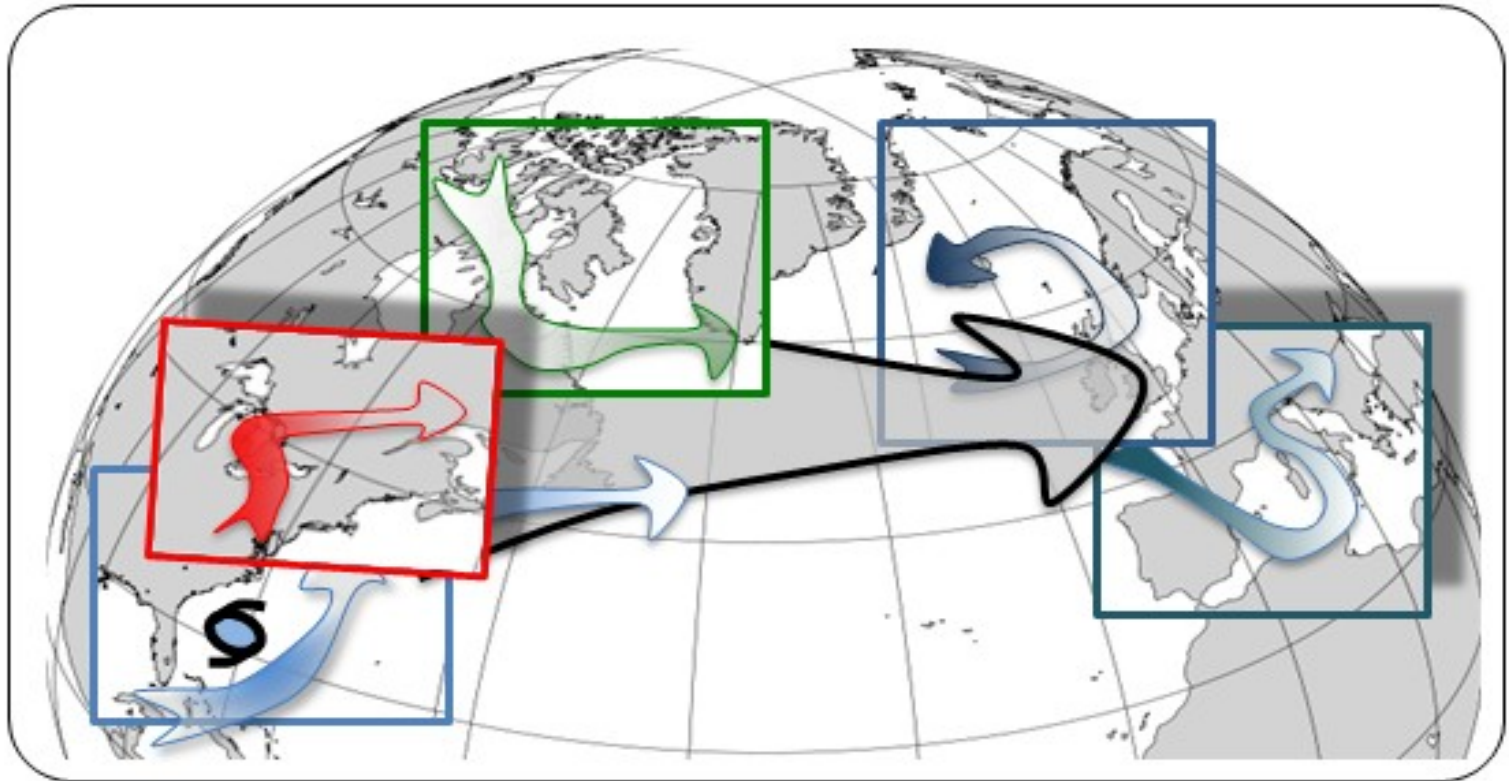


# NAWDEX - Weather Discussion

07 October 2016, Keflavik 16 UTC



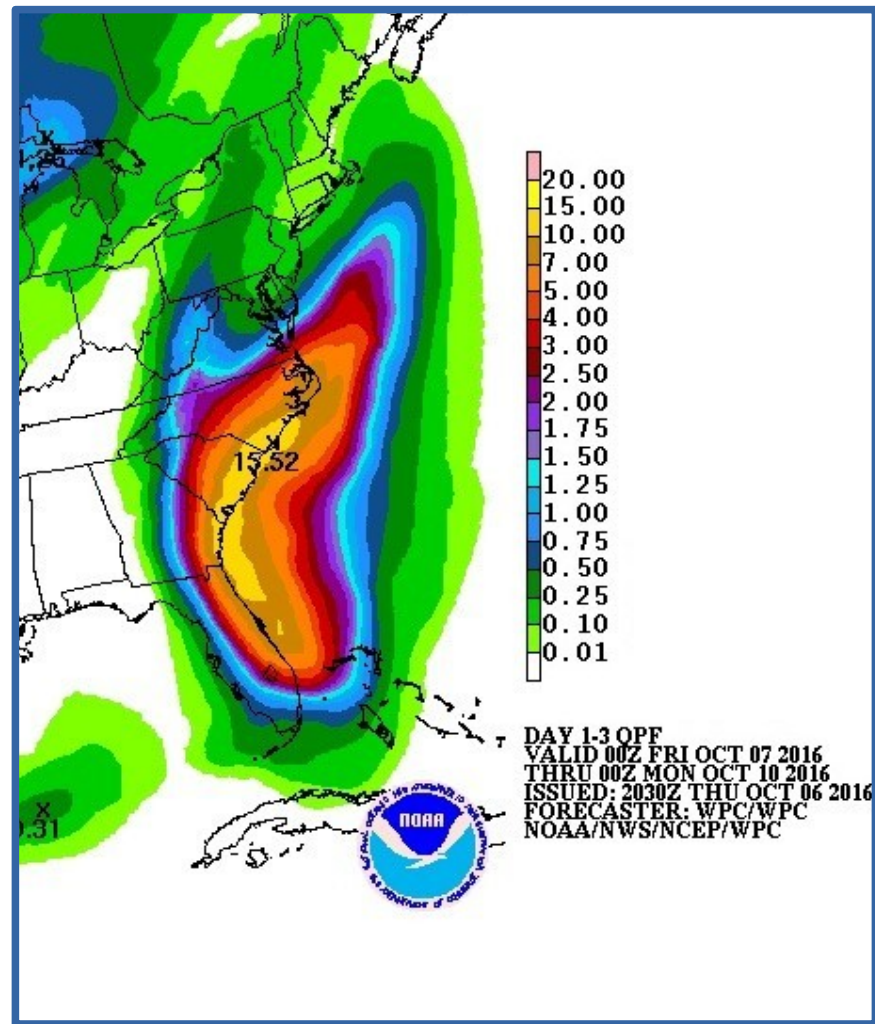
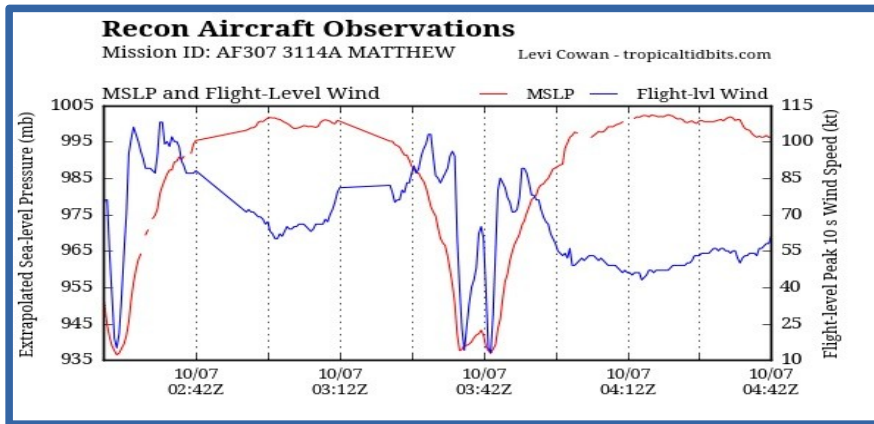
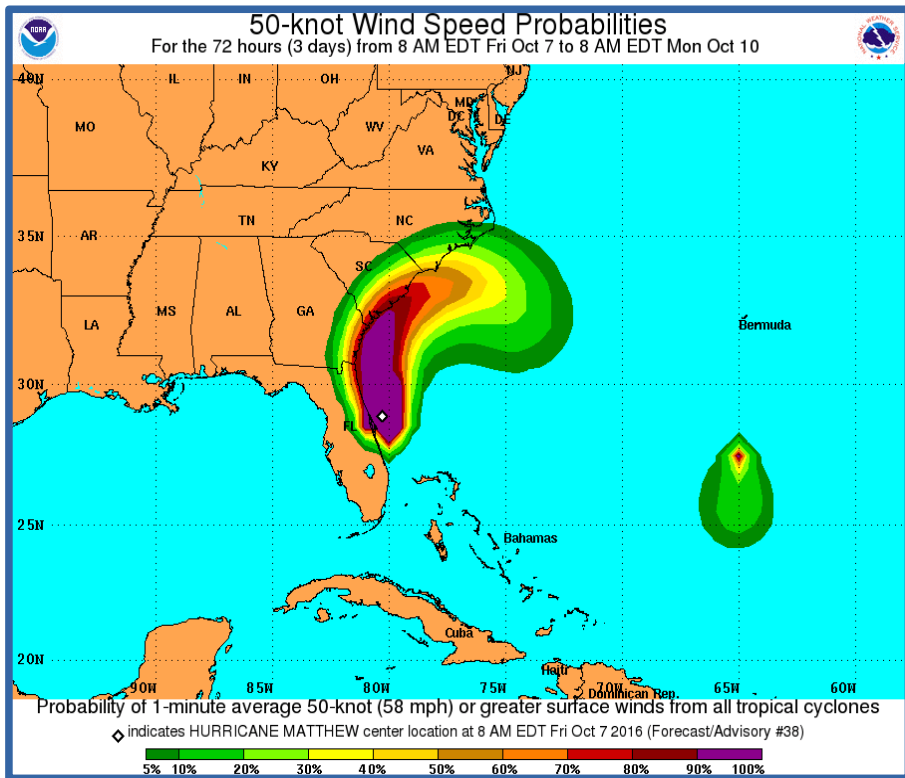
# NAWDEX – Weather Discussion

07 October 2016, Keflavik 16 UTC

Key issues today

- Day off on Saturday
- Sunday: Plans for HALO / SAFIRE / DLR-Falcon
- Monday: Plans for HALO / DLR-Falcon?
- Radiosondes
- Tuesday/Wednesday: Radiometer intercomparison?

# Hurricane Matthew and TS Nicole



Very close to the coast, no official landfall. No landfall in USA since 2005!

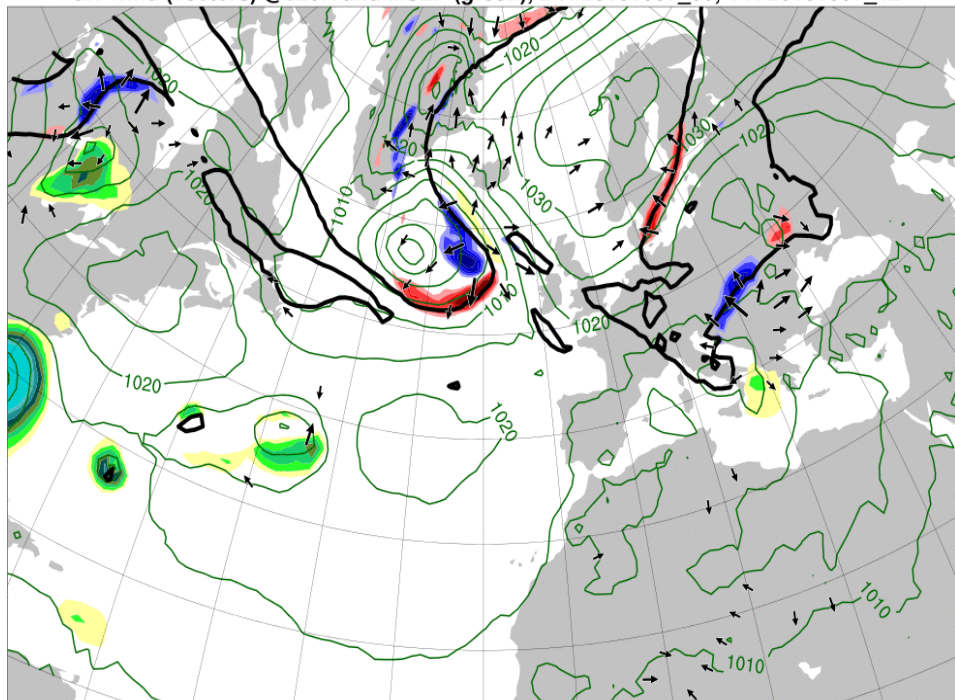


# Forecast – Fri 7 Oct 2016, 12UTC

# THE850K, trajectories, irrwind320K

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa  
Valid: Fri, 07 Oct 2016, 12 UTC (step 012 h from Fri, 07 Oct 2016, 00 UTC)

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161007\_12



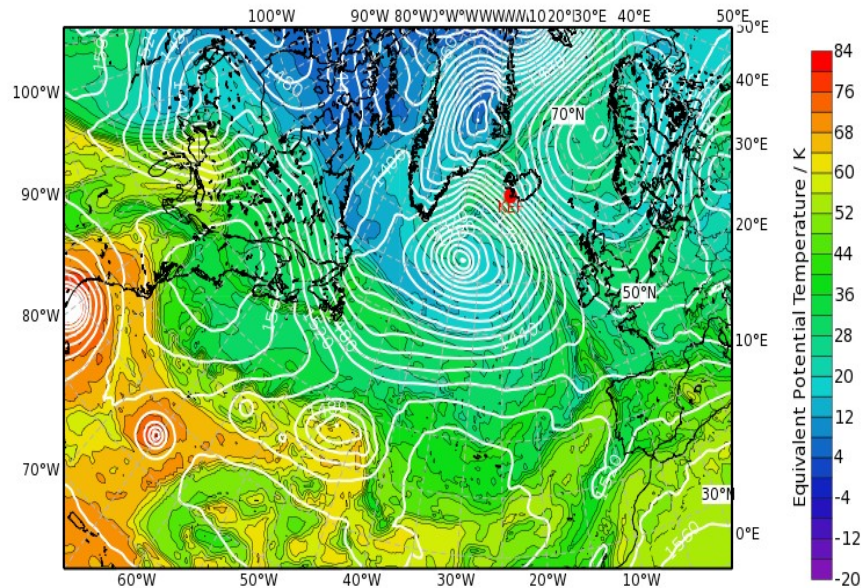
500 600 700 800 900 1000 1100 1200

kg/(m s)

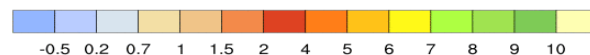
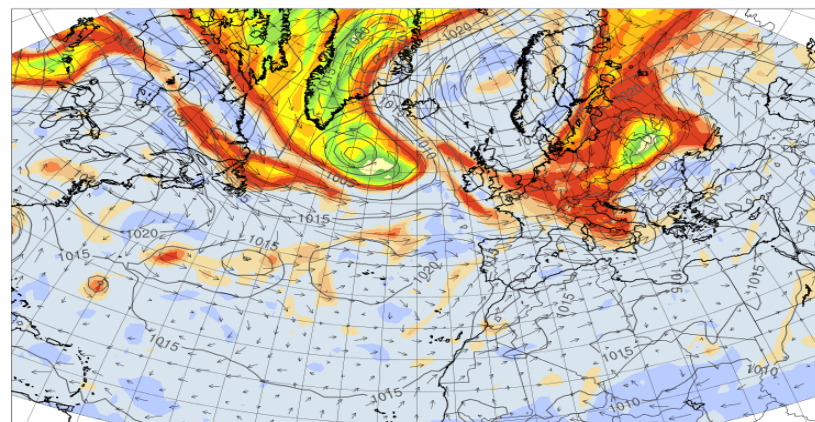


-12 -10 -8 -6 -4 4 6 8 10 12

PVU/d



PV@320K at 20161007\_12



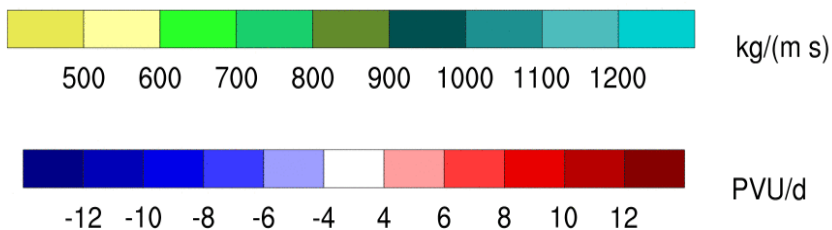
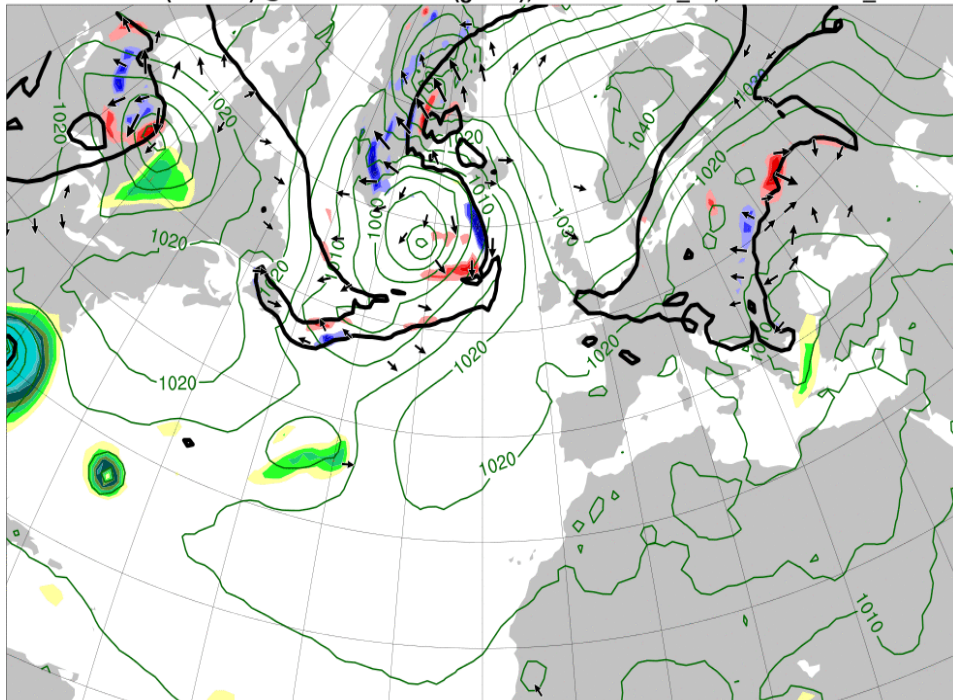
-0.5 0.2 0.7 1 1.5 2 4 5 6 7 8 9 10

pvu



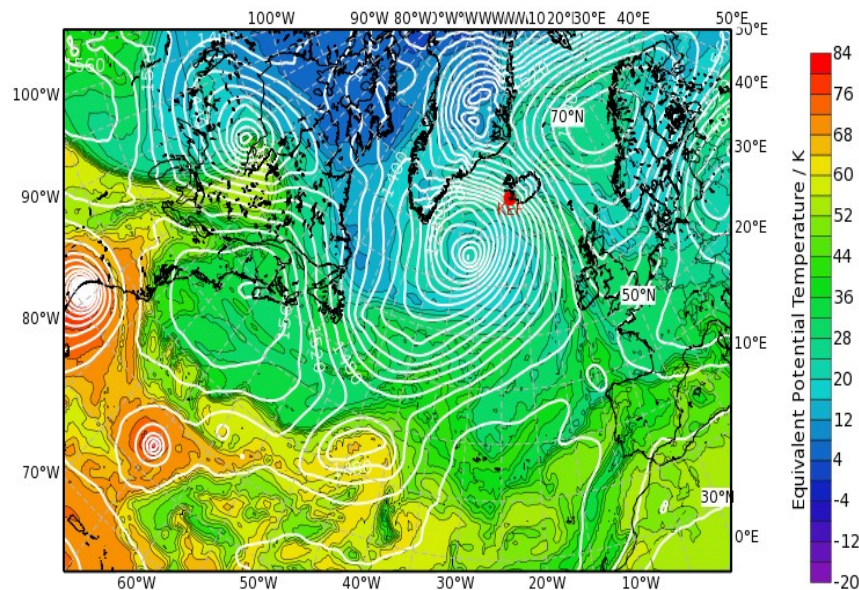
# Forecast – Sat 8 Oct 2016, 00UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161008\_00

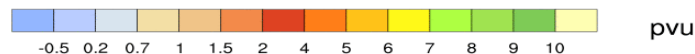
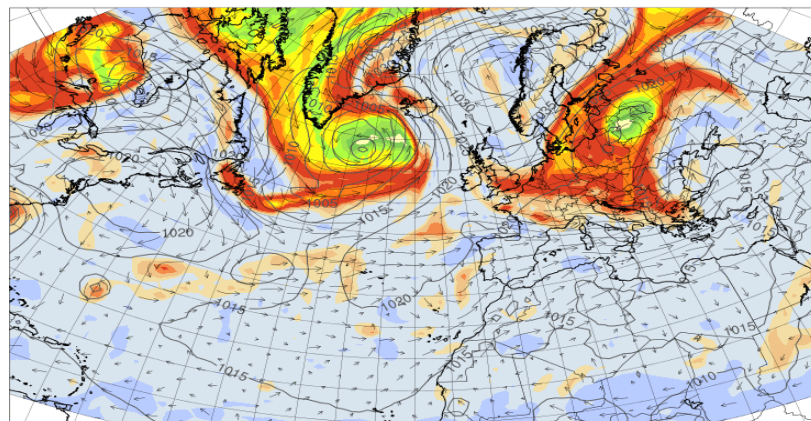


## THE850K, trajectories, irrwind320K

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa  
Valid: Sat, 08 Oct 2016, 00 UTC (step 024 h from Fri, 07 Oct 2016, 00 UTC)



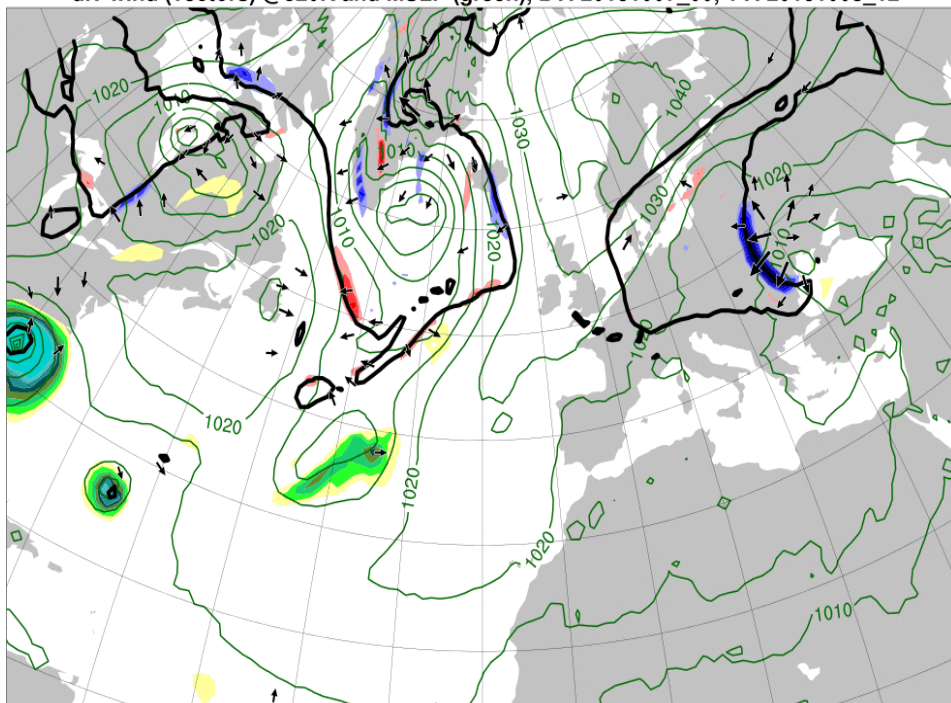
PV@320K at 20161008\_00





# Forecast – Sat 8 Oct 2016, 12UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161008\_12



kg/(m s)

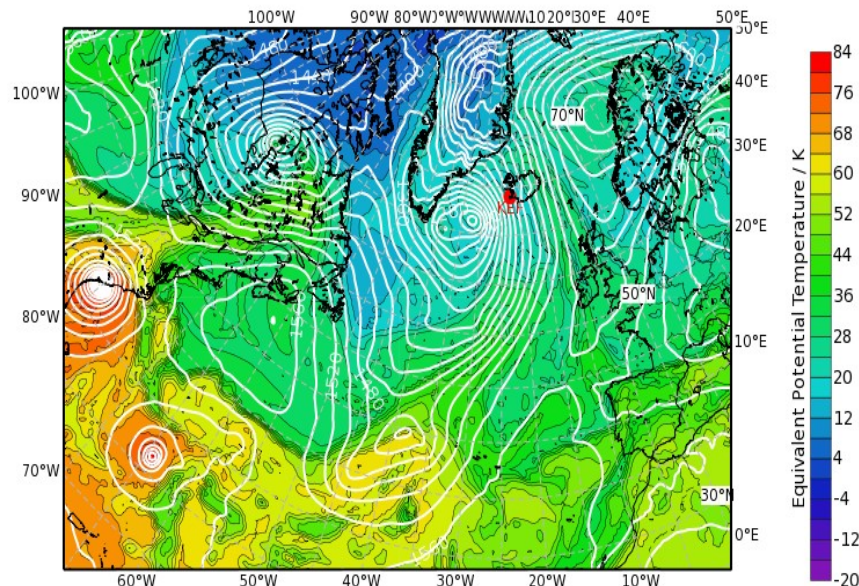


PVU/d

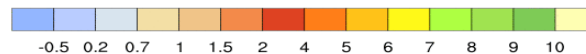
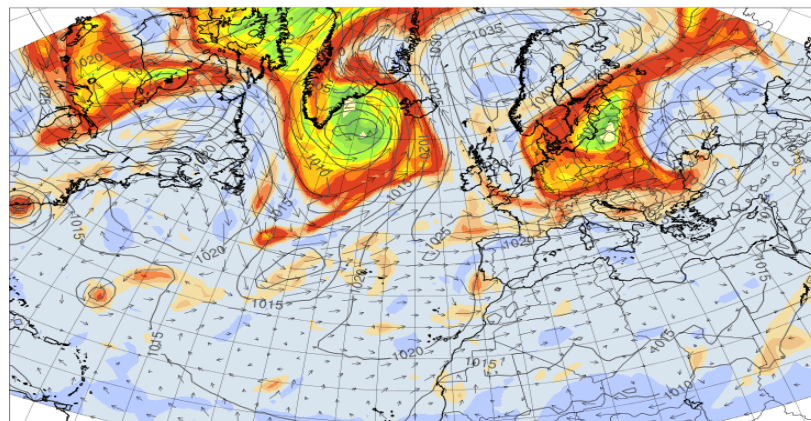
## THE850K, trajectories, irrwind320K

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa

Valid: Sat, 08 Oct 2016, 12 UTC (step 036 h from Fri, 07 Oct 2016, 00 UTC)



PV@320K at 20161008\_12

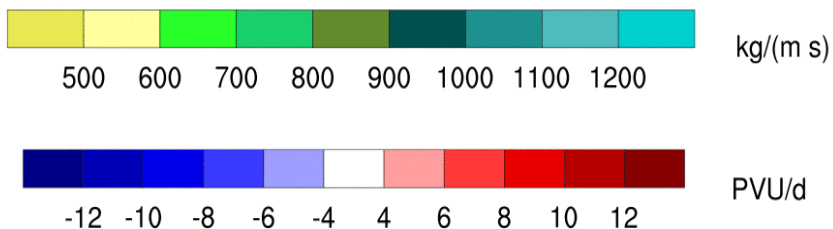
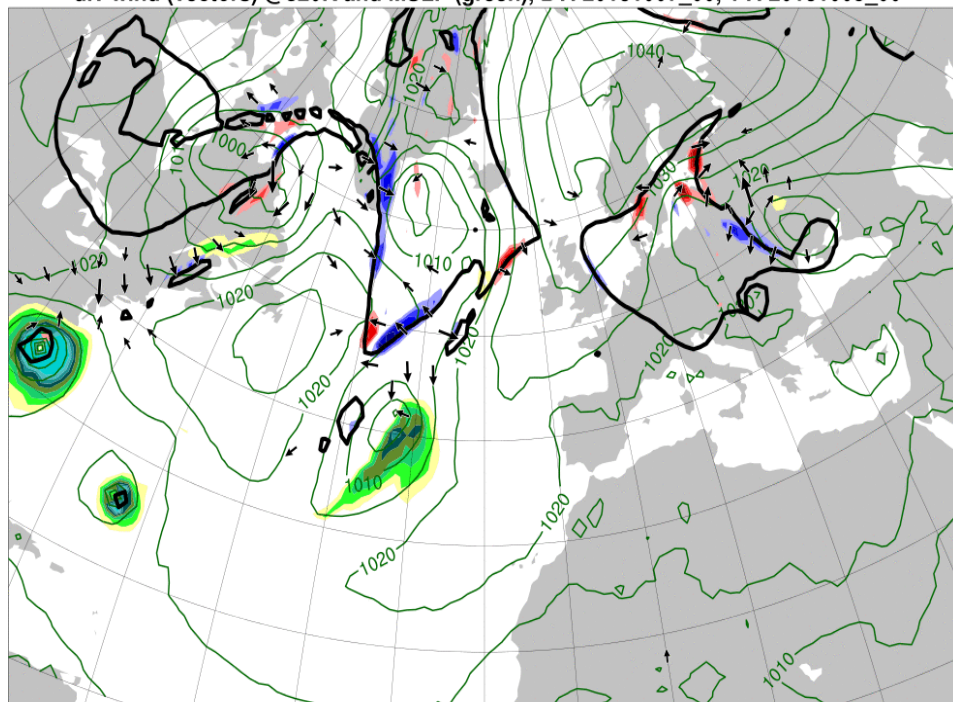


pvu



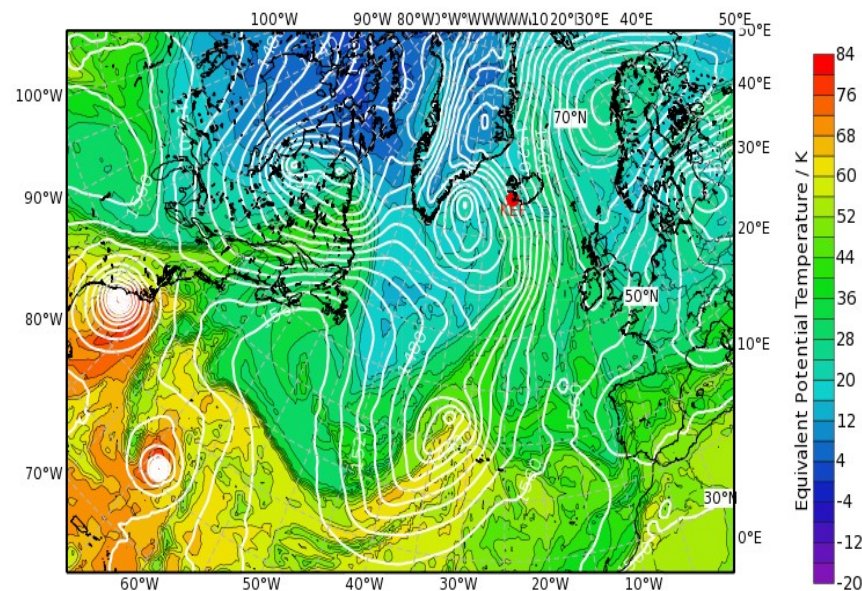
# Forecast – Sun 9 Oct 2016, 00UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161009\_00

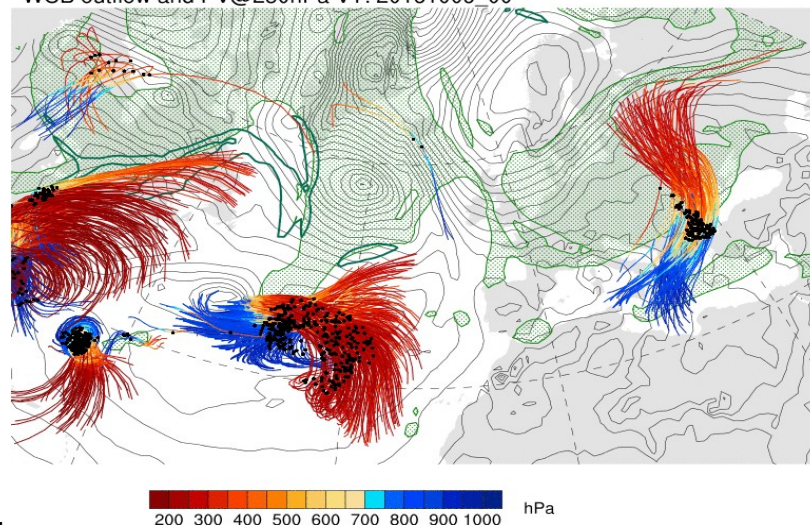


## THE850K, trajectories, irrwind320K

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa  
Valid: Sun, 09 Oct 2016, 00 UTC (step 048 h from Fri, 07 Oct 2016, 00 UTC)



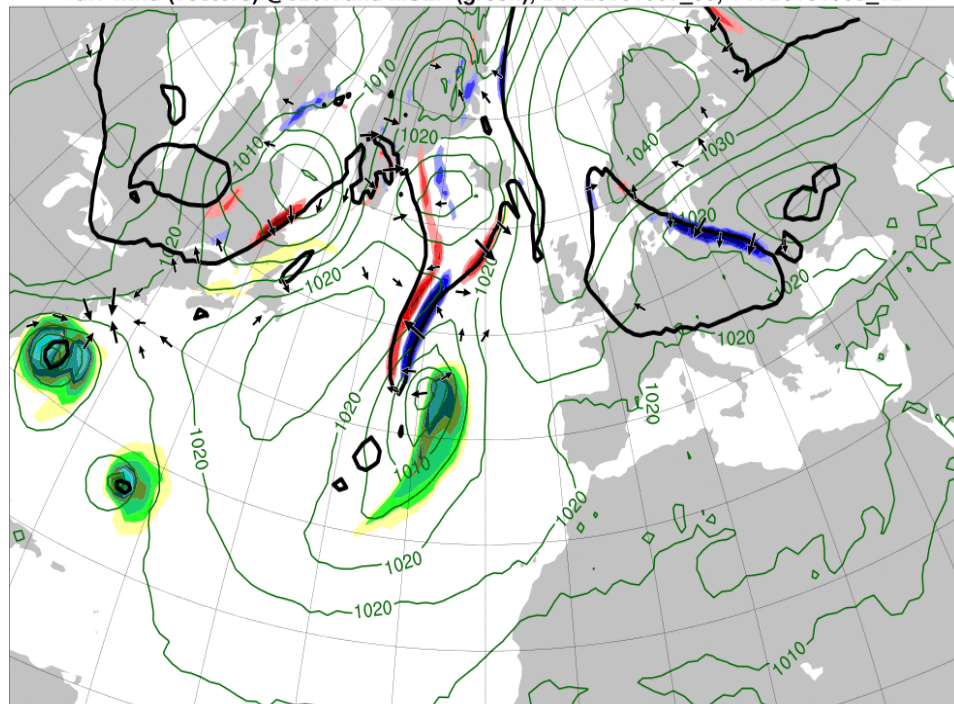
Trajectory start and SLP VT: 20161007\_00  
WCB outflow and PV@250hPa VT: 20161009\_00





# Forecast – Sun 9 Oct 2016, 12UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161009\_12



500 600 700 800 900 1000 1100 1200

kg/(m s)



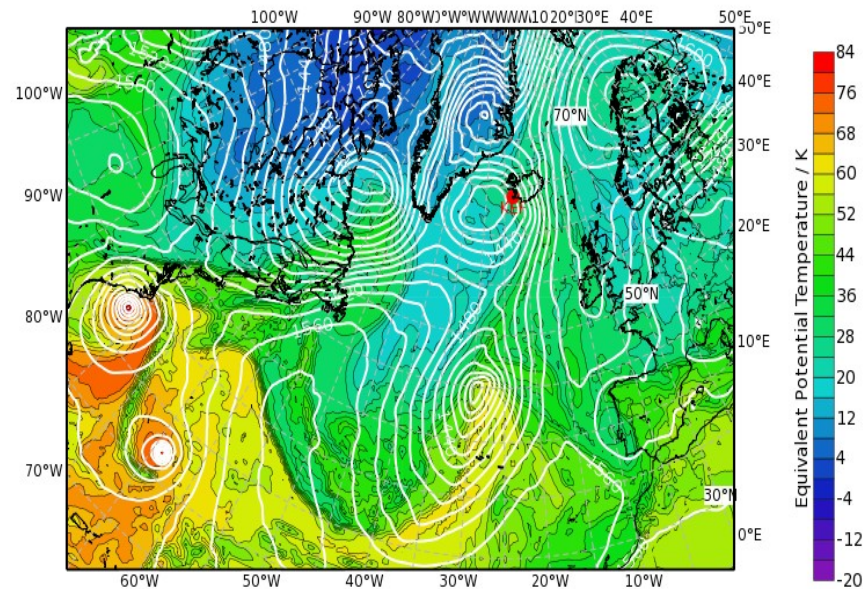
-12 -10 -8 -6 -4 4 6 8 10 12

PVU/d

## THE850K, trajectories, irrwind320K

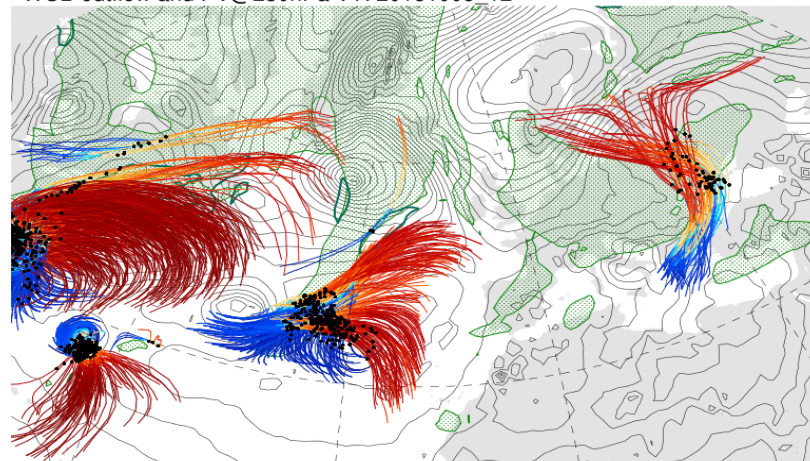
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa

Valid: Sun, 09 Oct 2016, 12 UTC (step 060 h from Fri, 07 Oct 2016, 00 UTC)



Trajectory start and SLP VT: 20161007\_12

WCB outflow and PV@250hPa VT: 20161009\_12

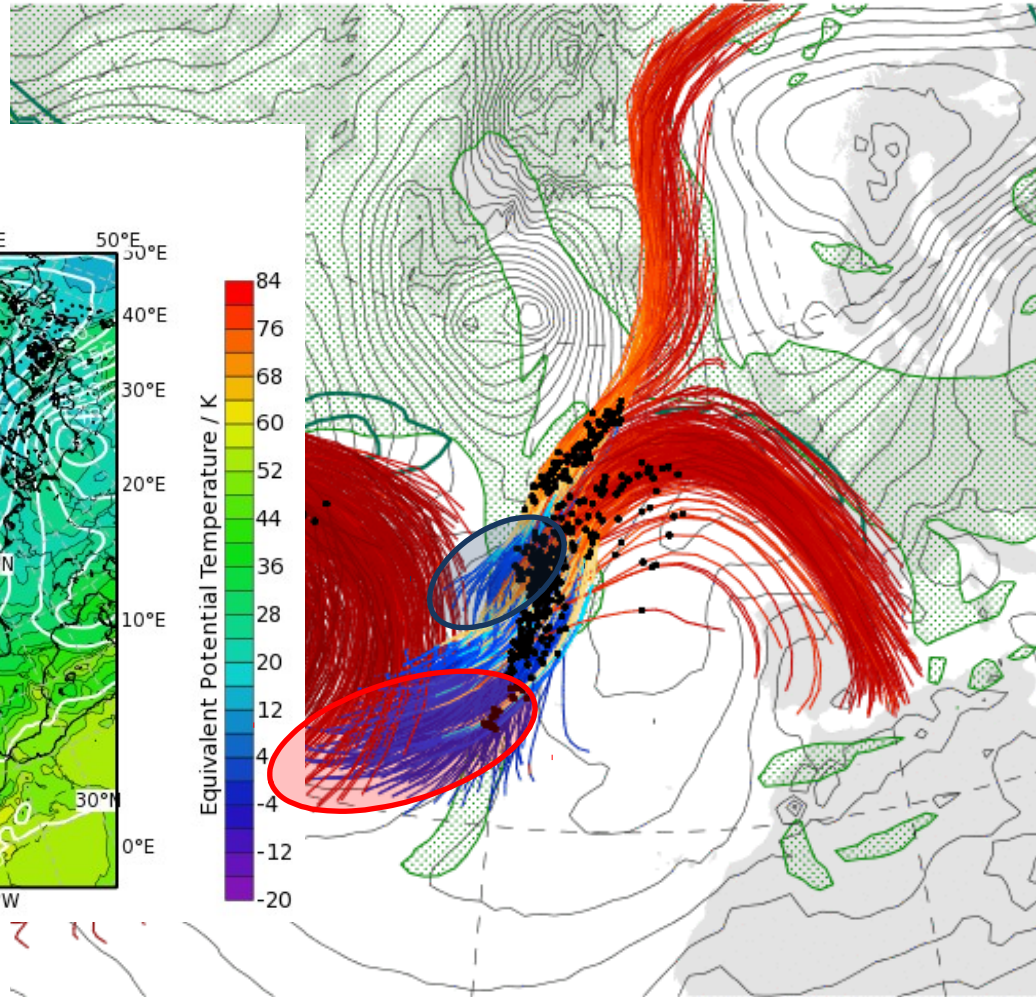
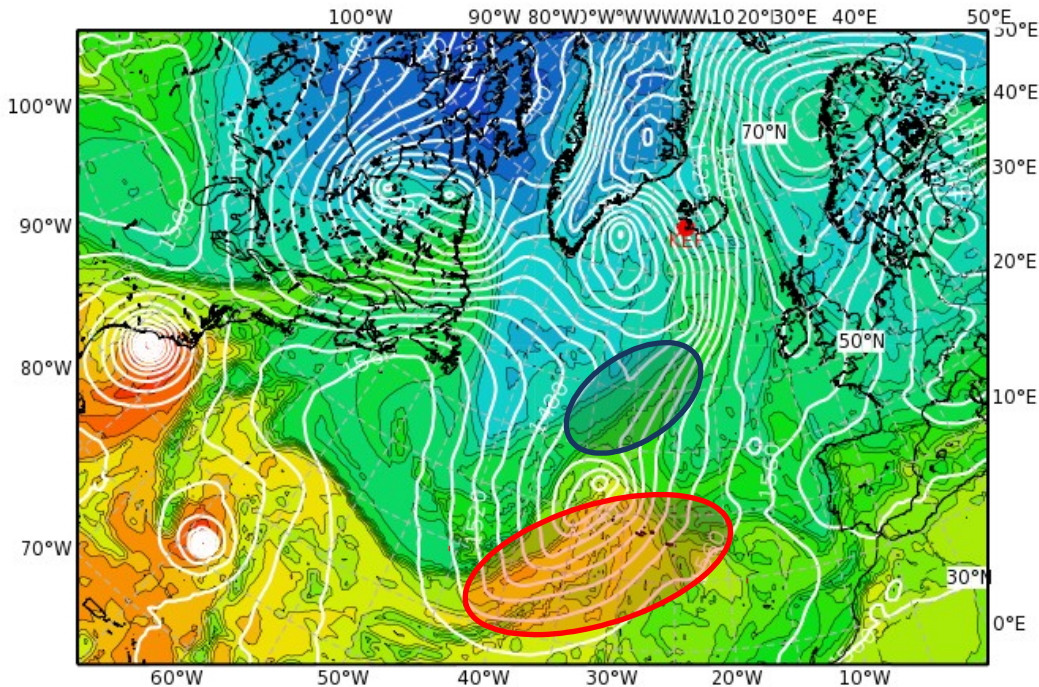


200 300 400 500 600 700 800 900 1000 hPa



# WCB activity during weekend: inflow

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa  
Valid: Sun, 09 Oct 2016, 00 UTC (step 048 h from Fri, 07 Oct 2016, 00 UTC)



-> WCB related to cyclone: more moisture, long lived.

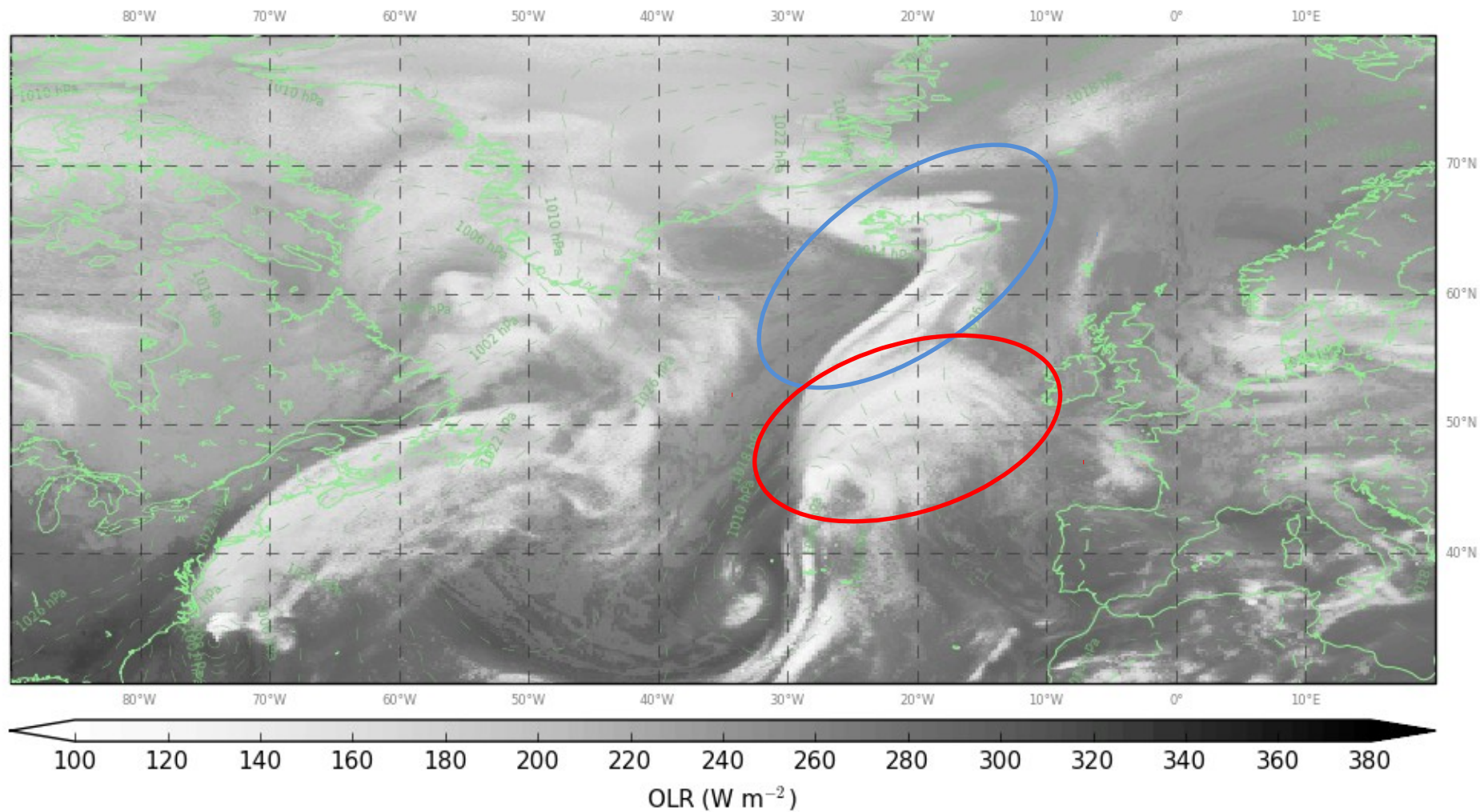
-> WCB related to moving PV streamer, short lived.







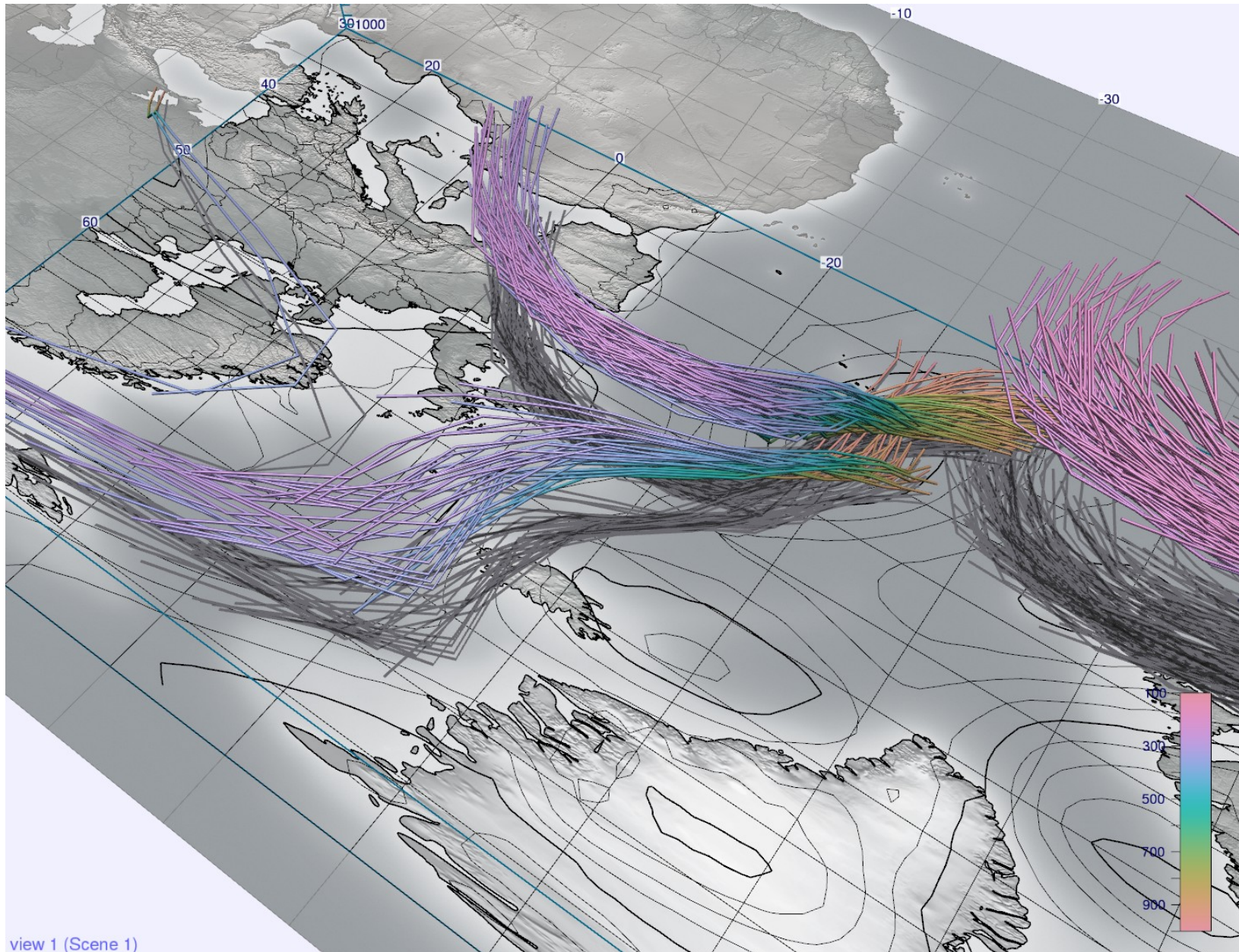
Met Office Oper. Global: Outgoing Longwave Radiation ( $\text{Wm}^{-2}$ ) at TOA  
2016/10/09 18Z T+60 from 2016/10/07 06Z





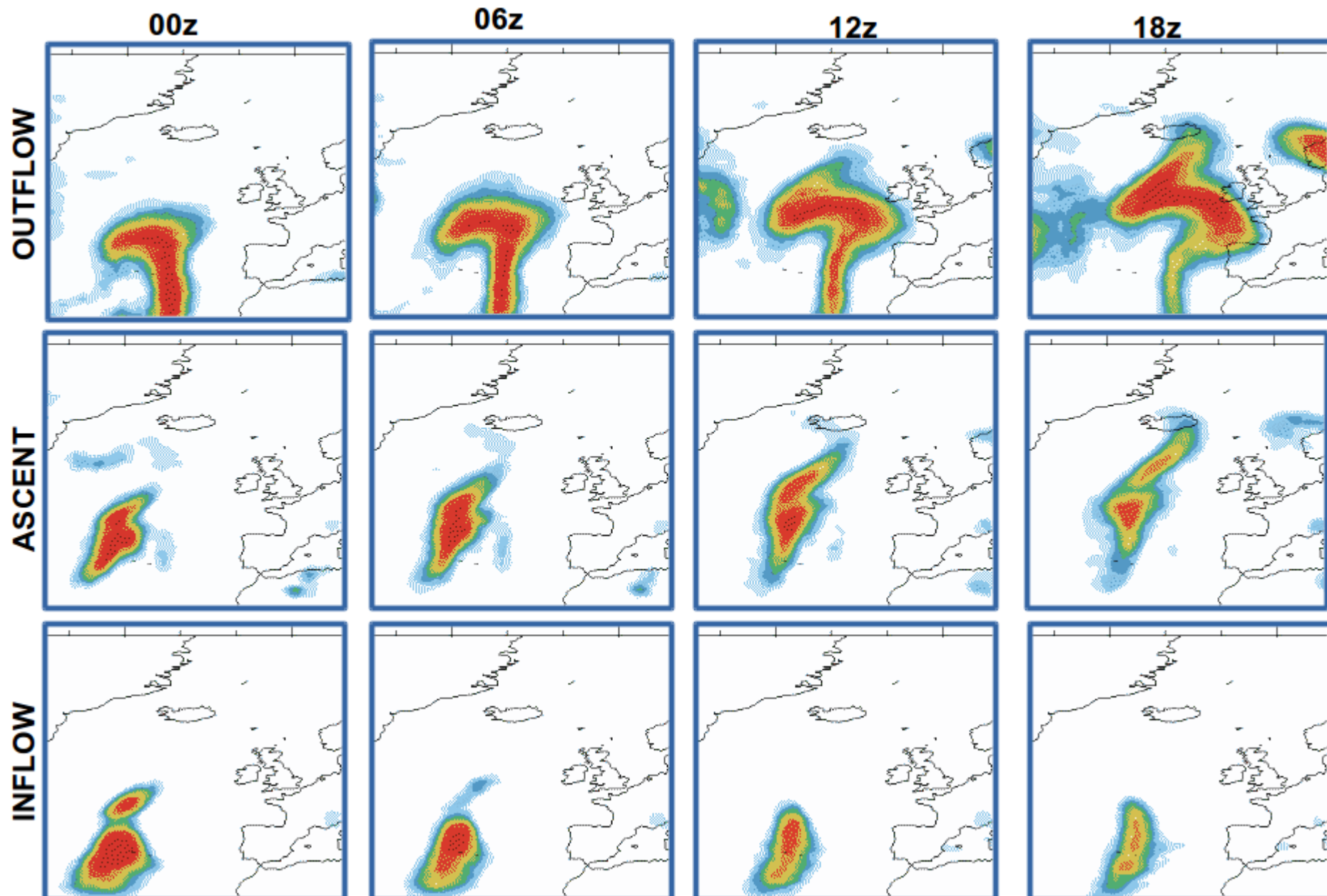
# WCB activity during weekend: 3D visualization

Thanks to Florian Baur  
and Roman Attinger!



view 1 (Scene 1)

# WCB Ens Probabilities Sunday 9 Oct (BT: 07/00z)



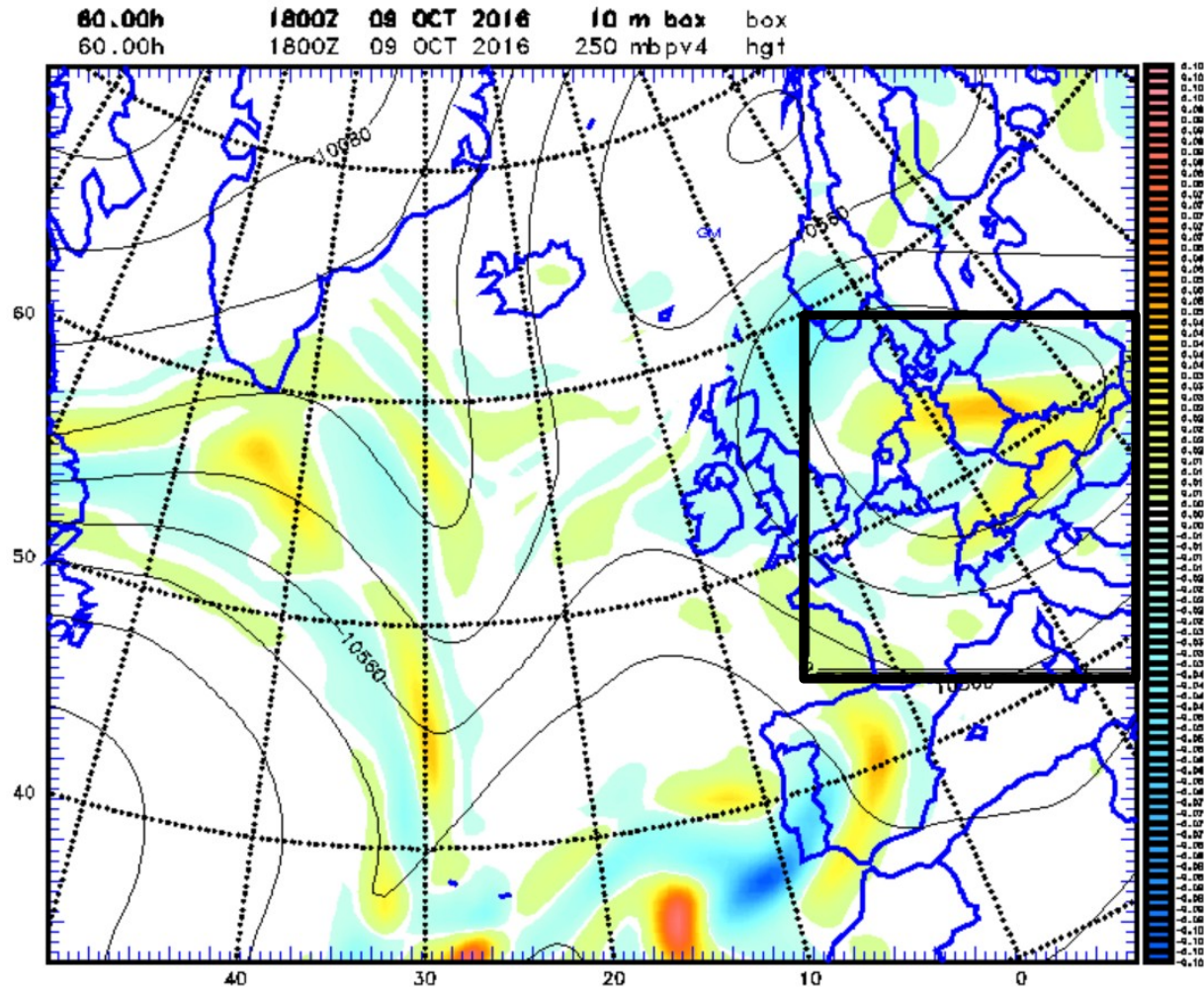
BT07/00Z



# COAMPS Sensitivity (48h) Valid 18Z 9 Oct

**Box centered on Europe (rainfall)**

**PV Sensitivity at 250 hPa**

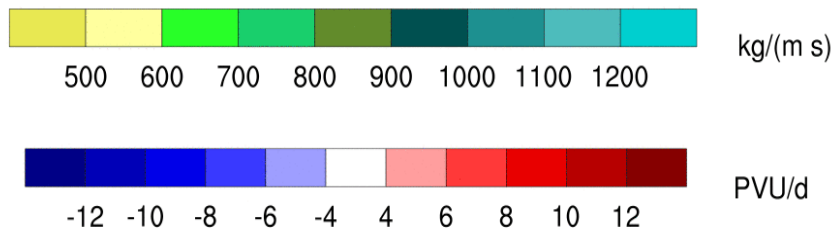
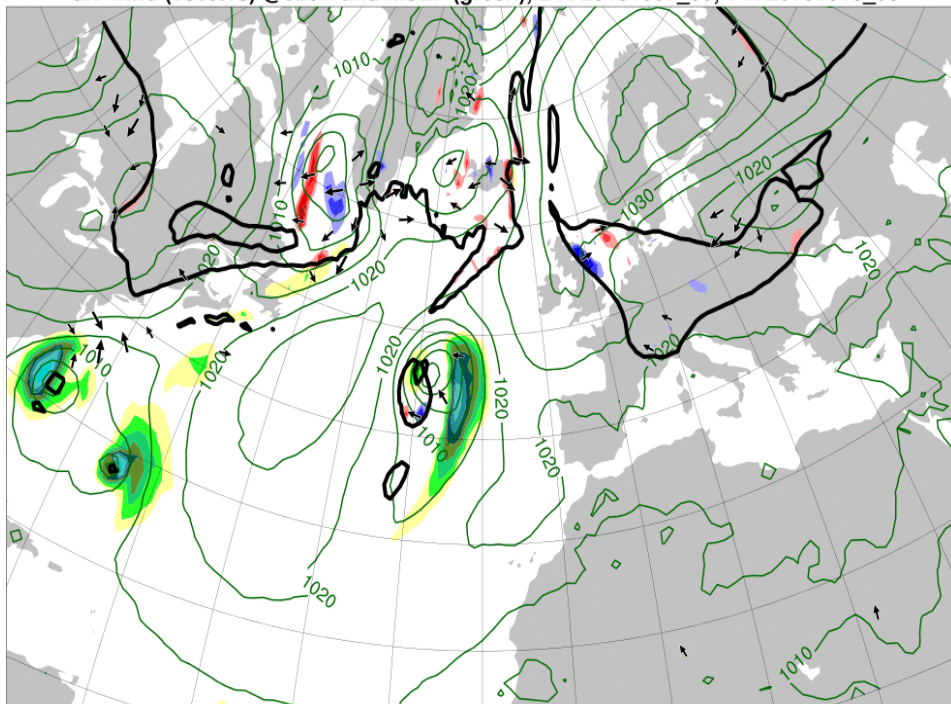


- The rainfall over Europe at 48h shows moderate sensitivity to the upper-level PV at 250-hPa valid 18Z 9 Oct. Stronger sensitivity is located to the south.
- Current running adjoint with the box over Iceland.

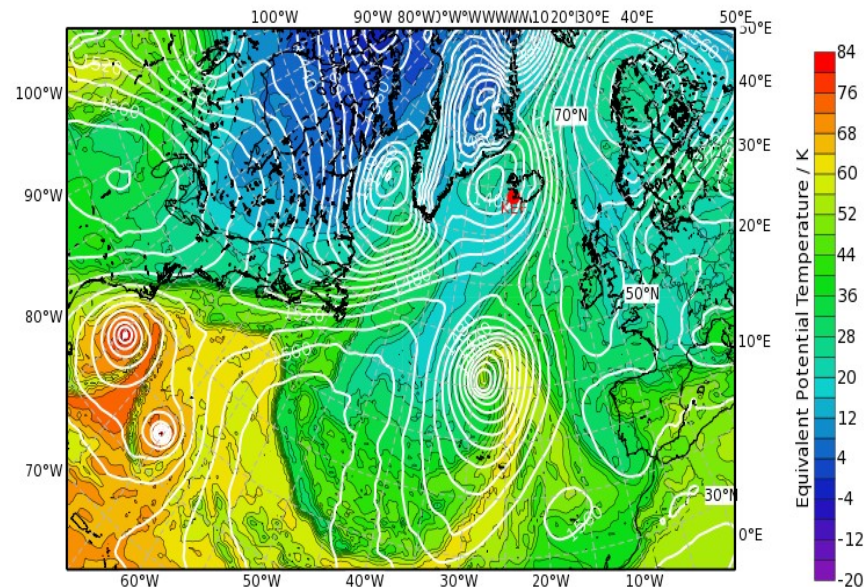


# Forecast – Mon 10 Oct 2016, 00UTC

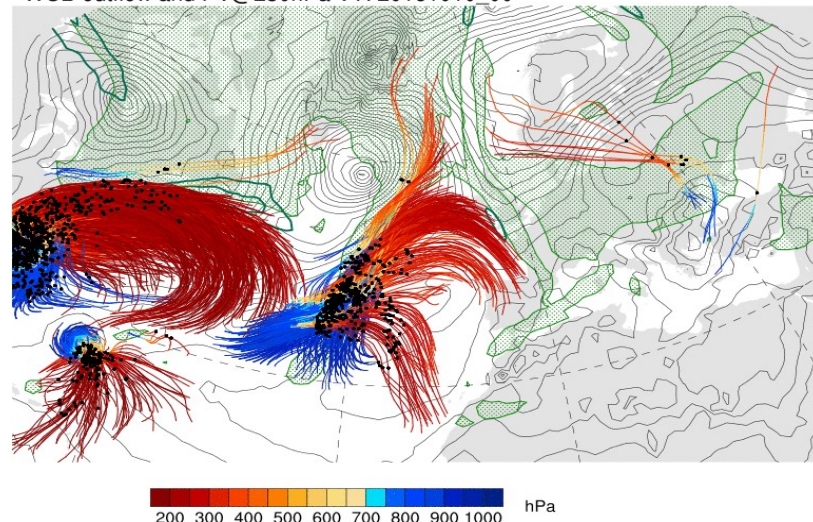
2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161010\_00



Equivalent Potential Temperature (degC) & Streamlines at 850 hPa  
Valid: Mon, 10 Oct 2016, 00 UTC (step 072 h from Fri, 07 Oct 2016, 00 UTC)



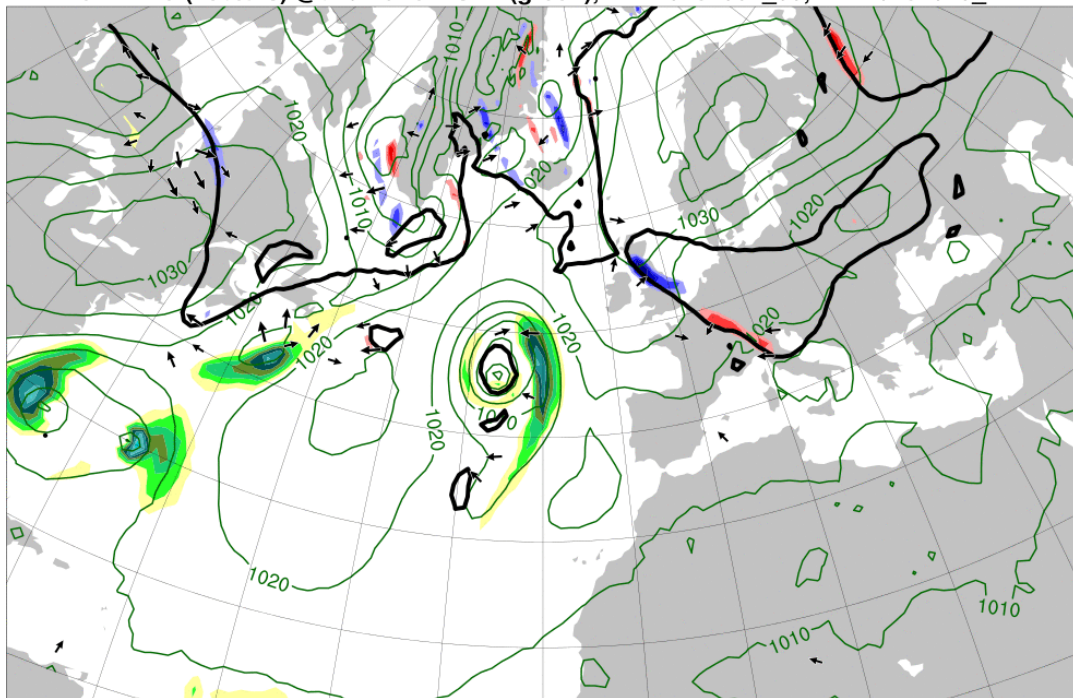
Trajectory start and SLP VT: 20161008\_00  
WCB outflow and PV@250hPa VT: 20161010\_00



200 300 400 500 600 700 800 900 1000 hPa

# Forecast – Mon 10 Oct 2016, 12UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161010\_12



500 600 700 800 900 1000 1100 1200

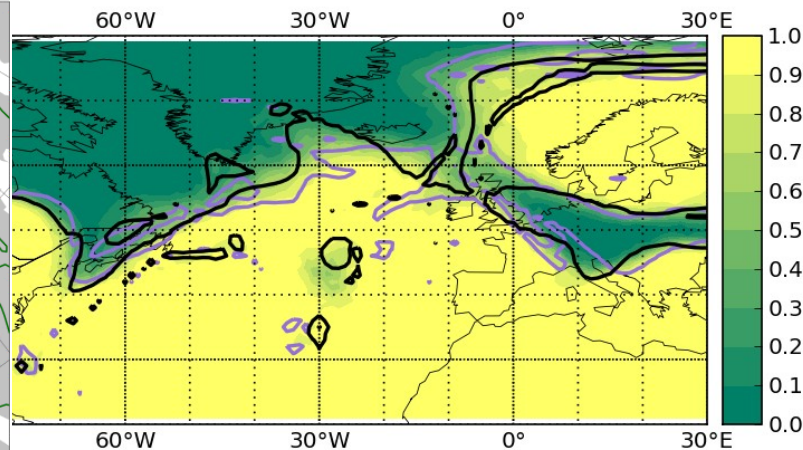
kg/(m s)



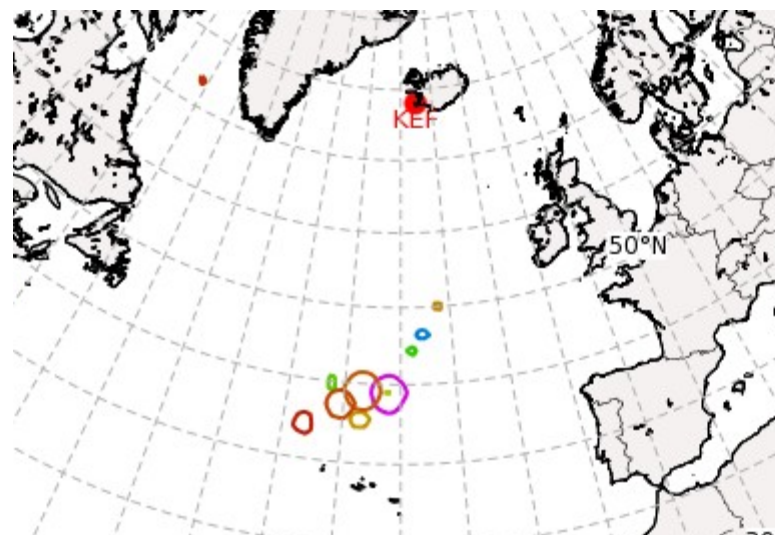
-12 -10 -8 -6 -4 4 6 8 10 12

PVU/d

ENS: 2PVU@320K

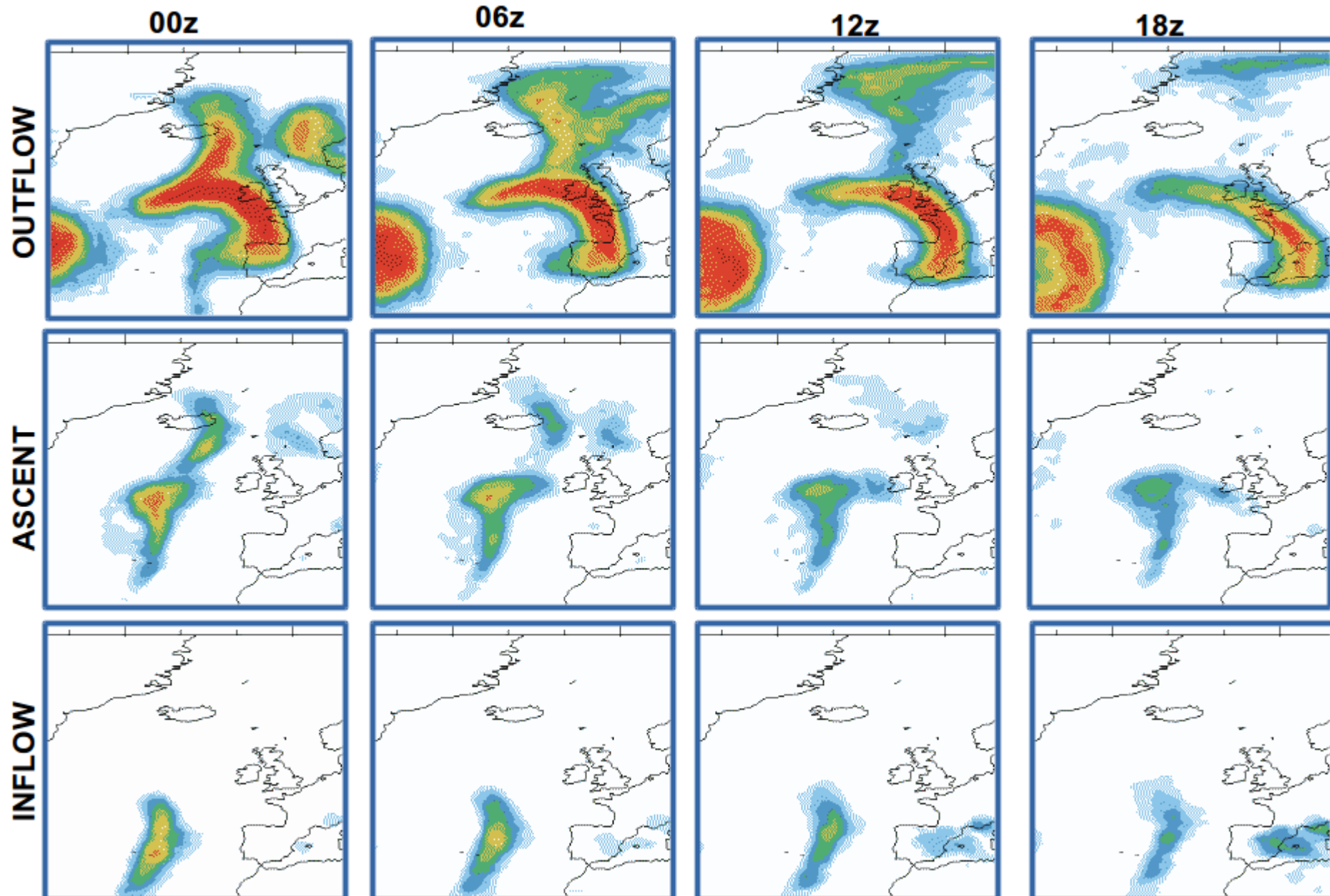


ENS: 990hPa





# WCB Ens Probabilities Monday 10 Oct (BT: 07/00z)



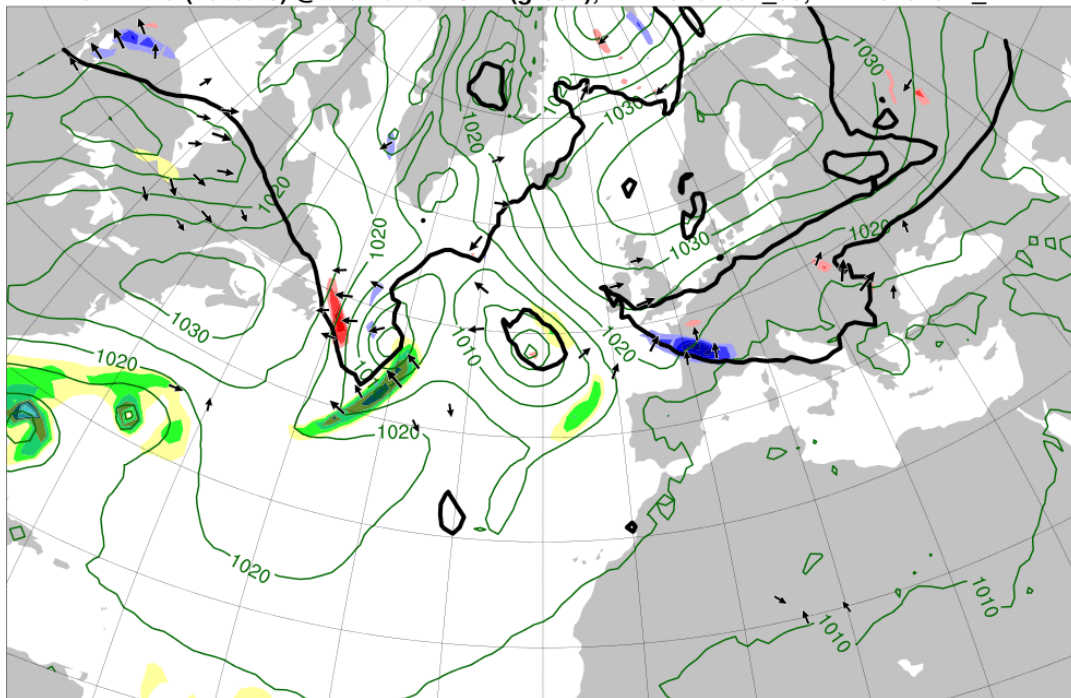
BT07/00Z

Keflavik, 01 October 2016



# Forecast – Tue 11 Oct 2016, 12UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161011\_12



500 600 700 800 900 1000 1100 1200

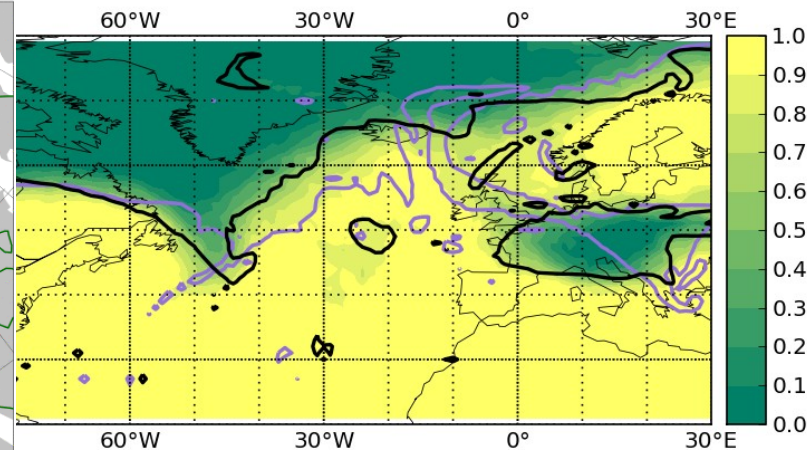
kg/(m s)



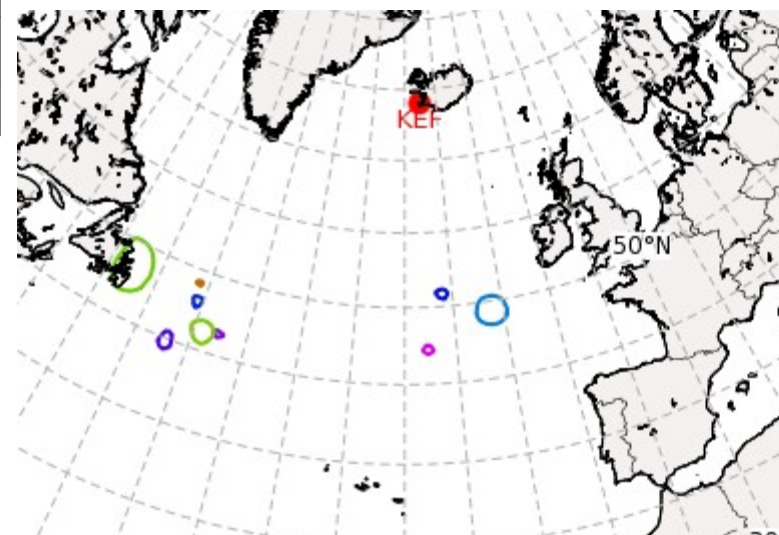
-12 -10 -8 -6 -4 4 6 8 10 12

PVU/d

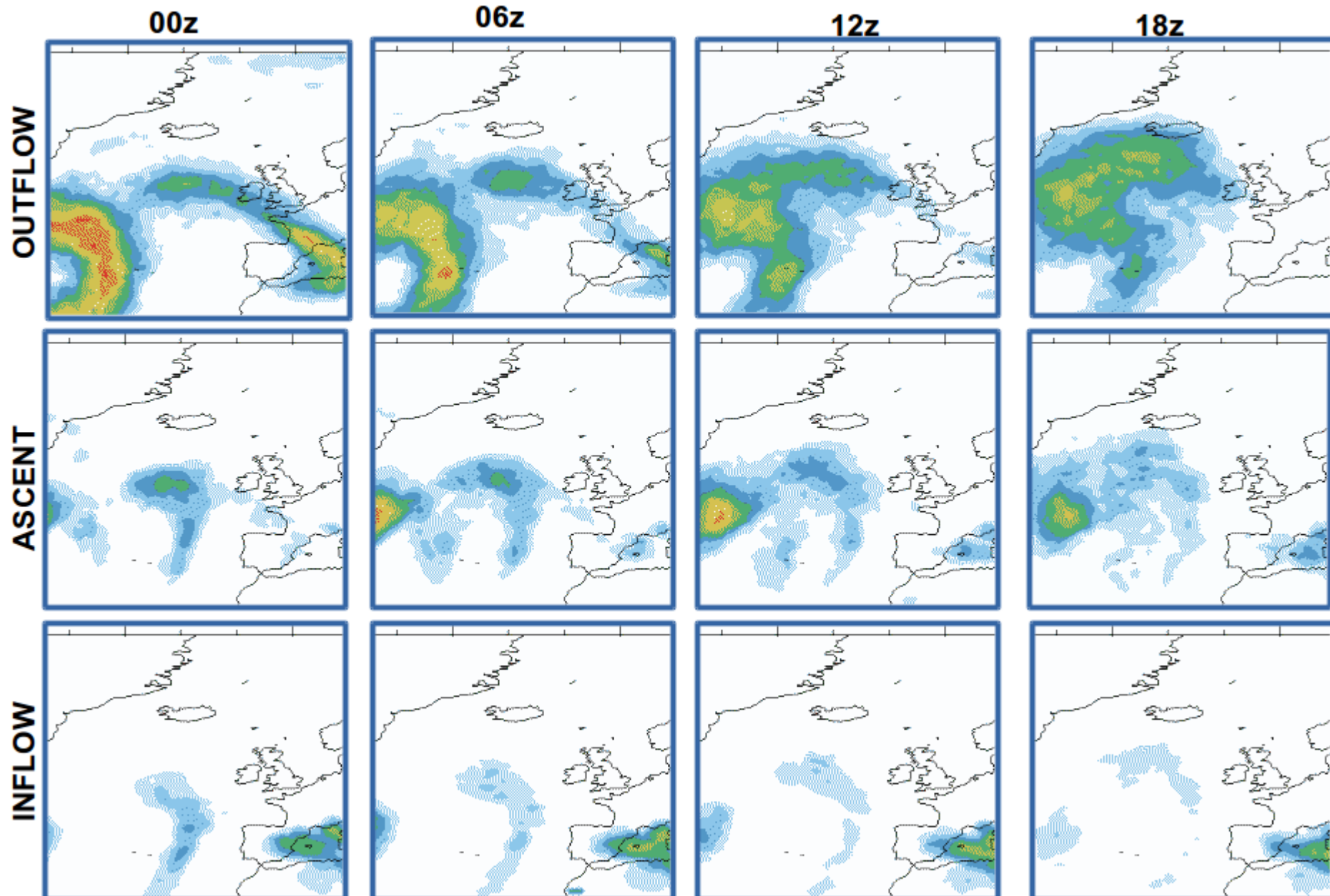
ENS: 2PVU@320K



ENS: 990hPa



# WCB Ens Probabilities Tuesday 11 Oct (BT: 07/00z)

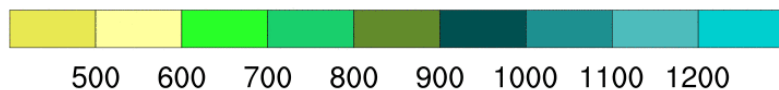
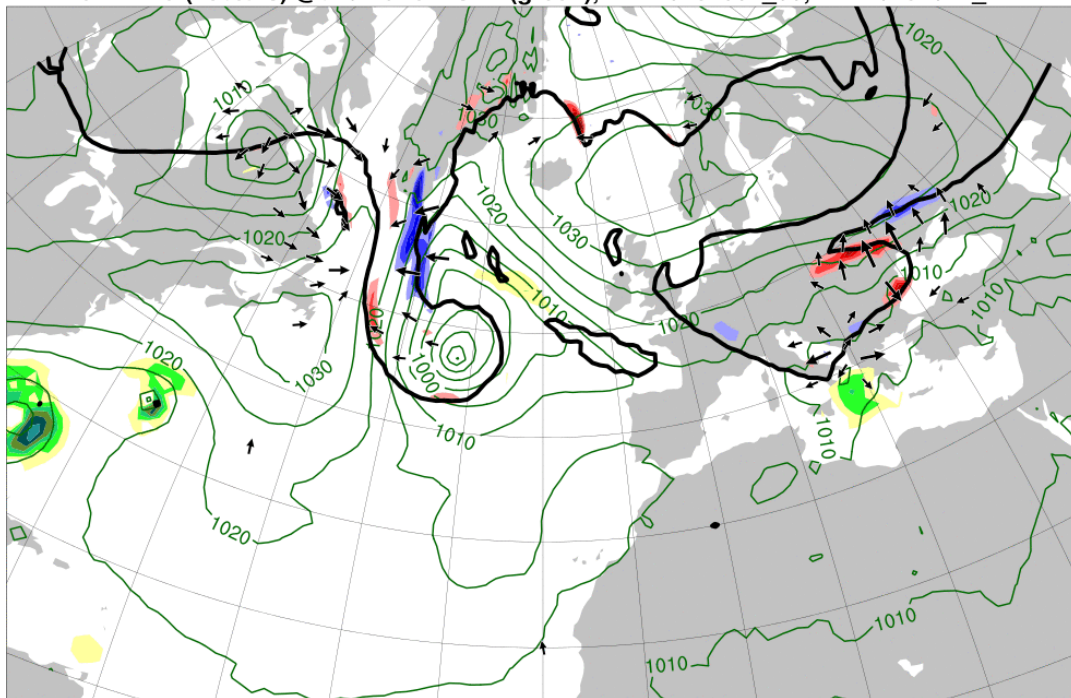


BT07/00Z

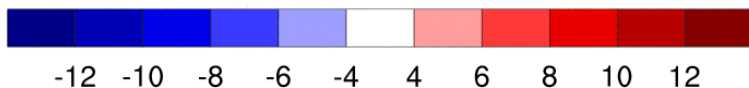


# Forecast – Wed 12 Oct 2016, 12UTC

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @320K and MSLP (green), BT: 20161007\_00, VT: 20161012\_12

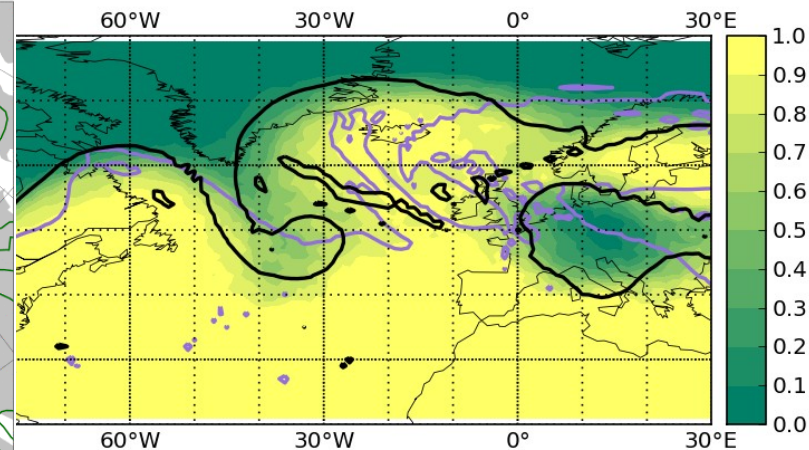


kg/(m s)

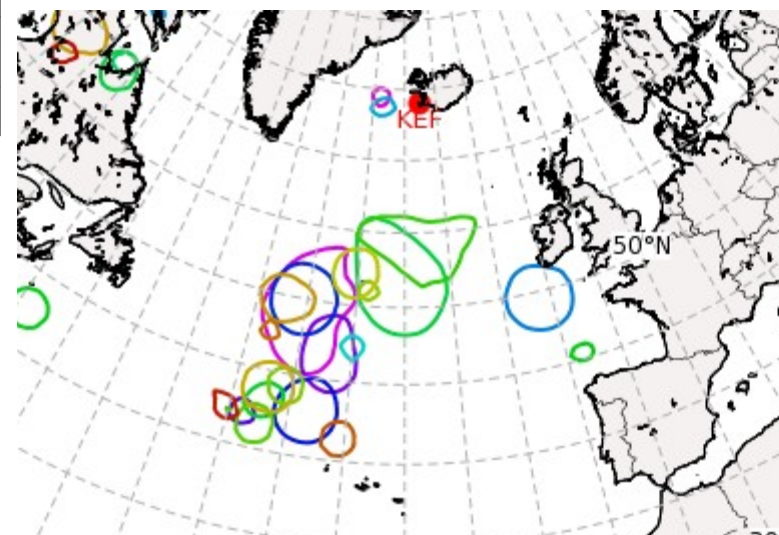


PVU/d

ENS: 2PVU@320K



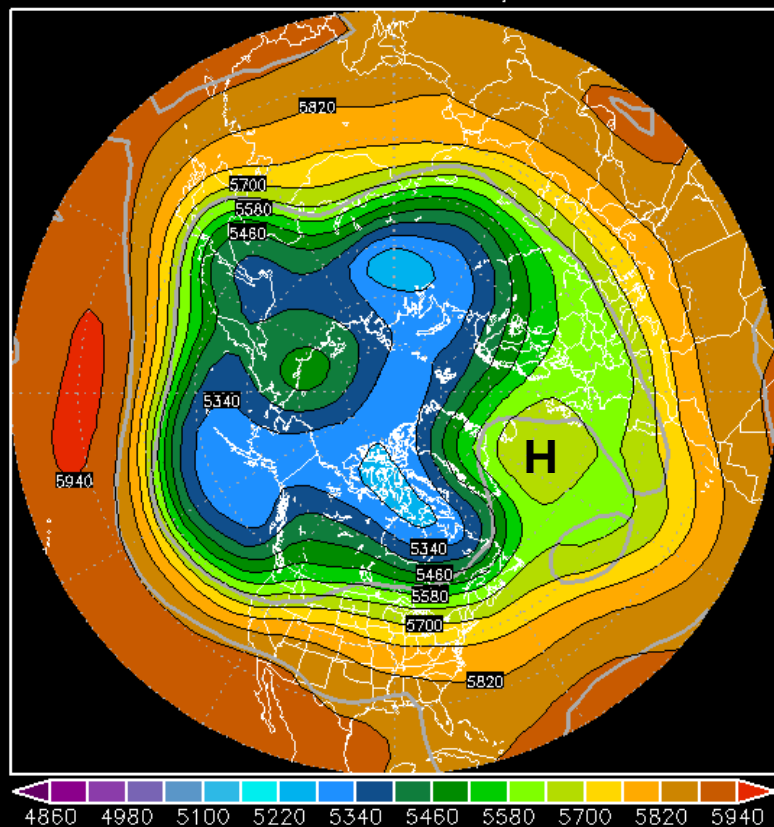
ENS: 990hPa



# Outlook: Sat 15 Oct 00 UTC – Comparison ENS GFS / EC

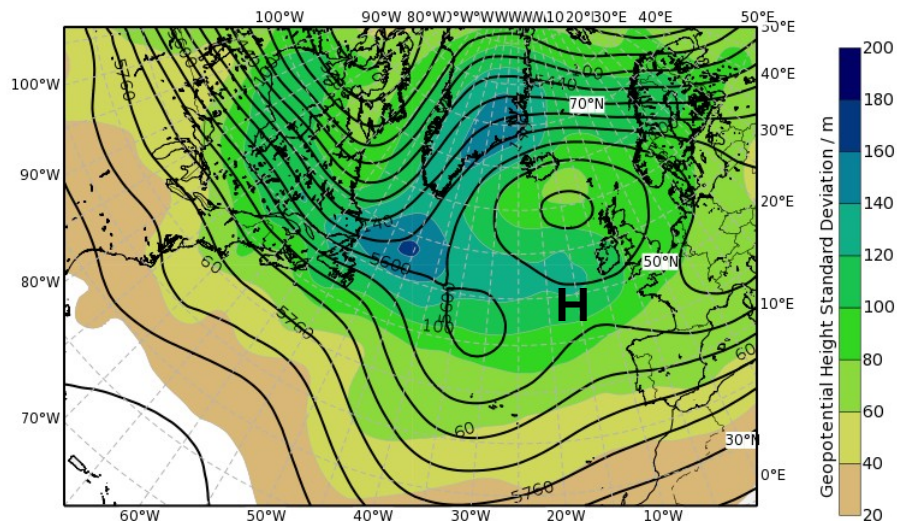
GFS MEAN Z500 in colours

NCEP ENSEMBLE MEAN – 500mb Z (m)  
192H Forecast from: 00Z Fri OCT,07 2016  
Valid time: 00Z Sat OCT,15 2016



EC MEAN Z500 in contours

ECMWF ENS MEAN & STDEV @ Z500  
Valid: Sat, 15 Oct 2016, 00 UTC (step 192 h from Fri, 07 Oct 2016, 00 UTC)





# Radiosondes

# SUNDAY 18 UTC

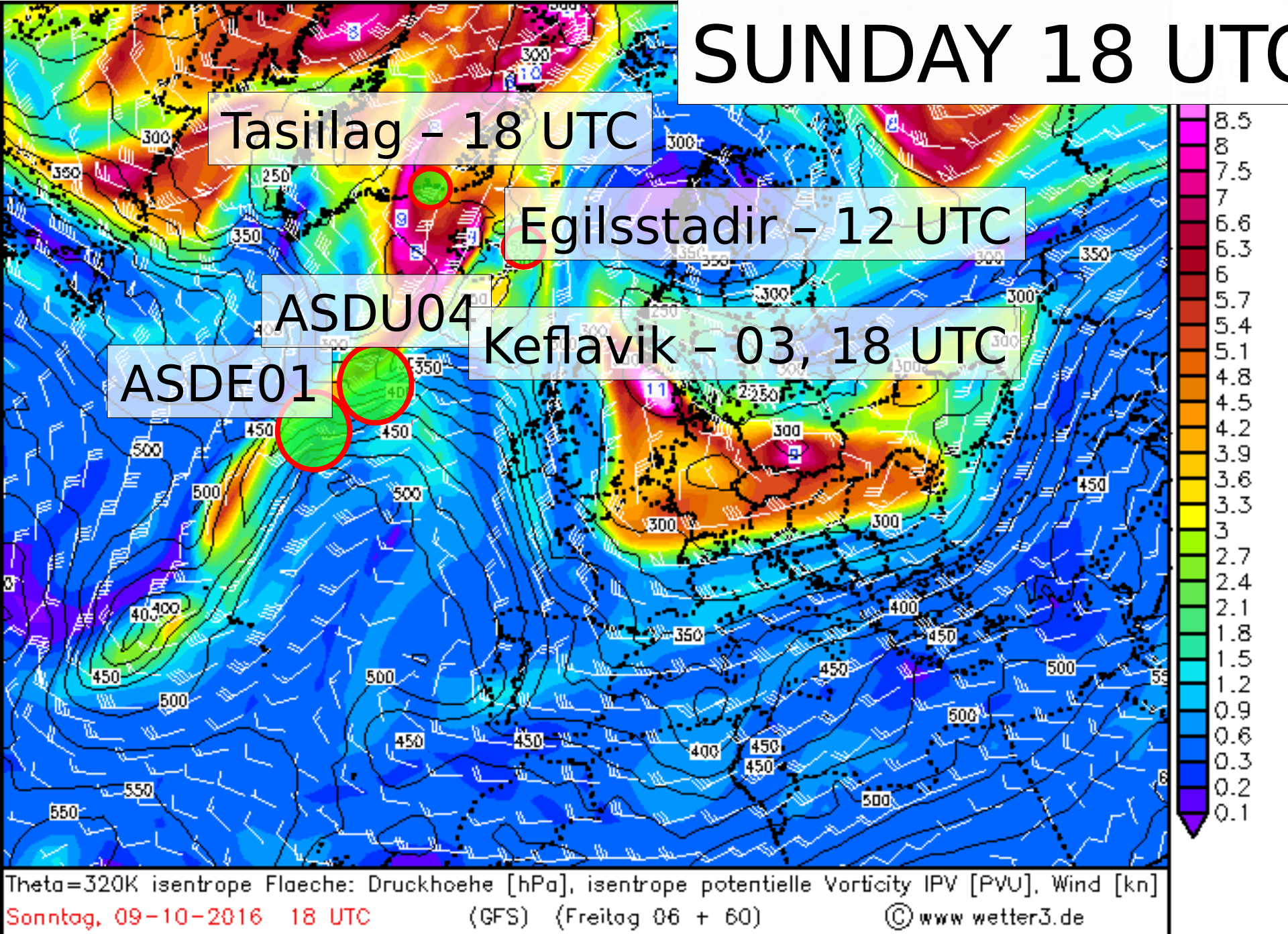
Tasiilag - 18 UTC

Egilsstadir - 12 UTC

ASDU04

Keflavik - 03, 18 UTC

ASDE01



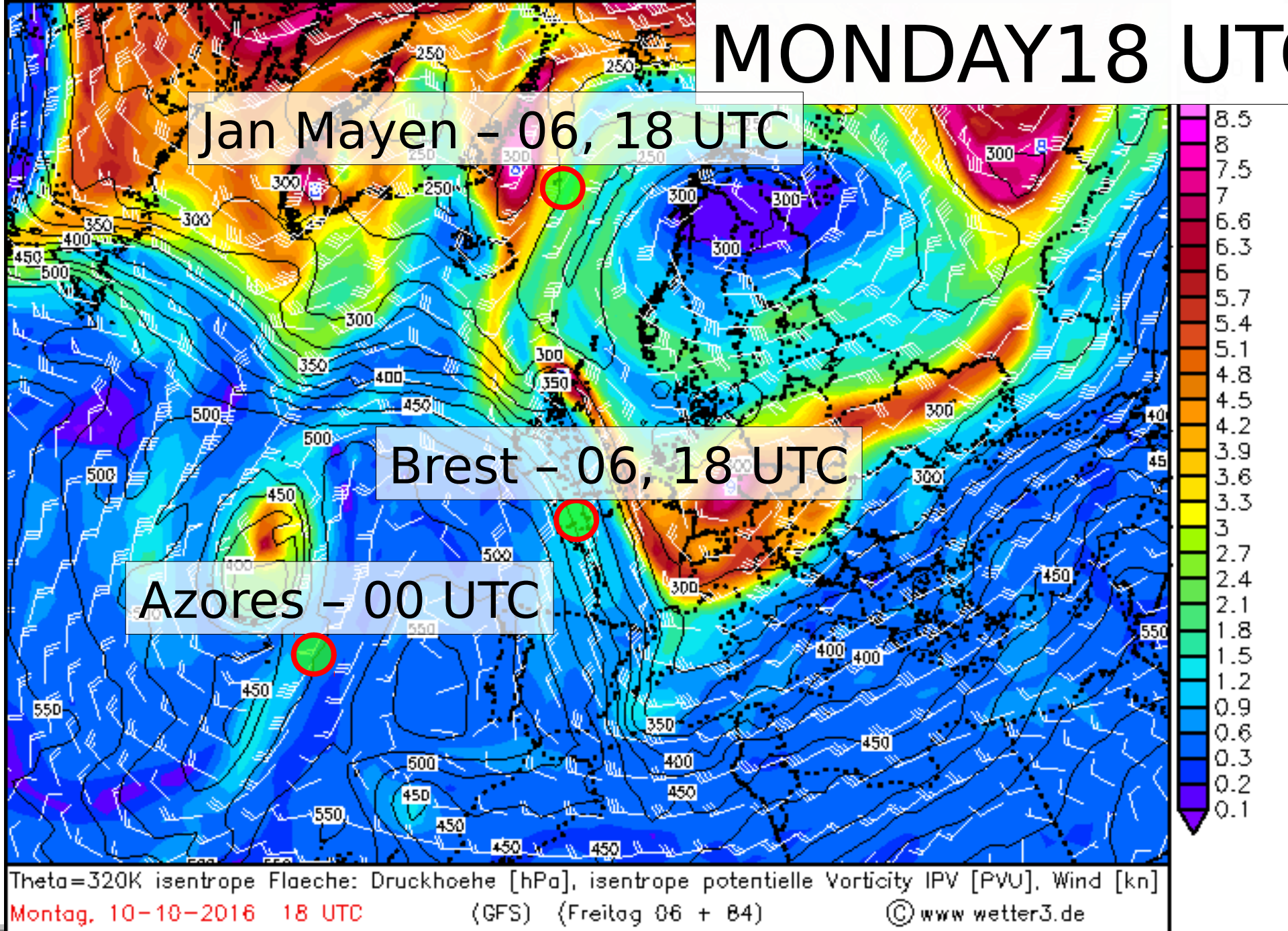


# MONDAY18 UTC

Jan Mayen - 06, 18 UTC

Brest - 06, 18 UTC

Azores - 00 UTC



# Radiometer intercomparison



# Flight plans

# Sunday 9 October

## DLR-Falcon

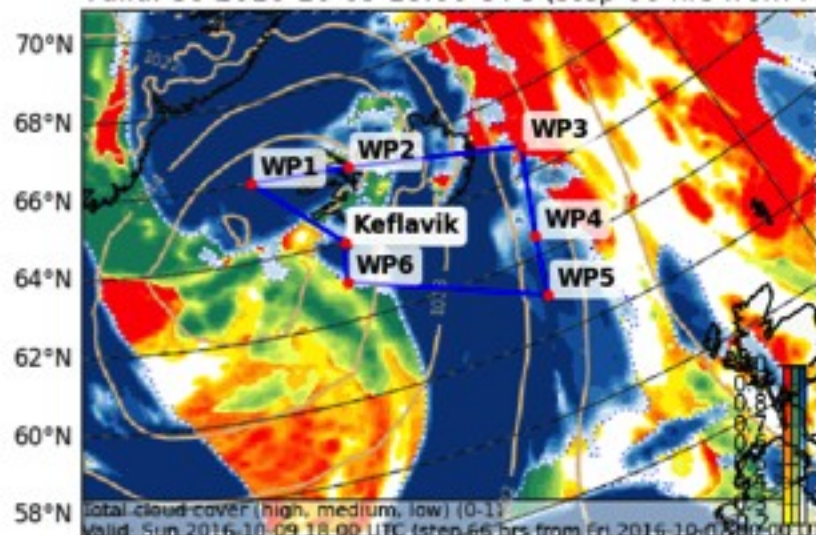


# Falcon flight Sunday, 09 Oct

BT 07/00Z, VT 09/18Z

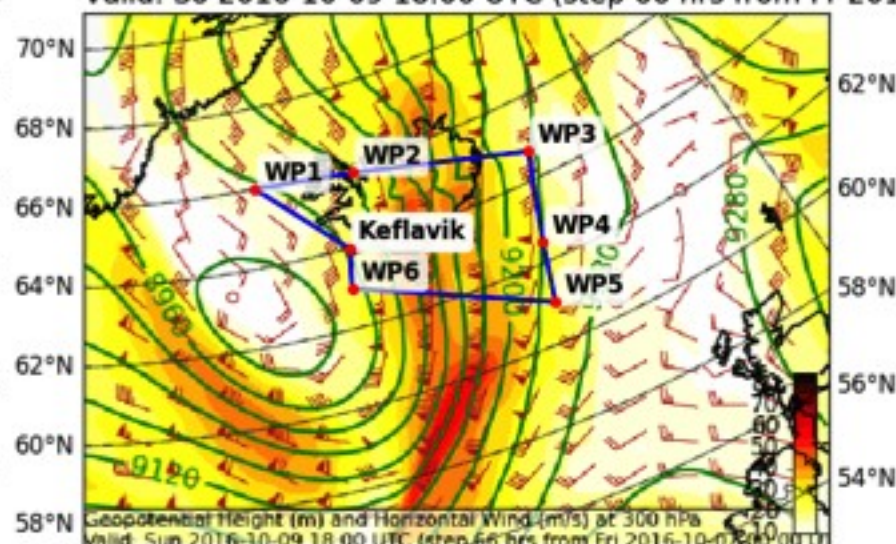
Cloud Cover (0-1) (Total Cloud Cover)

Valid: So 2016-10-09 18:00 UTC (step 66 hrs from Fr 2016-10-08 00:00 UTC)



Geopotential Height (m) and Horizontal Wind (m/s) (Wind

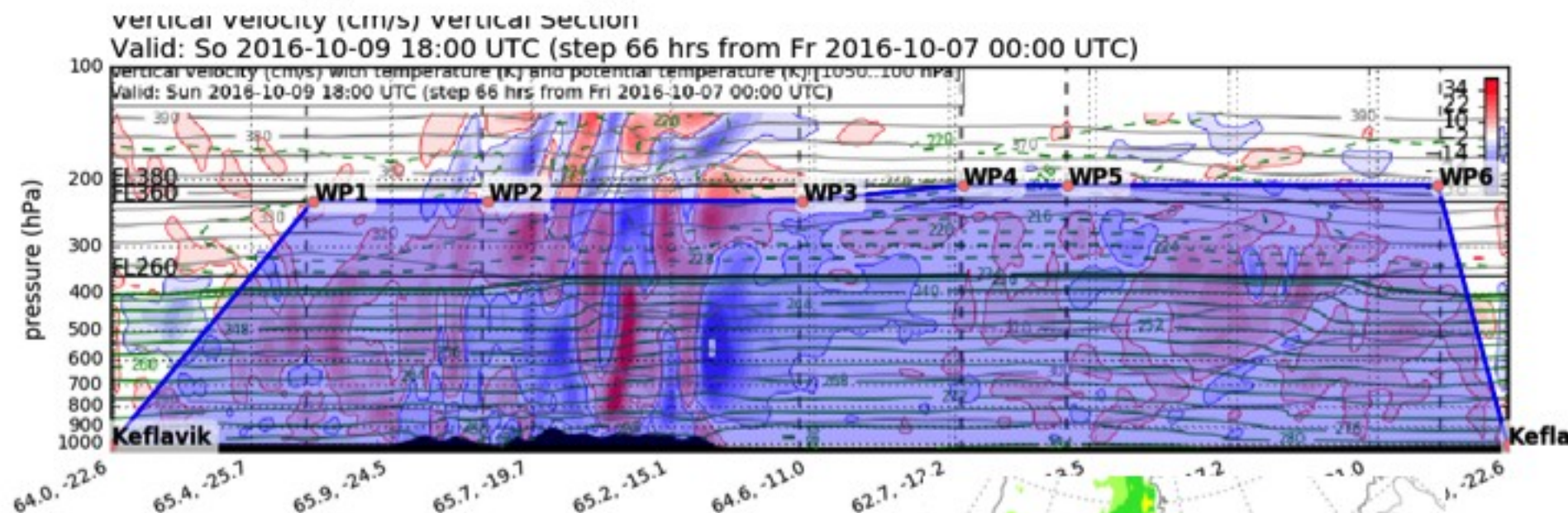
Valid: So 2016-10-09 18:00 UTC (step 66 hrs from Fr 2016-10-08 00:00 UTC)



- Coordination with HALO & SAFIRE on leg WP5-6, meeting point @ WP5, 17.45UTC
- Across Jet legs WP2-3 (jet exit) and WP5-6
- Legs WP1-3@FL360, legs WP4-6@FL380
- Exact waypoints subject to changes due to cloud forecast
- Take off 15.25UTC, landing 18.35UTC, expected flight time: 3h 15min

# Falcon flight Sunday, 09 Oct

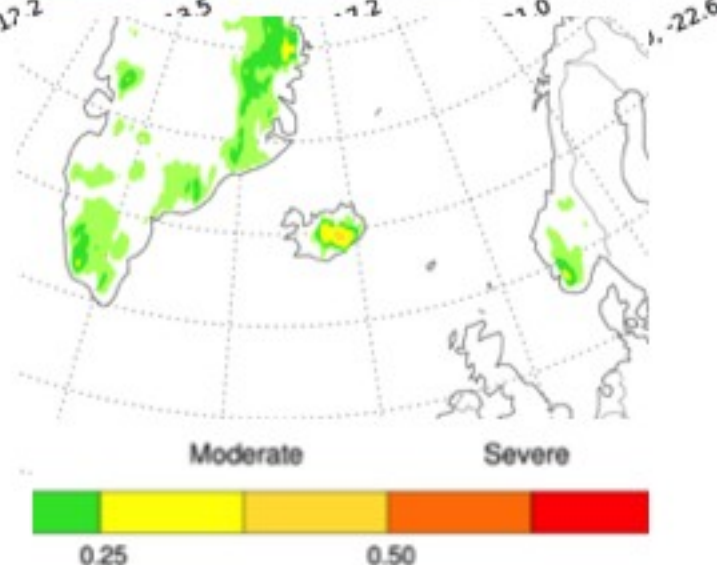
BT 07/00Z, VT 09/18Z



Topography induced gravity waves  
over Iceland

Moderate CAT expected on leg 2-3

Possibility to measure gravity waves  
with LIDAR?





# Falcon flight Sunday, 09 Oct

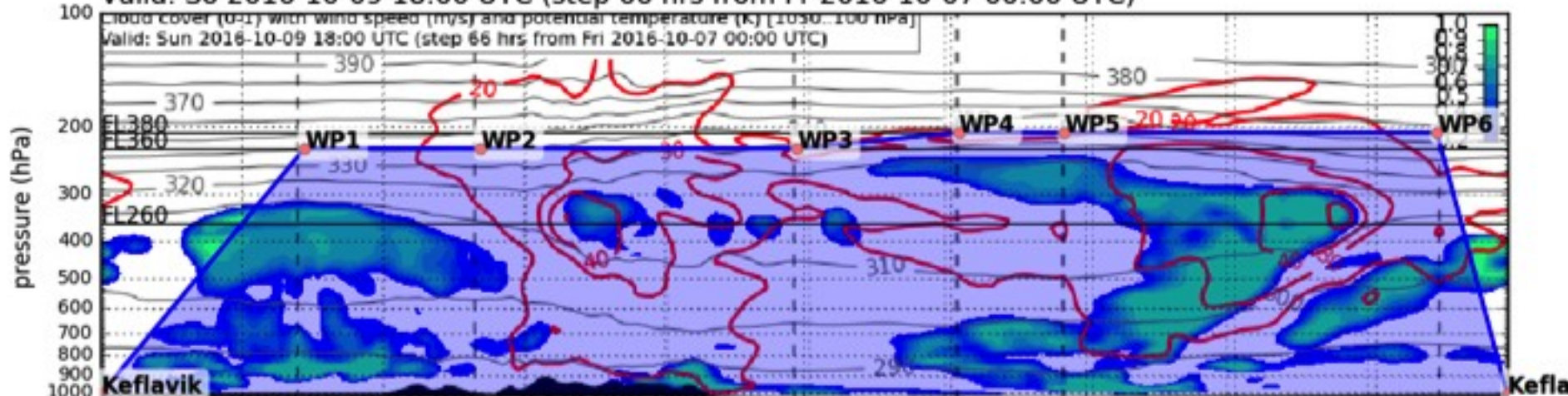
BT 07/00Z, VT 09/18Z

Cloud Cover (0-1) and wind Speed (m/s) vertical section

Valid: So 2016-10-09 18:00 UTC (step 66 hrs from Fr 2016-10-07 00:00 UTC)

Cloud cover (0-1) with wind speed (m/s) and potential temperature (K) [1050..100 hPa]

Valid: Sun 2016-10-09 18:00 UTC (step 66 hrs from Fri 2016-10-07 00:00 UTC)

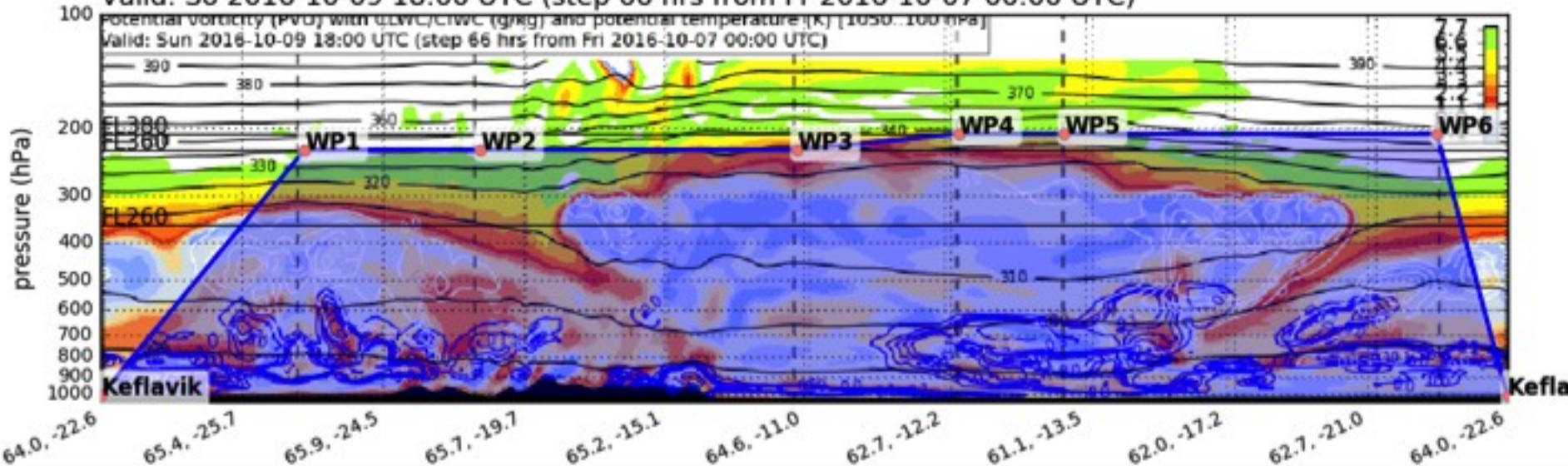


Potential vorticity (PVU) vertical section (Northern Hemisphere)

Valid: So 2016-10-09 18:00 UTC (step 66 hrs from Fr 2016-10-07 00:00 UTC)

Potential vorticity (PVU) with QWV/CWV (g/kg) and potential temperature (K) [1050..100 hPa]

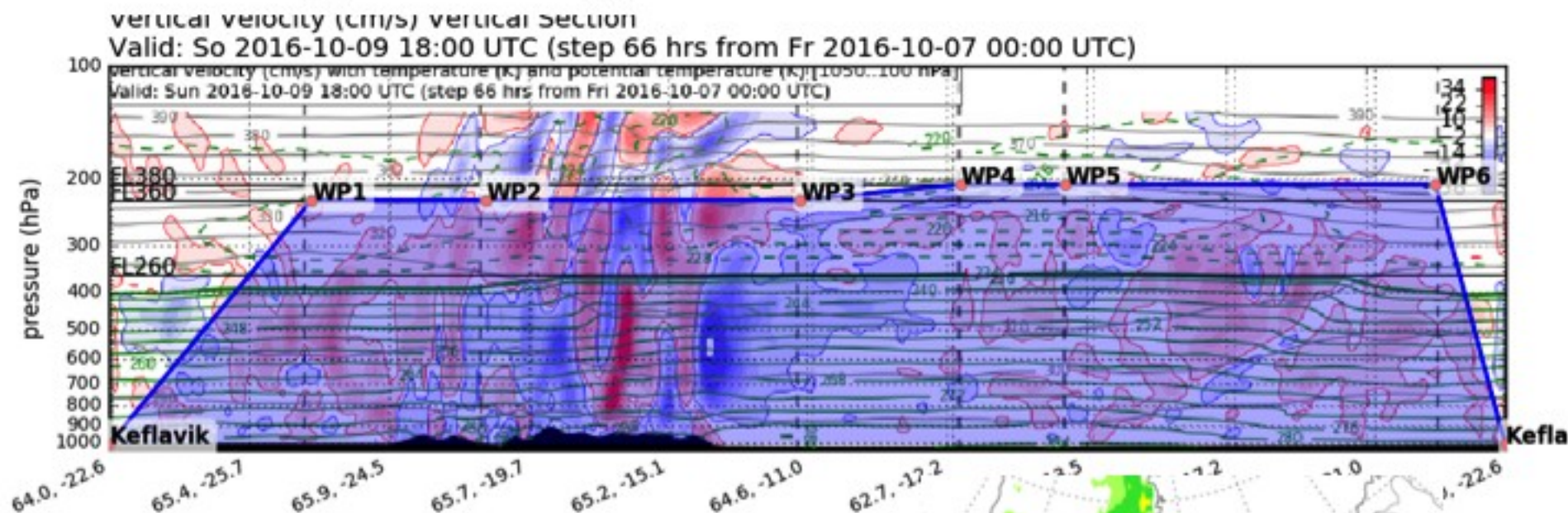
Valid: Sun 2016-10-09 18:00 UTC (step 66 hrs from Fri 2016-10-07 00:00 UTC)





# Falcon flight Sunday, 09 Oct

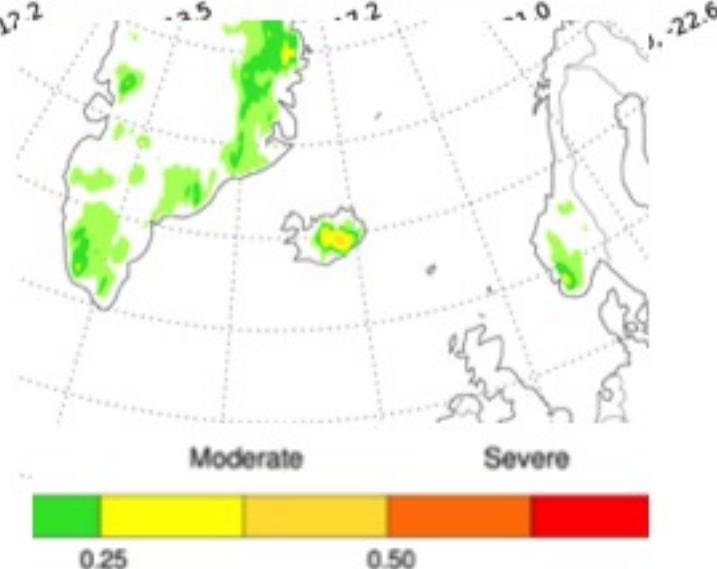
BT 07/00Z, VT 09/18Z



Topography induced gravity waves  
over Iceland

Moderate CAT expected on leg 2-3

Possibility to measure gravity waves  
with LIDAR?

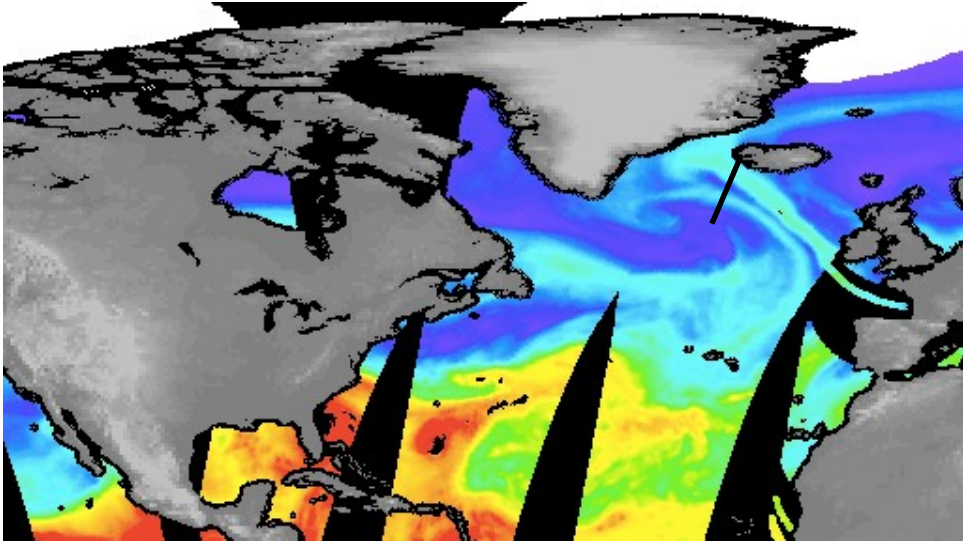




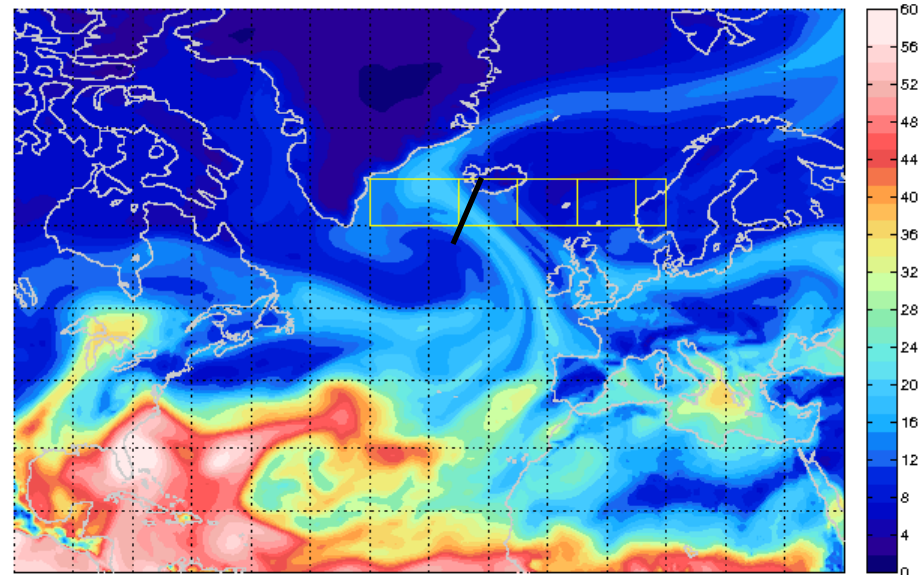
# Sunday 9 October

## SAFIRE

# EPATAN/NEAREX flight 7 Oct 2016



SSMI sat obs 20161007\_00



ECMWF ens mean IWV 7 Oct 12 UTC

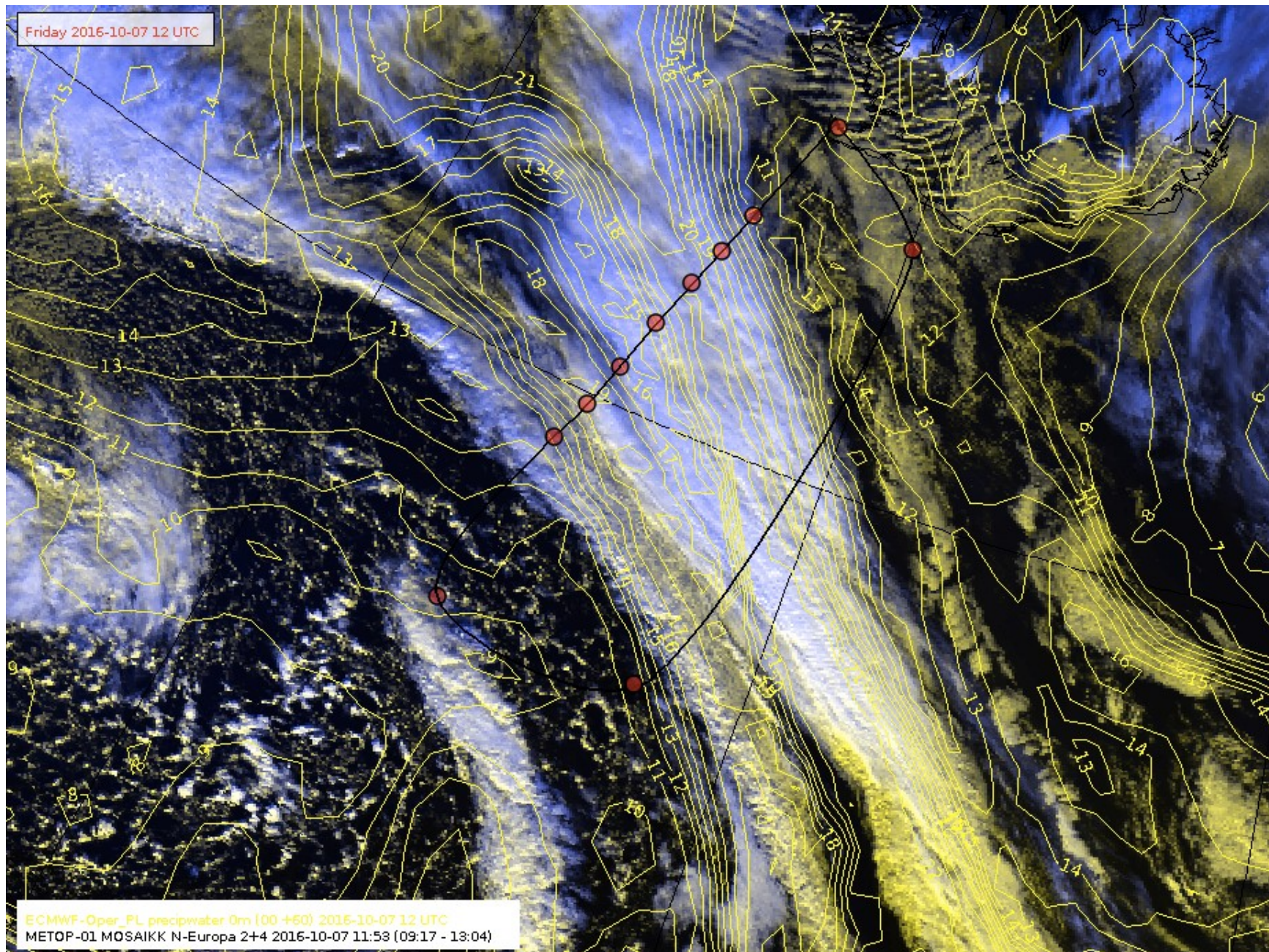


58°49.46'N - 31°37.42'W





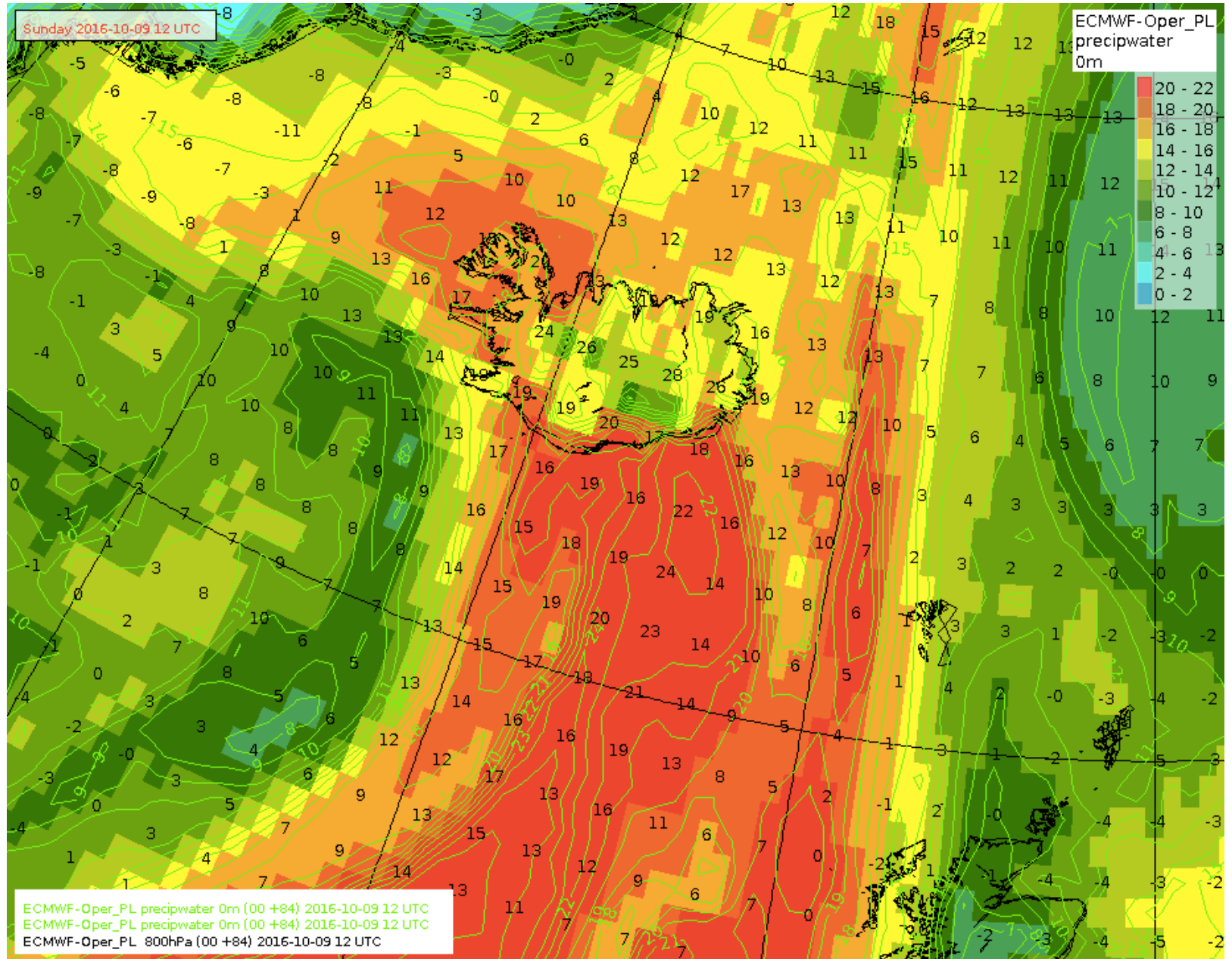
Friday 2016-10-07 12 UTC



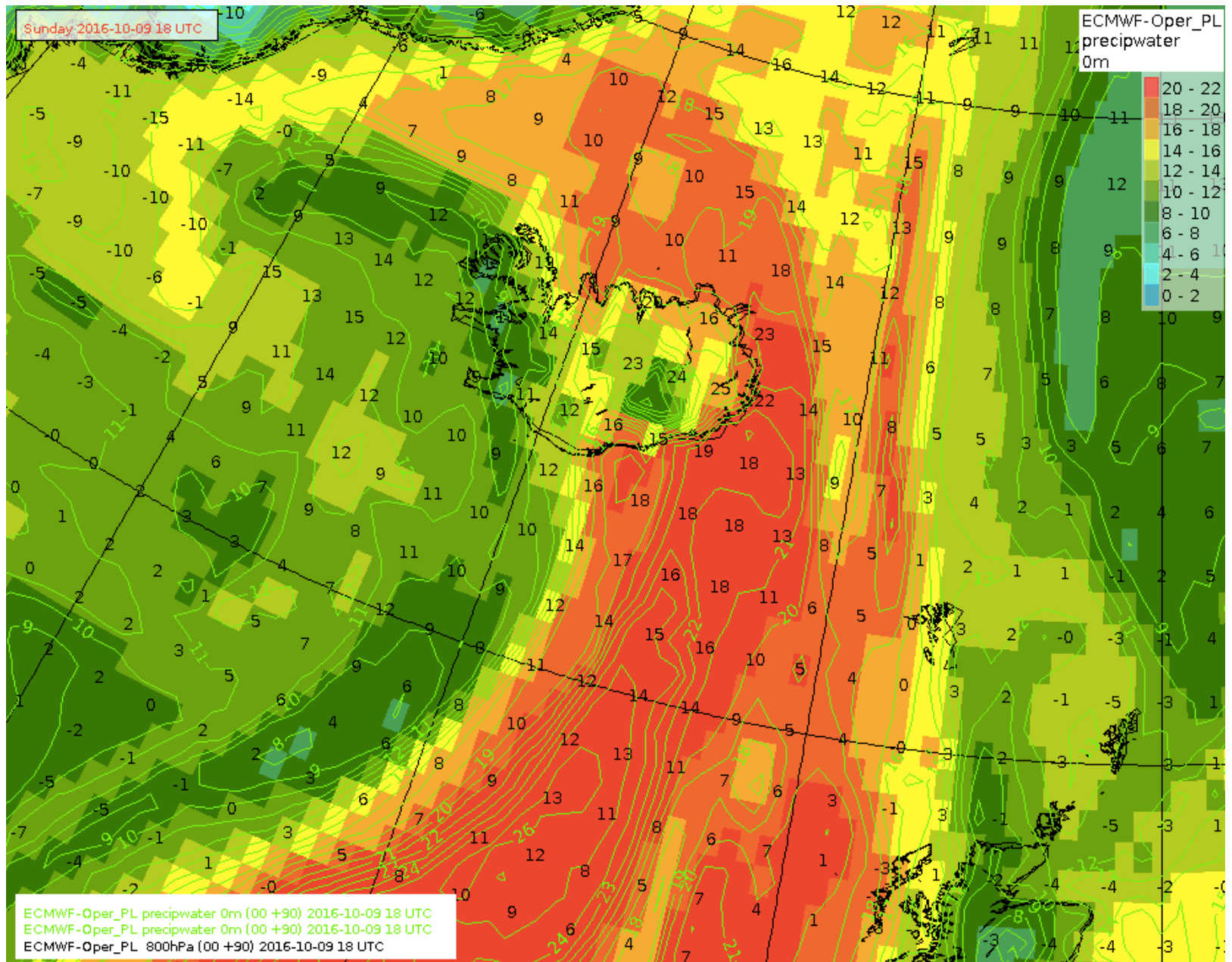
ECMWF-Oper. PL precipwater 0m (00 +60) 2016-10-07 12 UTC  
METOP-01 MOSAIKK N-Europa 2+4 2016-10-07 11:53 (09:17 - 13:04)



# IWV, meridional winds, 09 Oct 12 UTC



# IWV, meridional winds, 09 Oct 18 UTC





# Sunday 9 October

## HALO

# HALO flight Sun 09 Oct

**System under investigation:**

**„Sunday PV streamer“**

**Main objectives:**

- Structure of PV streamer
- WCB, frontal cloud structure
- WCB-jet interaction: divergent outflow

**Flight details:**

takeoff 10:50

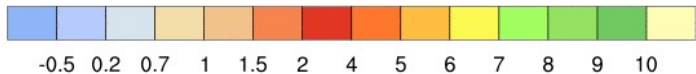
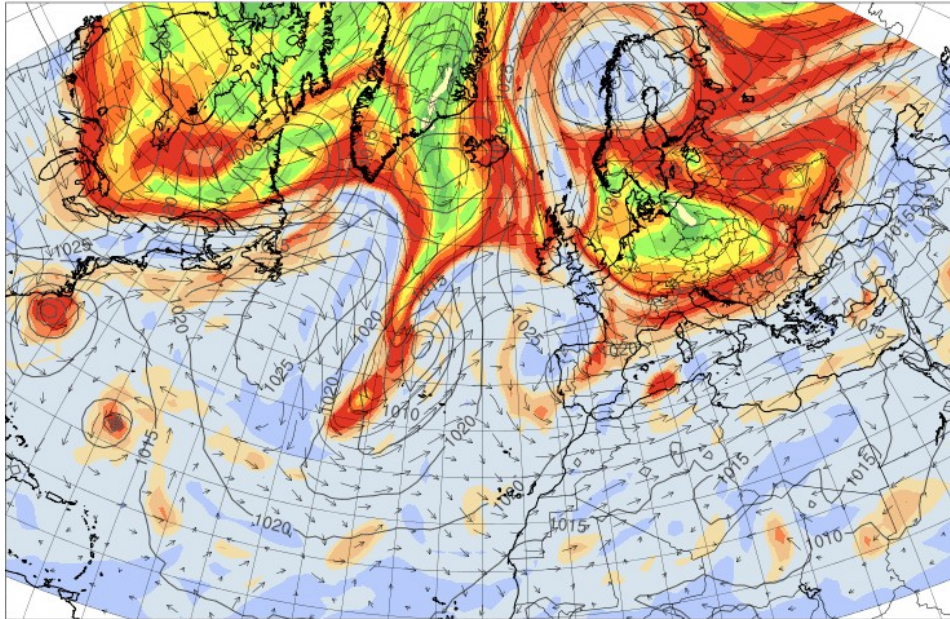
landing 18:35



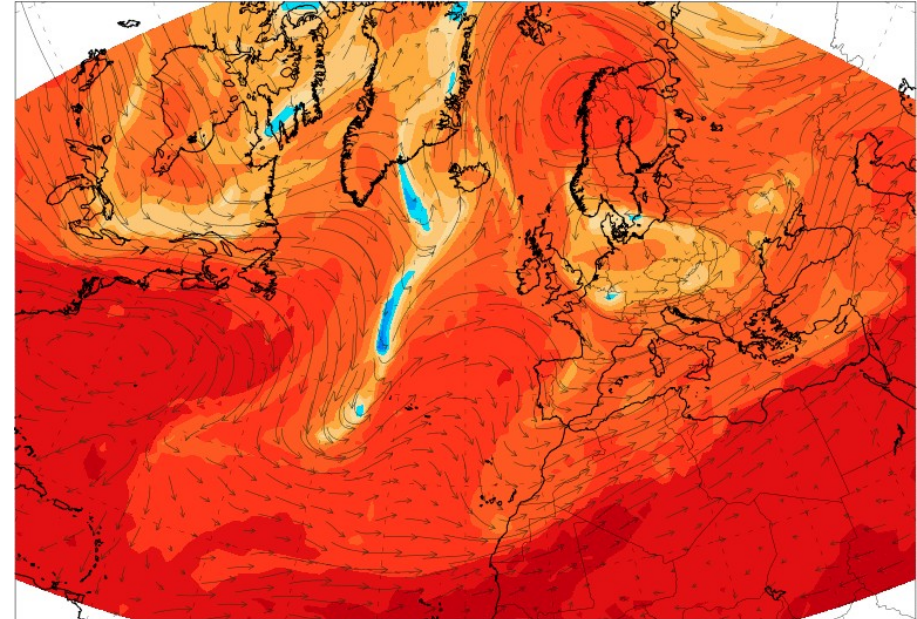
# HALO flight Sun 09 Oct

12 UTC

PV@325K at 20161009\_12



pvu



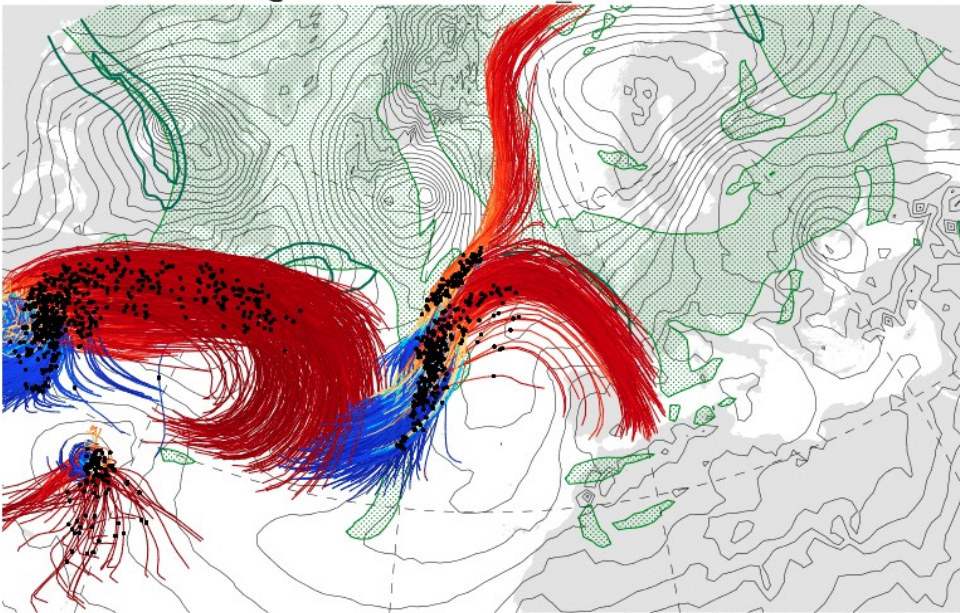
hPa



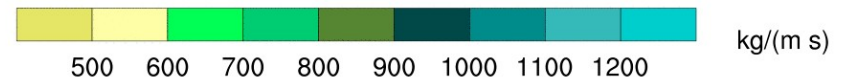
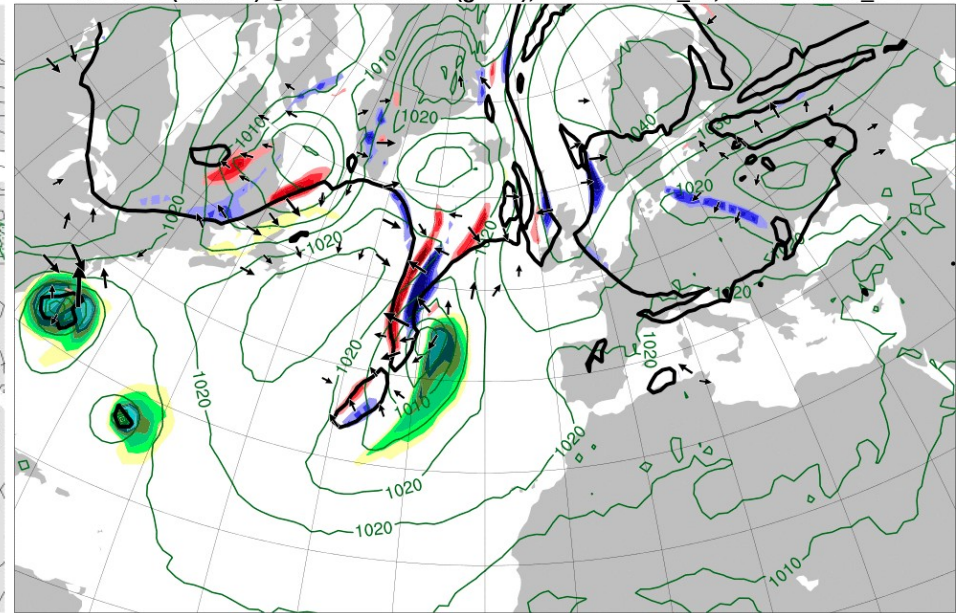
# HALO flight Sun 09 Oct

12 UTC

Trajectory start and SLP VT: 20161008\_12  
WCB outflow and PV@250hPa VT: 20161010\_12



2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @325K and MSLP (green), BT: 20161007\_00, VT: 20161009\_12

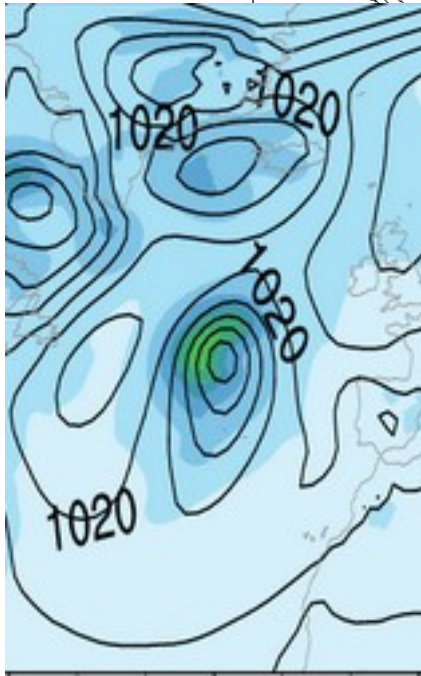
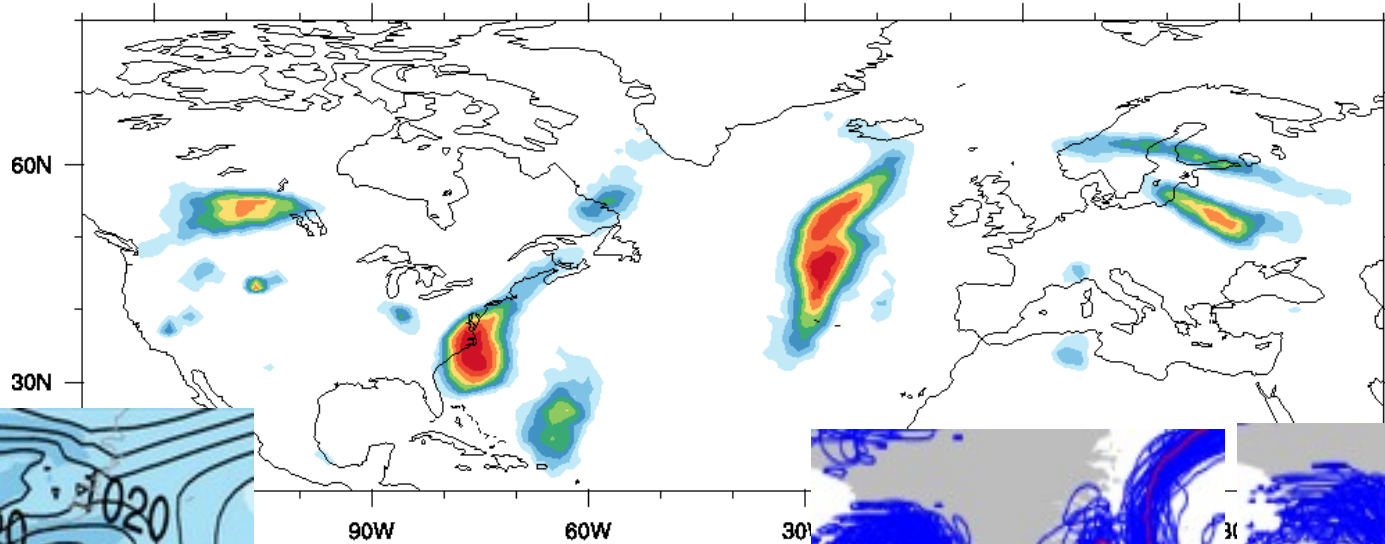




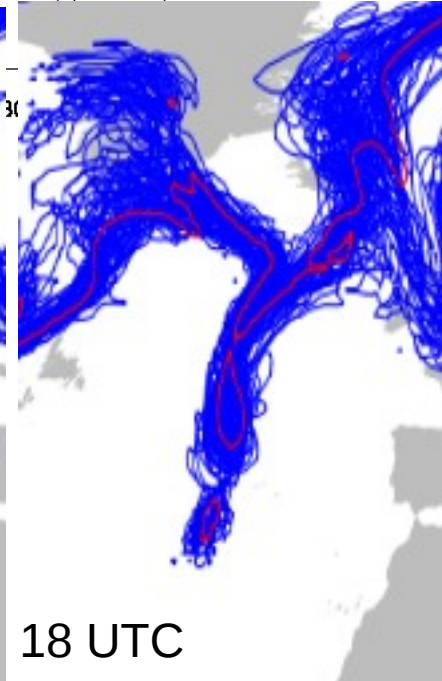
# HALO flight Sun 09 Oct

ECMWF ensemble forecast  
BT 20161007\_00UTC  
VT 20161009\_12UTC

in800-400hPa: Probability [%] of traj. occurrence in ENS



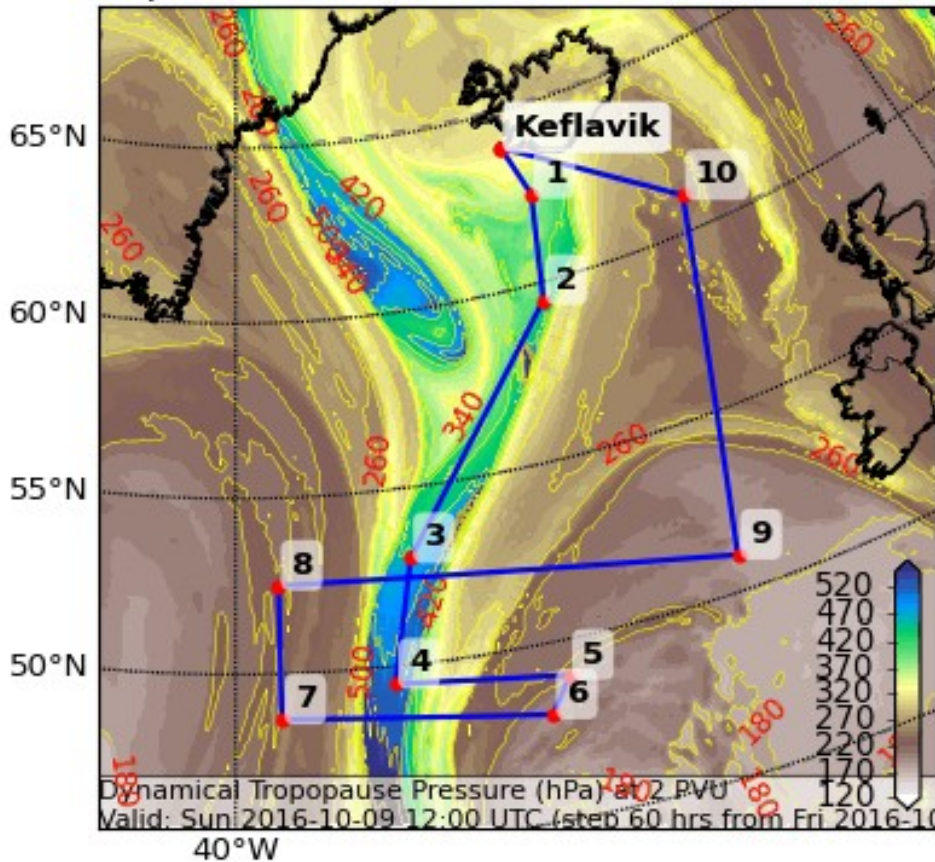
12 UTC



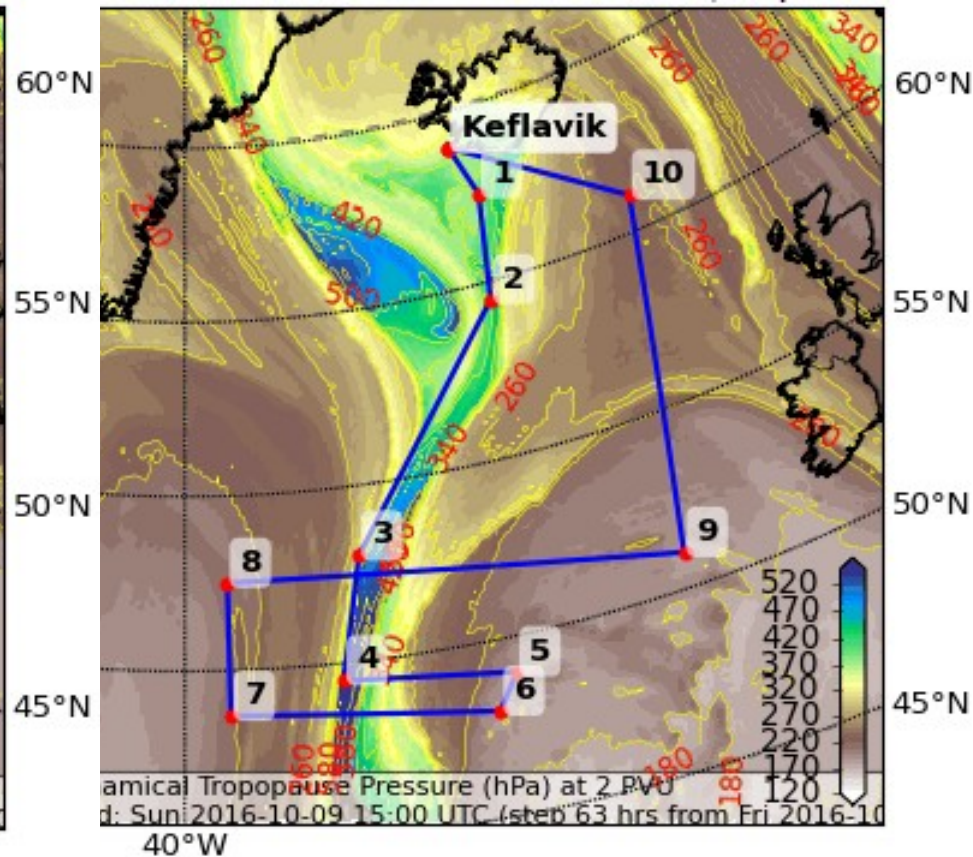
18 UTC

# HALO flight Sun 09 Oct

12 UTC

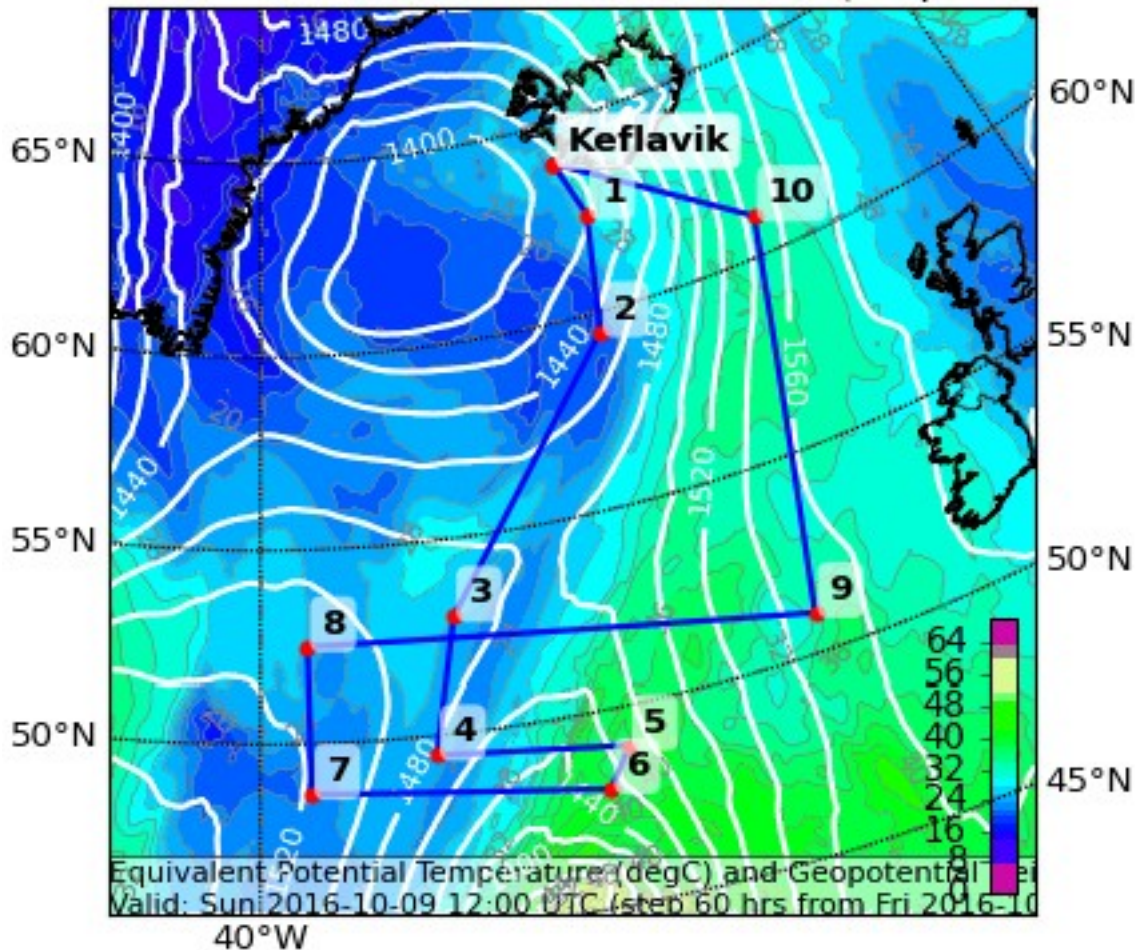


15 UTC





# HALO flight Sun 09 Oct

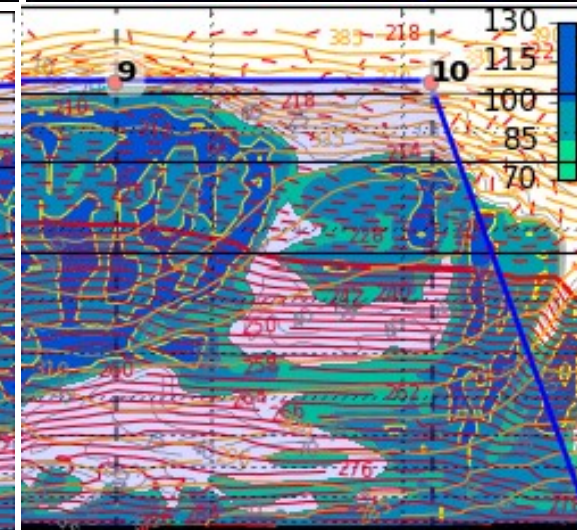
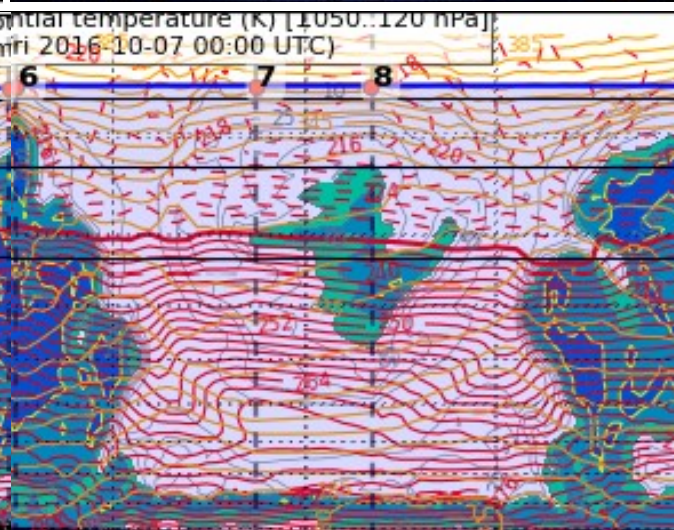
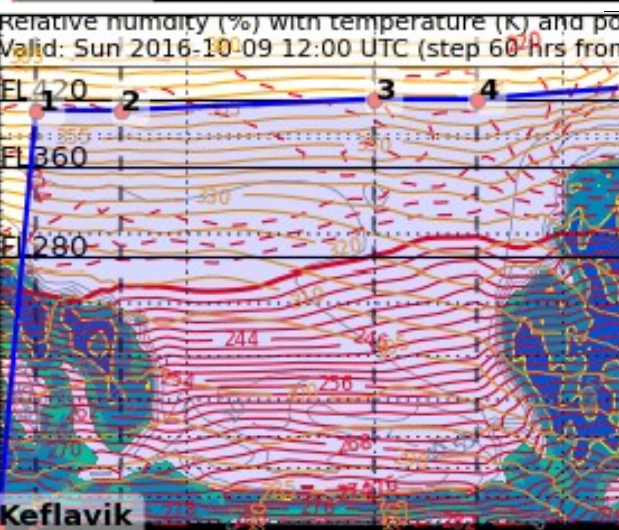
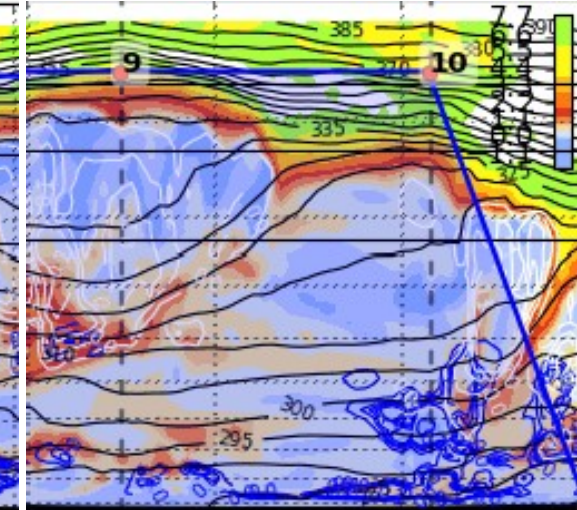
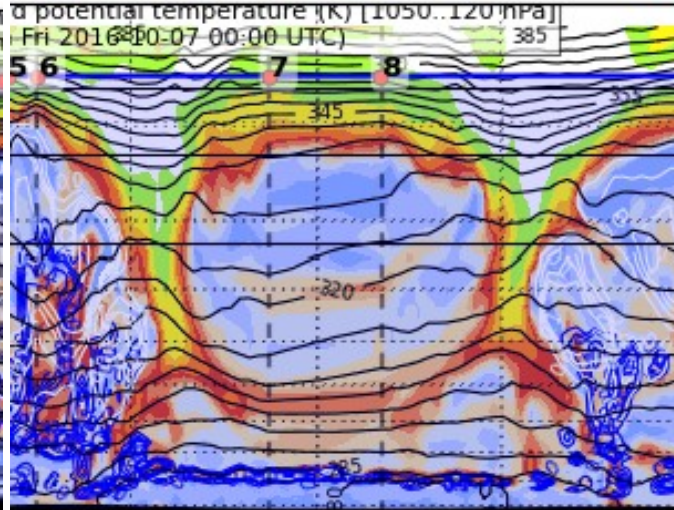
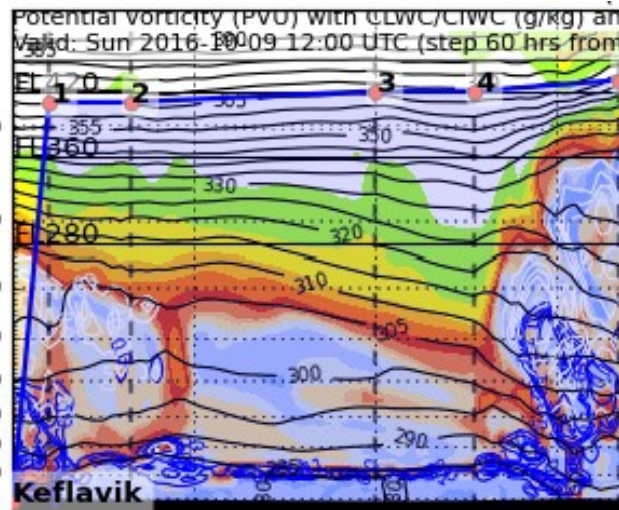


12 UTC

TH, Z at 850



# HALO flight Sun 09 Oct



12 UTC

15 UTC

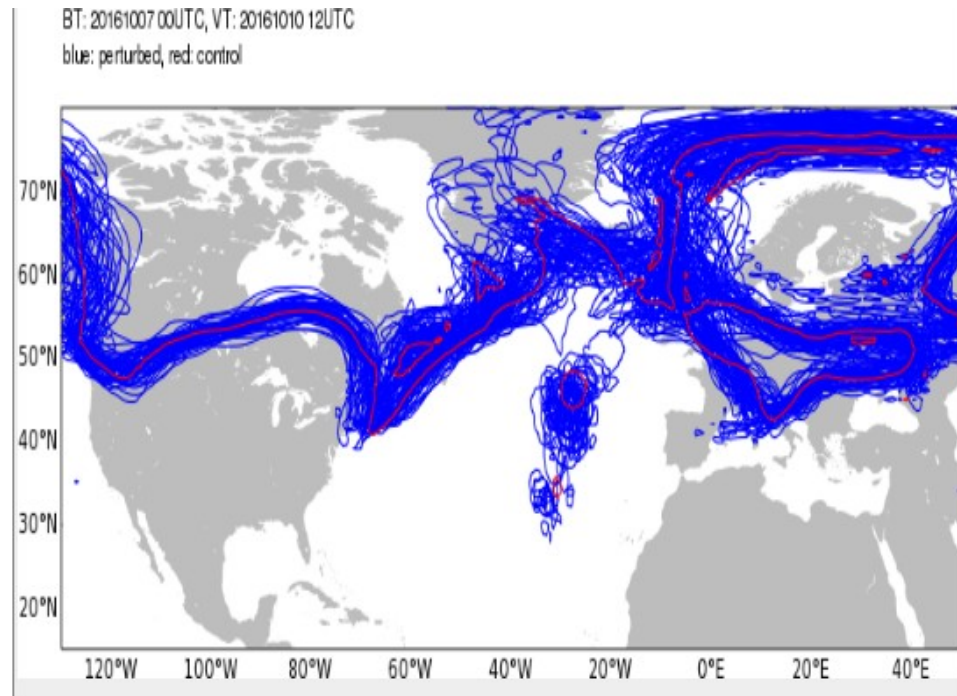
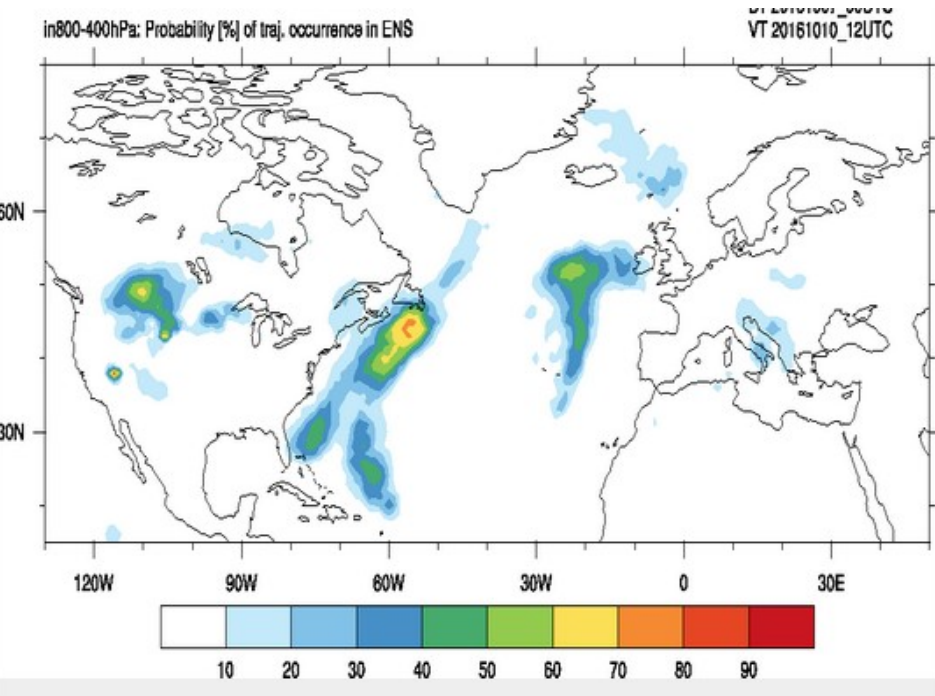
18 UTC



# Monday 10 October

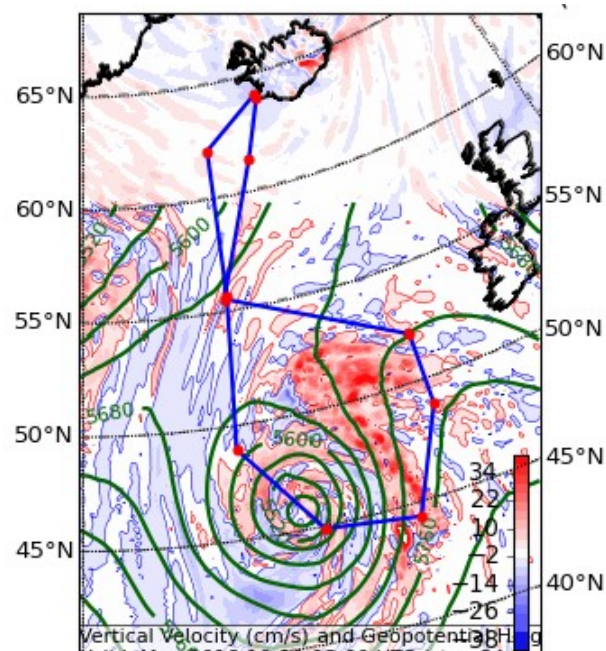
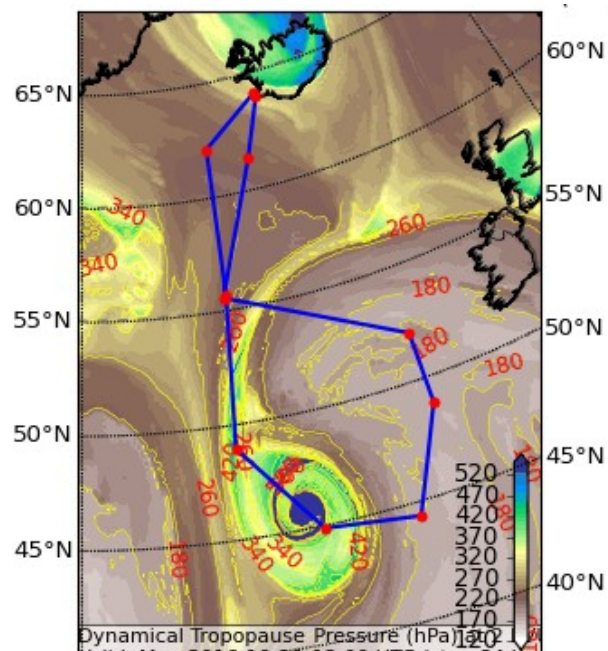
## HALO

# Outlook - Monday, 10 Oct 2016, 12 UTC

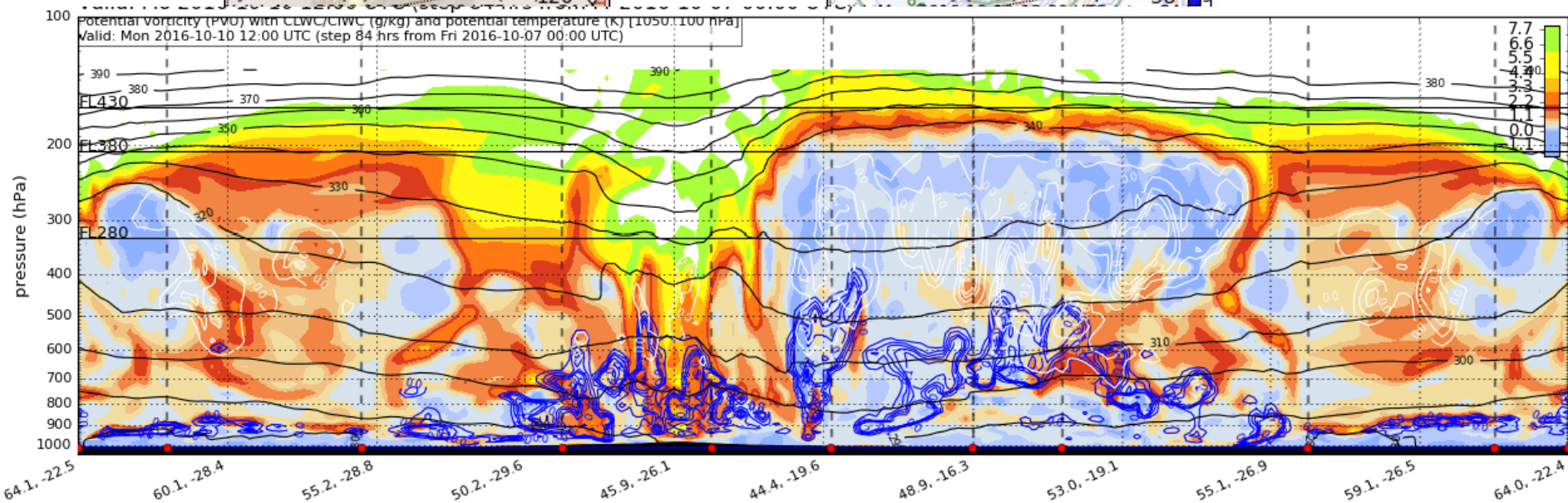




# Flightplan - Monday, 10 Oct 2016, 12 UTC



500hPa  
Vertical  
wind



# Summary plans

- **Friday 7 October IOP10?**
  - **HALO** WCB/Sat overpass and observing again ex-TPV; 11 dropsondes
- **Saturday 8 October** : Day off
- **Sunday 9 October:**
  - HALO: PV streamer break-up, moisture transport, (wcb) ascent
  - DLR Falcon / SAFIRE: WCB outflow and jet south of Iceland
- **Monday:**
  - HALO: follow-up on Sundays flight
  - No comparison flight
- **Tuesday/Wednesday:**
  - Radiometer intercomparison?