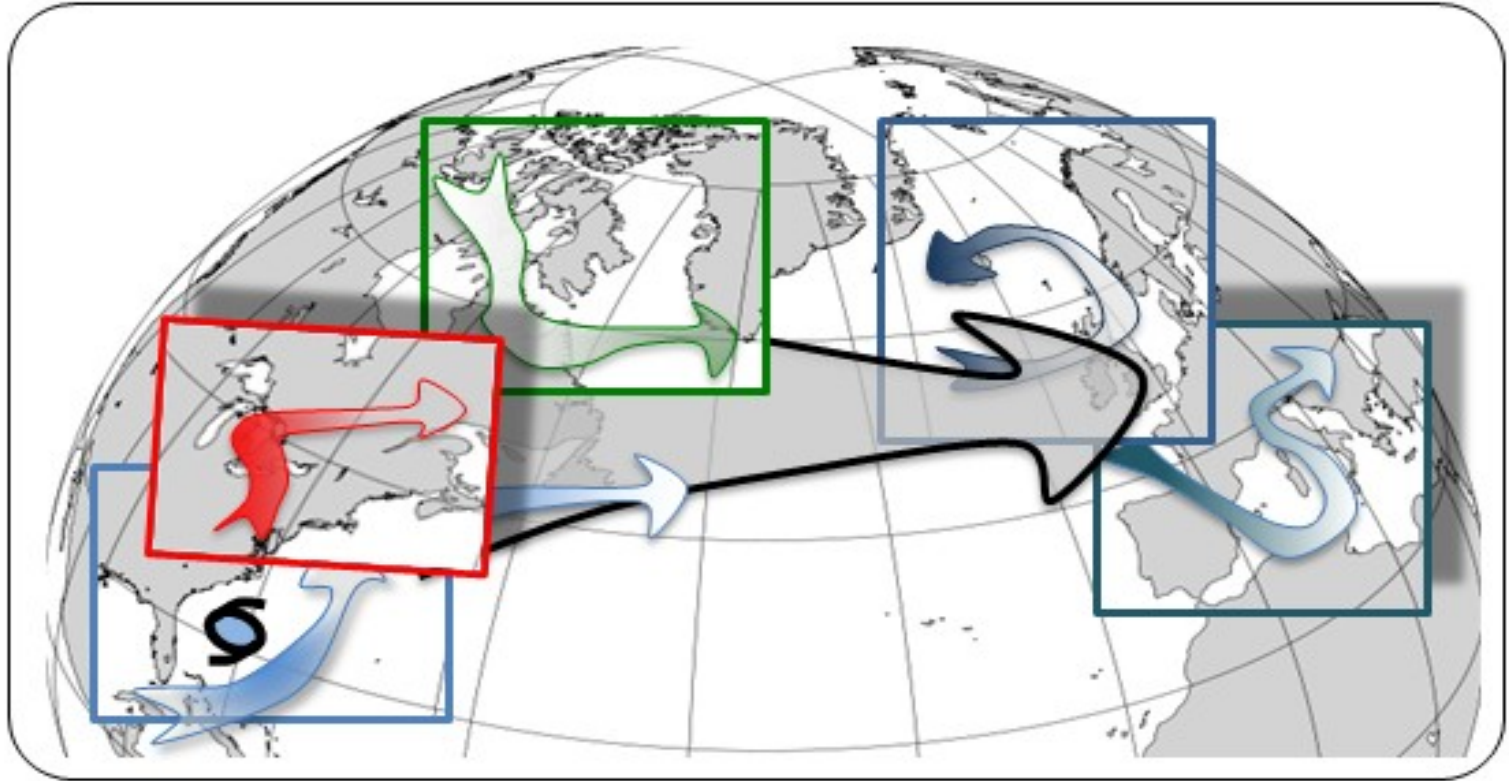


NAWDEX – General Planning Meeting

05 October 2016, Keflavik 11 UTC



Summary plans

- **Wednesday 5 October**
 - **SAFIRE** flight depends on wind conditions in Keflavik
 - **HALO** flight at 16-21 UTC?
- **Thursday 6 October**
 - **HALO** flight plan to go SW of Greenland (TPV, jet interaction)
- **Friday 7 October**
 - **HALO** and **FALCON**: coordinated flights W of Iceland (WCB ascent, TP fold, Greenland lee cyclone formation, ...), plus **SAFIRE** (moisture transport?)
- **Outlook Saturday-Monday 8-10 October:**
 - Situation rather uncertain; possibility for HPE over Europe; not too much „dynamics“ near Iceland

NAWDEX – General Planning Meeting

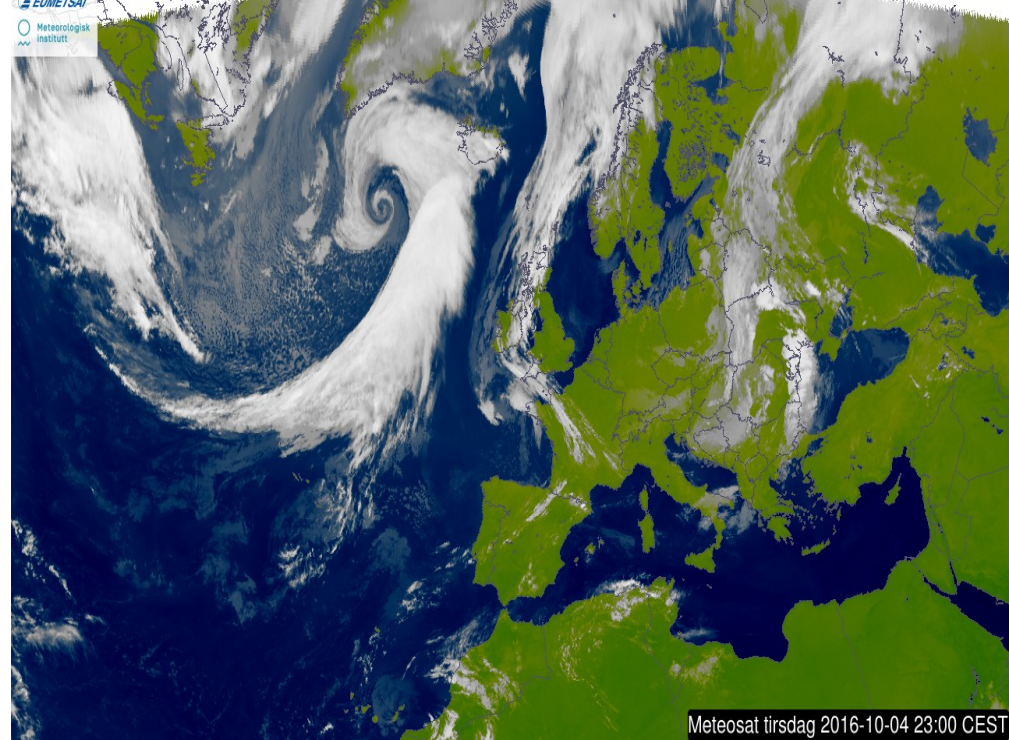
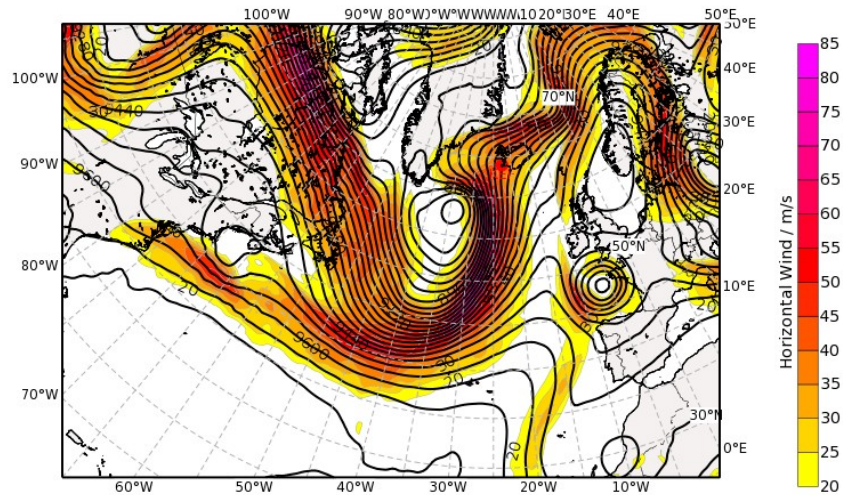
05 October 2016, Keflavik 11 UTC

Key issues today

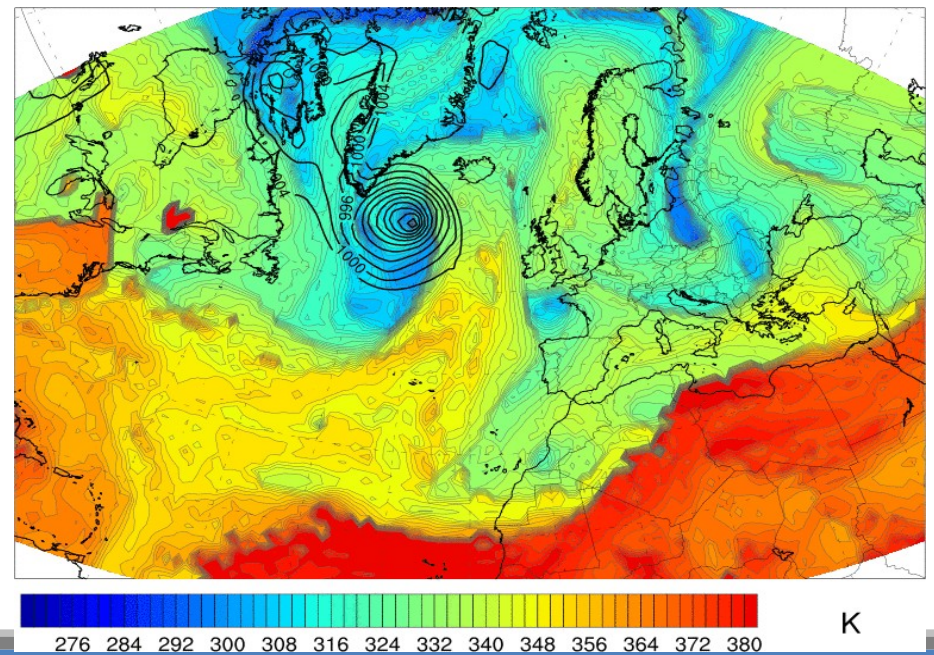
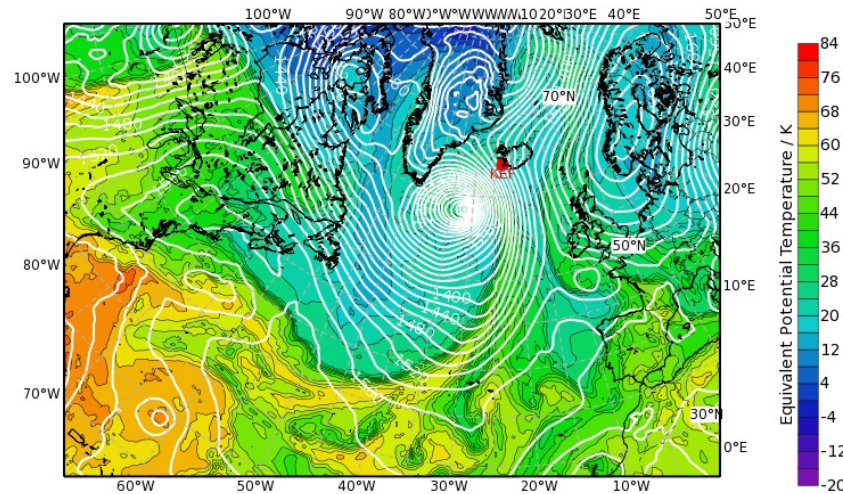
1. Flights today with SAFIRE and HALO? (FALCON has down day)
2. Flight plans for Thursday and Friday
 - Thu: HALO yes, FALCON no, SAFIRE tbd
 - Fri: interesting situation for all aircraft
3. Radiosonde task team: who can help with technical work?

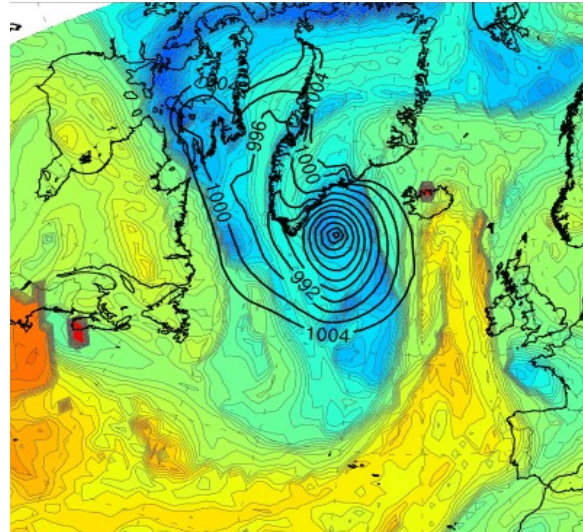
Analysis – 05 Oct 2016, 00 UTC

Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Wed, 05 Oct 2016, 00 UTC (step 000 h from Wed, 05 Oct 2016, 00 UTC)



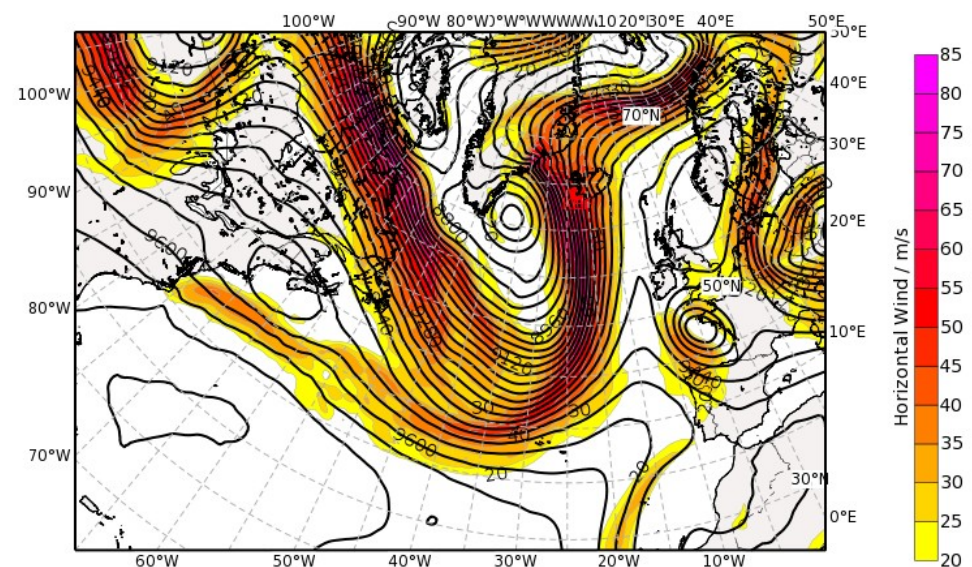
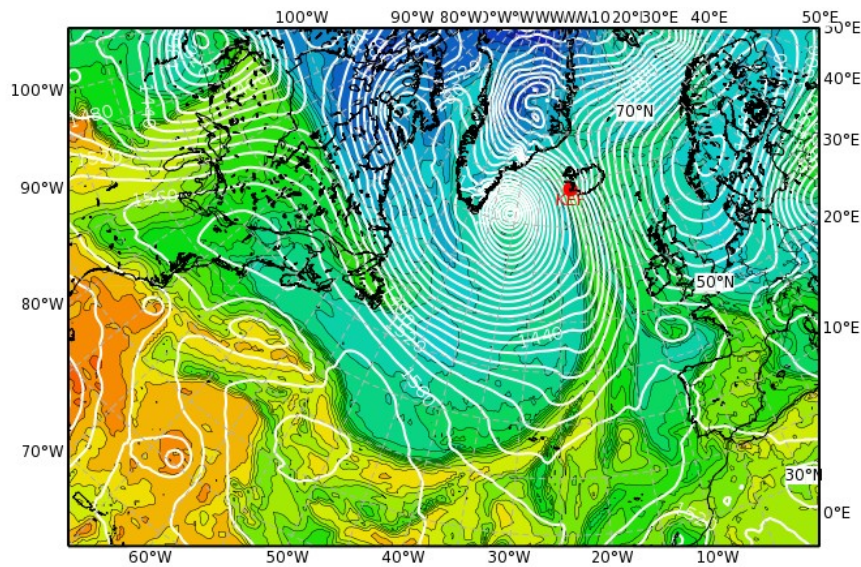
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 05 Oct 2016, 00 UTC (step 000 h from Wed, 05 Oct 2016, 00 UTC)

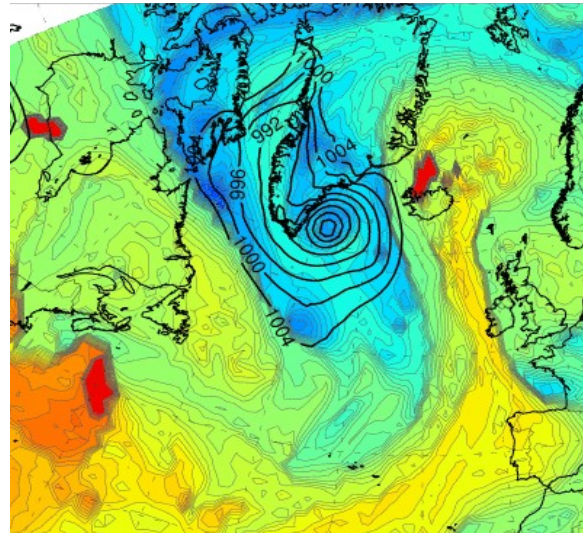




Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 05 Oct 2016, 12 UTC (step 012 h from Wed, 05 Oct 2016, 00 UTC)

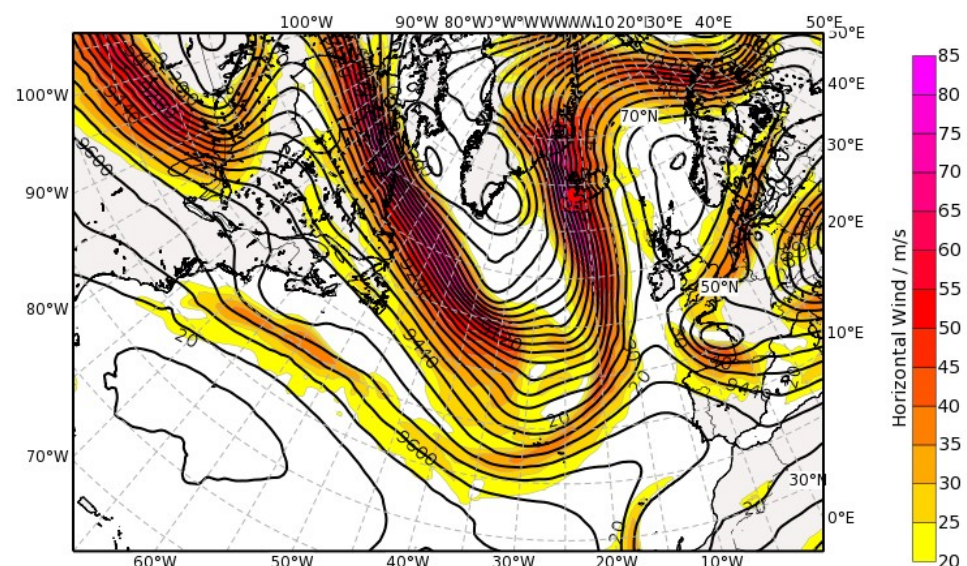
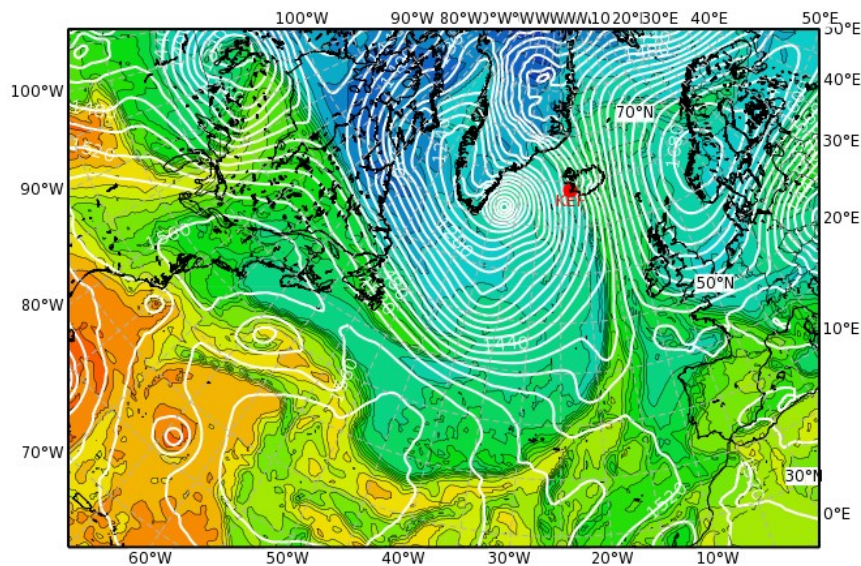
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Wed, 05 Oct 2016, 12 UTC (step 012 h from Wed, 05 Oct 2016, 00 UTC)

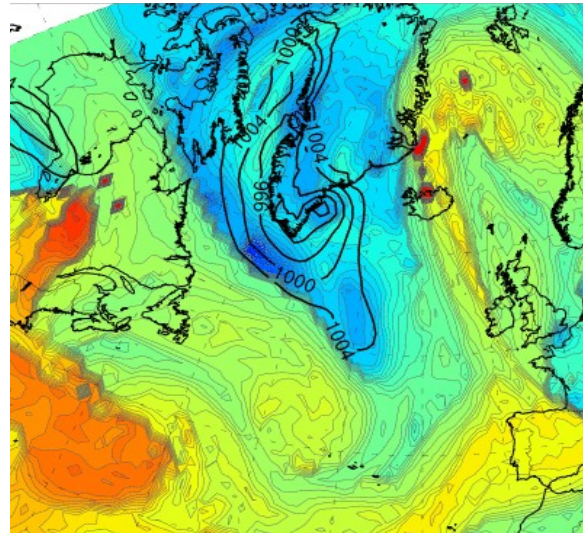




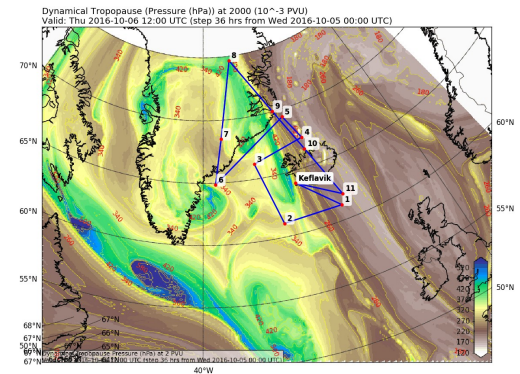
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Thu, 06 Oct 2016, 00 UTC (step 024 h from Wed, 05 Oct 2016, 00 UTC)

Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Thu, 06 Oct 2016, 00 UTC (step 024 h from Wed, 05 Oct 2016, 00 UTC)



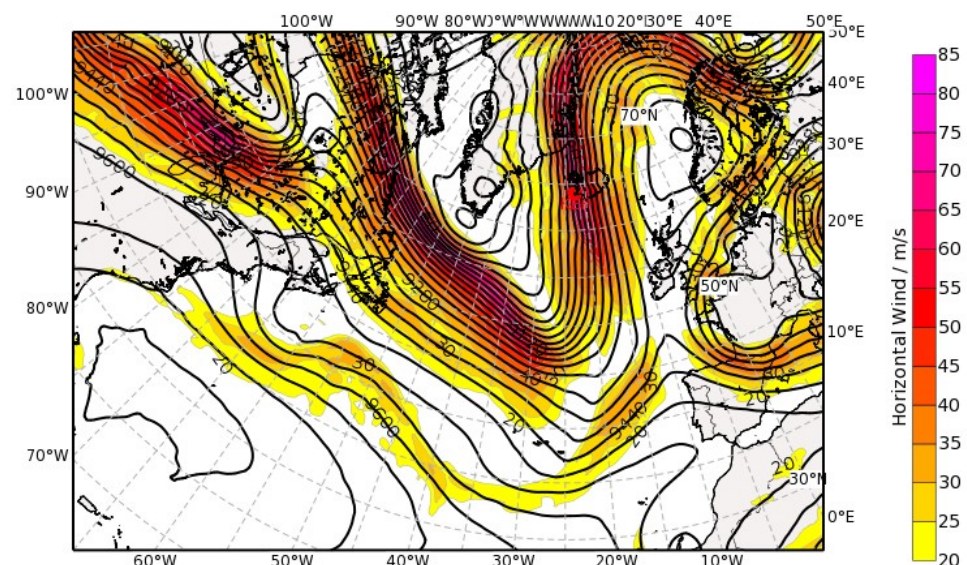
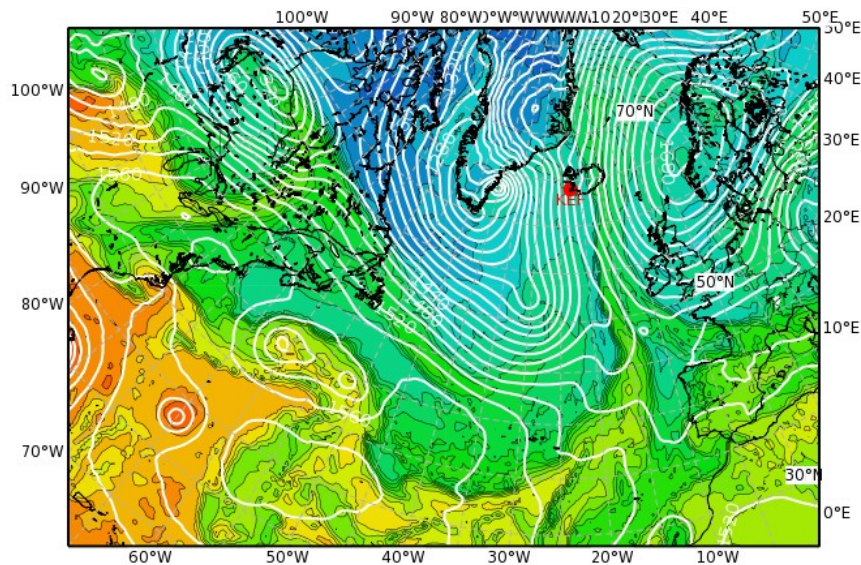


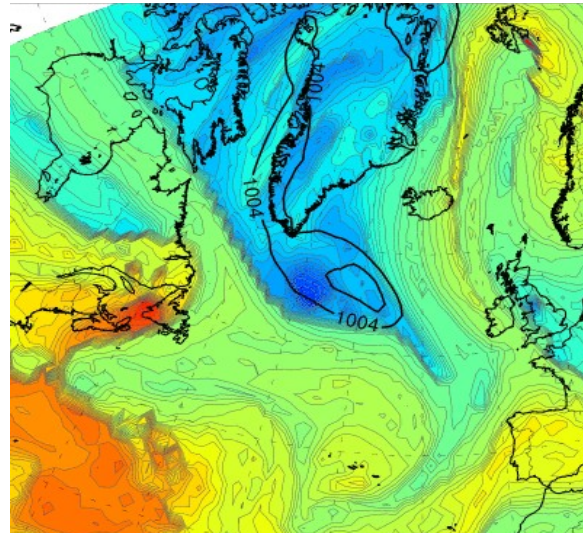
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Thu, 06 Oct 2016, 12 UTC (step 036 h from Wed, 05 Oct 2016, 00 UTC)



Pressure at tropopause

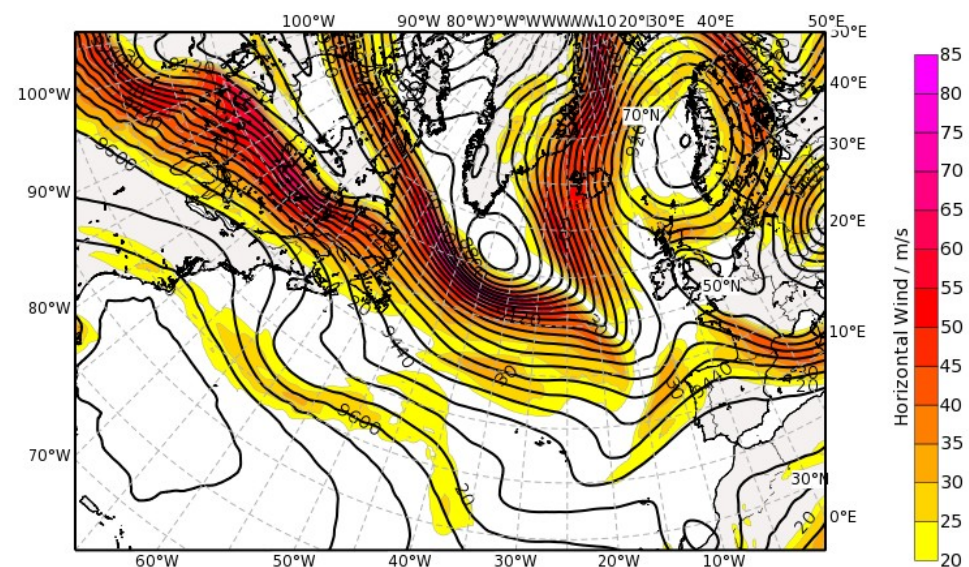
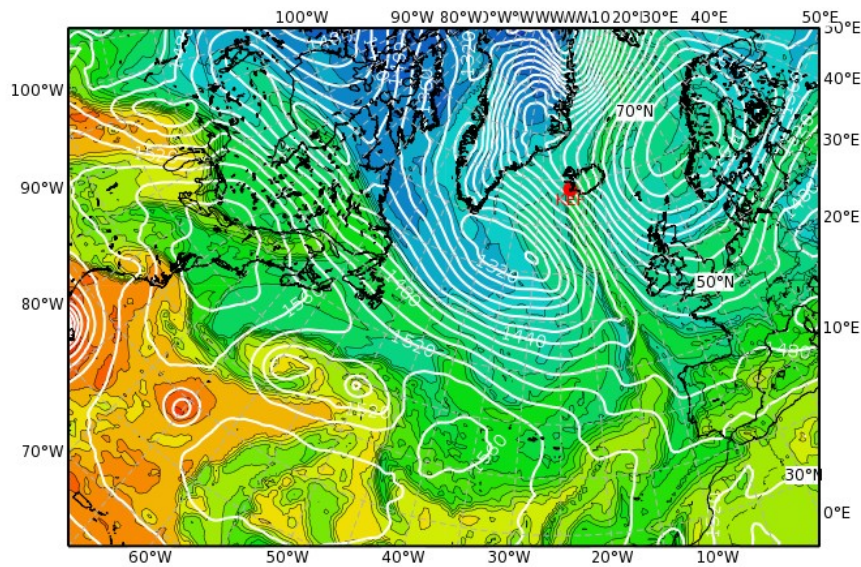
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Thu, 06 Oct 2016, 12 UTC (step 036 h from Wed, 05 Oct 2016, 00 UTC)

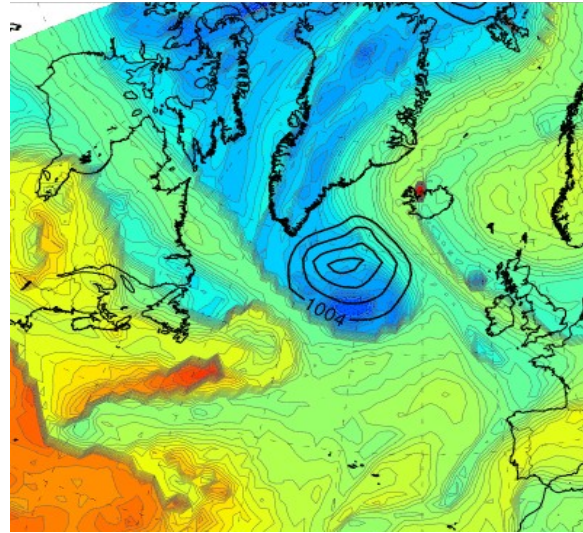




Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Fri, 07 Oct 2016, 00 UTC (step 048 h from Wed, 05 Oct 2016, 00 UTC)

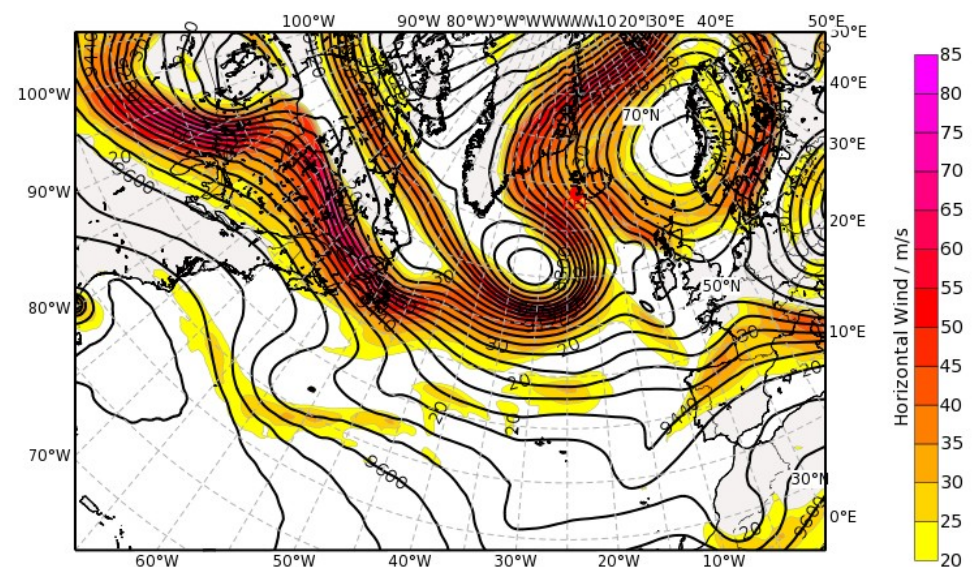
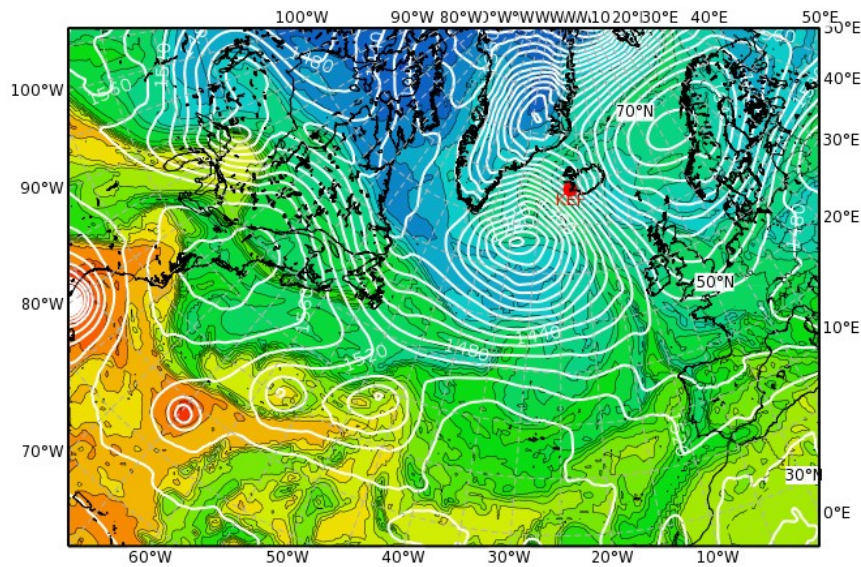
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Fri, 07 Oct 2016, 00 UTC (step 048 h from Wed, 05 Oct 2016, 00 UTC)





Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Fri, 07 Oct 2016, 12 UTC (step 060 h from Wed, 05 Oct 2016, 00 UTC)

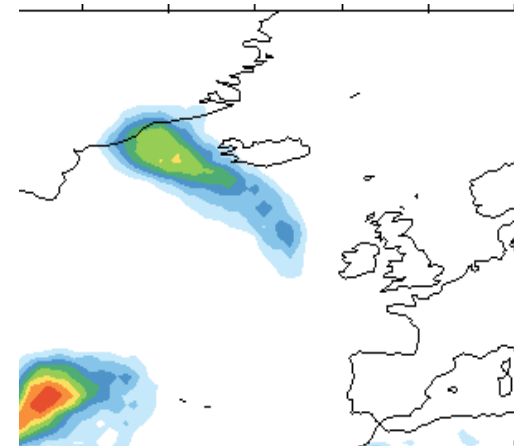
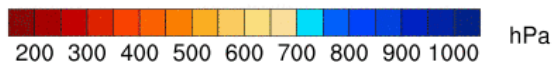
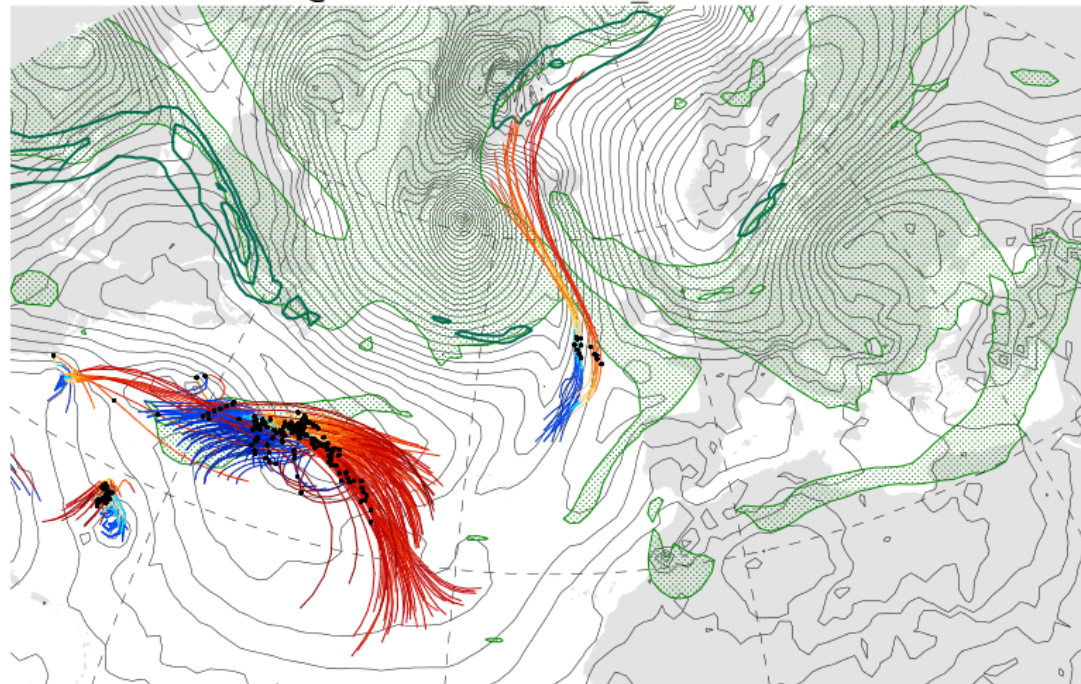
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Fri, 07 Oct 2016, 12 UTC (step 060 h from Wed, 05 Oct 2016, 00 UTC)



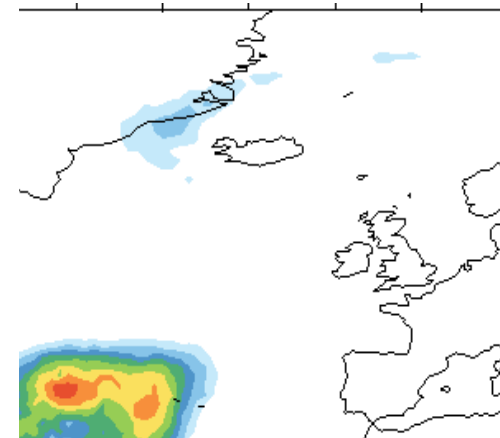
WCB activity on Friday 7 12UTC

Trajectory start and SLP VT: 20161005_12
WCB outflow and PV@250hPa VT: 20161007_12

BT 04/12Z



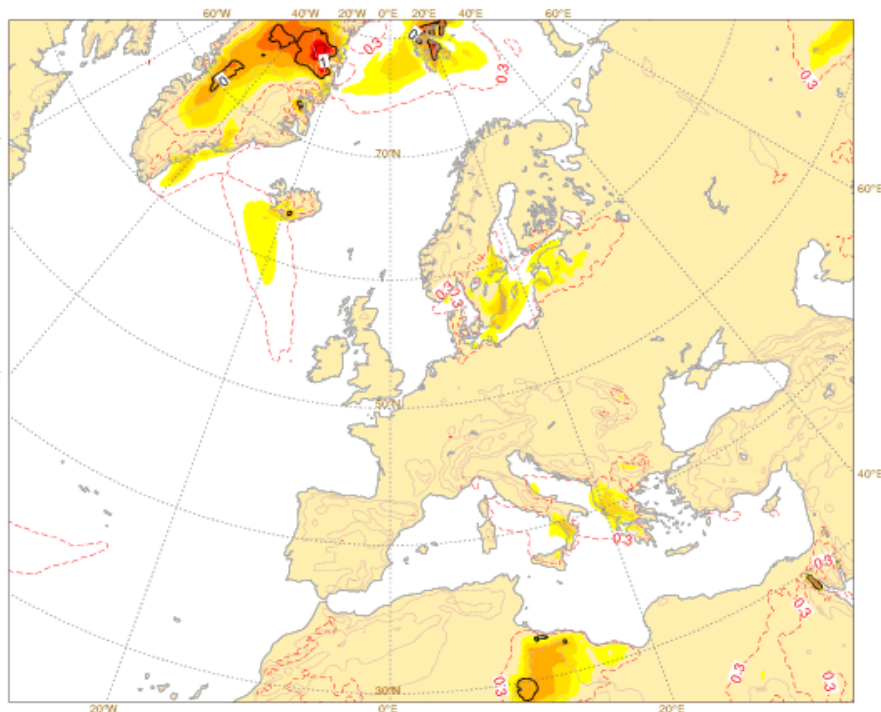
ASCENT



OUTFLOW

Wind constraints for Fri 07 (BT 05/00Z)

Wed 05 Oct 2016 00UTC @ECMWF t+48-72h VT: Fri 07 Oct 2016 00UTC - Sat 08 Oct 2016 00UTC
Extreme forecast index and Shift of Tails (black contours 0,1,2,5,8) for 10m wind gusts



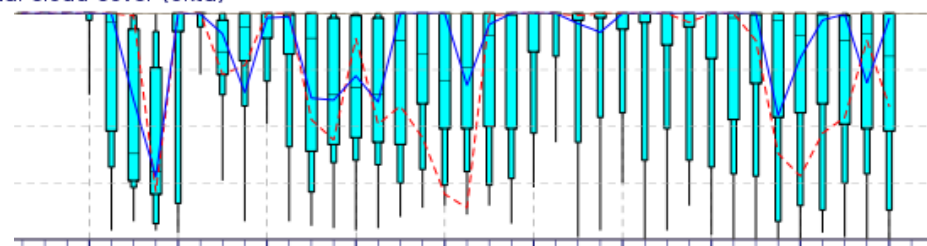
- Possibility of strong wind gusts (>20 m/s) on Friday afternoon from South-East.

ENS Meteogram

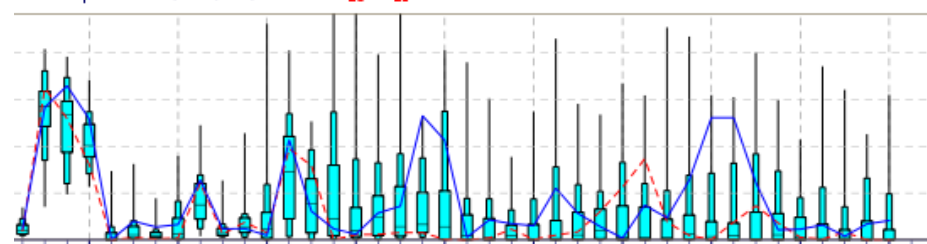
Keflavik, Iceland 63.89°N 22.26°W (ENS land point) 5 m

High Resolution Forecast and ENS Distribution Wednesday 5 October 2016 00 UTC

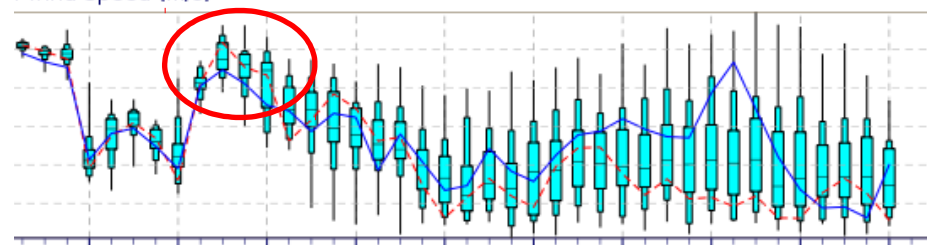
Total Cloud Cover (okta)



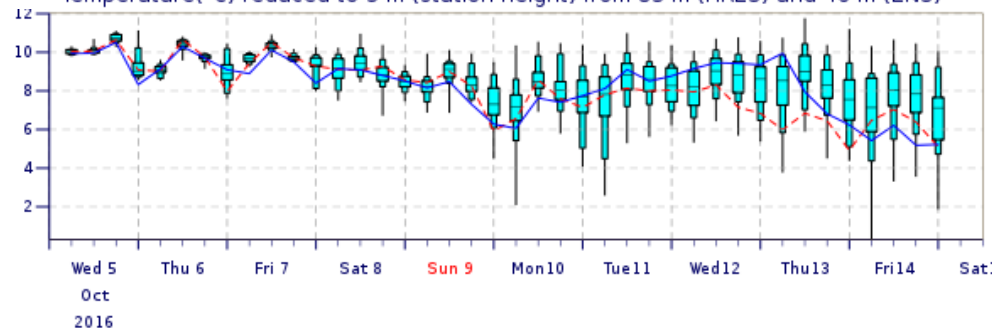
11 Precipitation (mm/6h)



1 Wind Speed (m/s)



Temperature(°C) reduced to 5 m (station height) from 83 m (HRES) and 46 m (ENS)



Wednesday 5 October

HALO flight

Scientific Objective of Wednesday flight

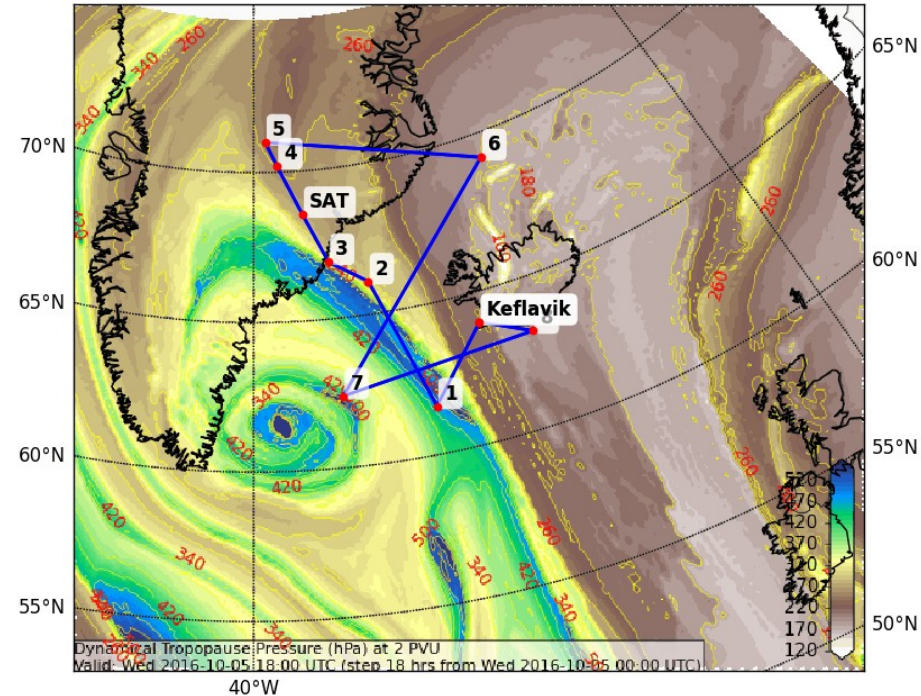
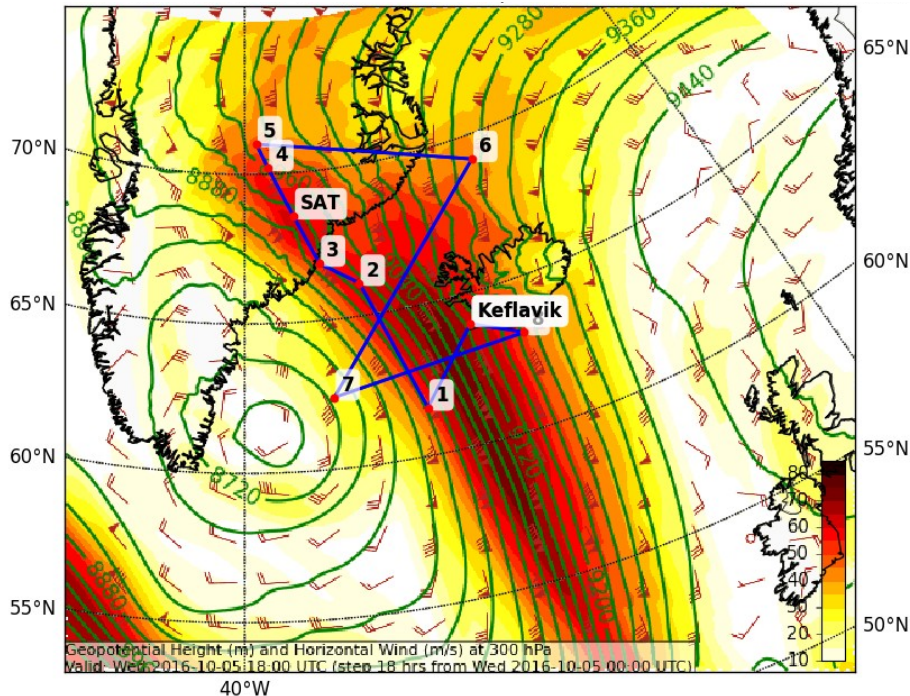
- Moisture transport
- Phases of the WCB ascent: strong ascent region
- ~~Satellite overpass~~
- Coordinated leg with SAFIRE
- CAT measurement
- Takeoff ~16 UTC
- Landing ~21 UTC

Change since yesterday: Shift of time by 3 hours

Wednesday 5 October HALO flight

Geopot (m) & Hor Wind (m/s) at 300 hPa

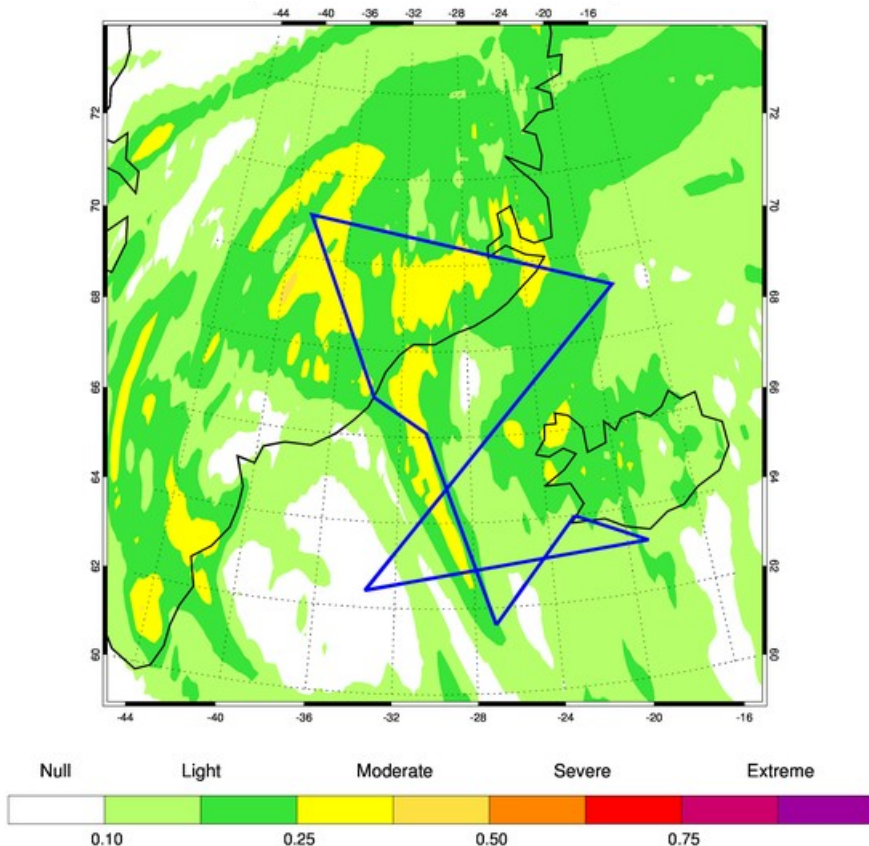
P (hPa) at 2 PVU



BT05/00Z VT05/18Z

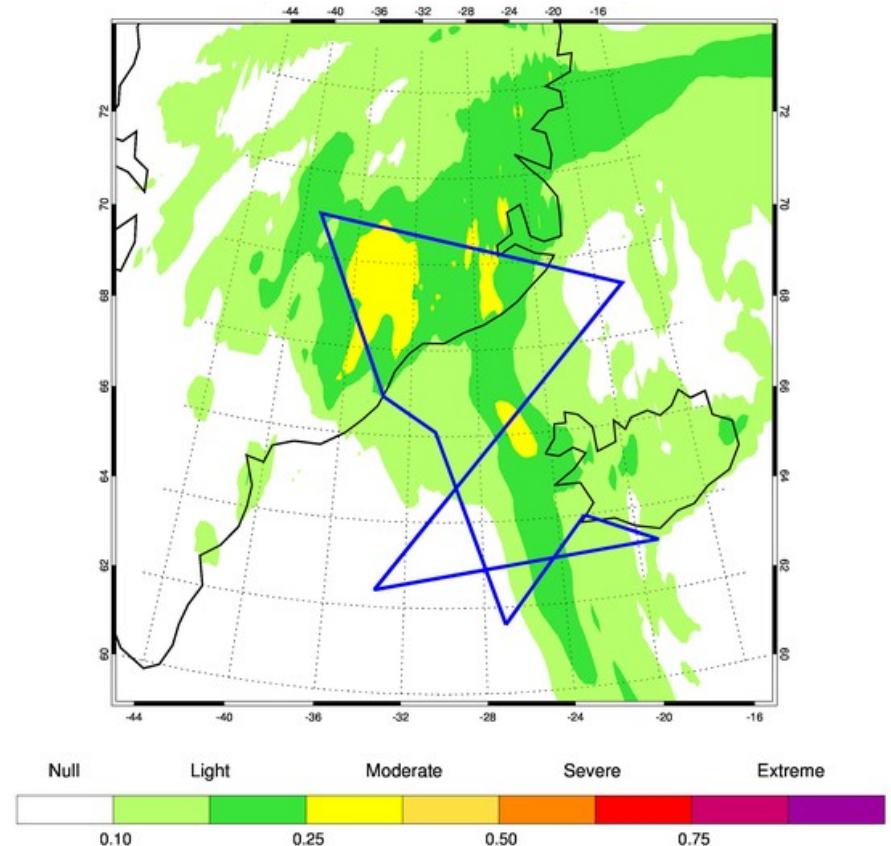
Wednesday 5 October HALO flight

EDR ($\text{m}^{2/3} / \text{s}$) at FL290



BT05/00Z VT05/15Z

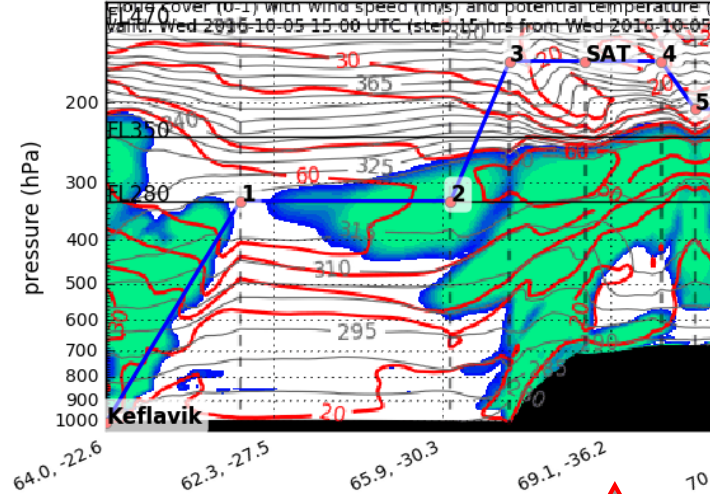
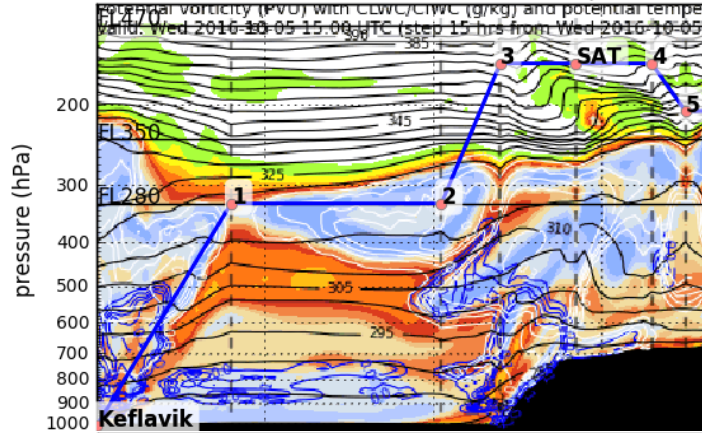
EDR ($\text{m}^{2/3} / \text{s}$) at FL380



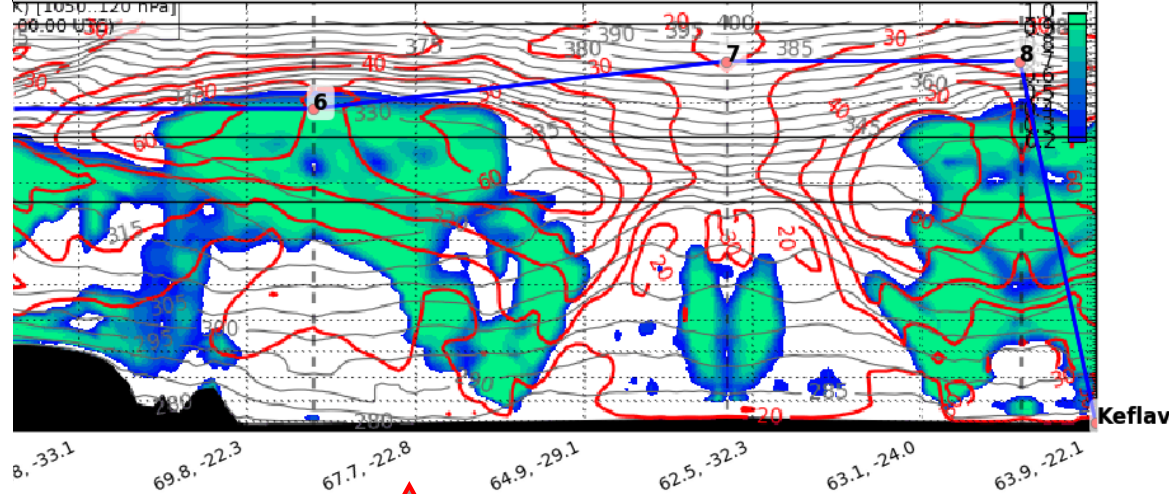
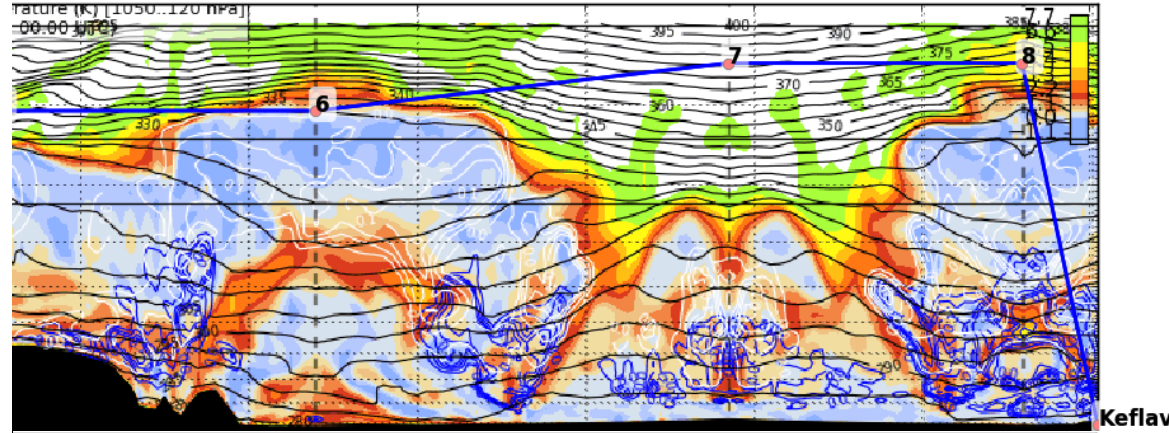
BT05/00Z VT05/18Z

Wednesday 5 October HALO flight

Potential Vorticity (PVU) Vertical Section (Northern Hemisphere)
Valid: Wed 2016-10-05 15:00 UTC (step 15 hrs from Wed 2016-10-05 00:00 UTC)



Potential Vorticity (PVU) Vertical Section (Northern Hemisphere)
Valid: Wed 2016-10-05 00:00 UTC (step 15 hrs from Wed 2016-10-05 00:00 UTC)



BT05/00Z VT05/15Z

+ SAFIRE

2 ★

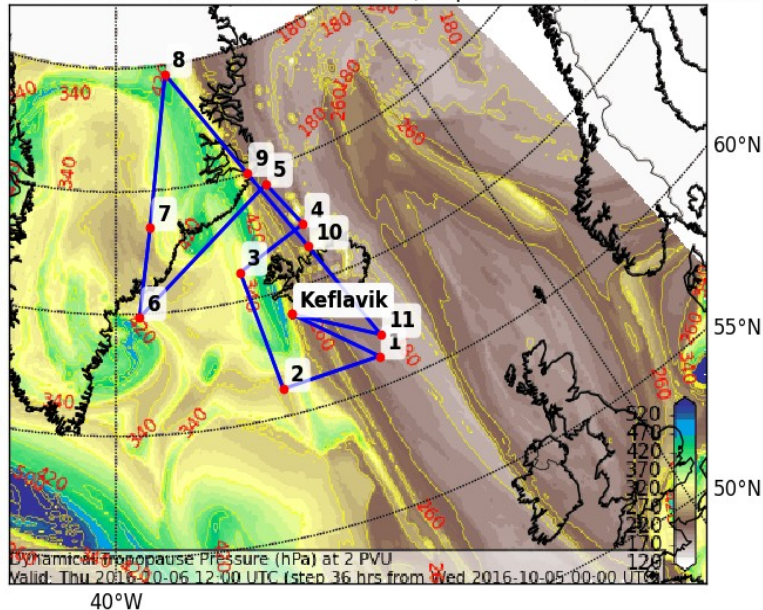
BT05/00Z VT05/18Z

Halo Thursday – Plan Z

HALO flighttrack 06/10/2016, 12 UTC

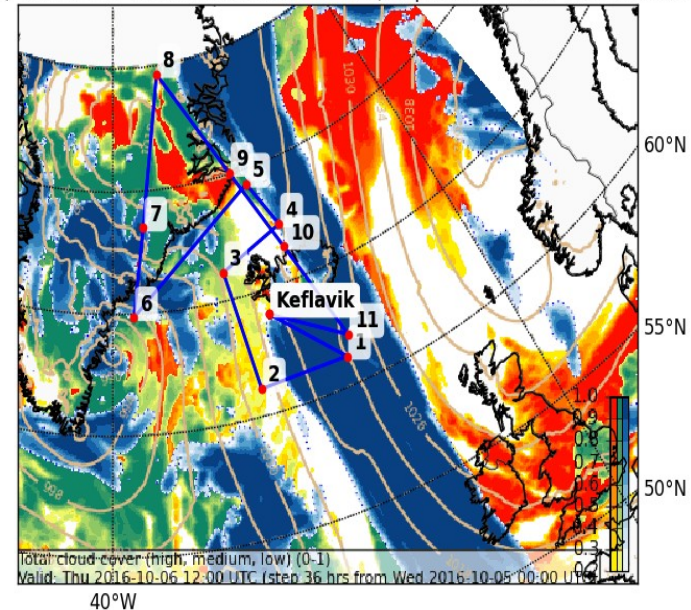
Dynamical Tropopause (Pressure (hPa)) at 2000 (10^{-3} PVU)

Valid: Thu 2016-10-06 12:00 UTC (step 36 hrs from Wed 2016-10-05 00:00 UTC)



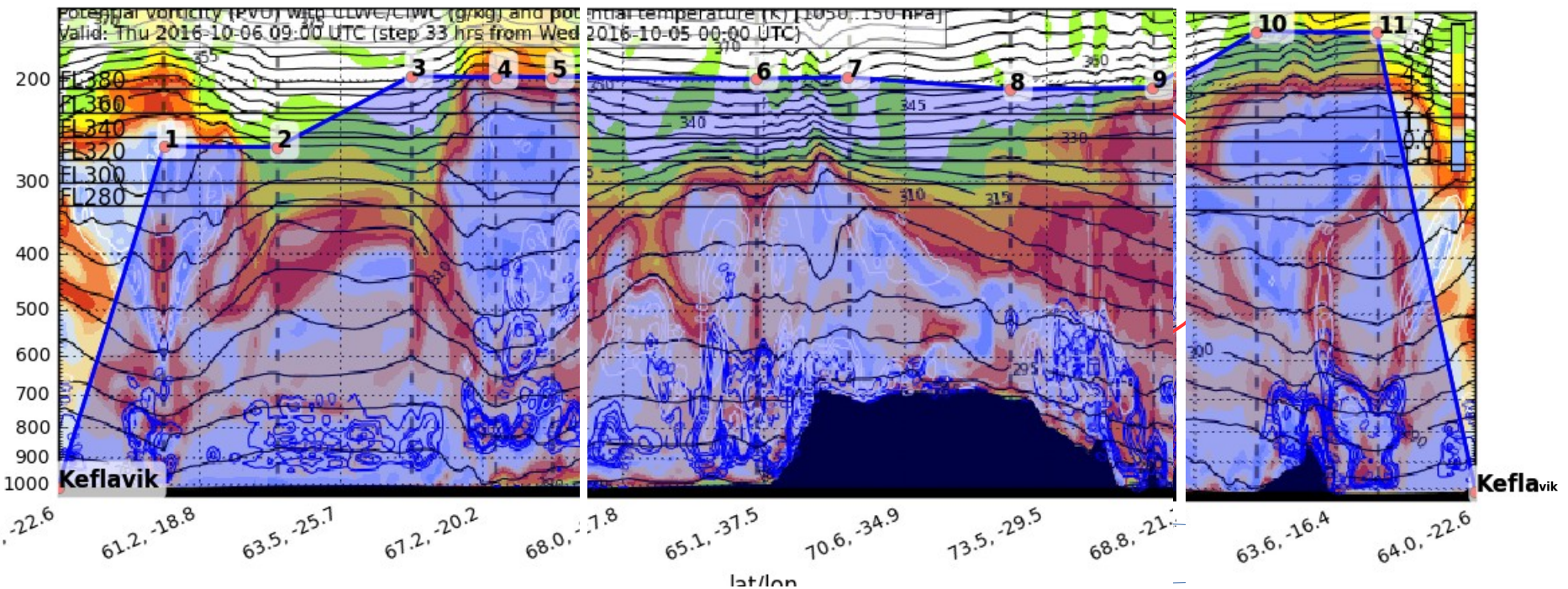
Cloud Cover (0-1) (Total Cloud Cover)

Valid: Thu 2016-10-06 12:00 UTC (step 36 hrs from Wed 2016-10-05 00:00 UTC)



- Tropopause structure of south-north oriented jet
- Structure of tropopause disturbance west of Iceland
- Mixed-phase clouds over Greenland
- Calipso satellite overpass at around 13:41 UTC
- Coordinated leg with Safire Falcon
- Turbulence measurements in strong jet stream

HALO flighttrack 06/10/2016



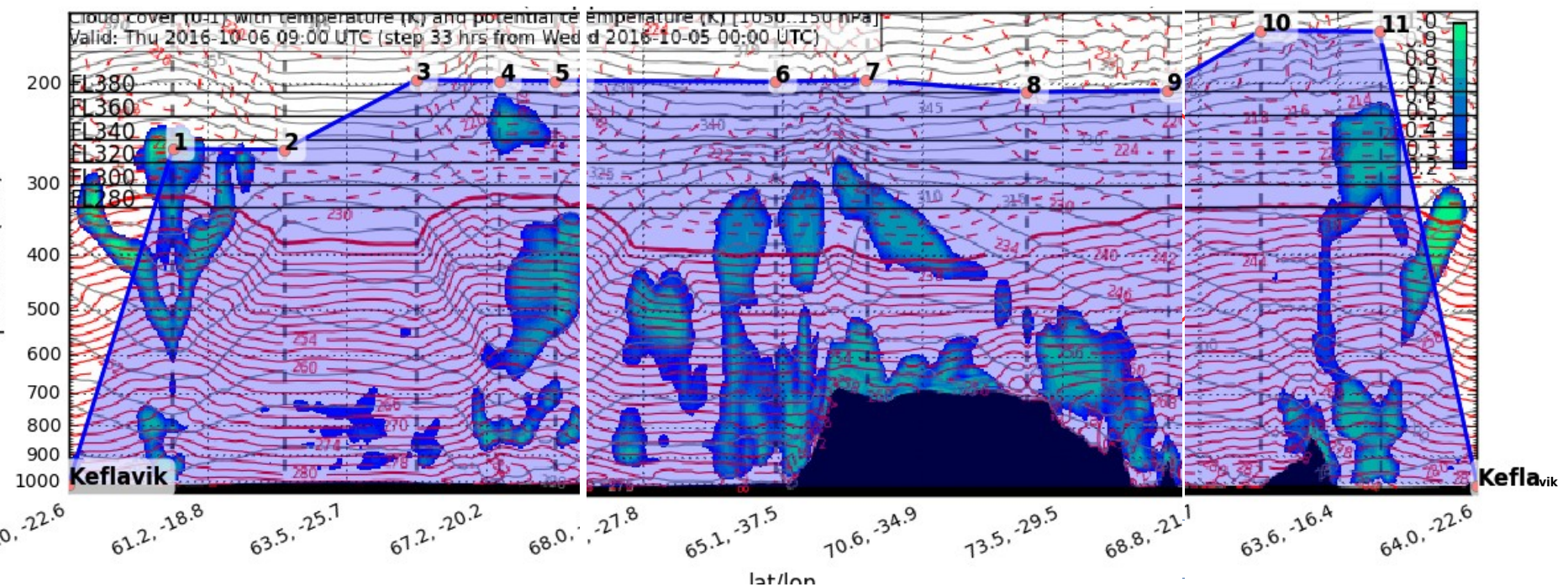
Trop disturbance

Sat overpass
13:42-13:46 UTC



WCB ascent and
outflow

HALO flighttrack 06/10/2016



Trop disturbance

Sat overpass
13:42-13:46 UTC

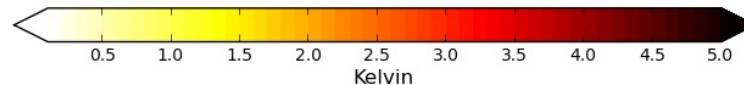
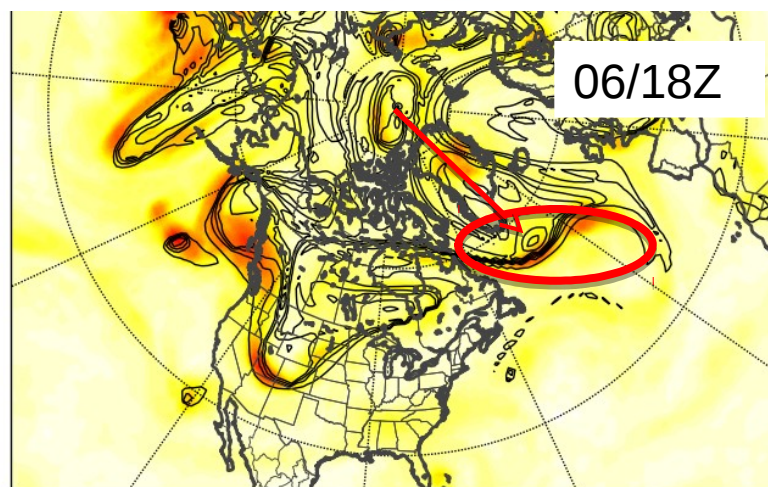
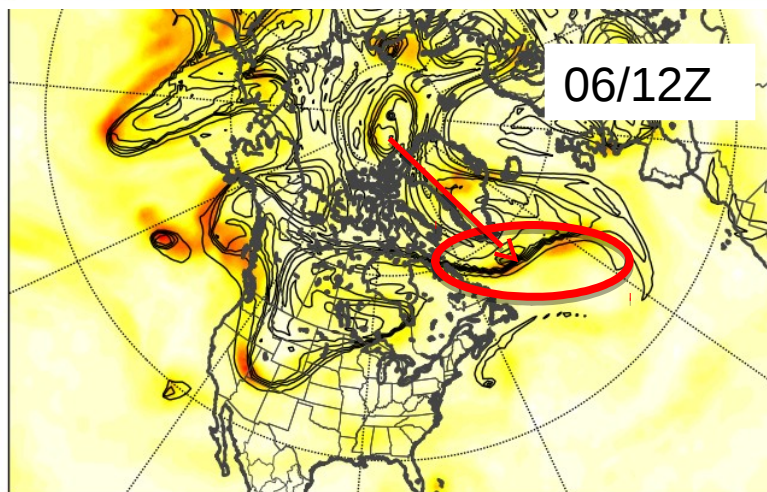
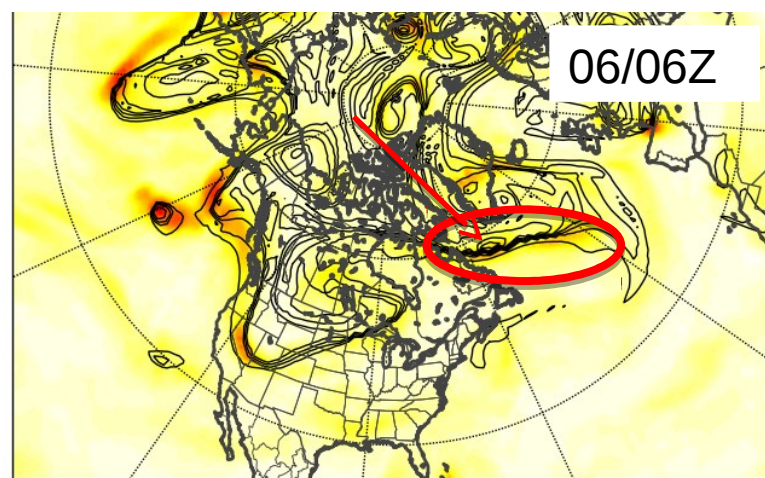
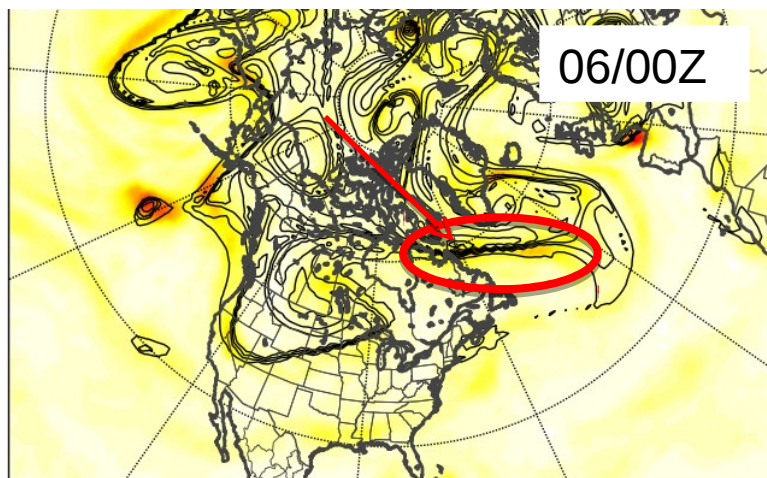


WCB ascent and
outflow

Halo Thursday – Plan Y

GEFS Theta@2PVU spread

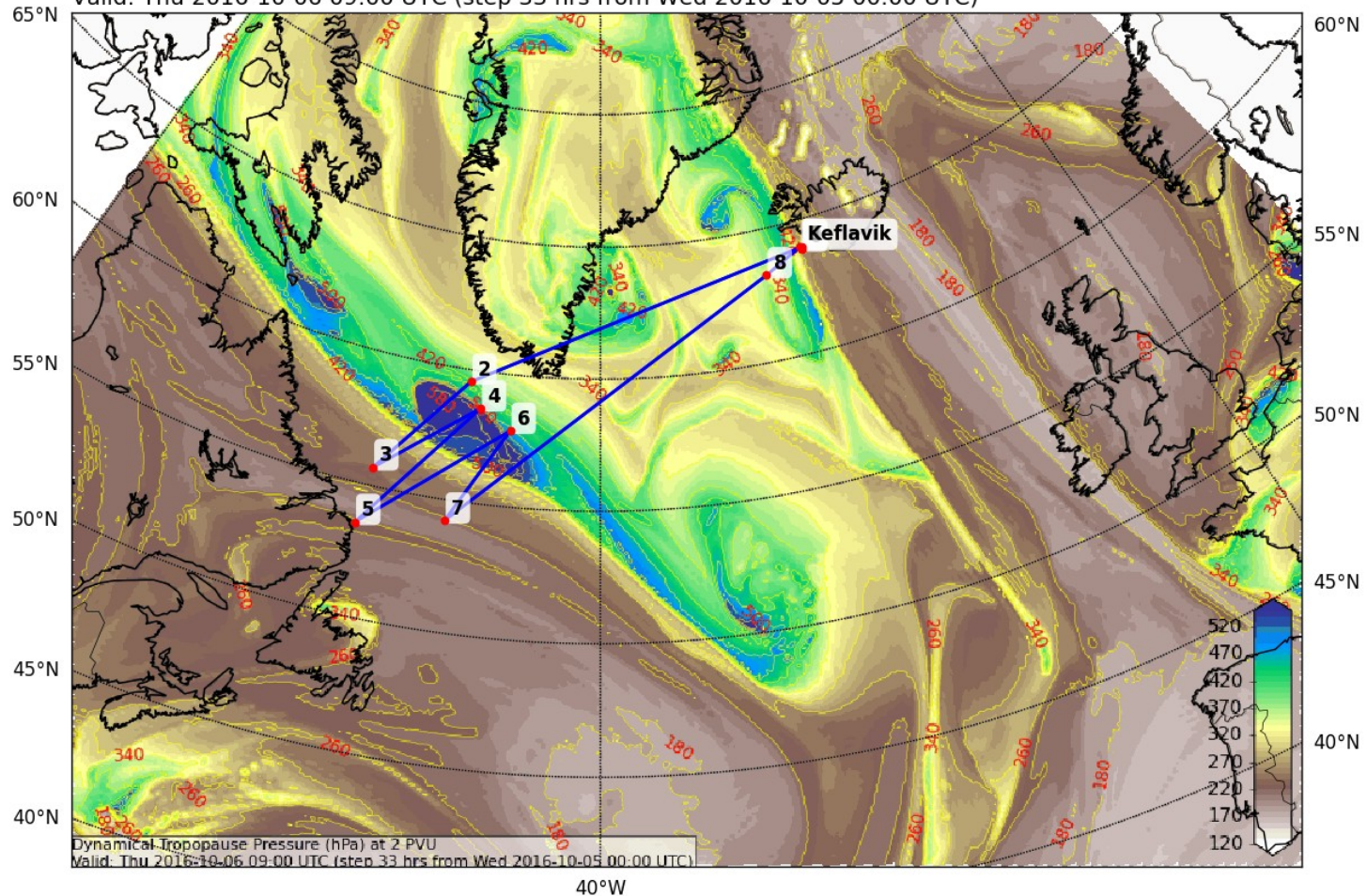
BT 04/00Z



HALO flighttrack 06/10/2016, 15 UTC

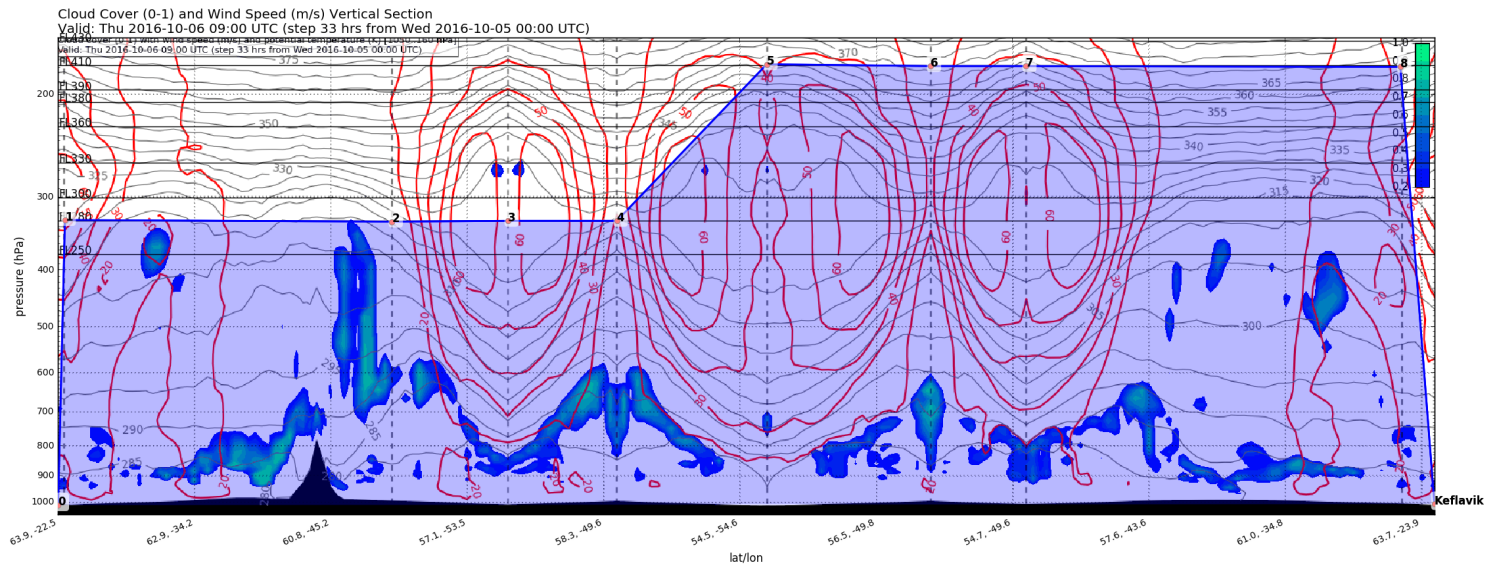
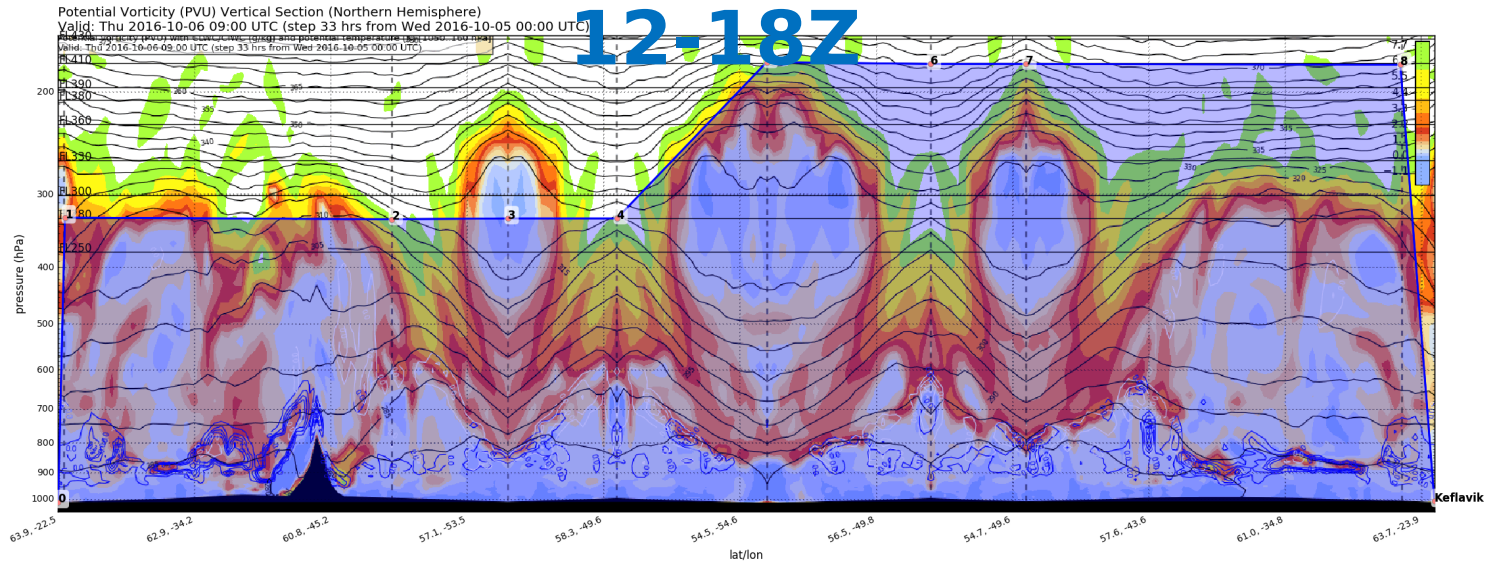
Dynamical Tropopause (Pressure (hPa)) at 2000 (10^{-3} PVU)

Valid: Thu 2016-10-06 09:00 UTC (step 33 hrs from Wed 2016-10-05 00:00 UTC)



HALO flighttrack 06/10/2016,

12-18Z

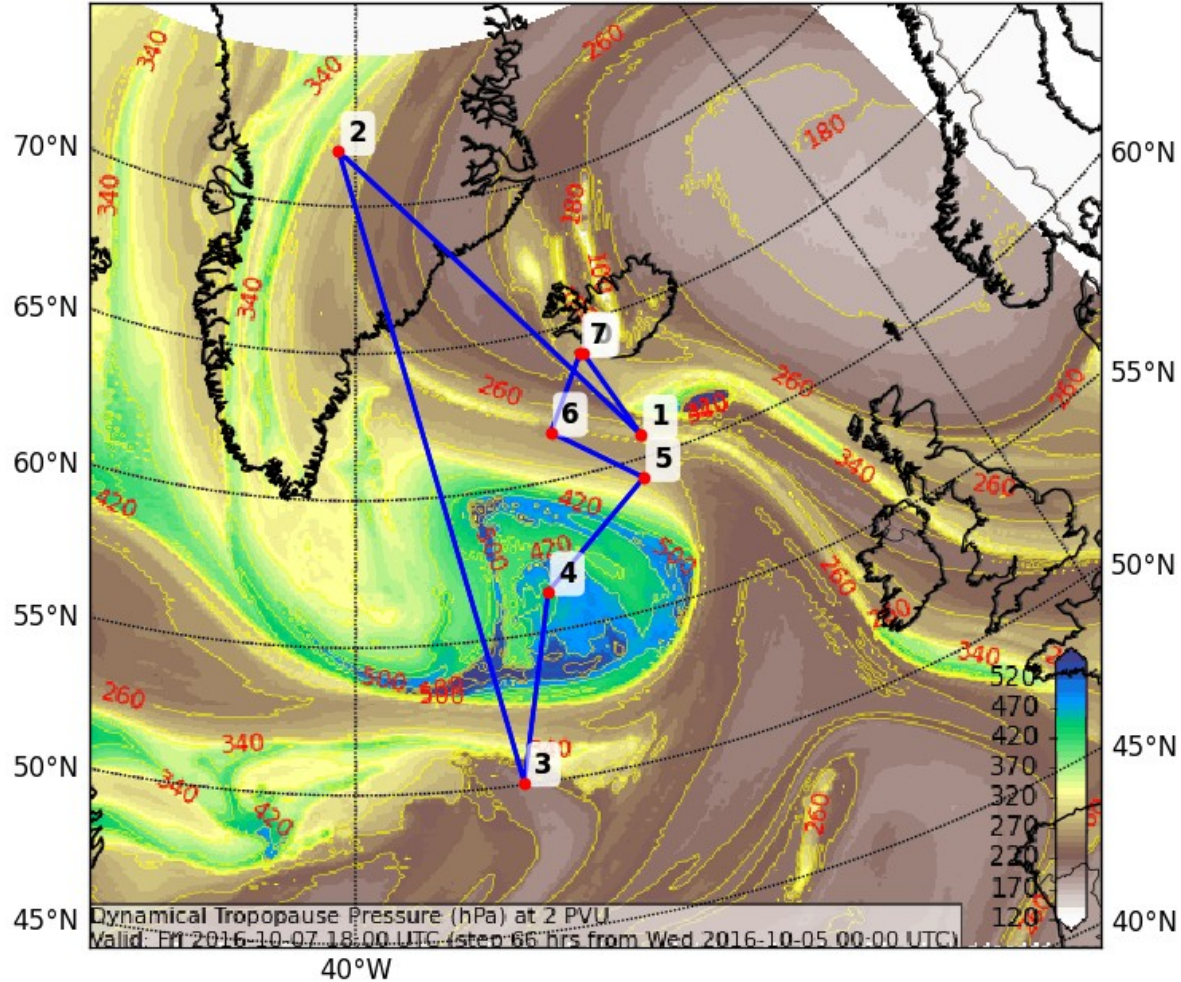


Objectives

- NAWDEX objective “moisture and cloud structure in tropopause region”
 - Moisture gradient across tropopause
 - Modification of PV through radiation
- Lagrangian tracking of TPV system THU-FRI
- Forecast uncertainty due to TPV interacting with jet streak -> Important for FRI-SAT evolution
- Ridge building/amplification due to balanced flow

Halo Friday – Preliminary

Dynamical Tropopause (Pressure (hPa)) at 2000 (10^{-3} PVU)
Valid: Fri 2016-10-07 18:00 UTC (step 66 hrs from Wed 2016-10-05 00:00 UTC)



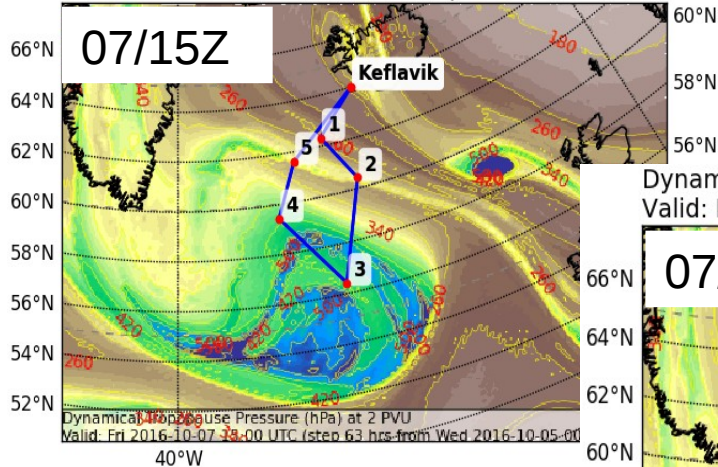
EPSG:77760320

DLR Falcon Friday

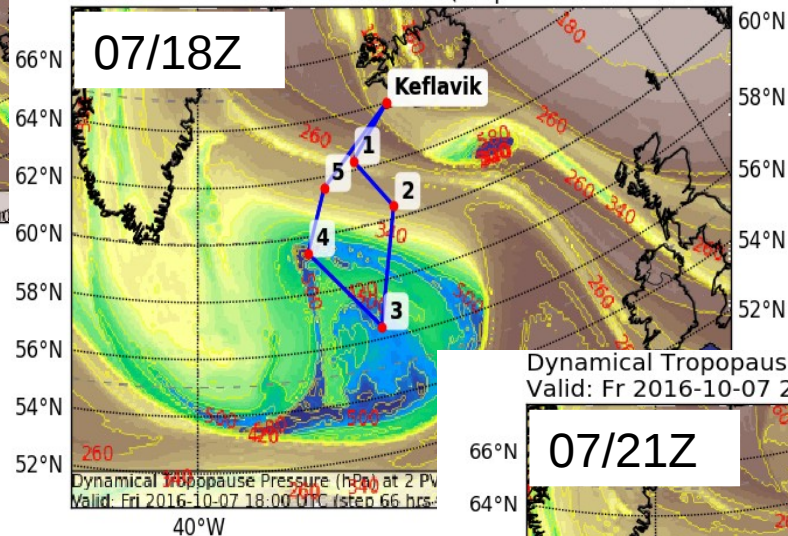
DLR Falcon flighttrack 07/10/2016, 15-21Z

BT 05/00Z

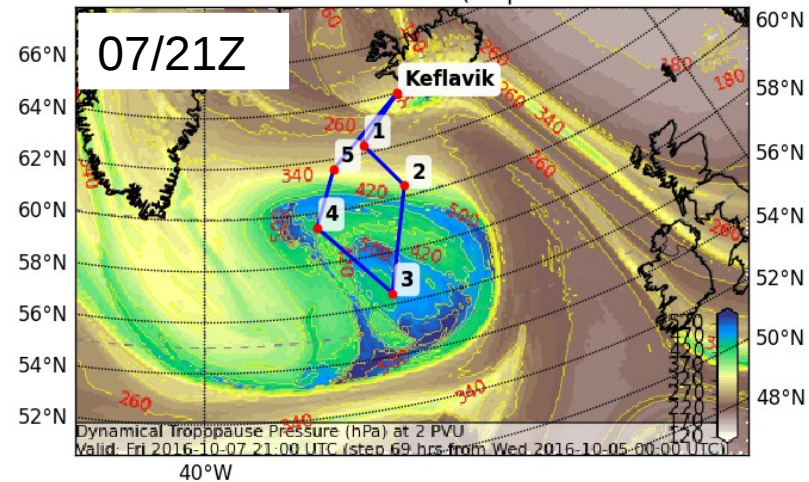
Dynamical Tropopause (Pressure (hPa)) at 2000 (10^{-3} PVU)
Valid: Fr 2016-10-07 15:00 UTC (step 63 hrs from Mi 2016-10-05-00 UTC)



Dynamical Tropopause (Pressure (hPa)) at 2000 (10^{-3} PVU)
Valid: Fr 2016-10-07 18:00 UTC (step 66 hrs from Mi 2016-10-05-00 UTC)



Dynamical Tropopause (Pressure (hPa)) at 2000 (10^{-3} PVU)
Valid: Fr 2016-10-07 21:00 UTC (step 69 hrs from Mi 2016-10-05-00 UTC)



TPV feature moves closer to KEF during the day.

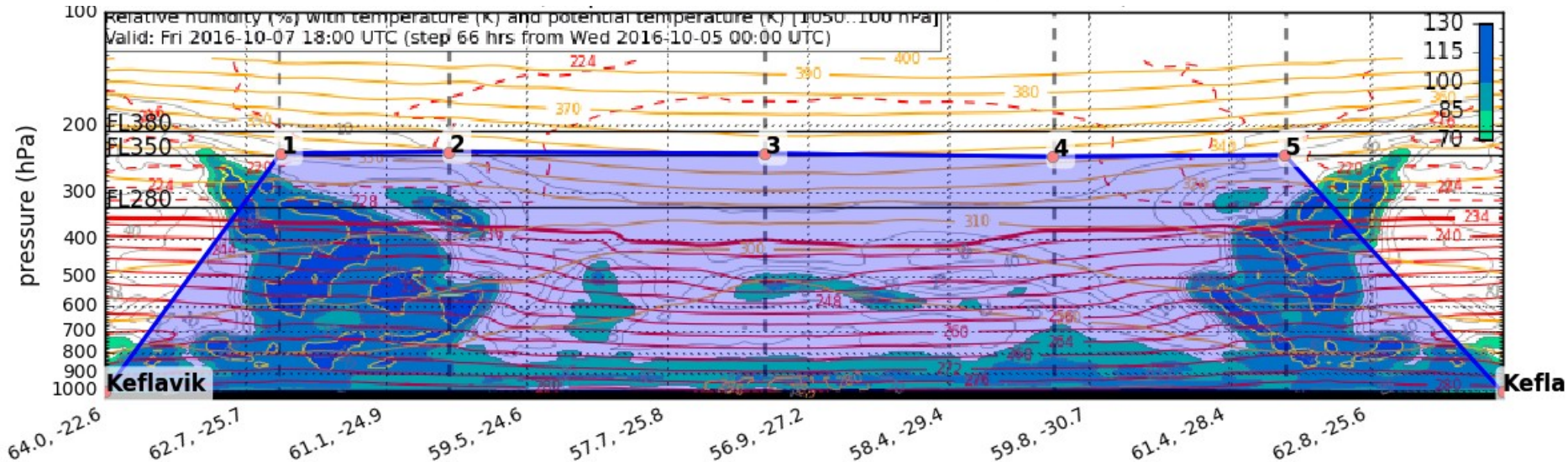
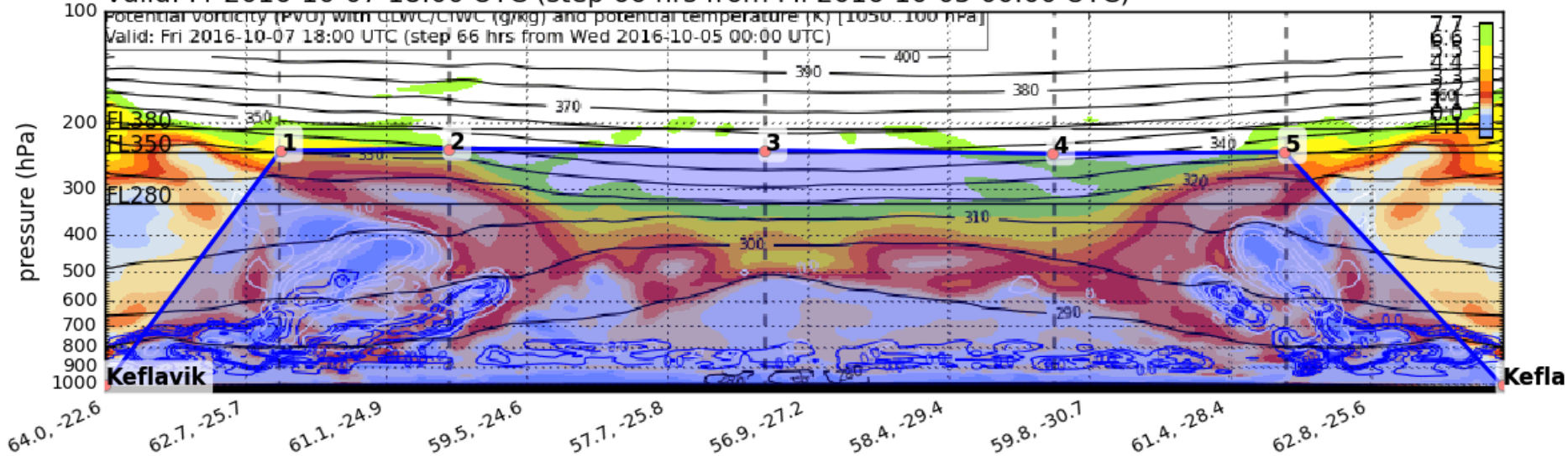
DLR FALCON flighttrack 07/10/ 18Z

07/18Z

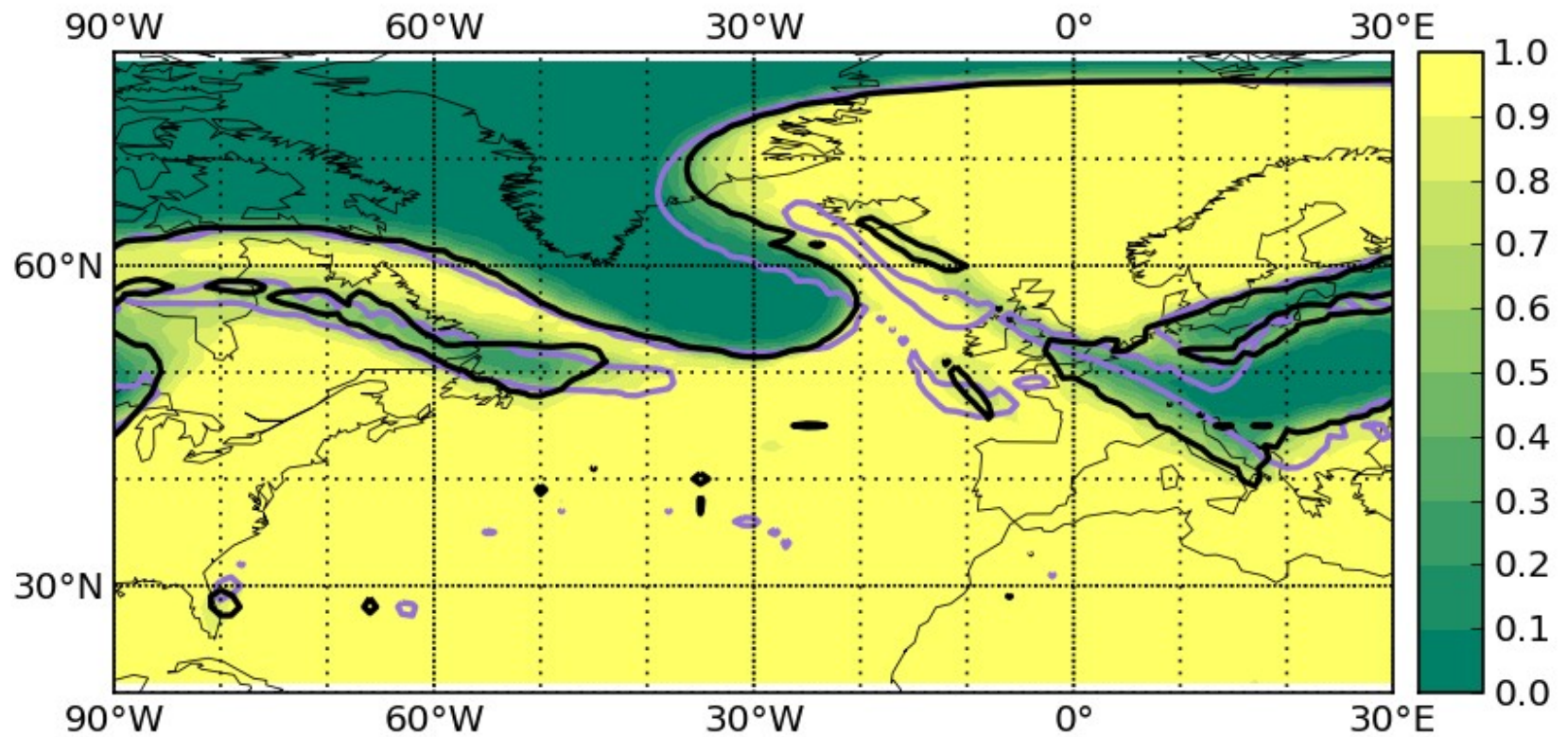
Potential vorticity (PVO) vertical section (Northern Hemisphere)

Valid: Fr 2016-10-07 18:00 UTC (step 66 hrs from Mi 2016-10-05 00:00 UTC)

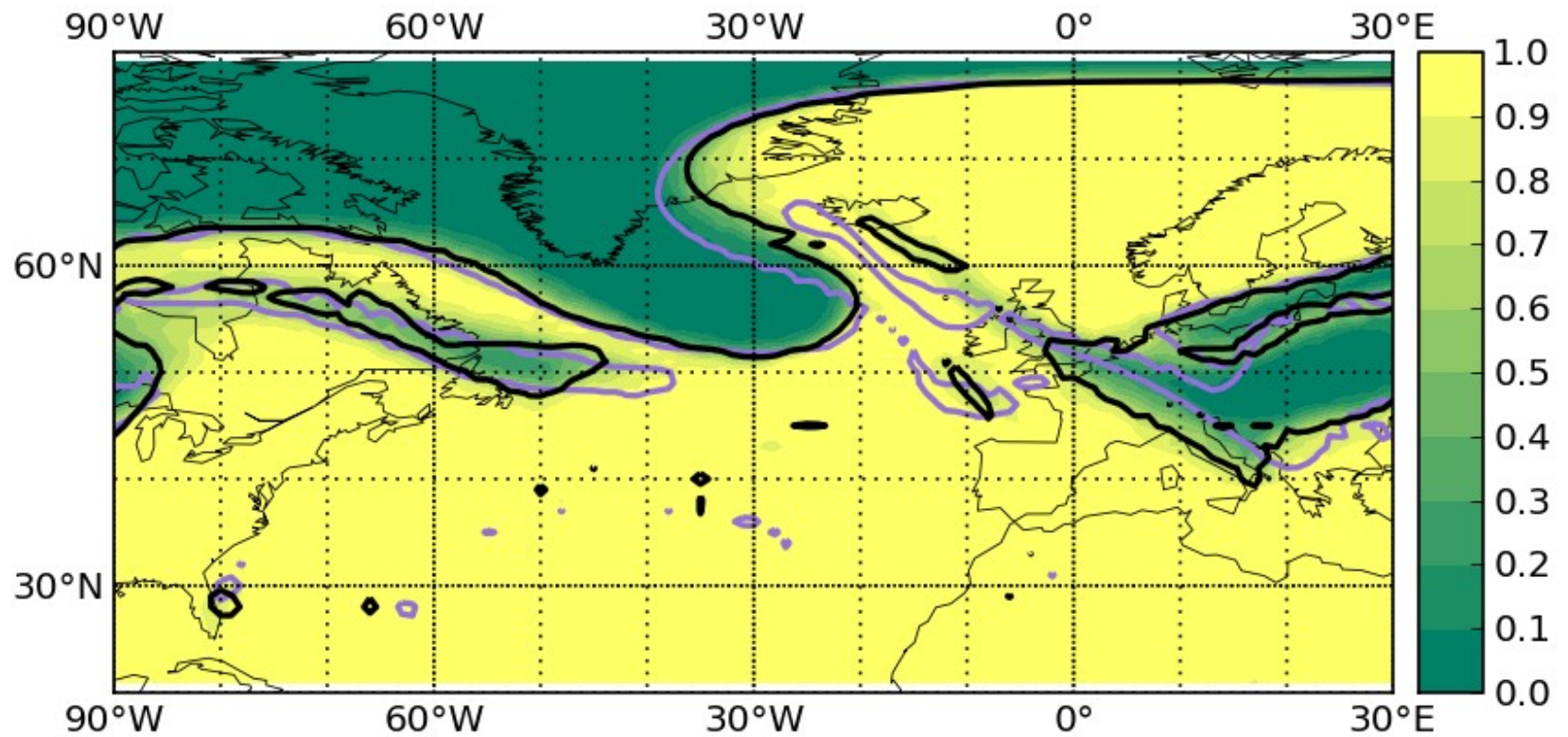
BT 05/00Z



Uncertainty



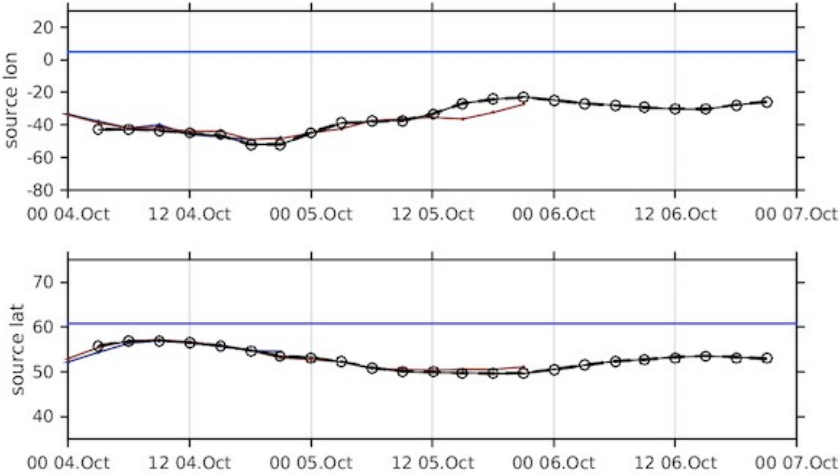
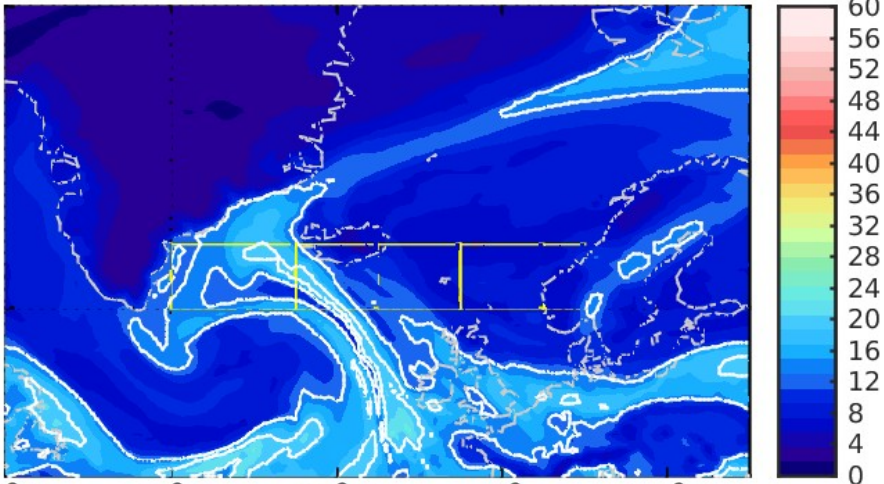
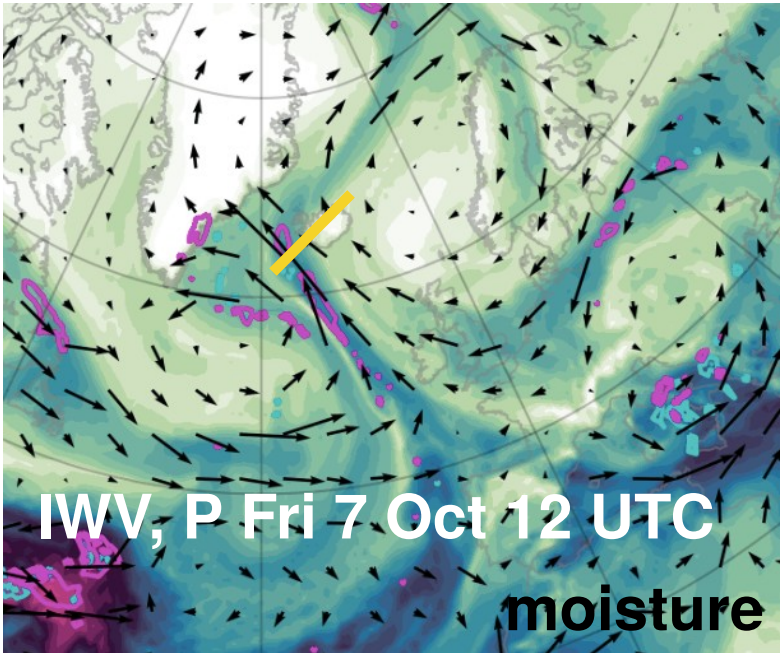
Uncertainty



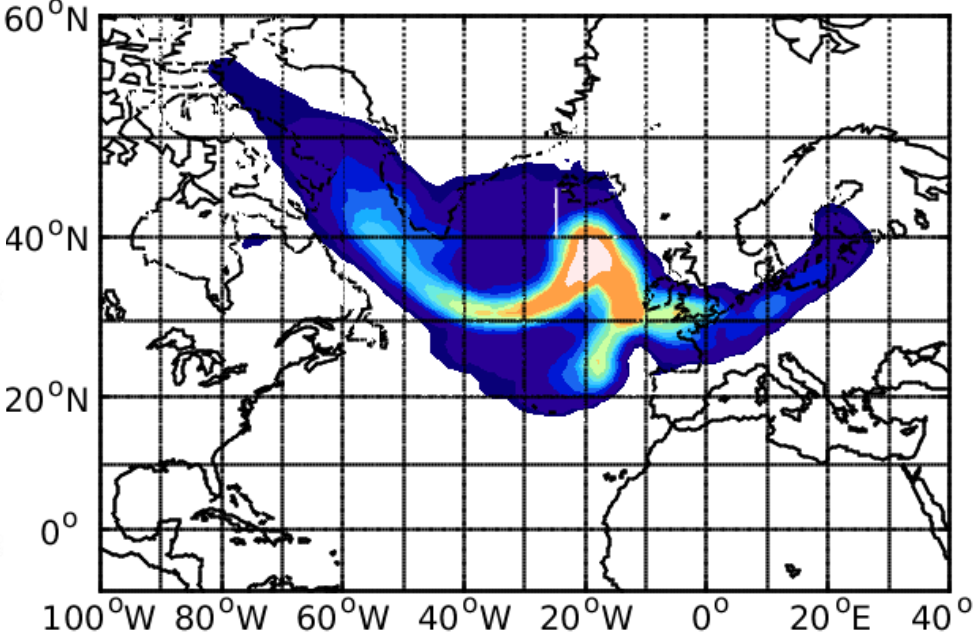
Objectives

- Lagrangian tracking of TPV system THU-FRI
- Divergence measurements
- Possibly coordination with French Falcon and Halo
- Exact timing is still to be discussed

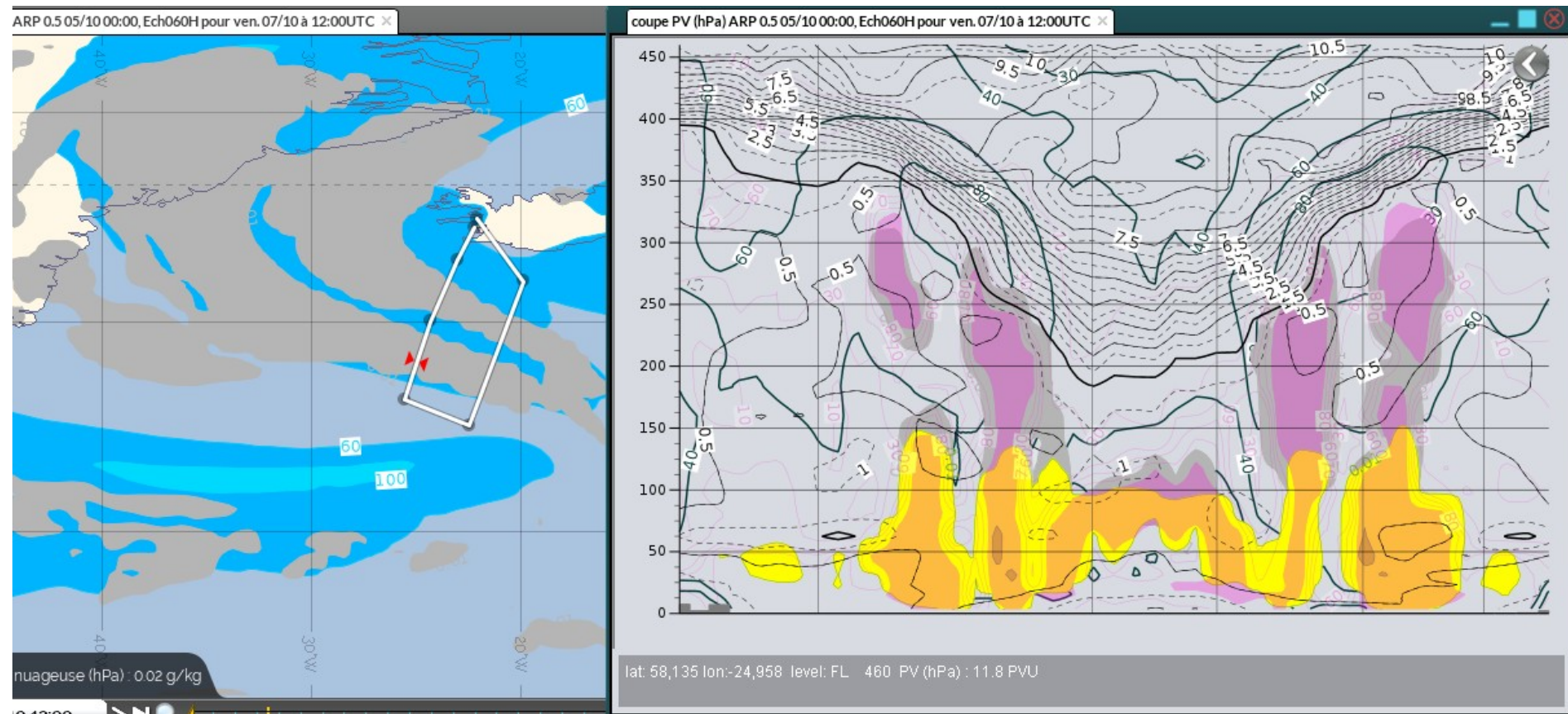
EPATAN/NEAREX plan for Fri, 7 Oct: formation of AR



moisture sources Iceland, Fri 6 Oct 18 UTC



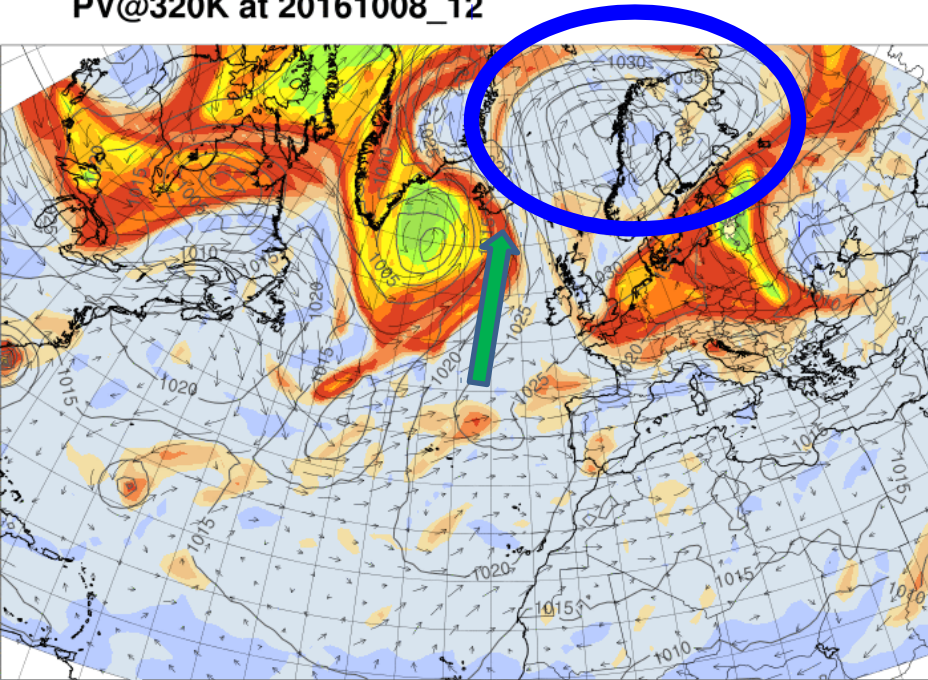
EPATAN/NEAREX plan for Fri, 7 Oct: formation of AR



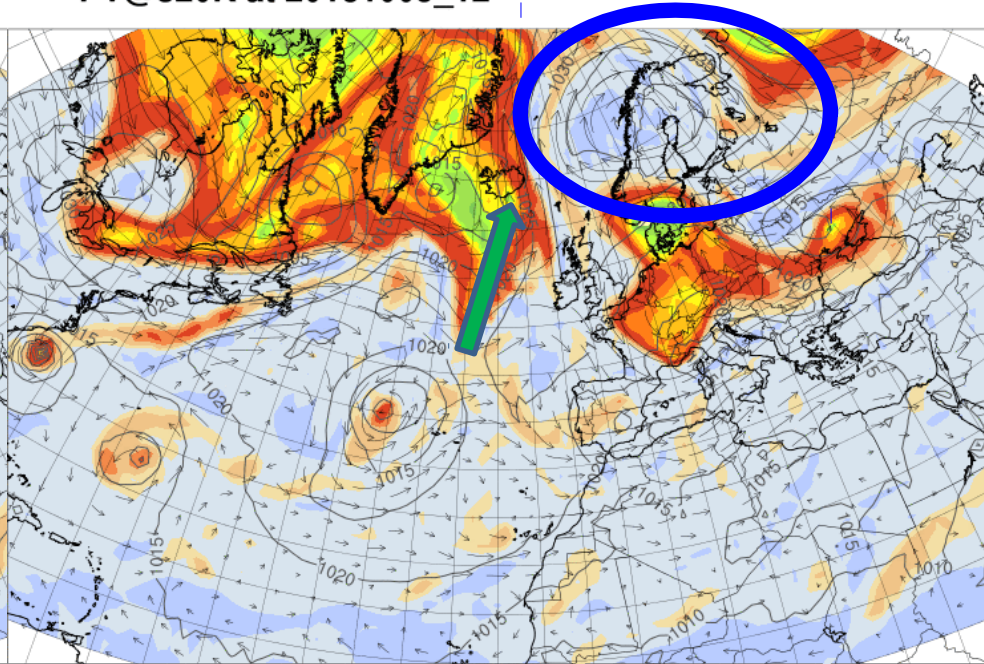
OUTLOOK

7-8 October Blocking anticyclone over Scandinavia

PV@320K at 20161008_12



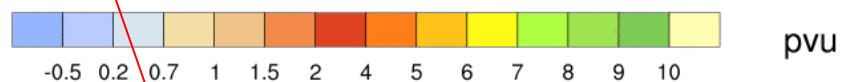
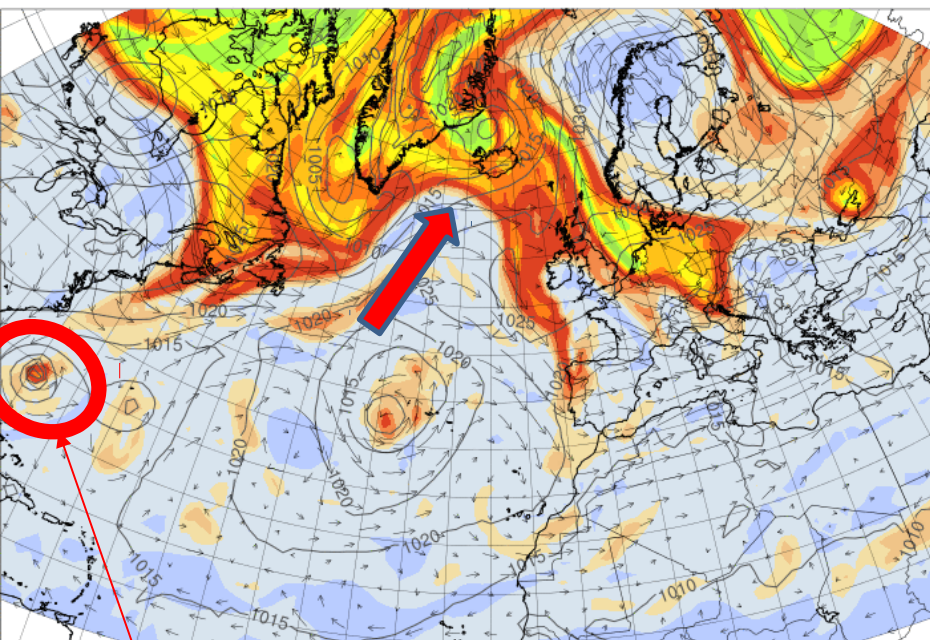
PV@320K at 20161009_12



Synoptic pattern
rather constant over
weekend.

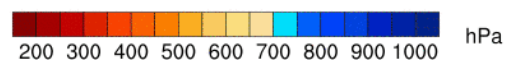
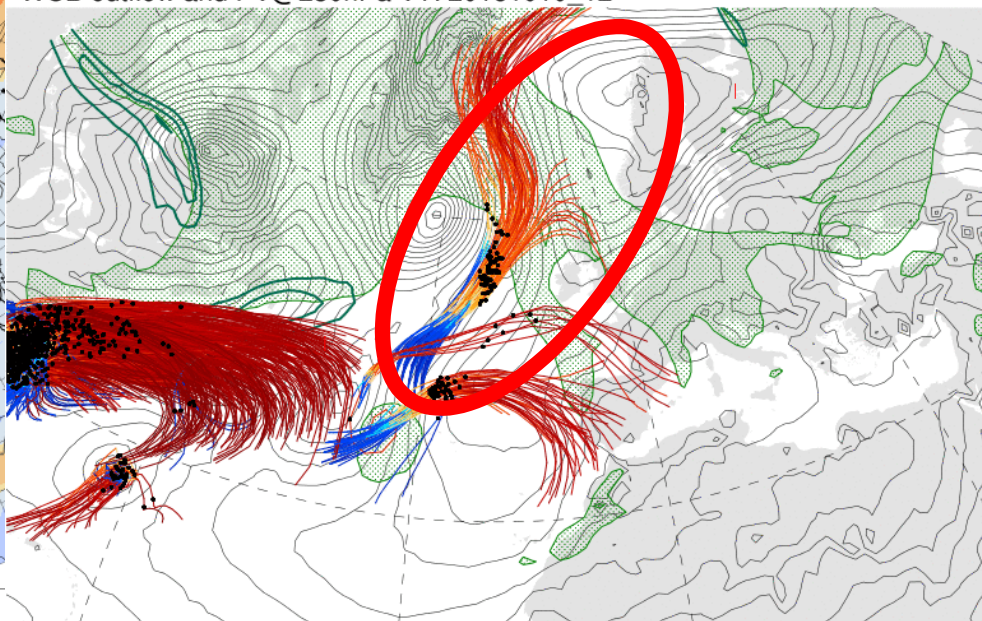
New ridgebuilding beginning of next week

PV@320K at 20161010_12



Still, uncertainty due to track of TC Matthew.

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

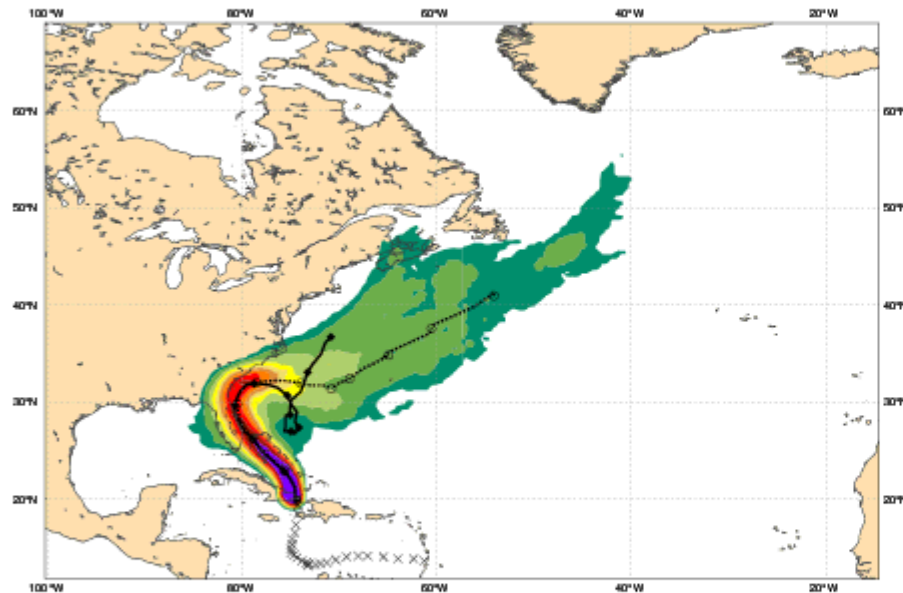


Situation Hurricane Matthew

Date 20161005 00 UTC @ECMWF

Probability that **MATTHEW** will pass within 120 km radius during the next 240 hours
tracks: **solid**=HRES; **dot**=Ens Mean [reported minimum central pressure (hPa) **950**]

5-10 10-20 20-30 30-40 40-50 50-60 60-70 70-80 80-90 > 90%

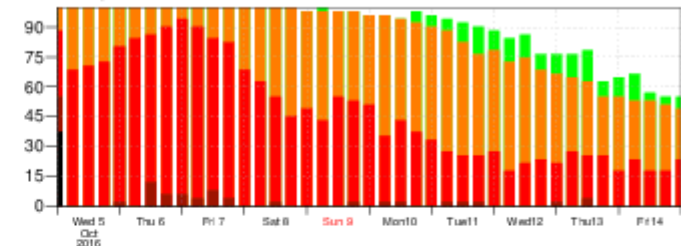


List of ensemble members numbers forecast Tropical Cyclone

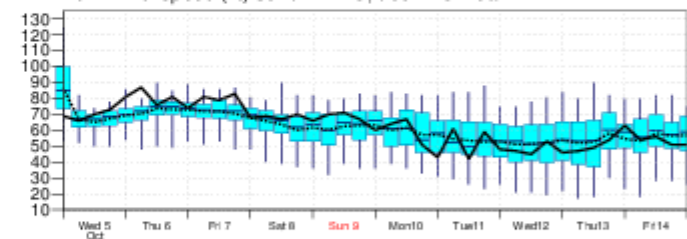
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

+024 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+048 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+072 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+096 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+120 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+144 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+168 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+192 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+216 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
+240 h	hr	cl	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

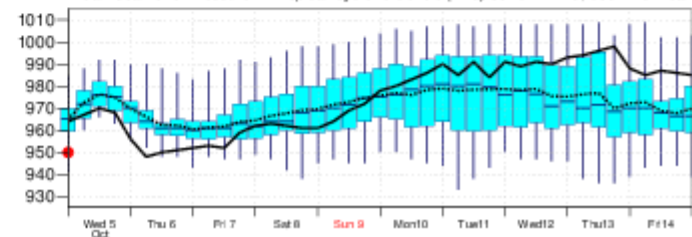
Probability (%) of Tropical Cyclone Intensity falling in each category
TD[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



10m Wind Speed (kt) **solid**=HRES; **dot**=Ens Mean



Mean Sea Level Pressure in Tropical Cyclone Centre (hPa) **solid**=HRES; **dot**=Ens Mean



Summary plans

- **Wednesday 5 October**
 - **SAFIRE** flight depends on wind conditions in Keflavik
 - **HALO** flight at 16-21 UTC?
- **Thursday 6 October**
 - **HALO** flight plan to go SW of Greenland (TPV, jet interaction)
- **Friday 7 October**
 - **HALO** and **FALCON**: coordinated flights W of Iceland (WCB ascent, TP fold, Greenland lee cyclone formation, ...), plus **SAFIRE** (moisture transport?)
- **Outlook Saturday-Monday 8-10 October:**
 - Situation rather uncertain; possibility for HPE over Europe; not too much „dynamics“ near Iceland