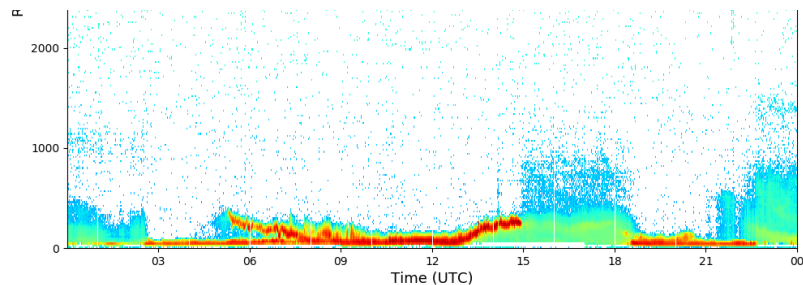
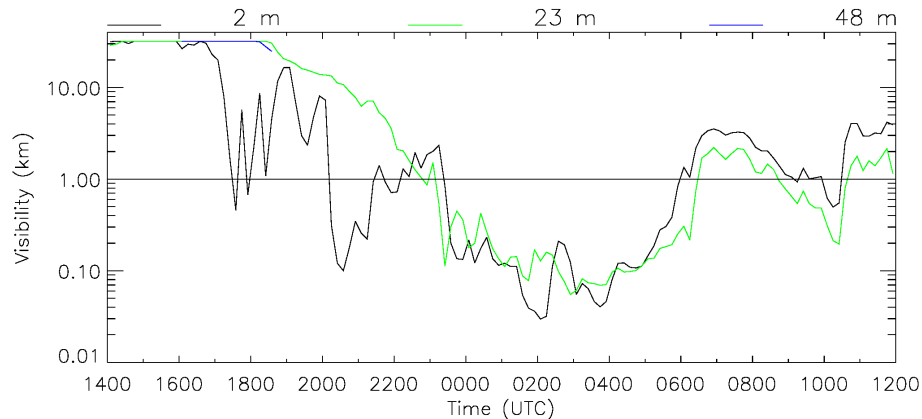
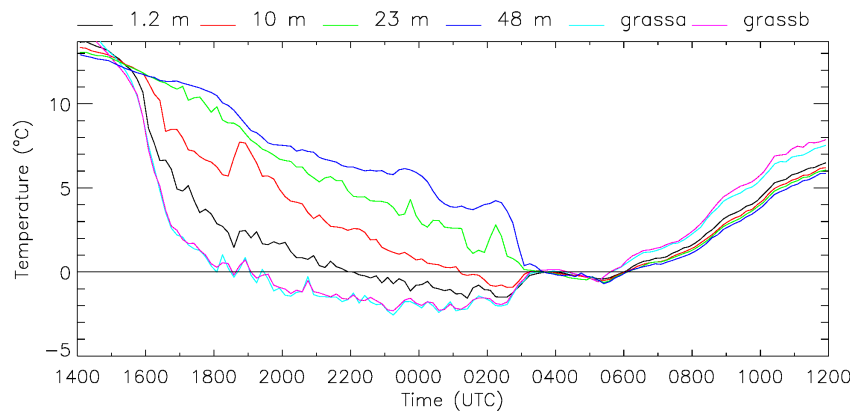
Ensemble members at 100m resolution at 02UTC, 29th October 2019

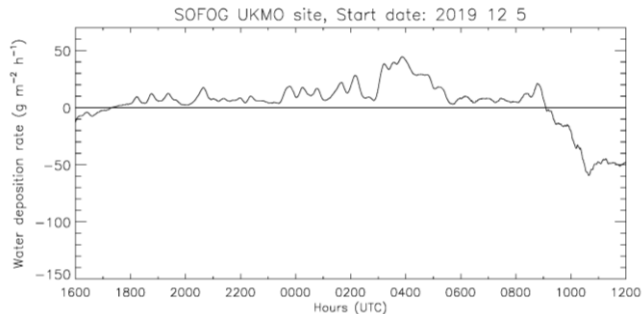
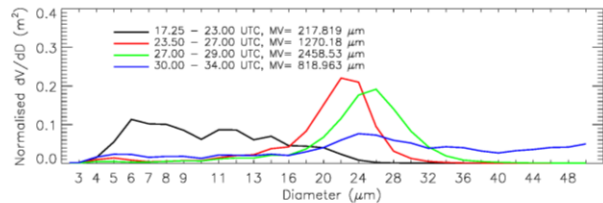
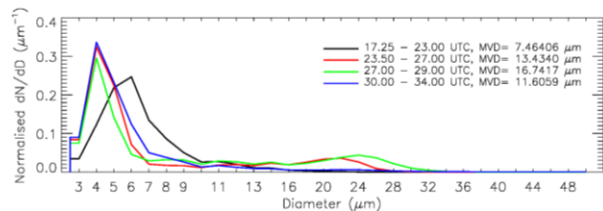
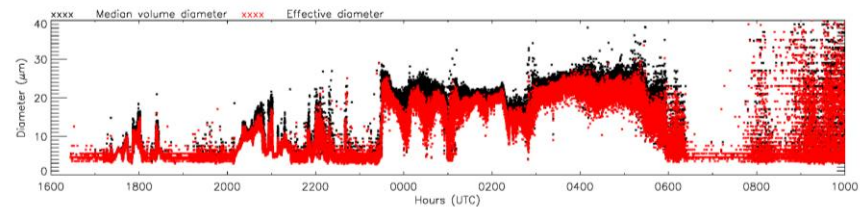
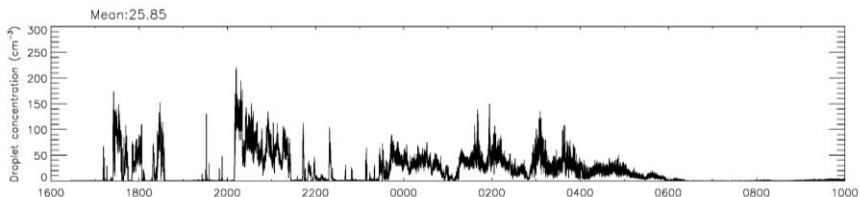
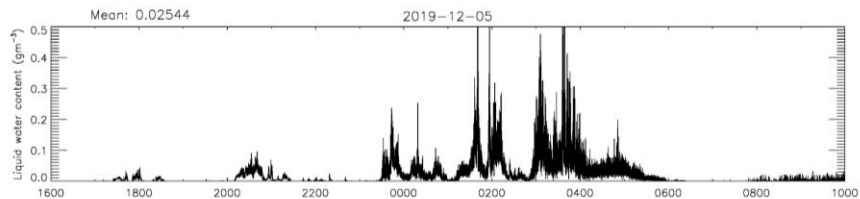


... some members predict fog very close to the observation site

5-6th December 2019 (POI 2)

Persistent fog, became deep-adiabatic, low cloud merged from above



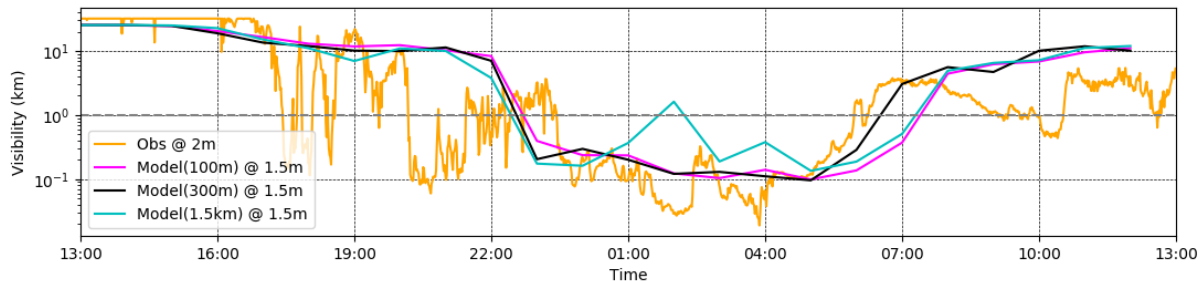


2019-12-05 UKMO UM results

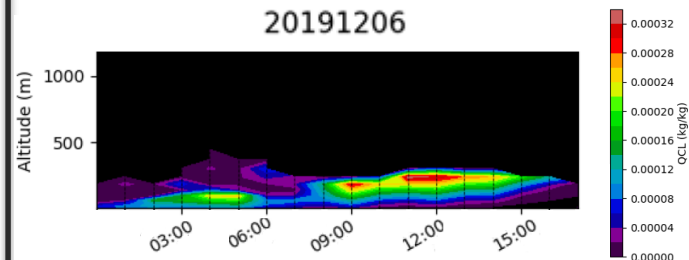
General agreement between **Observations** and Deterministic Model (at **100m**, **300m**, and **1.5km** resolution)... but with some 'timing issues':

- 'Lift-off' is an hour late for the 100m & 1.5km resolutions, but the 300m resolution model run agrees better with the observations.

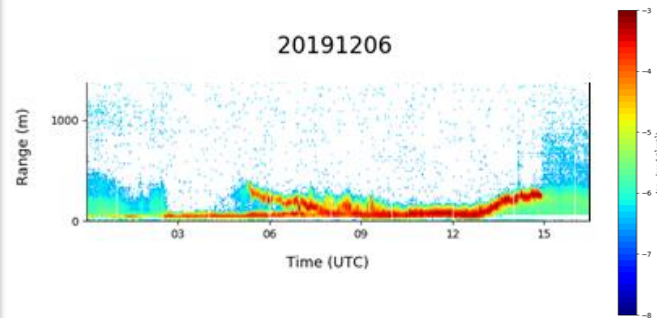
2019-12-05 & 2019-12-06



Model LWC – 300m resolution

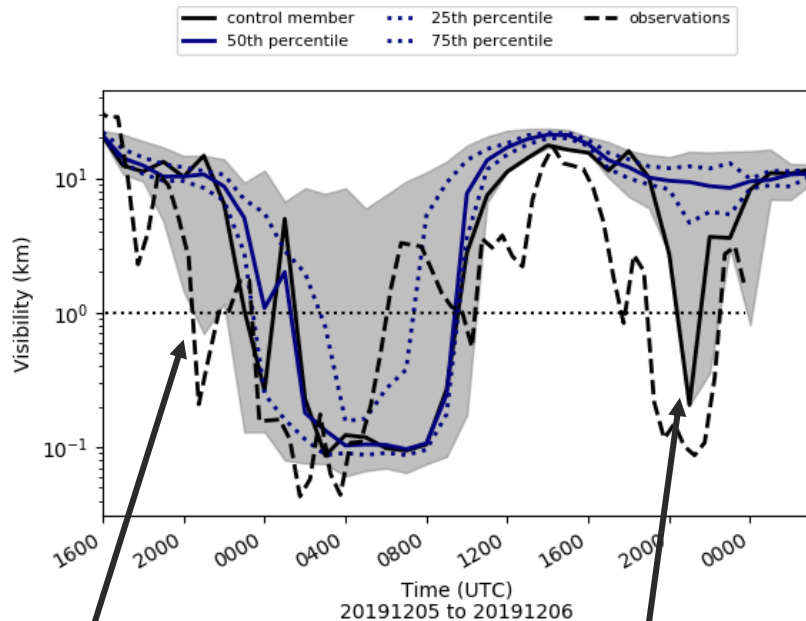


Obs - Ceilometer



Ensemble Evaluation: 5th December 2019

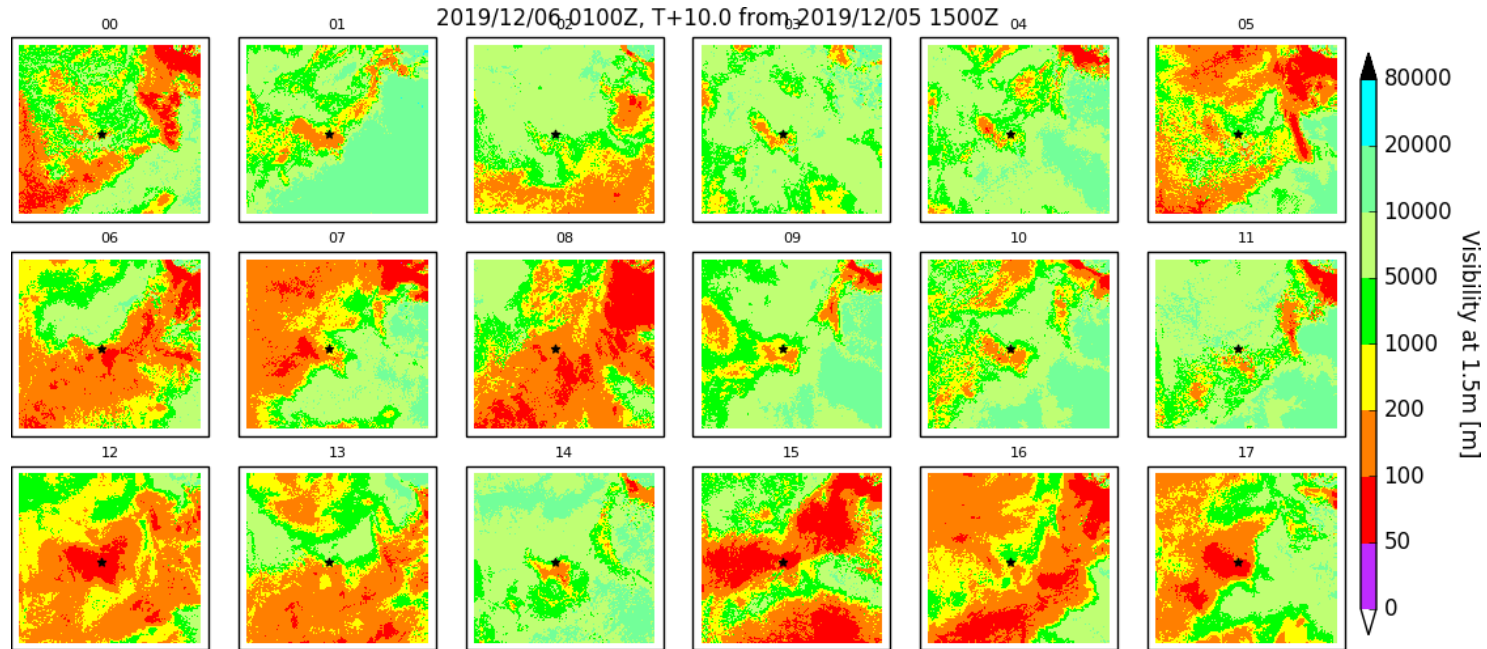
- Time series of 1.5m visibility at Le Couye shows the ensemble capturing the main fog event



1 member forecasts the first dip in visibility, missed by the rest of the ensemble

The control member gives the best forecast for the later fog event

Ensemble members at 100m at 01UTC, 5th December 2019



All members show low visibilities with around 50% of members forecasting widespread fog

Summary

- Observation phase mostly unaffected by Covid pandemic, and a good quantity of data was collected
- Dynamics around forest clearing and effect on fog under study
- Relationship between droplet deposition and microphysics under investigation
- Modelling work in progress, but still at an early stage
- General performance of deterministic and ensembles under investigation
- Relation between visibility and Qcl under investigation.

Questions?