

# The DIAMET field campaign

Geraint Vaughan  
and the DIAMET team

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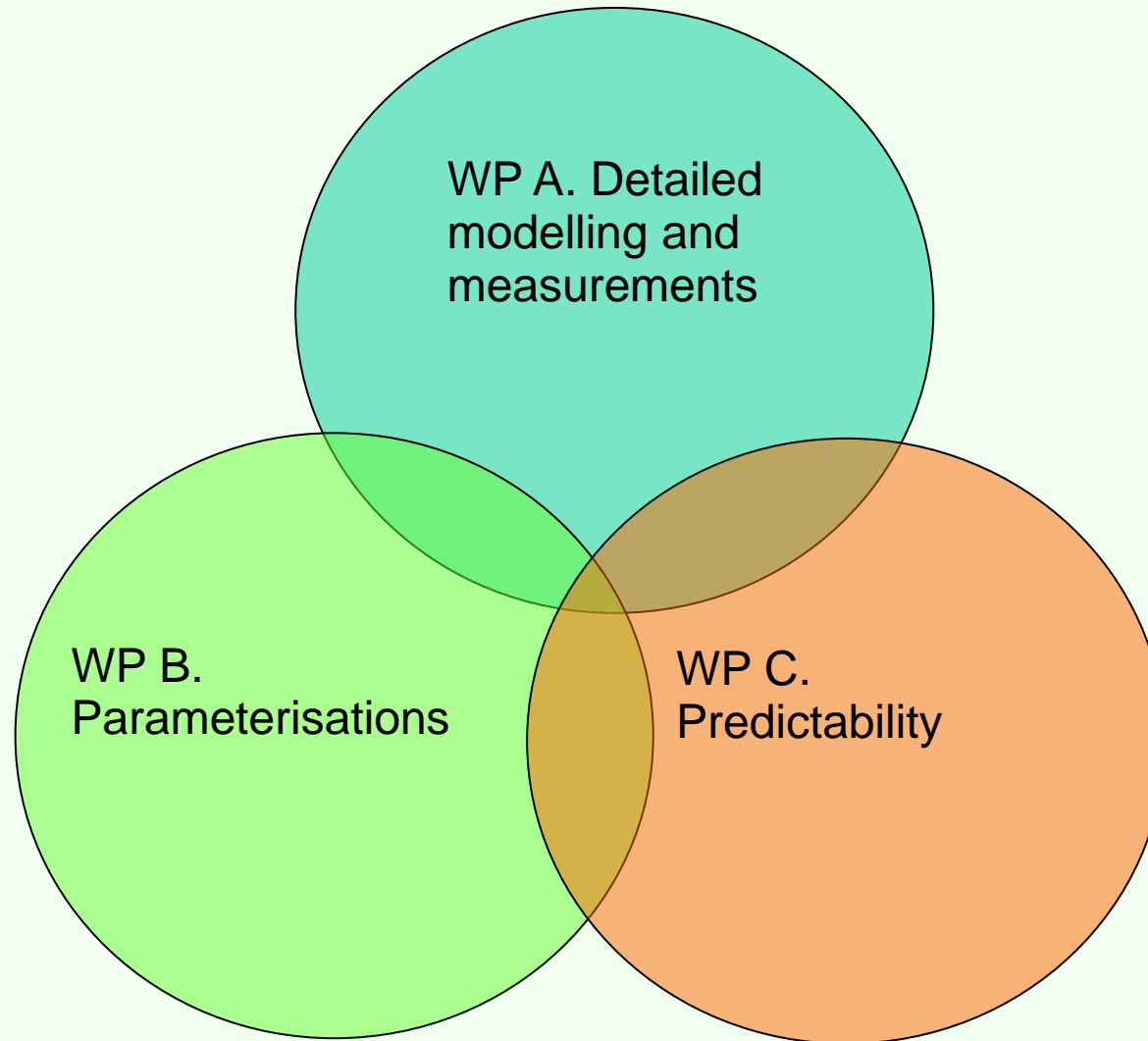
## Overarching questions for project:

What is the role of **diabatic processes** in generating mesoscale potential vorticity (PV) and moisture anomalies in cyclonic storms?, and

What are the consequences of those anomalies for the weather we experience?

We focus on two key diabatic processes: **latent heating/cooling** and **air-sea fluxes of heat and moisture**.

# Structure of project



Project combines field campaigns, high-resolution modelling, ensemble analysis and data assimilation

# Field Measurements

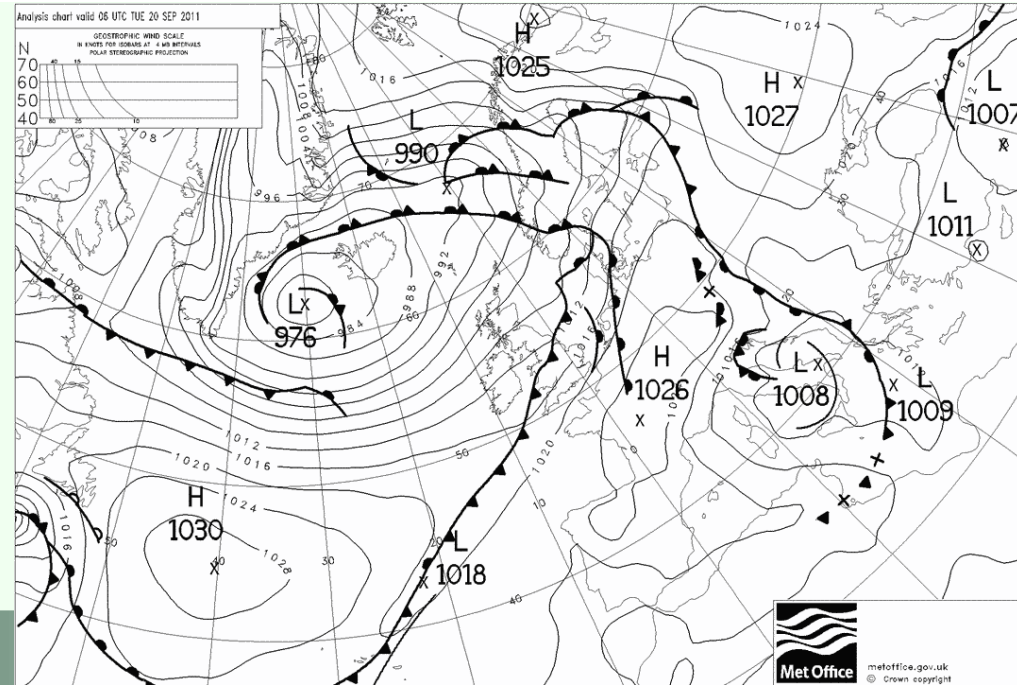
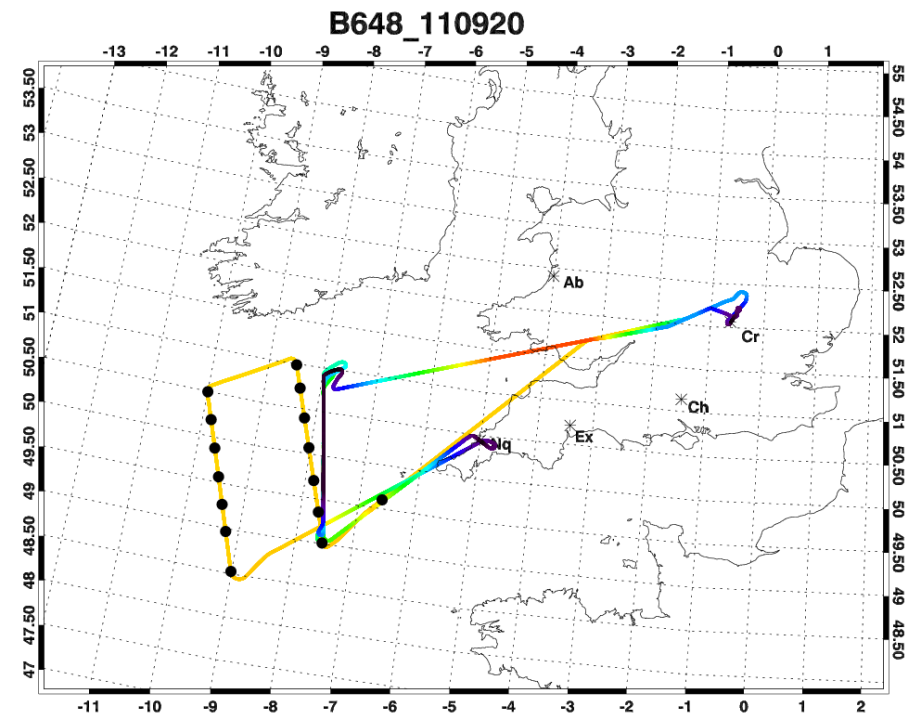


BAe 146 aircraft

Chilbolton radar

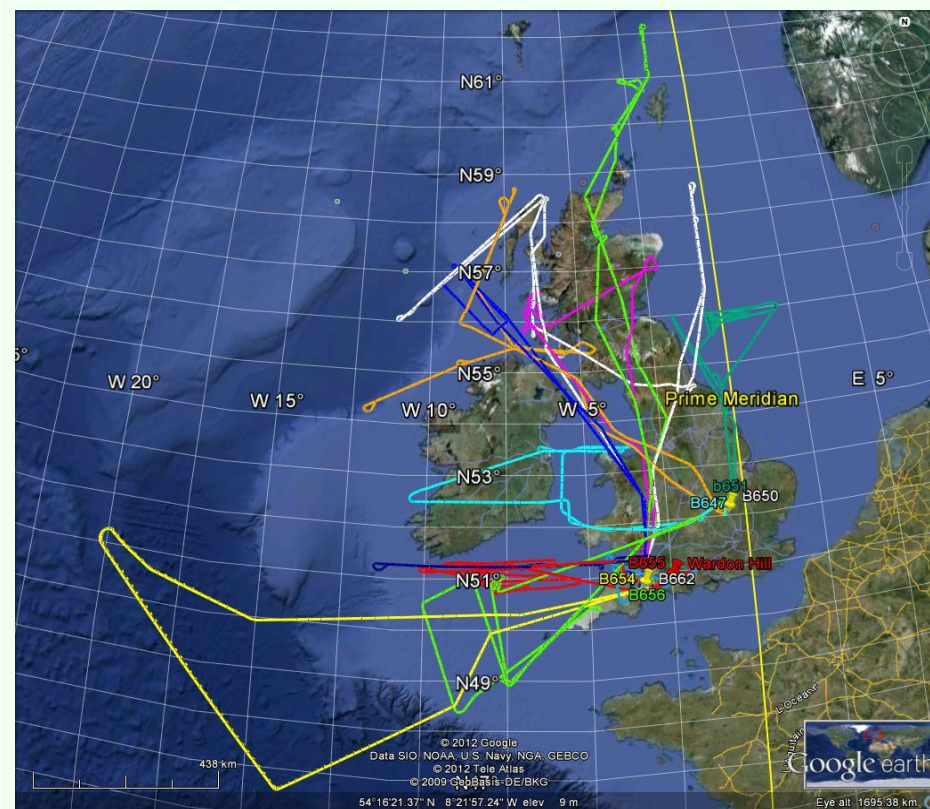


Radiosondes and MST (wind profiling) radar

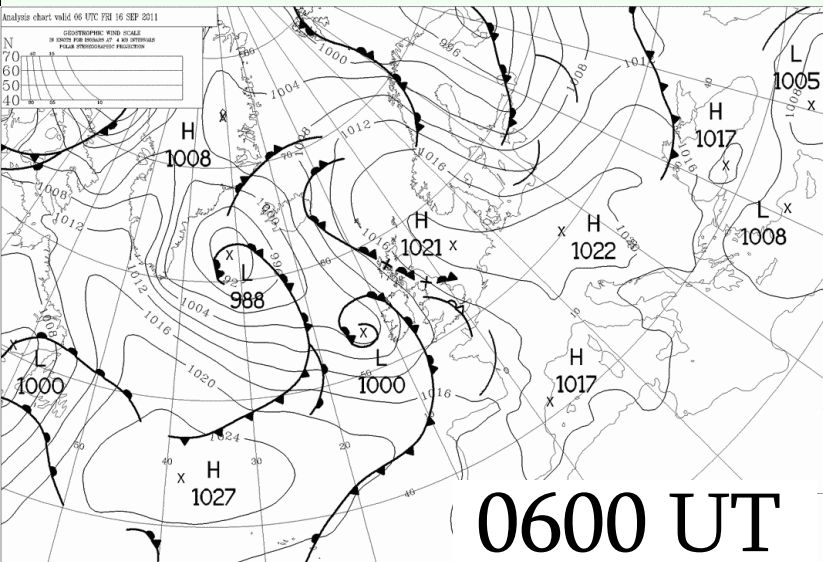


# Field Campaigns in autumn 2011

Date	IOP	Event
16 Sept	1	Convective band ahead of upper-level PV max
20 Sept	2	Baroclinic waves propagating on long trailing cold front
23 Sept	3	Ascent in warm conveyor belt
26 Nov	4	Surface fluxes
28 Nov	5a	Double cold front in Atlantic (dropsonde flight)
29 Nov	5b	Cold front passage over Exeter and Chilbolton
1 Dec	6	Bent back warm front near Shetland + surface fluxes
5 Dec	7	Organised convection west of Scotland
8 Dec	8	Bent back warm front: Windstorm over Scotland
12 Dec	9	Warm front approaching UK from the west

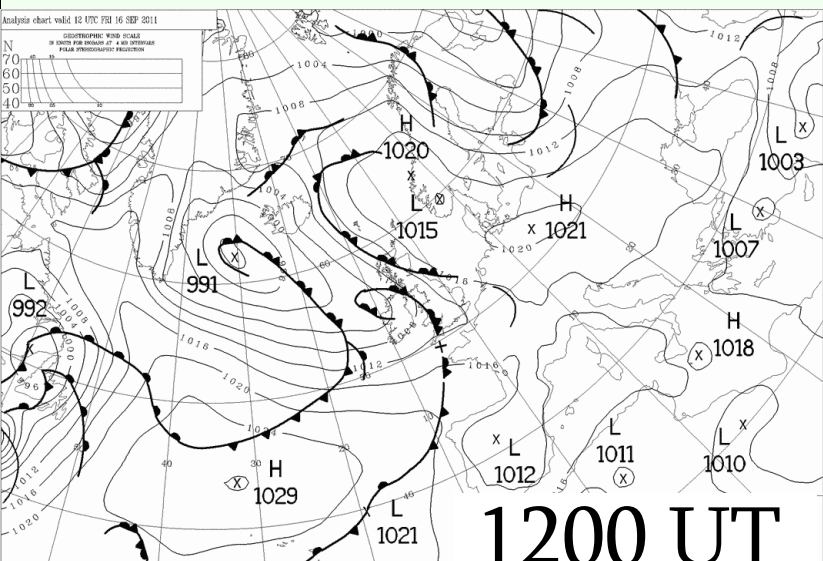
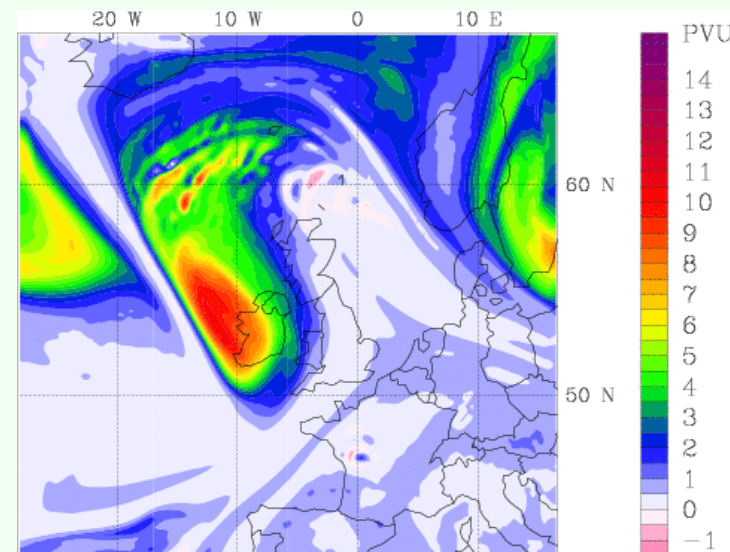
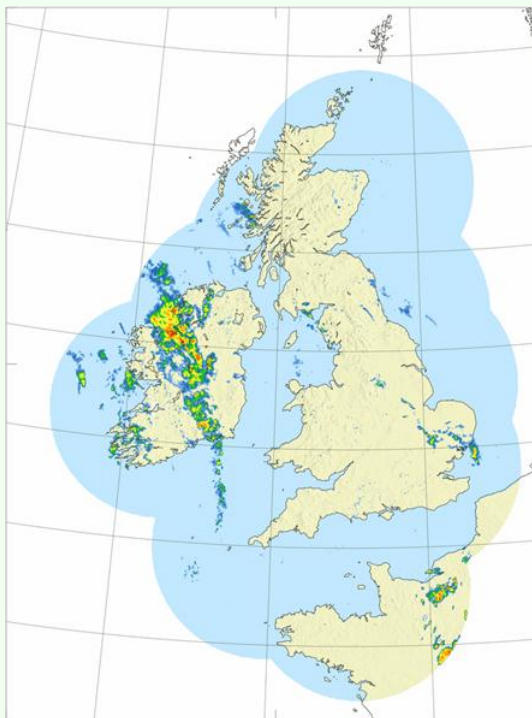


# IOP I, 16 Sept 2011: Convective band



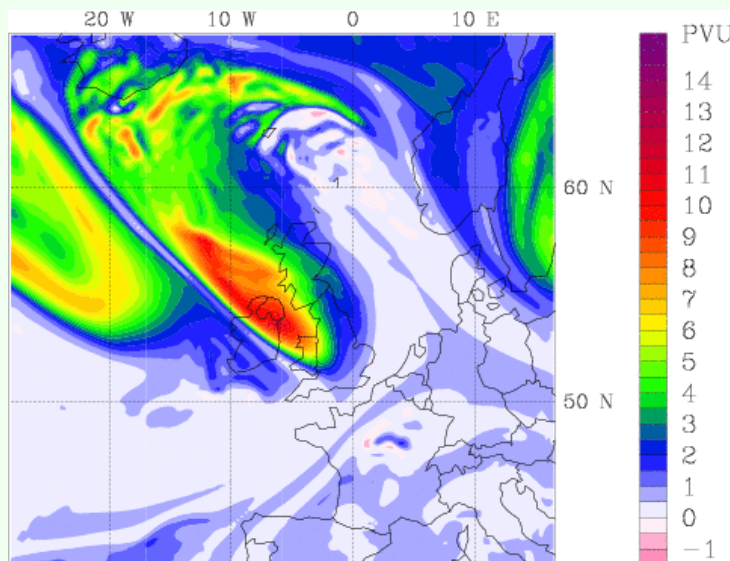
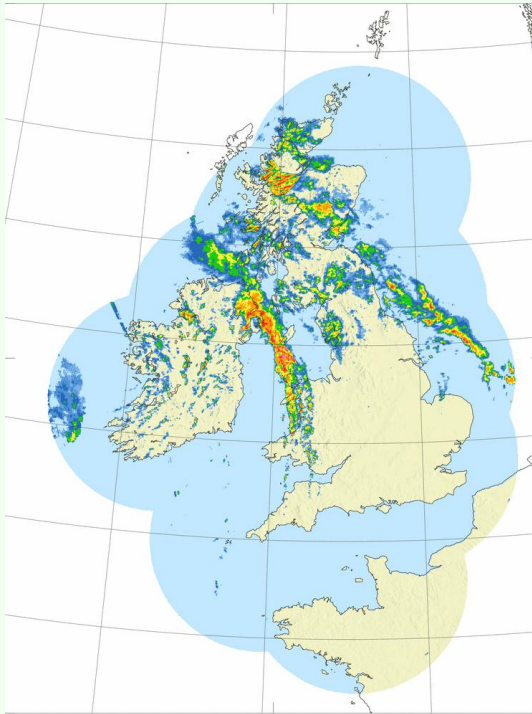
Archived by [www.wetter3.de](http://www.wetter3.de)

16-09-11 06 UTC



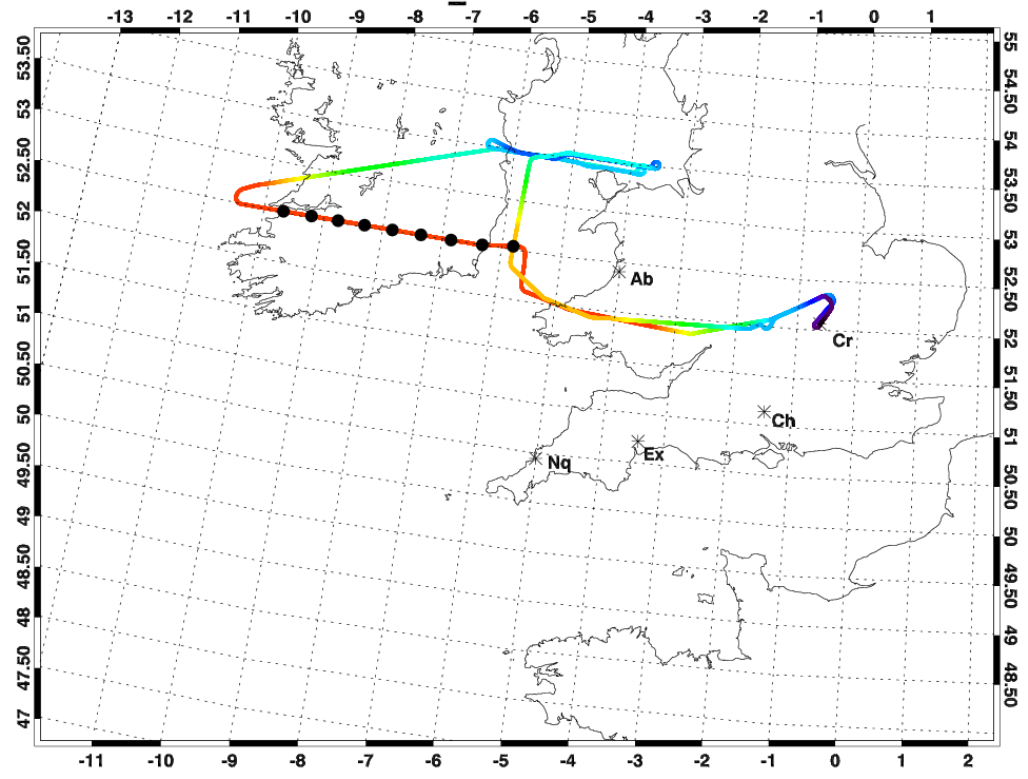
Archived by [www.wetter3.de](http://www.wetter3.de)

16-09-11 12 UTC

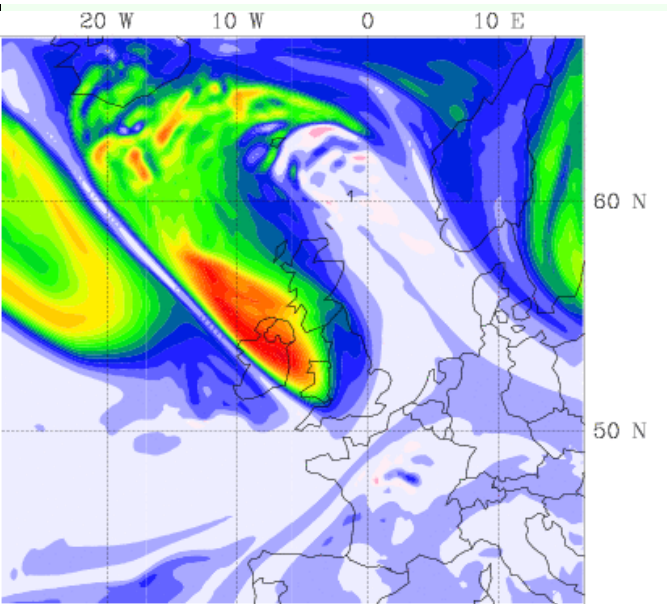
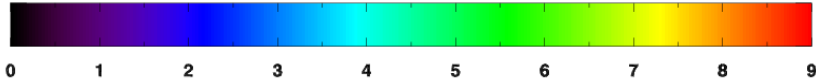


320 K PV

# B647\_110916



Aircraft Altitude, km

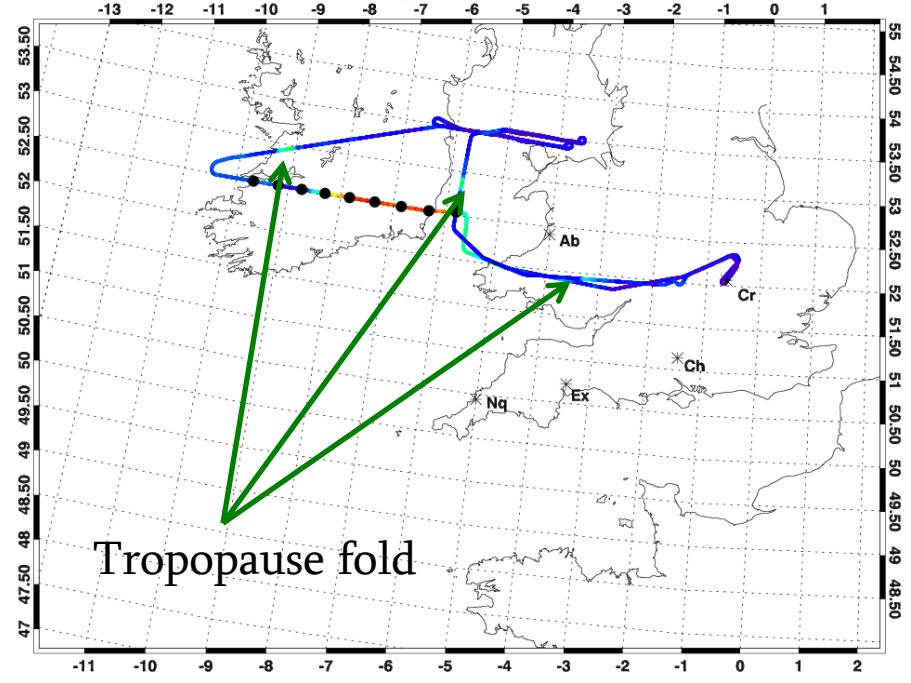


320 K  
PV at  
10.00

Flight B647 coloured according to altitude (left) and ozone (below)

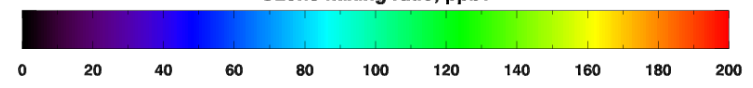
Dots denote dropsondes

# B647\_110916

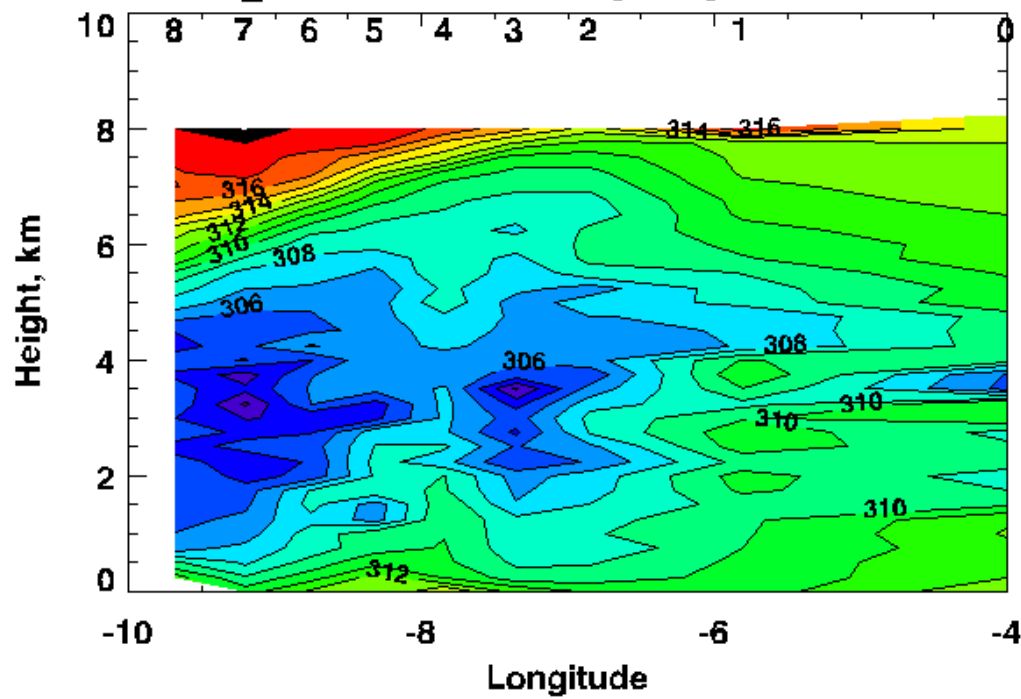


Tropopause fold

Ozone mixing ratio, ppbv

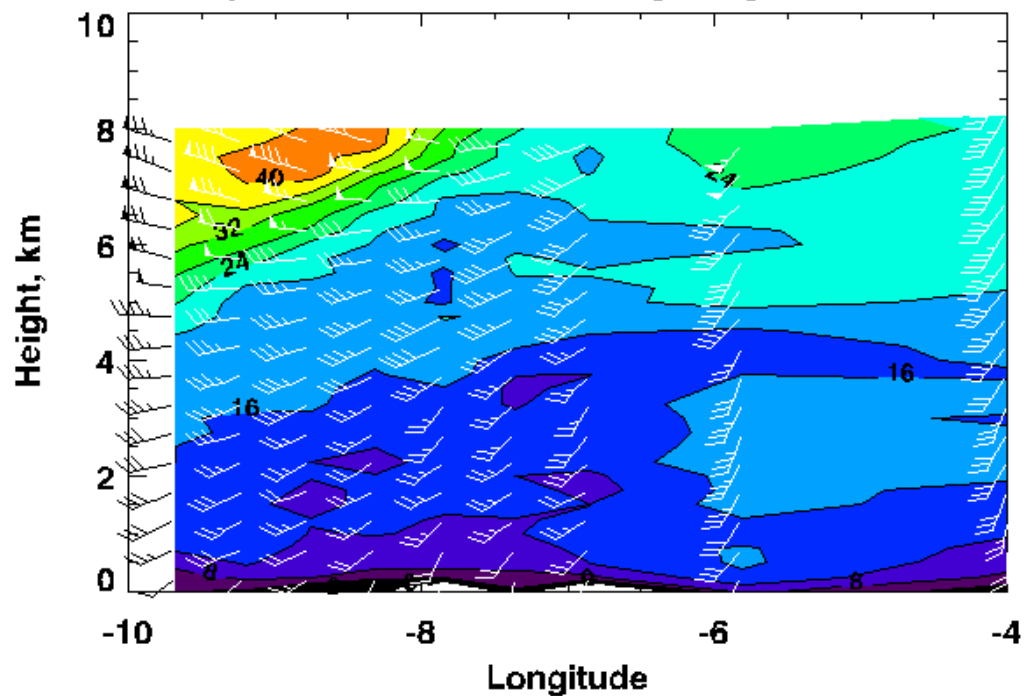


Theta\_e, B647 and Aberystwyth radiosonde



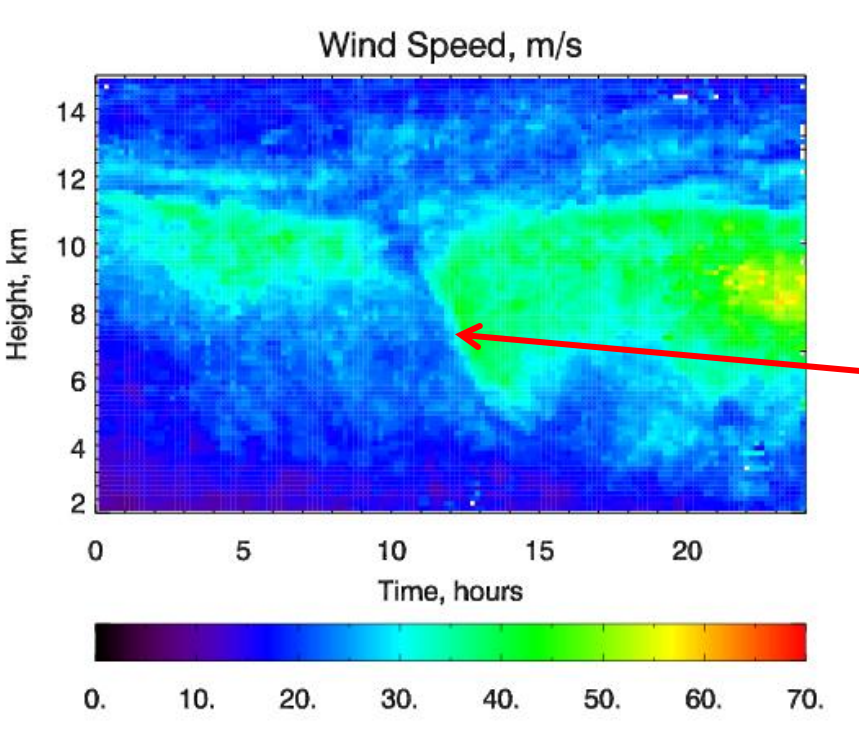
Cross-section  
along 52.5 N

Wind speed, B647 and Aberystwyth radiosonde

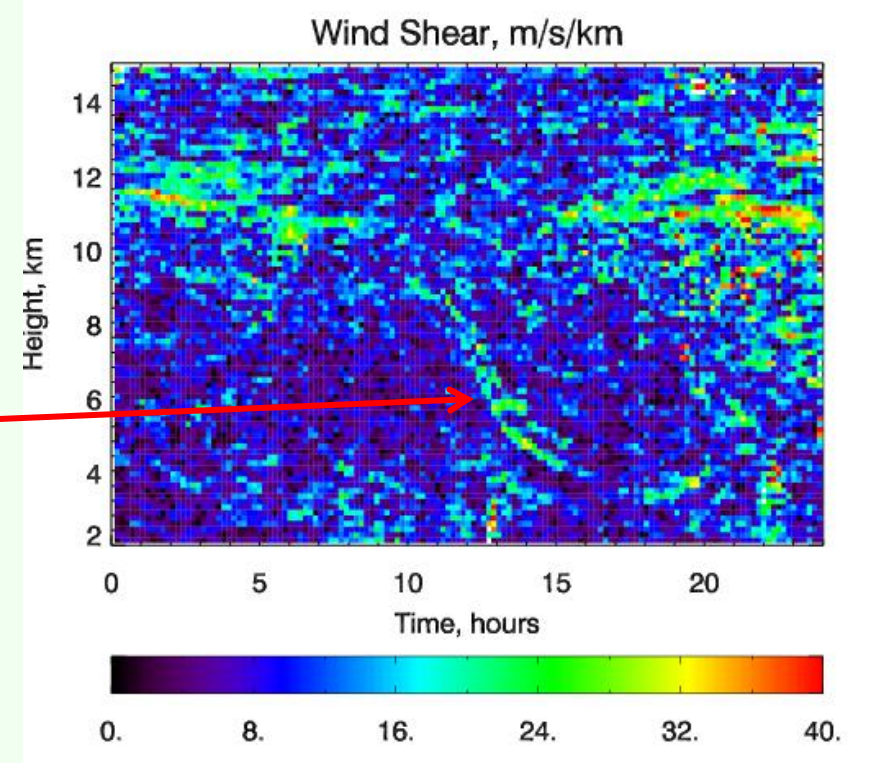




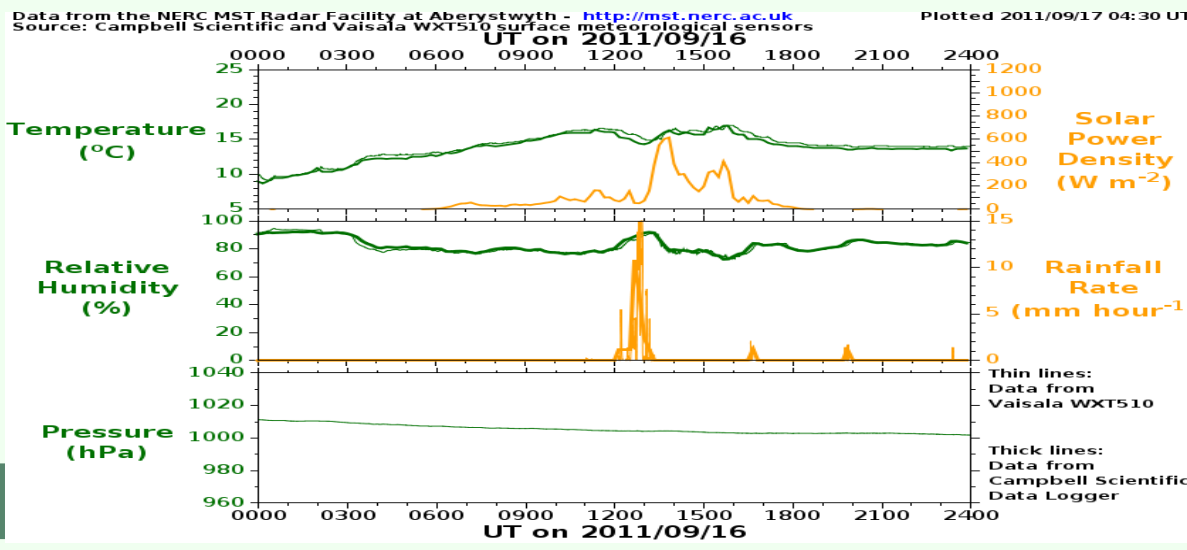
# MST radar observations



fold



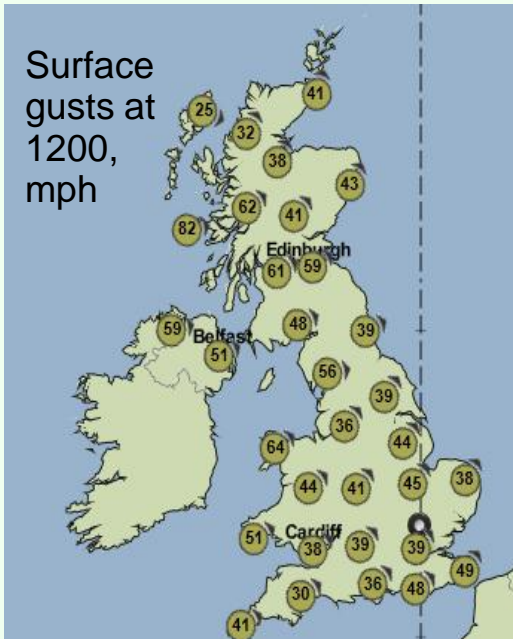
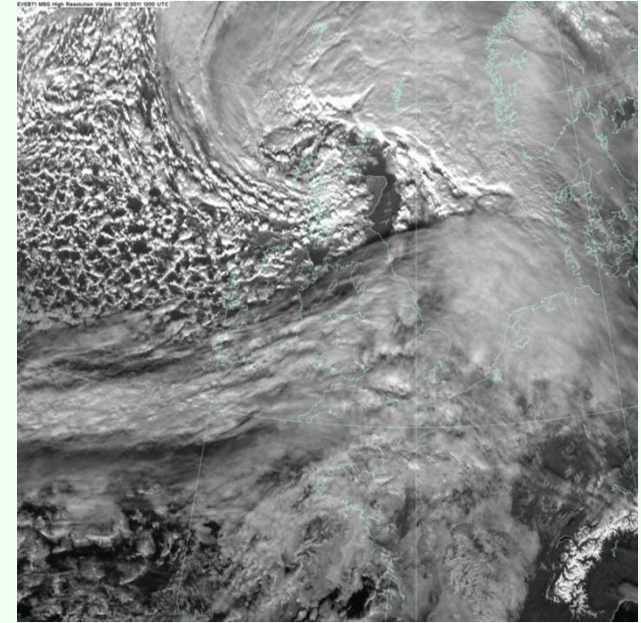
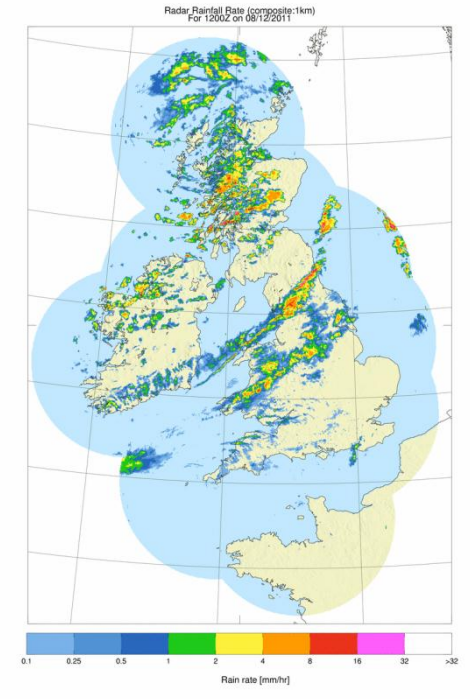
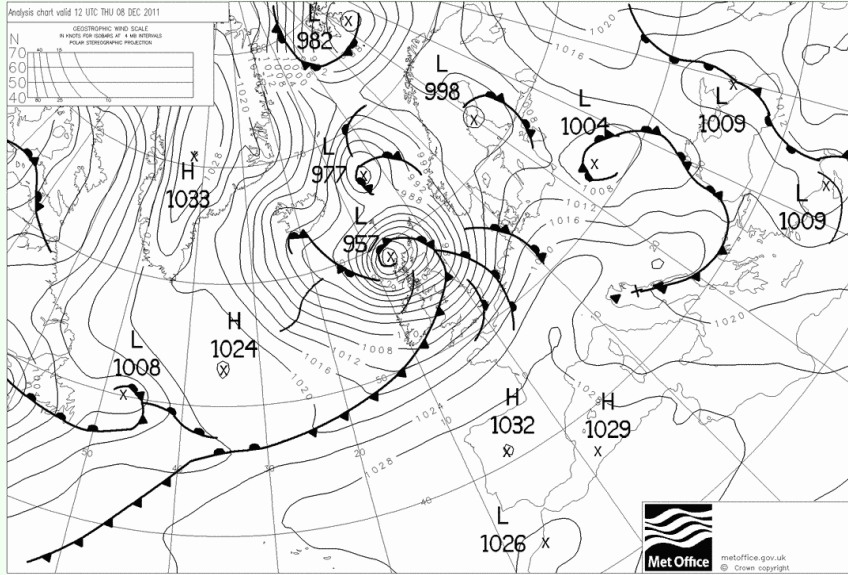
These show that the fold was only prominent on the western side of the PV anomaly, and suggest that the rain band occurred underneath the fold.



## Summary

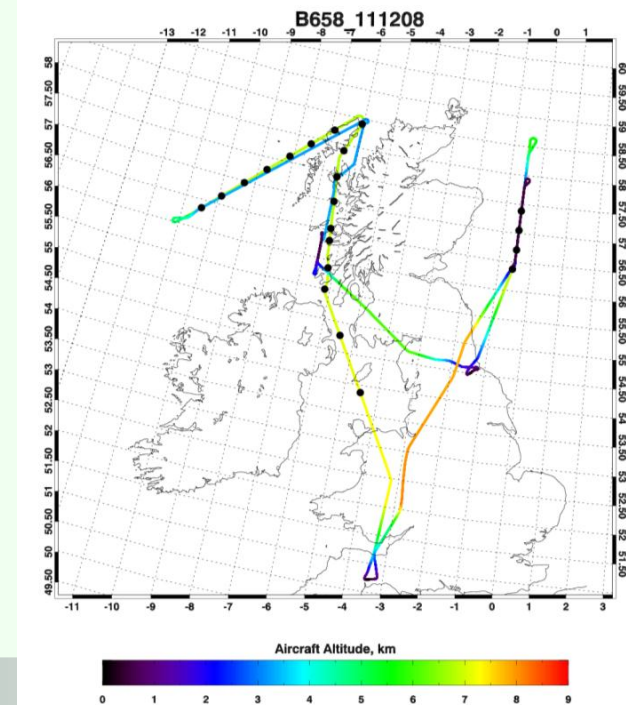
- Convective band, diagnosed as an occlusion on the surface charts, intensified as it passed over Ireland
- A second band formed later over NE England
- Band was located beneath an upper-level PV anomaly, but not in a consistent fashion
- What led to the development of the band?
- How did diabatic generation of PV in the band affect its development?

# IOP 8, 8 Dec 2011: Sting Jet?

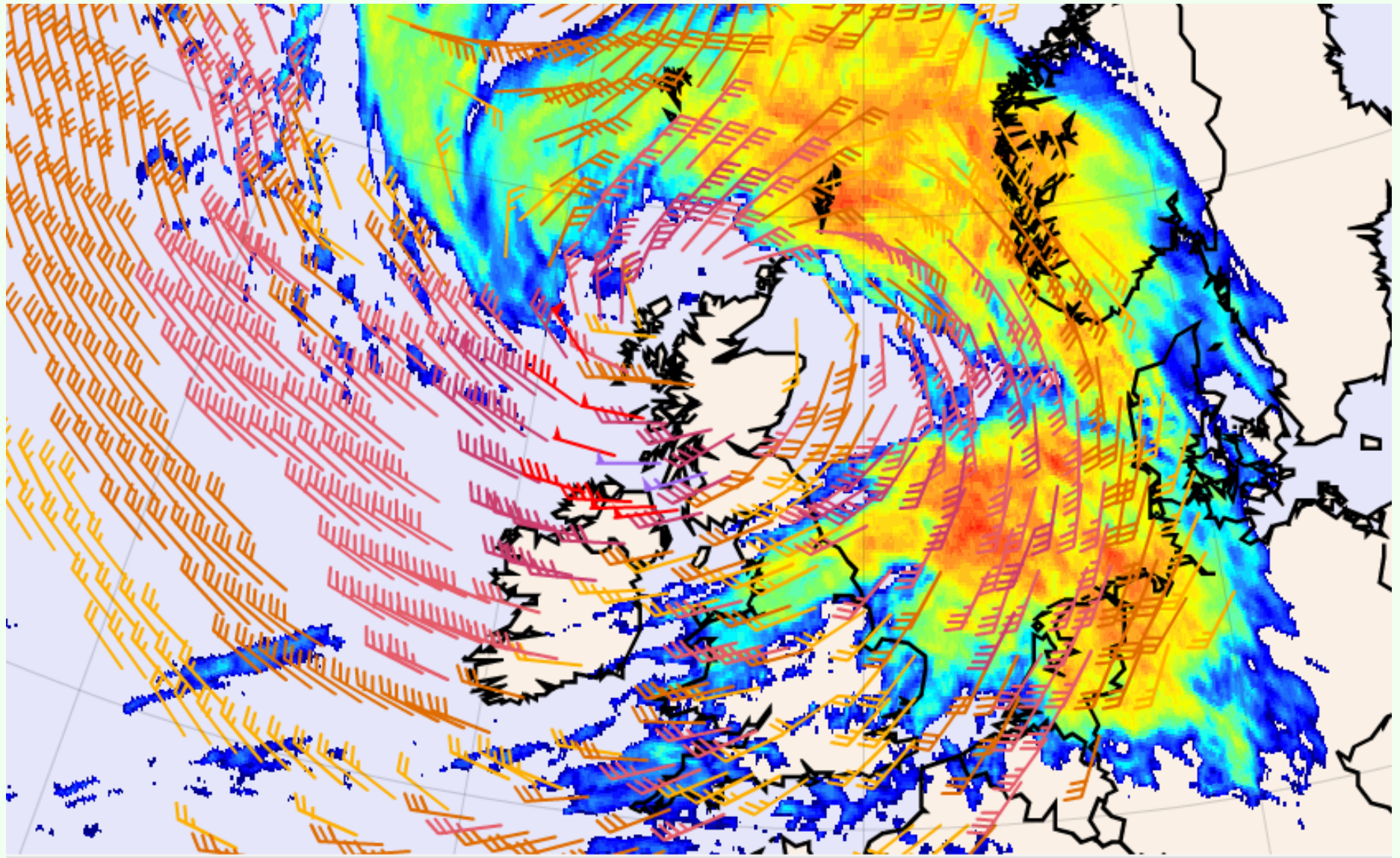


Cyclone Friedhelm, with bent-back warm front, passed over Scotland. Strong surface winds caused widespread damage in the Glasgow – Edinburgh region.

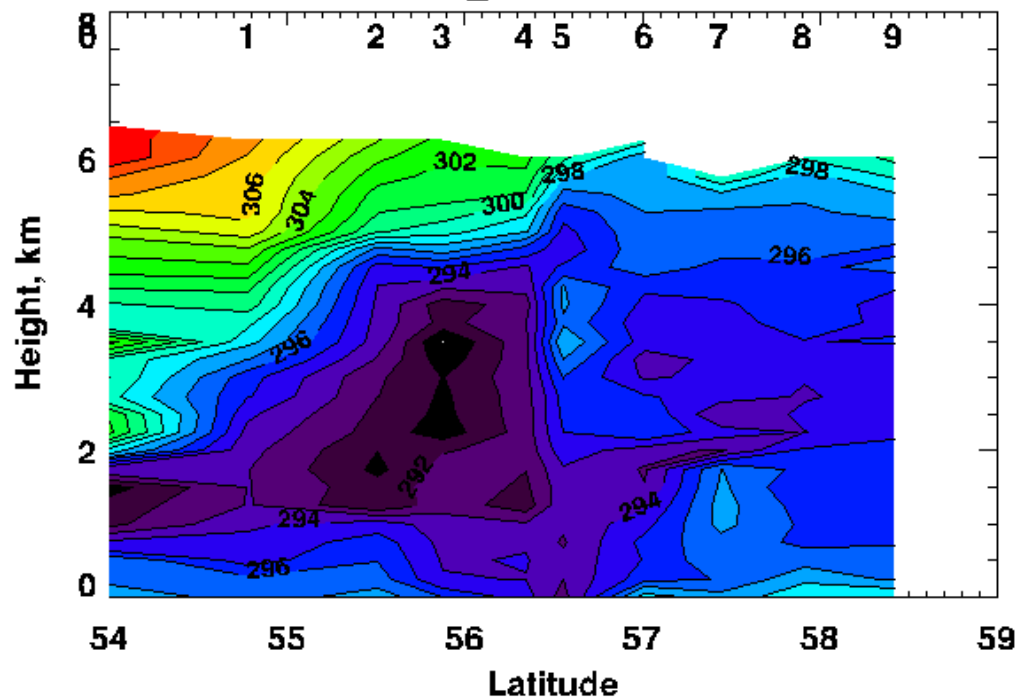
Aircraft flight measured three cross-sections of the system



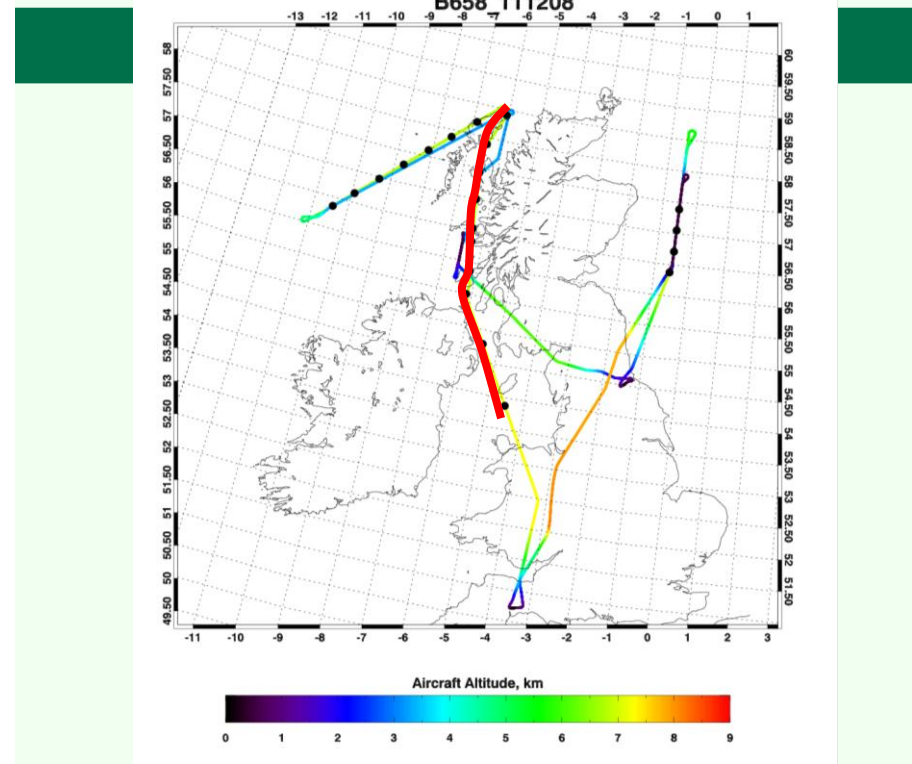
# 1200 IR + 10 m wind (ECMWF)



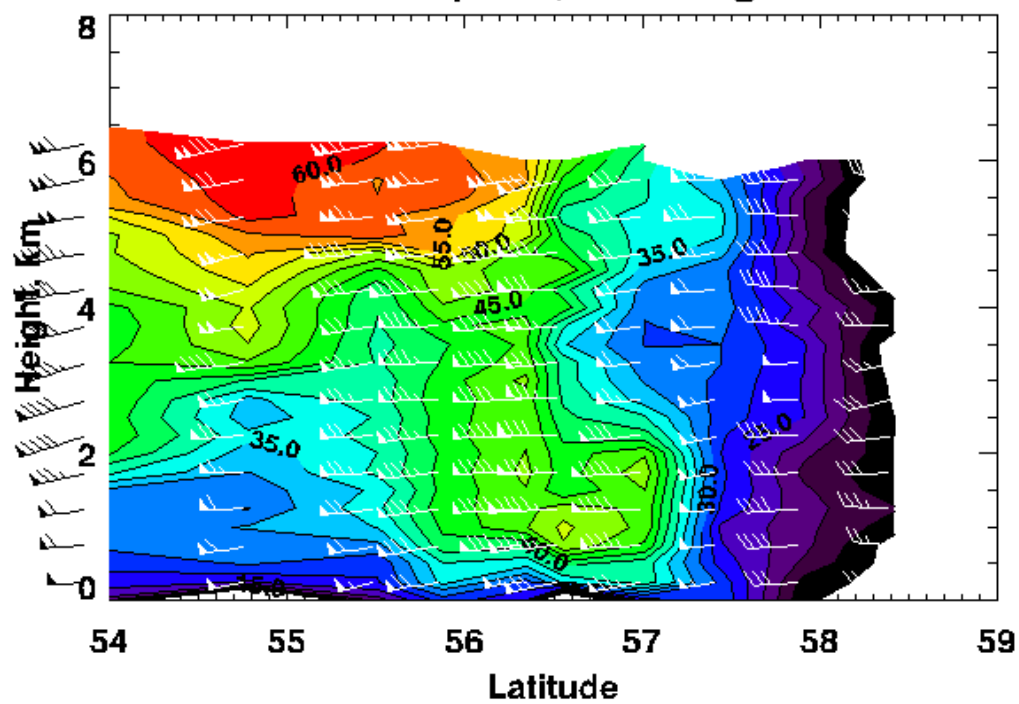
Theta\_e, B658 leg 1



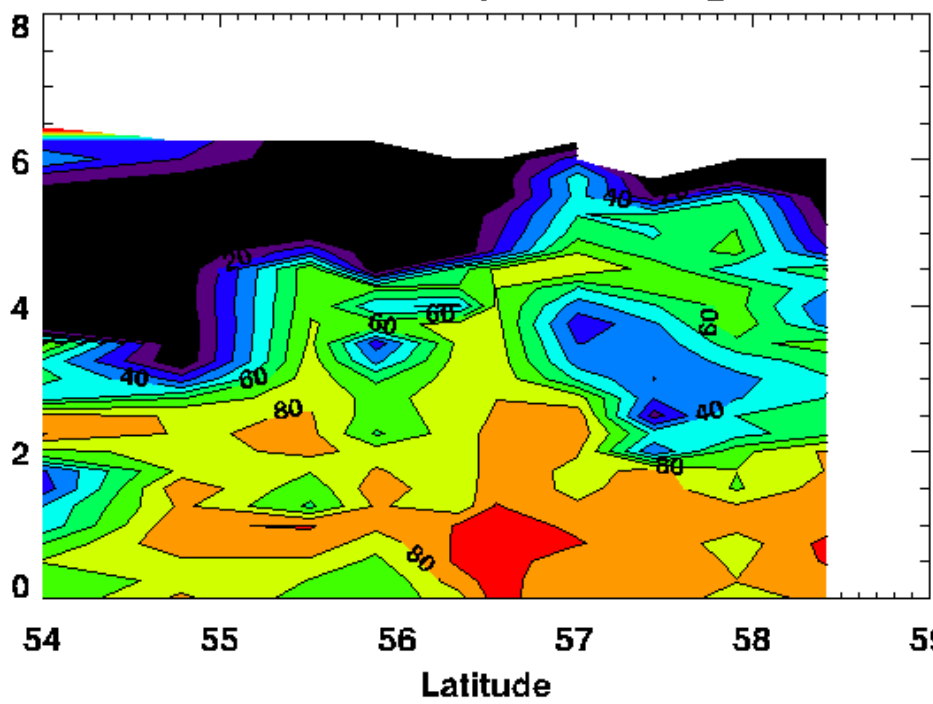
B658 111208



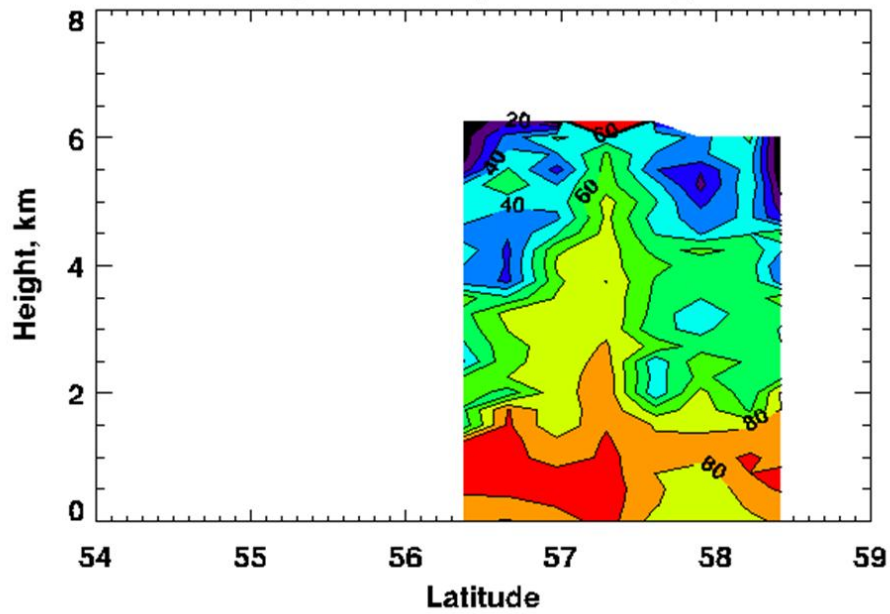
Wind speed, B658 leg 1



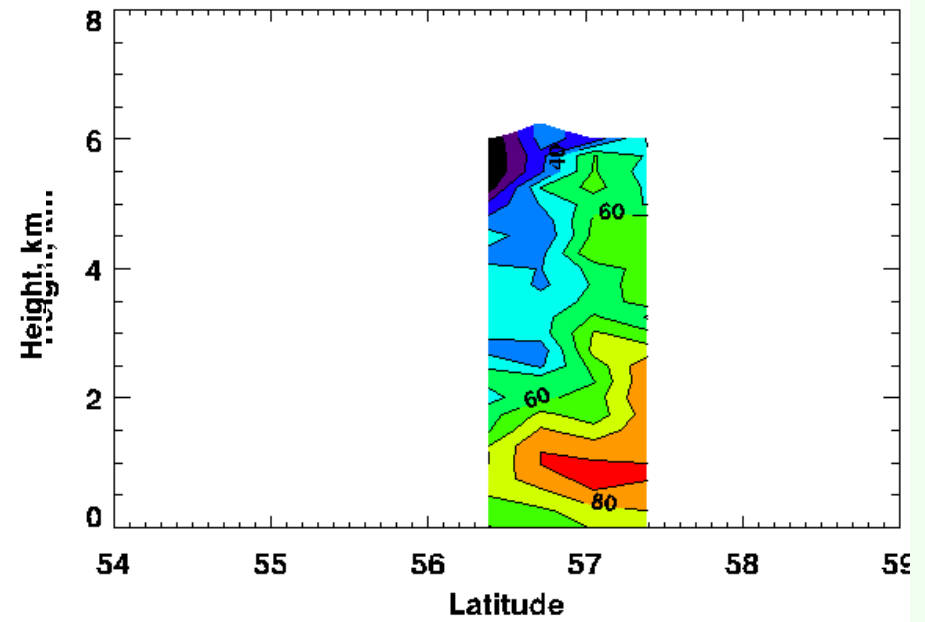
RH, B658 dropsondes leg 1



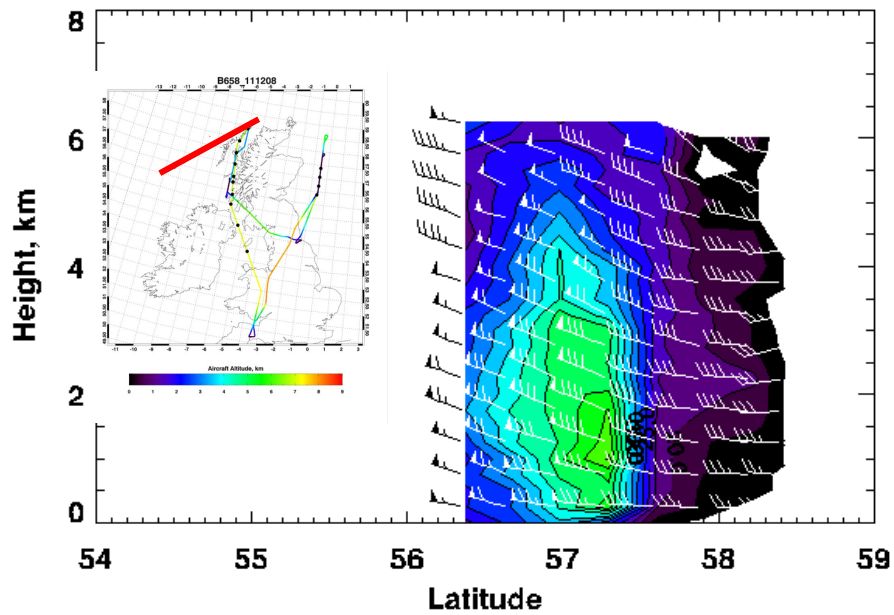
RH, B658 dropsondes leg 2



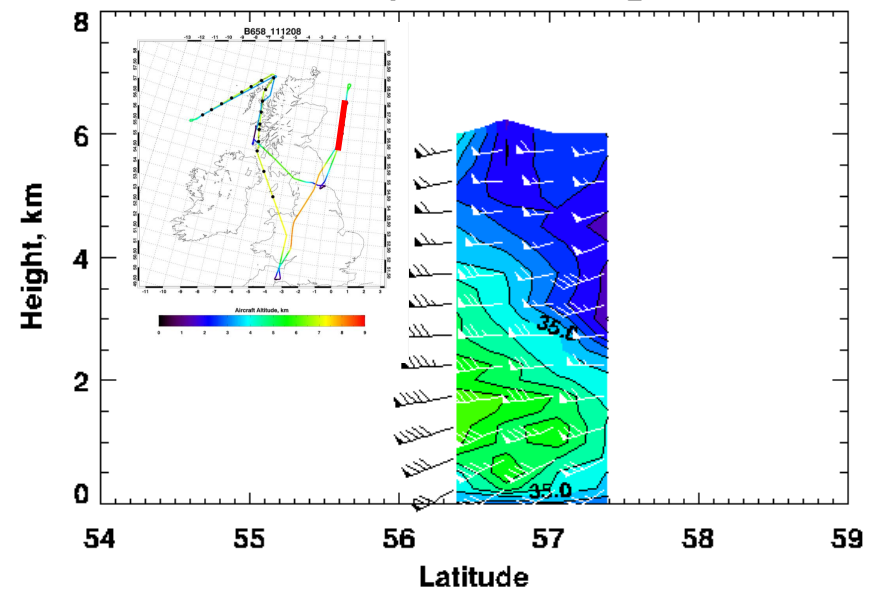
RH, B658 dropsondes leg 3



Wind speed, B658 leg 2



Wind speed, B658 leg 3



## Summary

- Strong low-level winds observed in the dry slot of the storm
- Some evidence for descending air in leg 3
- Key questions from this case are: what caused the air to descend? What caused the near-vertical bands of convection wrapping around the low centre, interleaved with stratospheric air?
- On a larger scale is the question of predictability for this kind of storm, and for the maximum low-level winds within it.