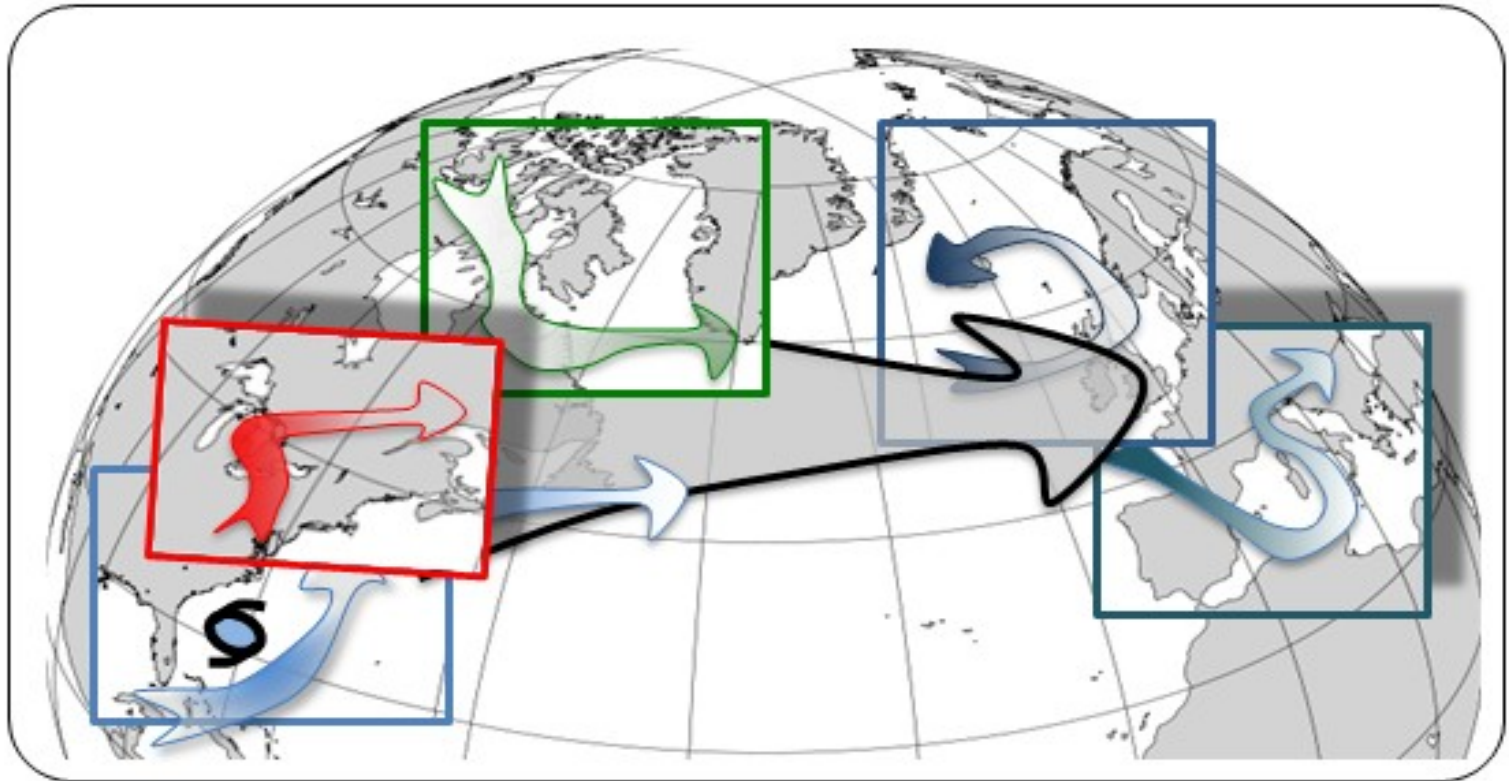


# NAWDEX – Weather discussion

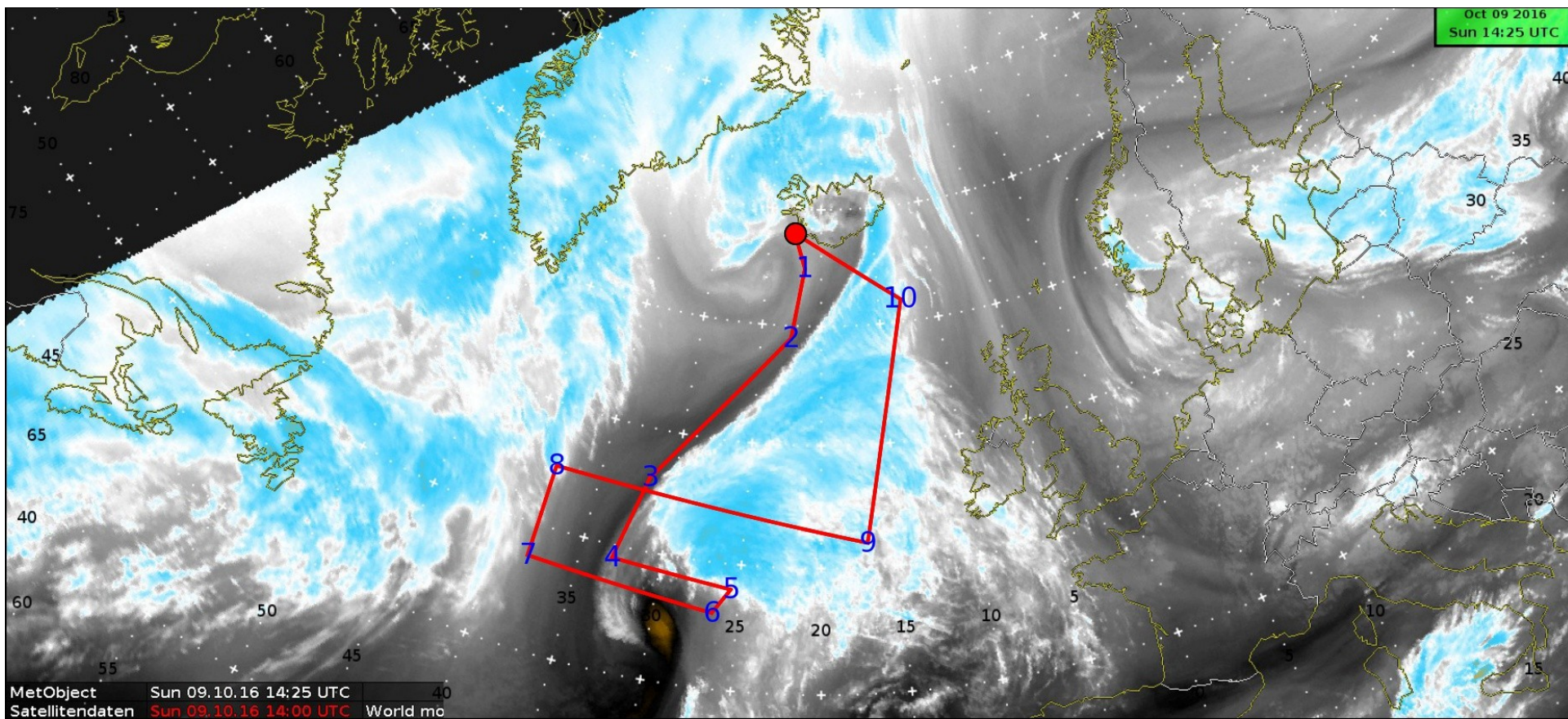
09 October 2016, Keflavik, Iceland



# Agenda

- Safire Falcon/HALO/DLR Falcon flights today
- Current synoptic situation and forecast until Tuesday
- HALO flight Monday
- Intercomparison flight of UK FAAM, HALO and Safire Falcon
- DLR Falcon/Safire Falcon flights west of Iceland on Tuesday
- Outlook until Friday
- HALO/DLR Falcon/Safire Falcon flights on Wednesday
- Additional Radiosoundings

# **Safire Falcon, HALO, DLR Falcon flights today**



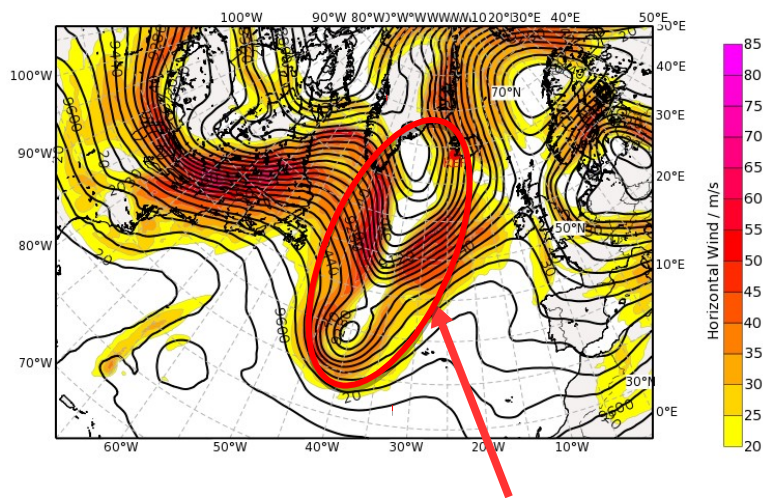


# **Current synoptic situation and forecast until Tuesday**

# Analysis – 09 Oct 2016, 00 UTC

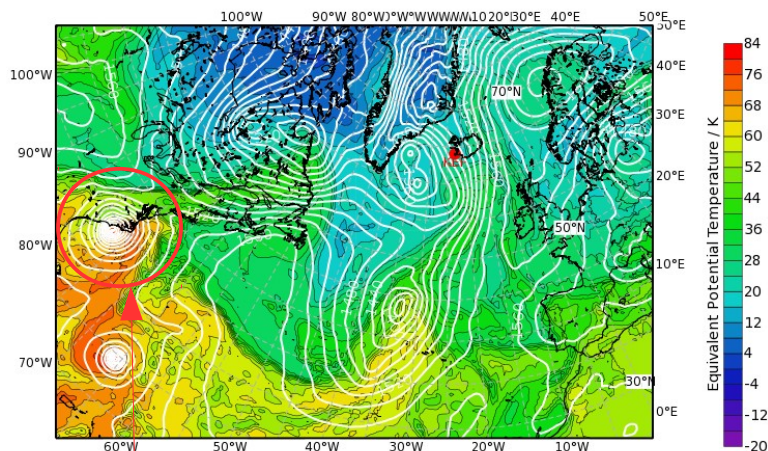
Z300, SAT  
THE850, RH700

Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa  
Valid: Sun, 09 Oct 2016, 00 UTC (step 000 h from Sun, 09 Oct 2016, 00 UTC)

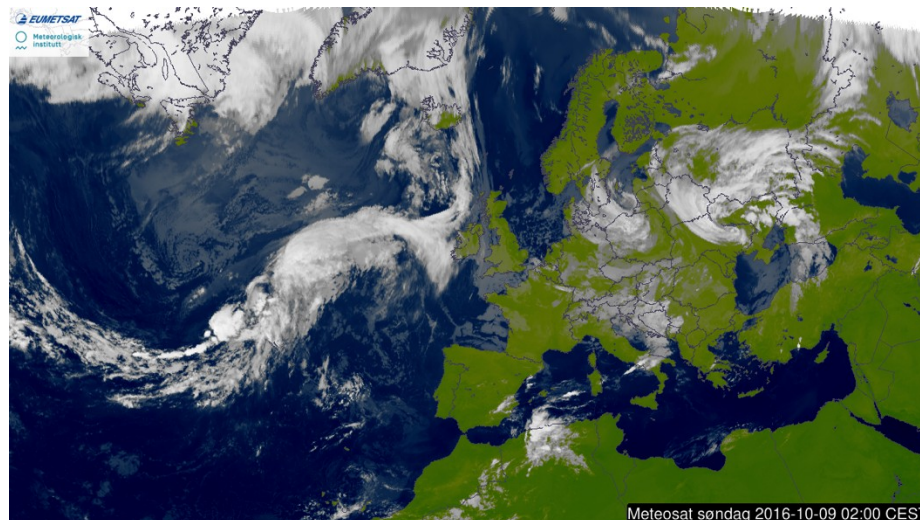


Sunday Streamer

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa  
Valid: Sun, 09 Oct 2016, 00 UTC (step 000 h from Sun, 09 Oct 2016, 00 UTC)



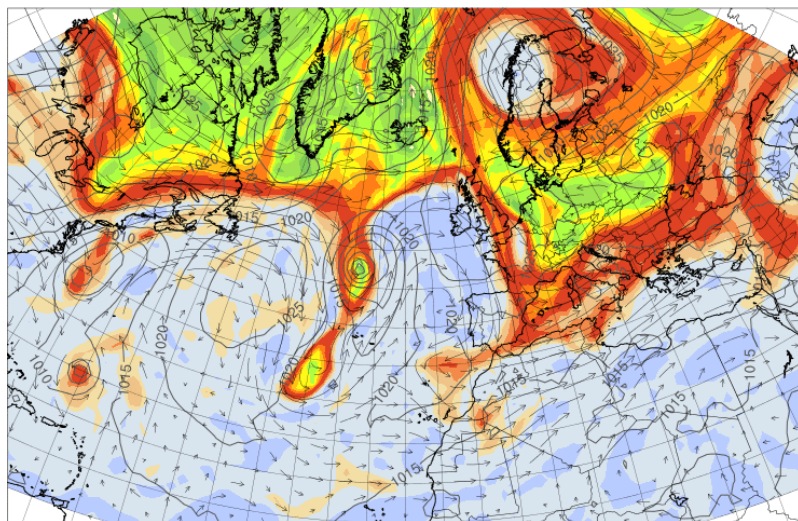
Matthew





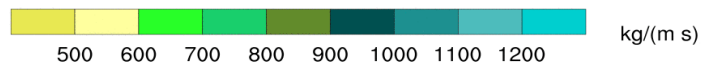
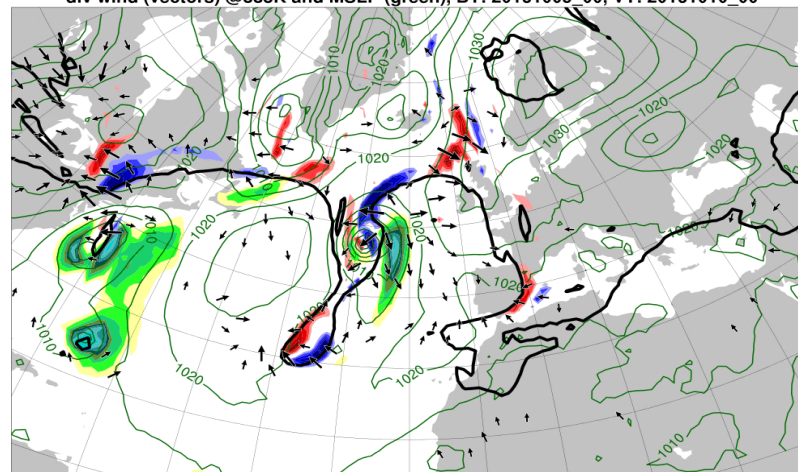
# Forecast – Mon, 10 Oct 2016, 00 UTC

PV@330K at 20161010\_00



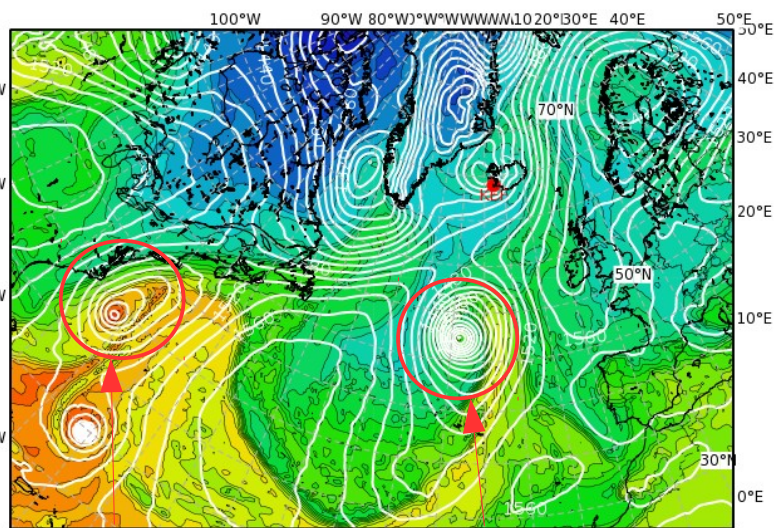
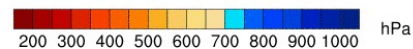
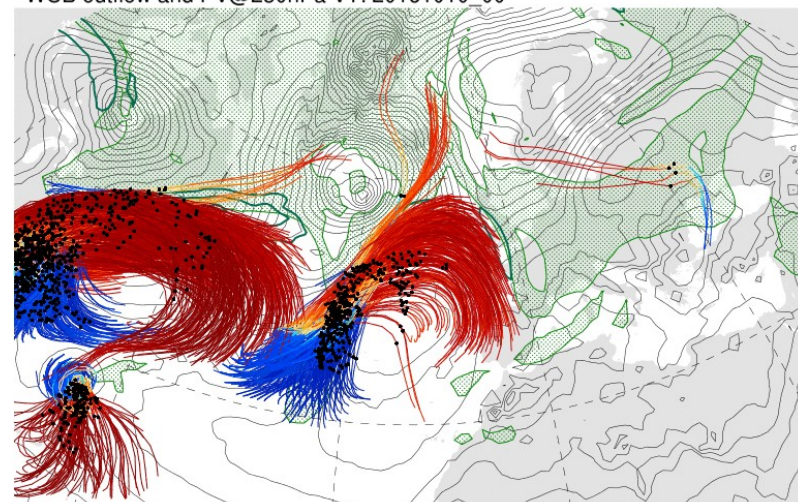
PV330,THE850, WCB

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009\_00, VT: 20161010\_00



Trajectory start and SLP VT: 20161008\_00

WCB outflow and PV@250hPa VT: 20161010\_00



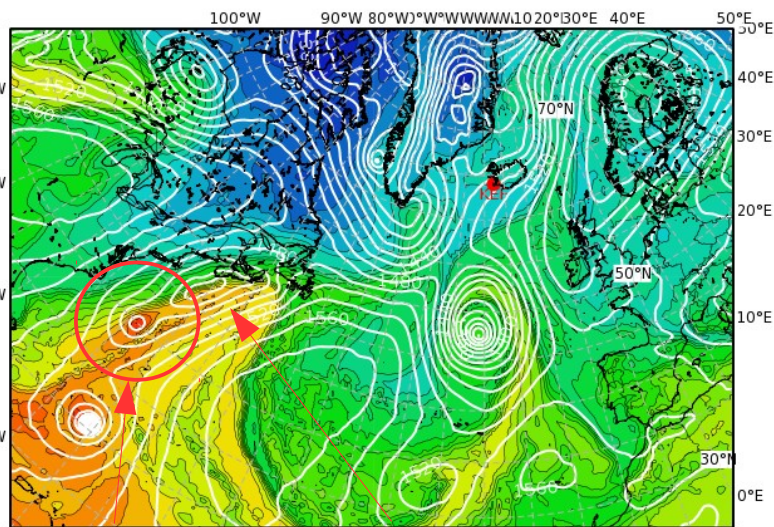
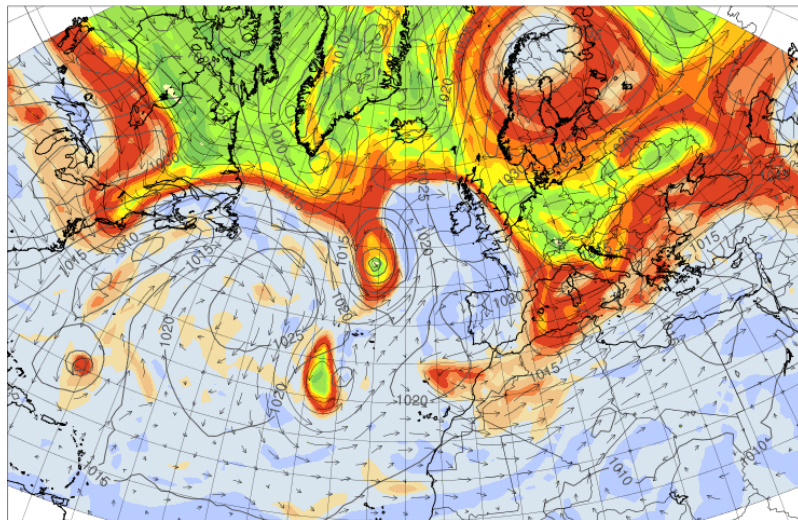
Matthew

Cut-off "Sanchez"



# Forecast – Mon, 10 Oct 2016, 12 UTC

PV@330K at 20161010\_12

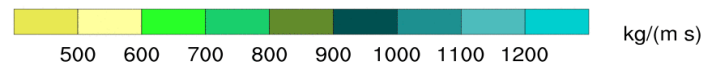
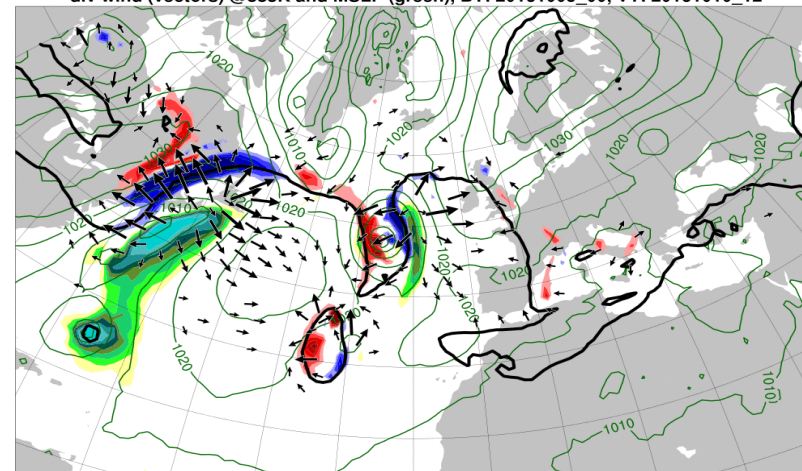


Matthew

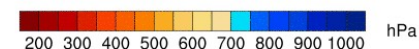
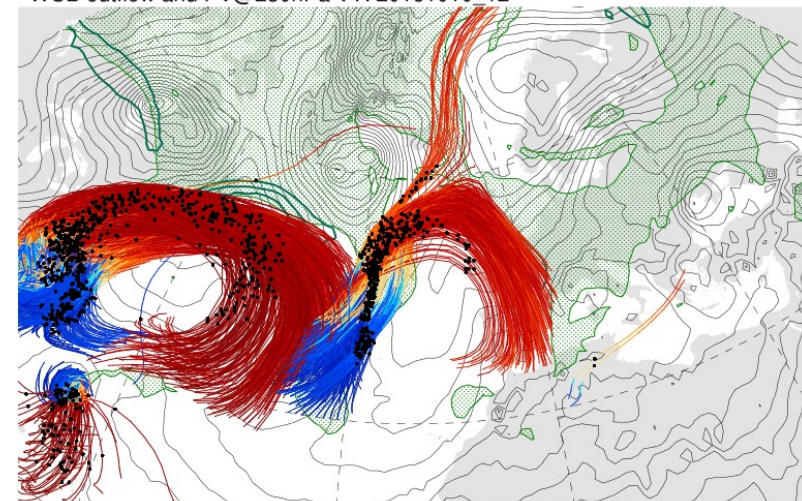
Downstream cyclone

PV330,THE850, WCB

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009\_00, VT: 20161010\_12



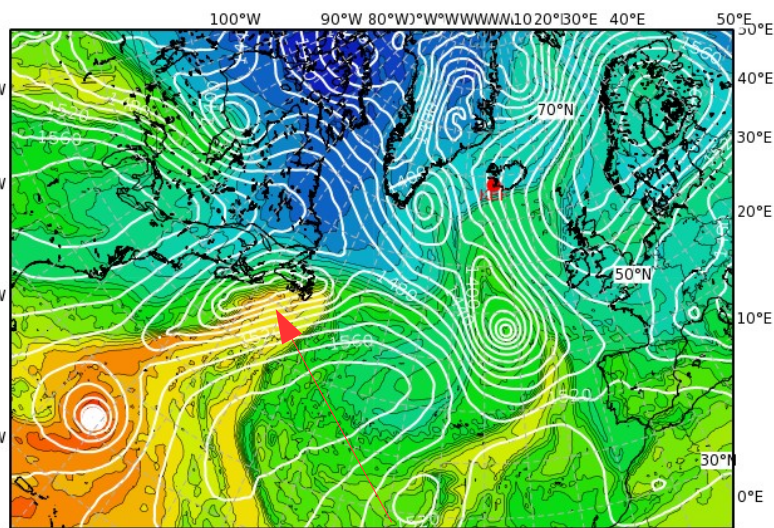
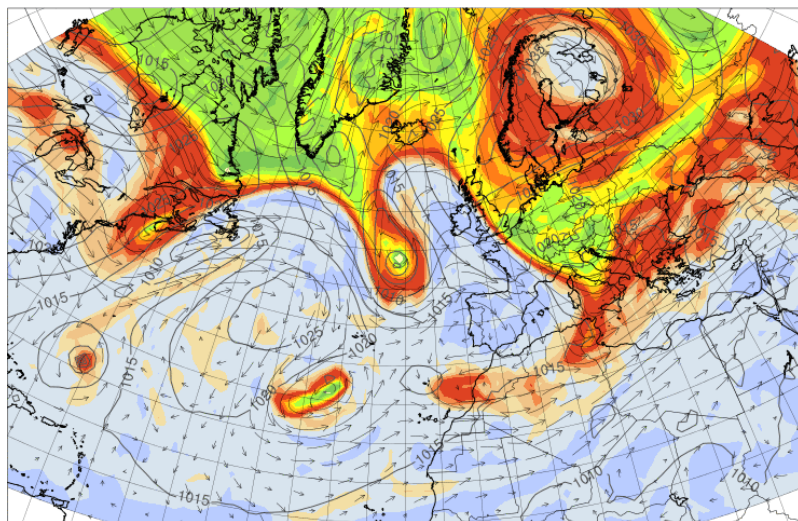
Trajectory start and SLP VT: 20161008\_12  
WCB outflow and PV@250hPa VT: 20161010\_12





# Forecast – Tue, 11 Oct 2016, 00 UTC

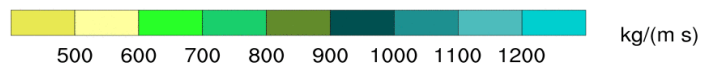
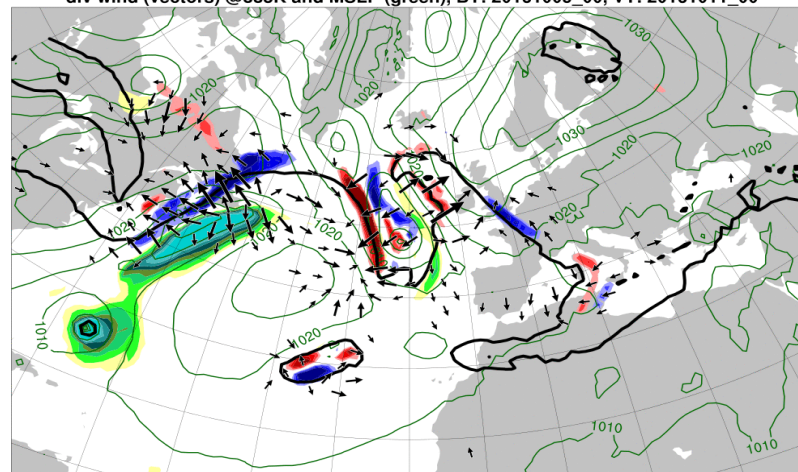
PV@330K at 20161011\_00



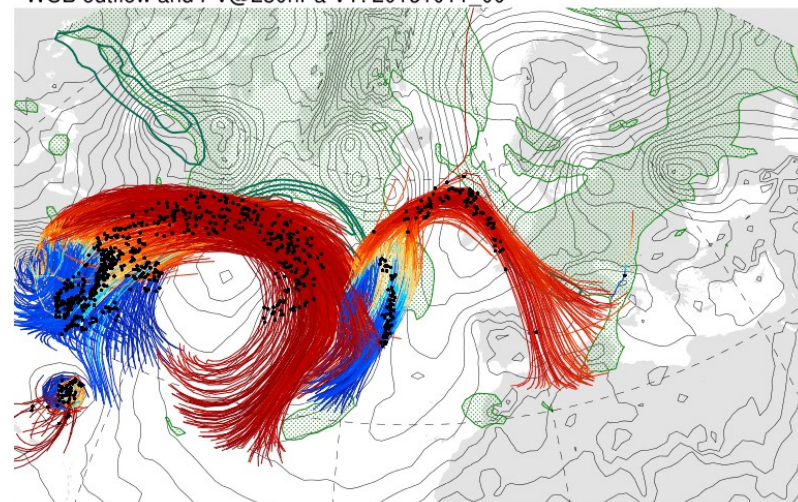
Downstream cyclone

PV330,THE850, WCB

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009\_00, VT: 20161011\_00



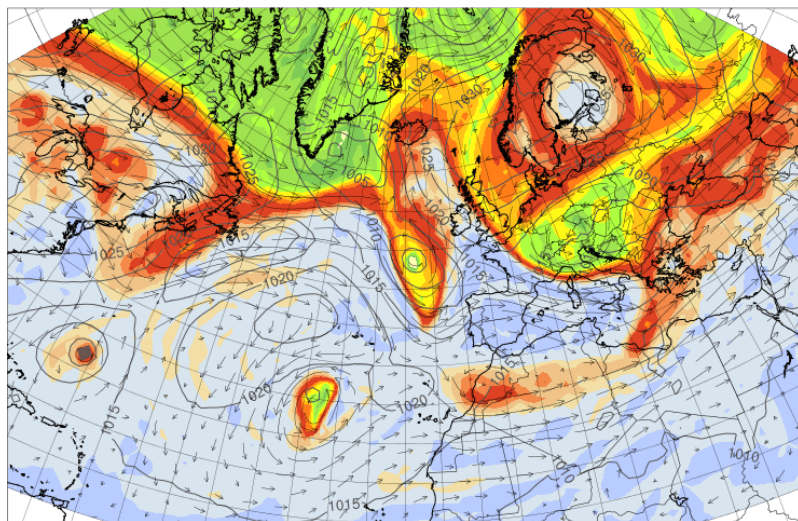
Trajectory start and SLP VT: 20161009\_00  
WCB outflow and PV@250hPa VT: 20161011\_00



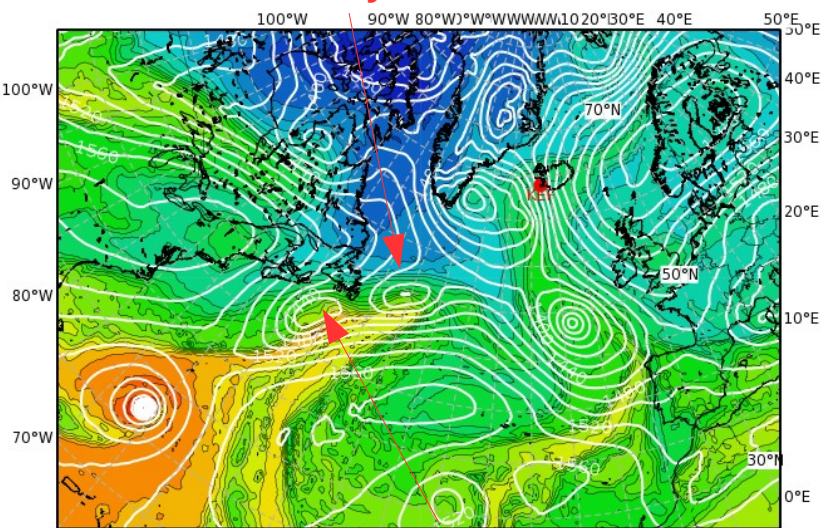


# Forecast – Tue, 11 Oct 2016, 12 UTC

PV@330K at 20161011\_12



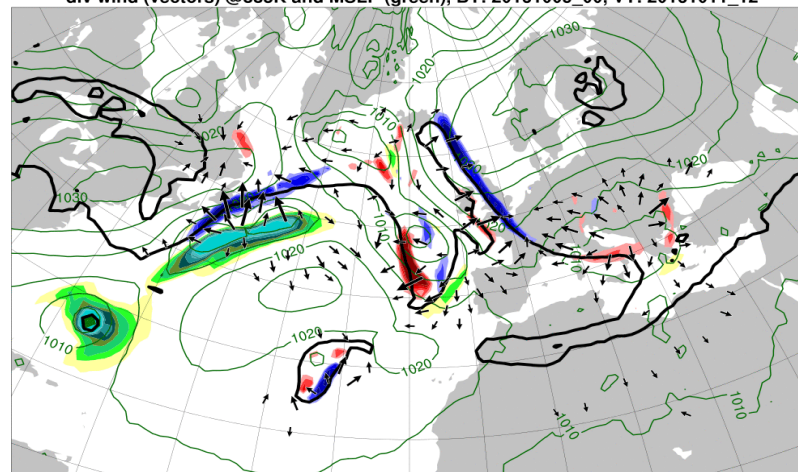
## Downstream cyclone 2



## Downstream cyclone

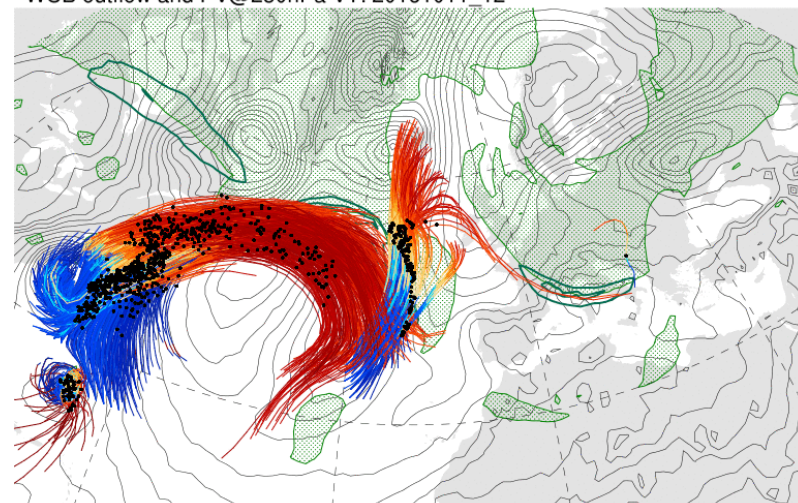
PV330,THE850, WCB

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009\_00, VT: 20161011\_12



500 600 700 800 900 1000 1100 1200 kg/(m s)

Trajectory start and SLP VT: 20161009\_12  
WCB outflow and PV@250hPa VT: 20161011\_12



200 300 400 500 600 700 800 900 1000 hPa

# HALO flight on Monday

# HALO flight Mon 10 Oct

**System under investigation:**  
**Cut-off „Sanchez“**

**Main objectives:**

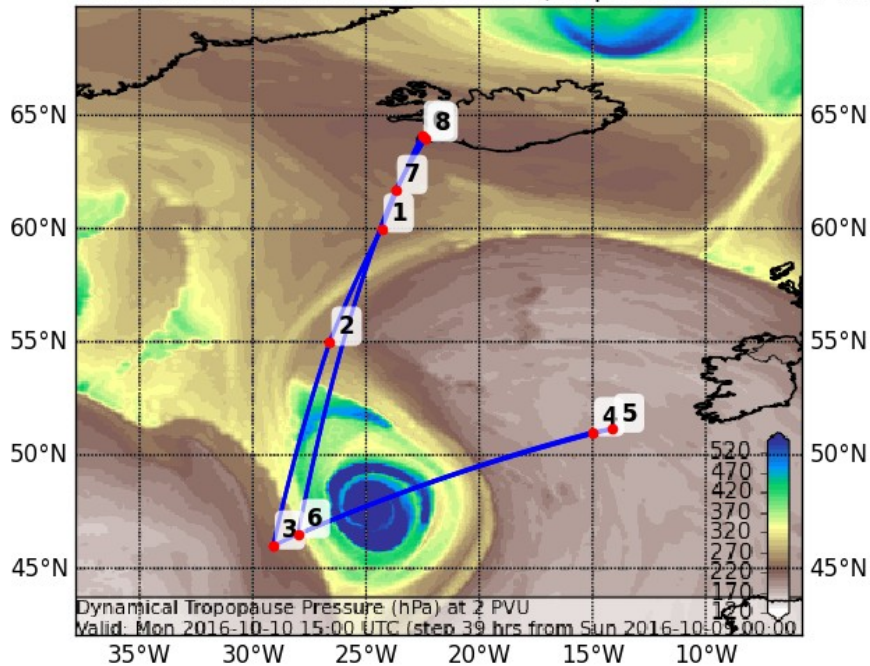
- Structure of PV cut-off
- WCB inflow and ascent
- Structure of tropopause



# HALO flight Mon 10 Oct

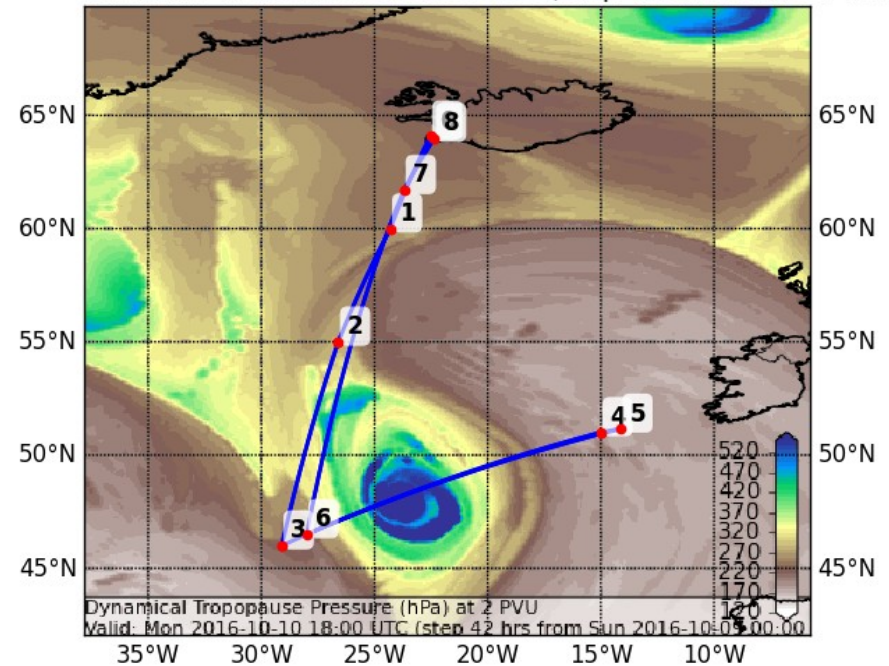
15 UTC

Dynamical Tropopause (Pressure (hPa)) at 2000 ( $10^{-3}$  PVU)  
Valid: Mo 2016-10-10 15:00 UTC (step 39 hrs from So 2016-10-09 00:00)



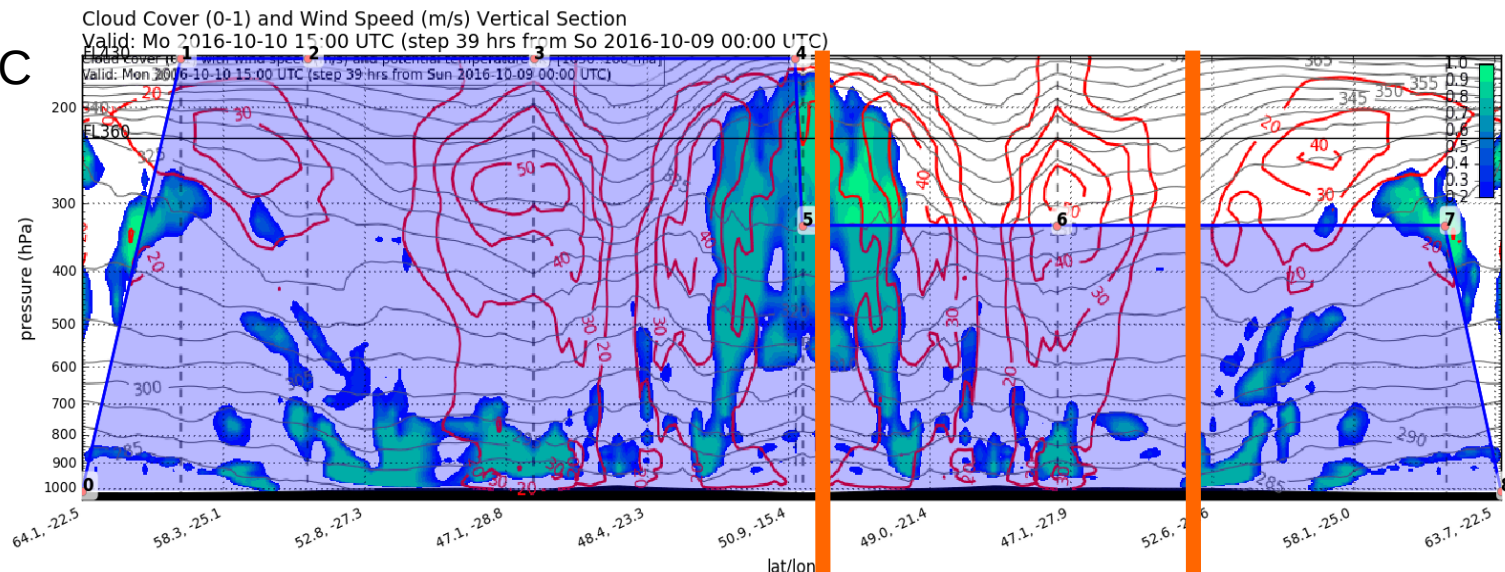
18 UTC

Dynamical Tropopause (Pressure (hPa)) at 2000 ( $10^{-3}$  PVU)  
Valid: Mo 2016-10-10 18:00 UTC (step 42 hrs from So 2016-10-09 00:00)

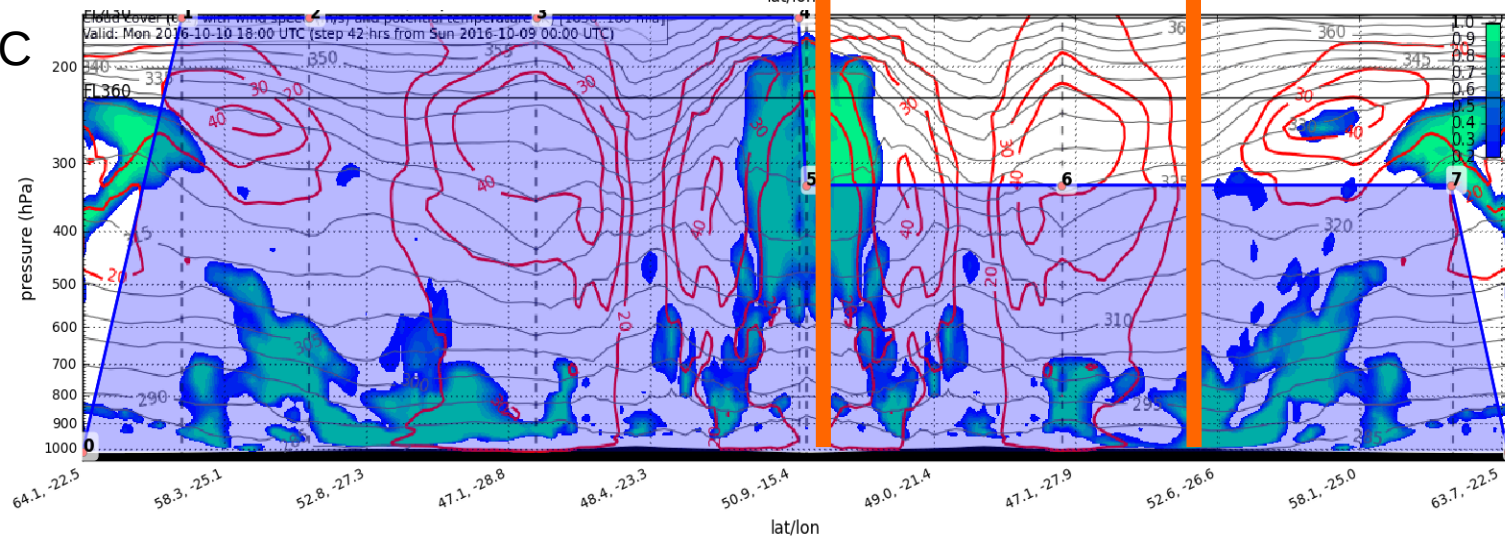


# HALO flight Mon 10 Oct

15 UTC



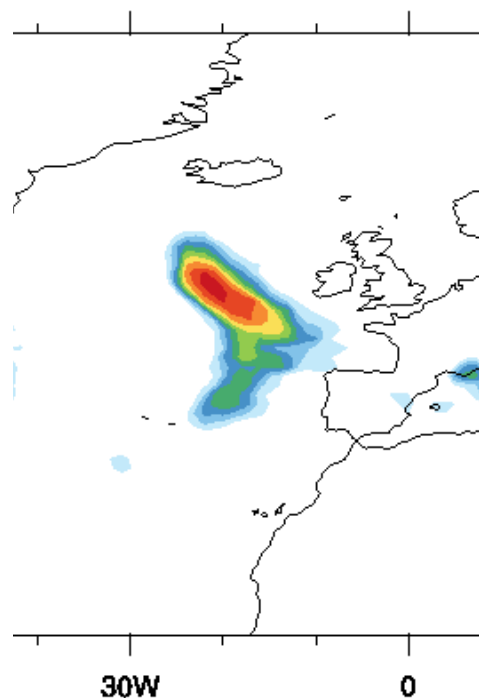
18 UTC



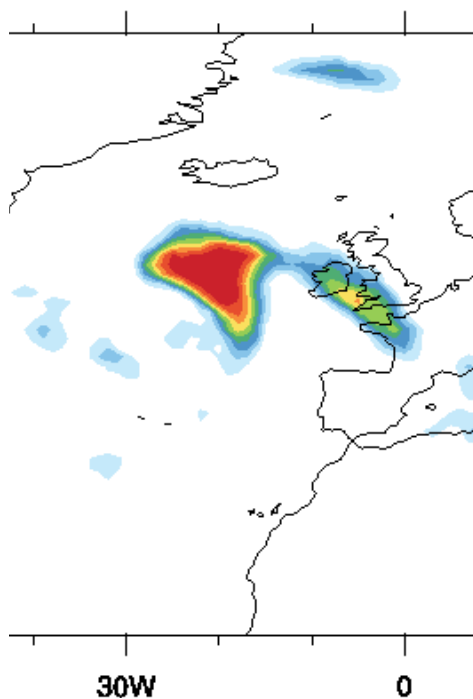
# HALO flight Mon 10 Oct

18 UTC

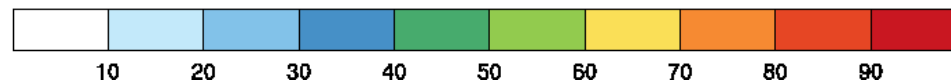
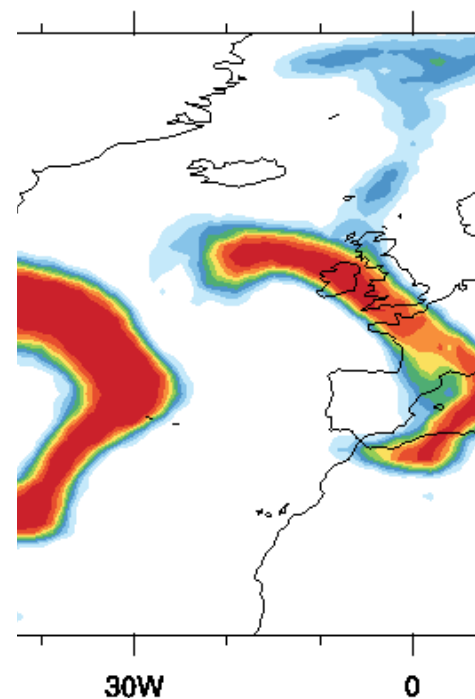
inflow



ascent



outflow

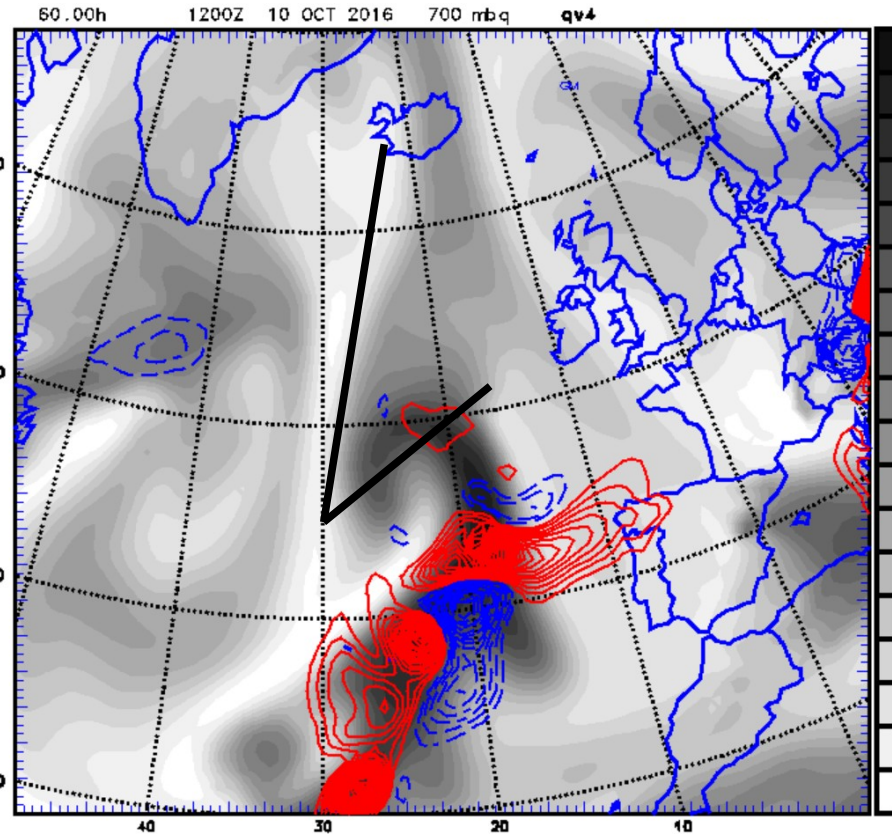




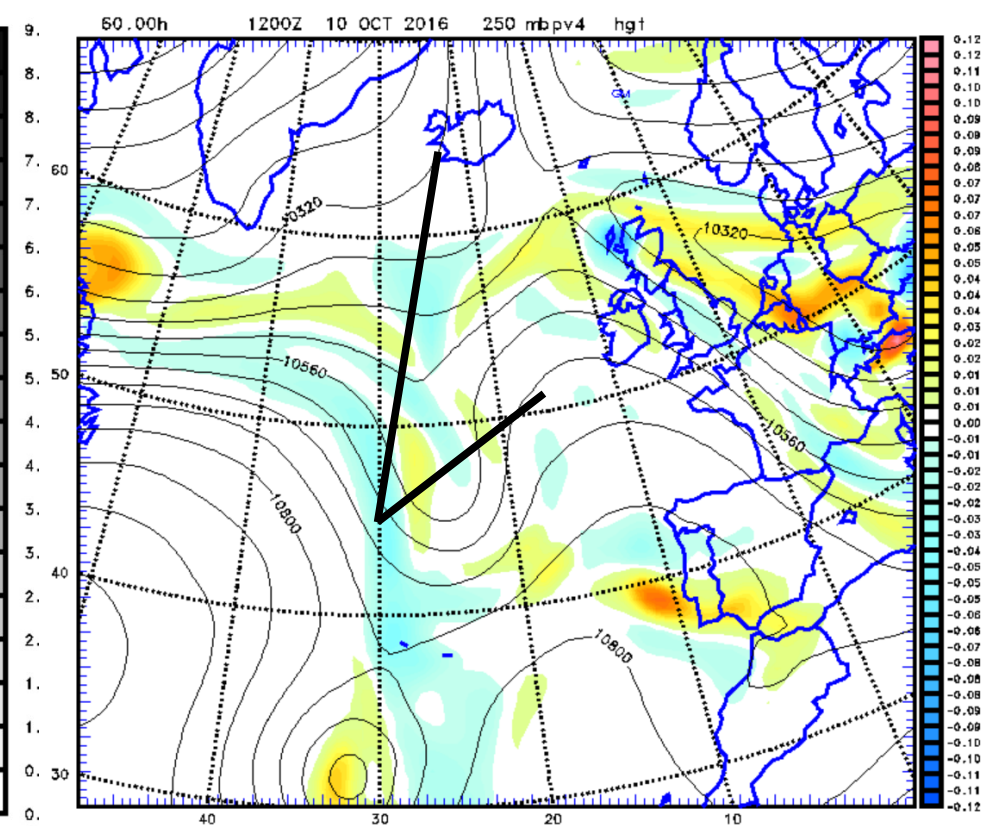
# COAMPS Sensitivity (48h) Valid 12Z 10 Oct

Box centered on Europe (Rainfall at final time, 12Z 12 Oct)

700-hPa q (shading), q sensitivity (contours)



300-hPa PV sensitivity (shaded) and Heights



- Box is located over Europe and the metric is rainfall at the 48 h time (12Z on 12 Oct)
- Maximum moisture sensitivity along ascending moist plume, mostly south of 45 N (likely too far south to observe)
- PV sensitivity at 300 hPa is extensive



# **Intercomparison flight of UK FAAM, HALO and Safire Falcon**

## Tue 11 Oct – Cloud Cover

ECMWF forecast from 00UT 9/10/16

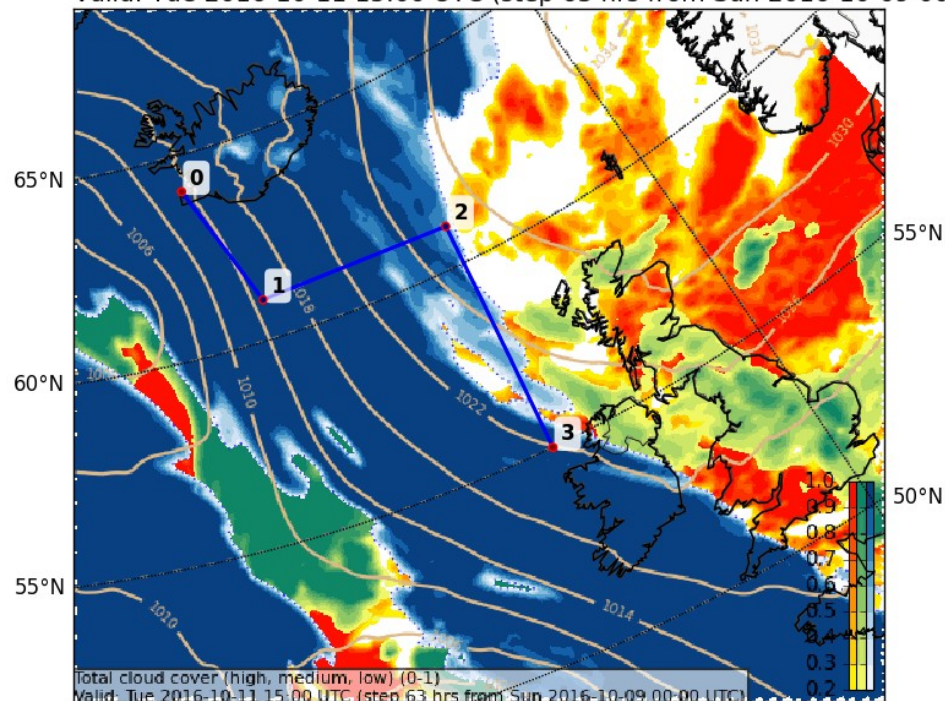
Section 1-2

Along 61N (Icelandic boundary)

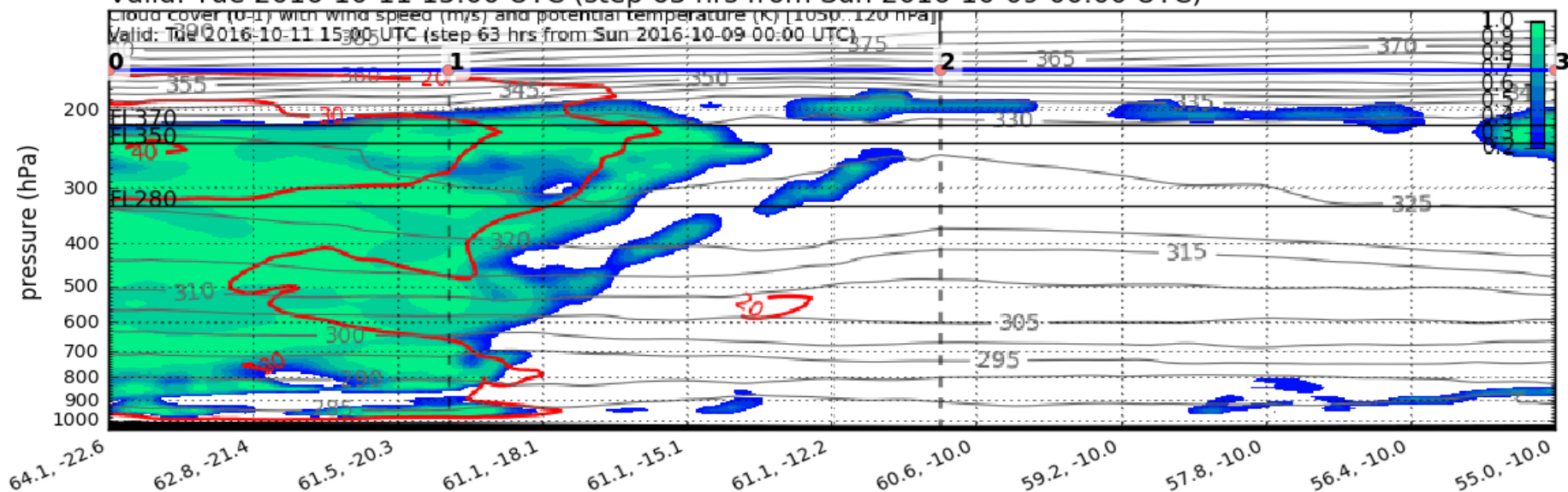
Section 2-3

Along 10W (marine boundary)

Cloud Cover (0-1) (Total Cloud Cover)  
Valid: Tue 2016-10-11 15:00 UTC (step 63 hrs from Sun 2016-10-09 00:00 UTC)



Cloud Cover (0-1) and Wind Speed (m/s) Vertical Section  
Valid: Tue 2016-10-11 15:00 UTC (step 63 hrs from Sun 2016-10-09 00:00 UTC)

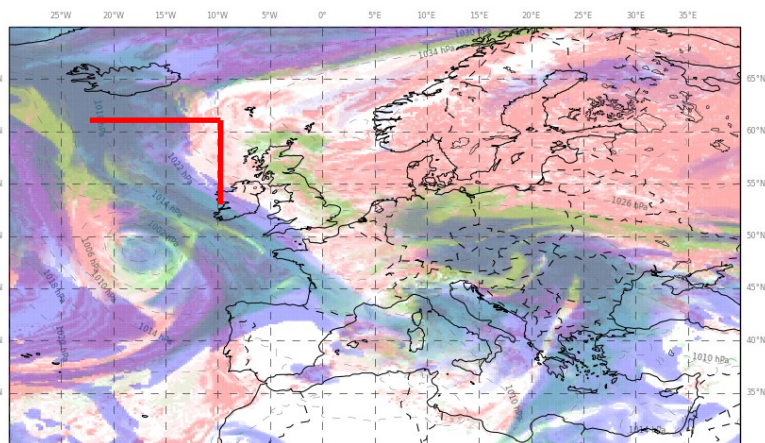


# Met Office global (00UT 9/10/16)



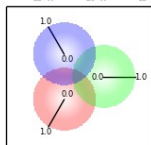
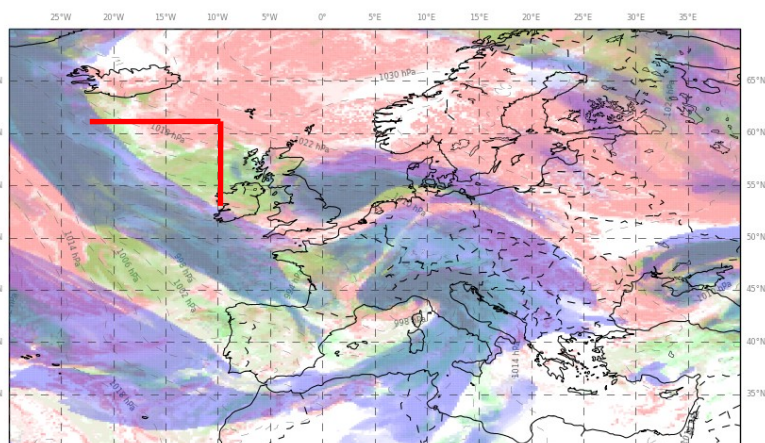
Met Office Oper. Global: Cloud: Low, Medium, High  
2016/10/11 12Z T+60 from 2016/10/09 00Z

Tuesday



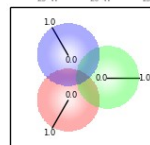
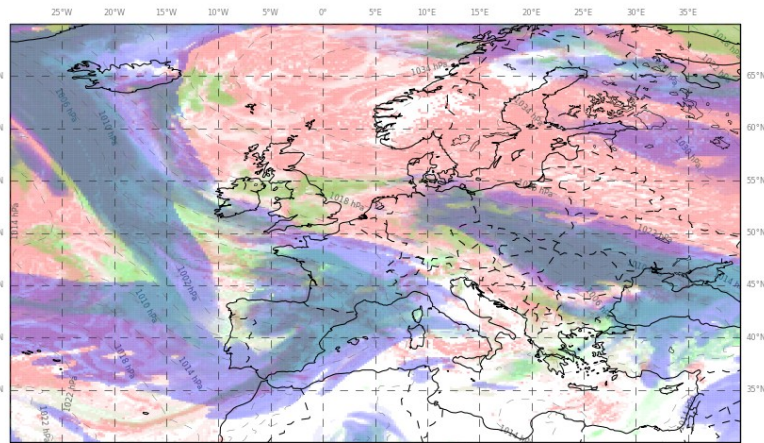
Met Office Oper. Global: Cloud: Low, Medium, High  
2016/10/13 12Z T+108 from 2016/10/09 00Z

Thursday



Met Office Oper. Global: Cloud: Low, Medium, High  
2016/10/12 12Z T+84 from 2016/10/09 00Z

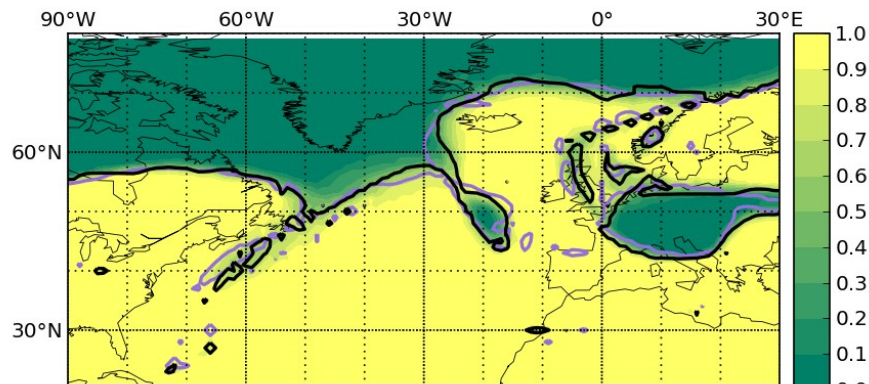
Wednesday



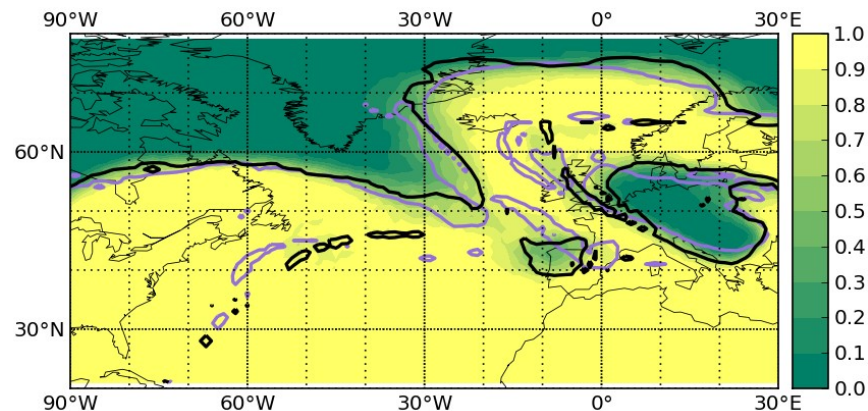


# ECMWF ens (00UT 9/10/16)

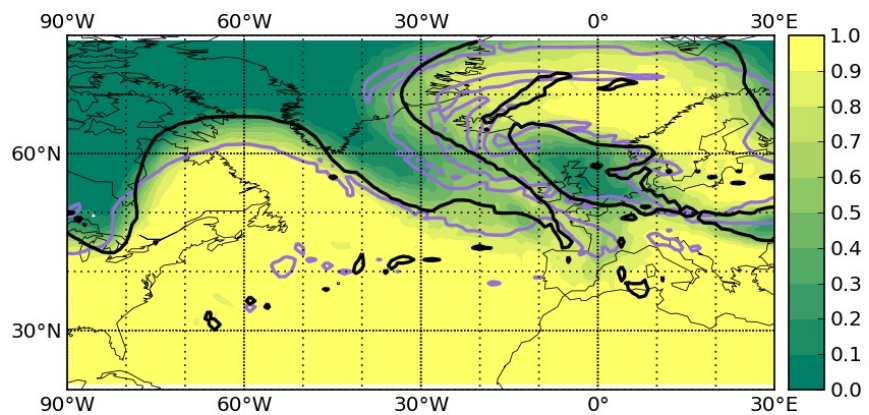
Tuesday



Wednesday



Thursday

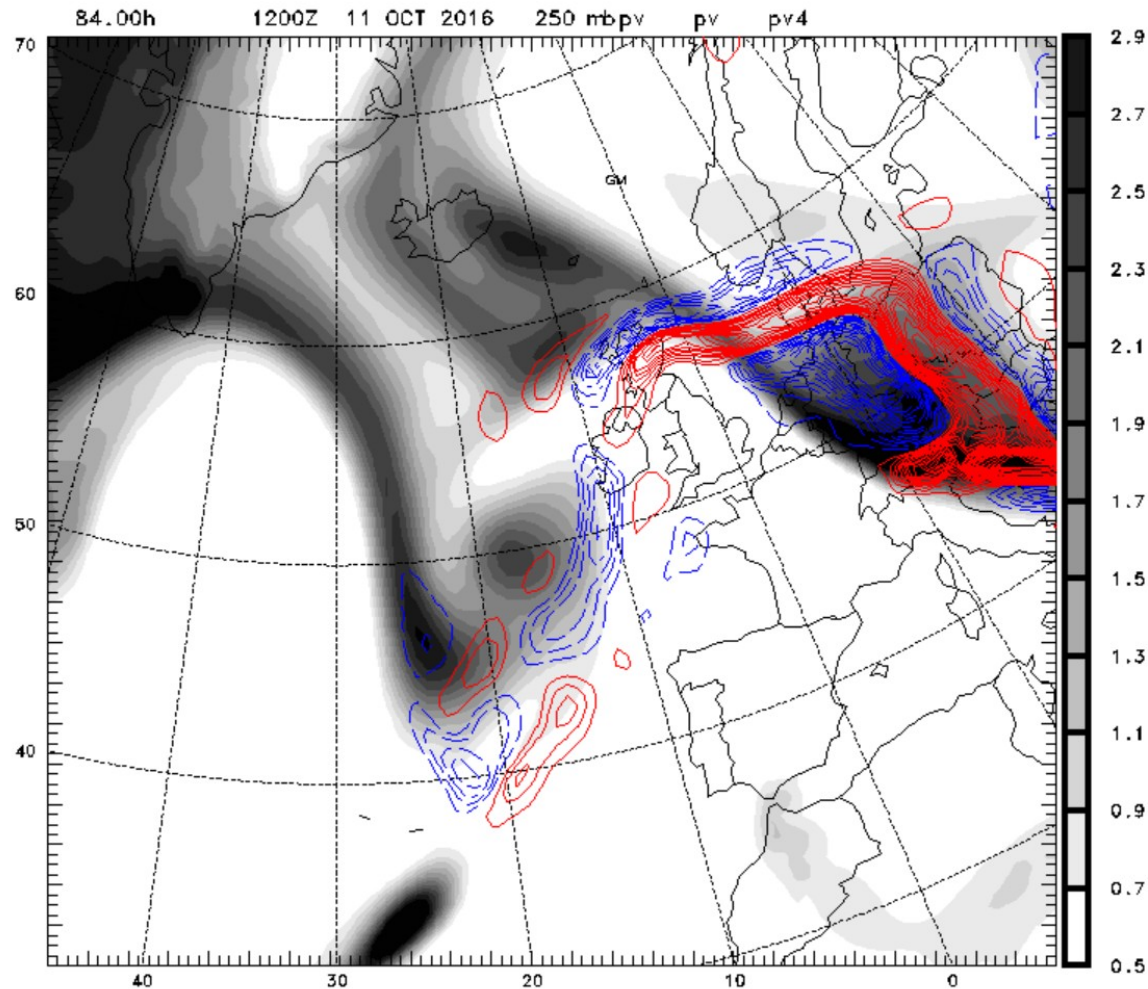




# COAMPS Sensitivity (24h) Valid 12Z 11 Oct

**Box centered on Europe (Rainfall at final time, 12Z 12 Oct)**

**250-hPa PV (shaded), PV sensitivity (contours)**



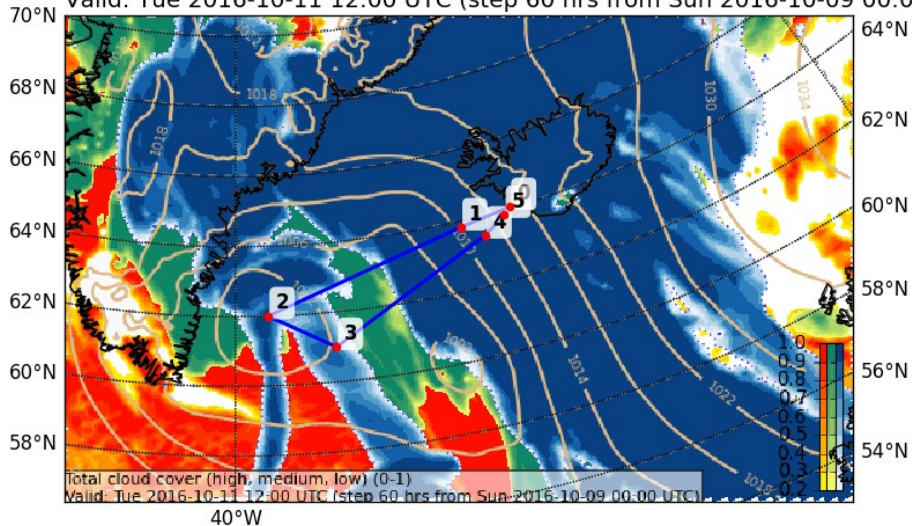
- Box is located over Europe and the metric is rainfall at the 24 h time (12Z on 12 Oct)
- PV sensitivity at 250 hPa along the PV streamer, extending to N of UK

# **Safire Falcon and DLR Falcon flights on Tuesday**

## Tue 11 12Z – DLR Falcon Plan

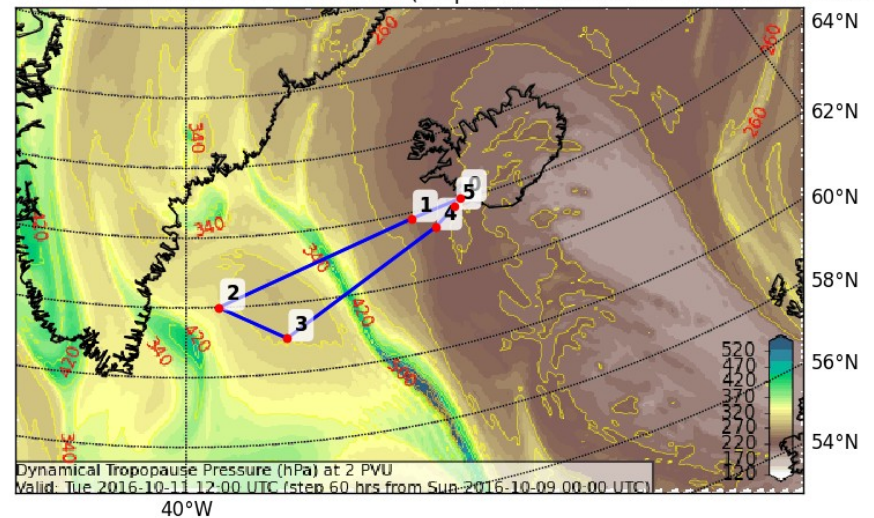
Cloud Cover (0-1) (Total Cloud Cover)

Valid: Tue 2016-10-11 12:00 UTC (step 60 hrs from Sun 2016-10-09 00:00 UTC)



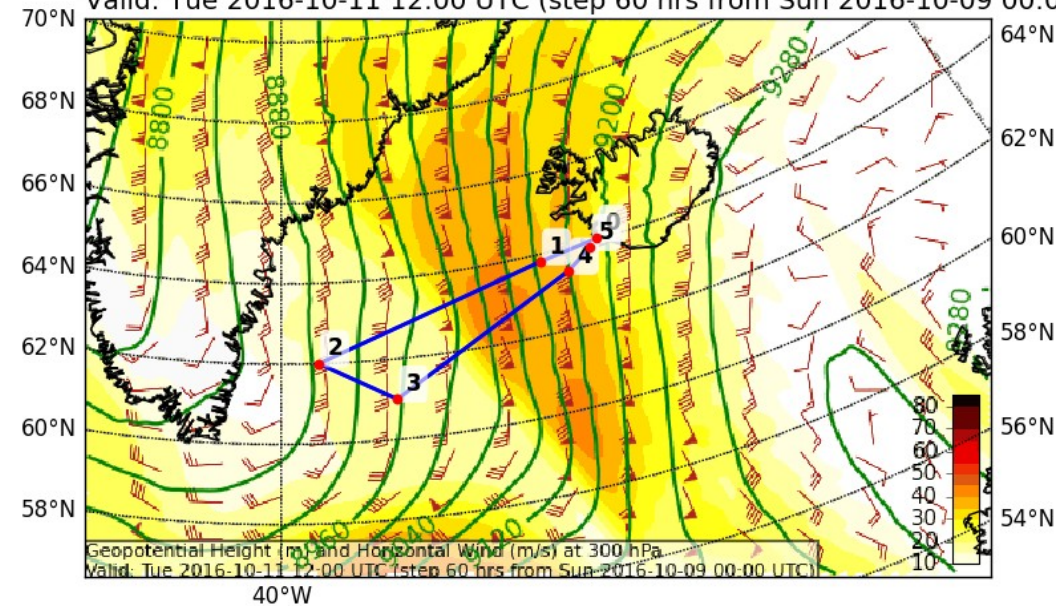
Dynamical Tropopause (Pressure (hPa)) at 2000 ( $10^{-3}$  PVU)

Valid: Tue 2016-10-11 12:00 UTC (step 60 hrs from Sun 2016-10-09 00:00 UTC)



Geopotential Height (m) and Horizontal Wind (m/s) (Wind Speed  $10^{-05}$  m/s) at 300 (hPa)

Valid: Tue 2016-10-11 12:00 UTC (step 60 hrs from Sun 2016-10-09 00:00 UTC)



**Coordination with SAFIRE  
along the whole flight.**

**TAKE-OFF: ~10:15am**

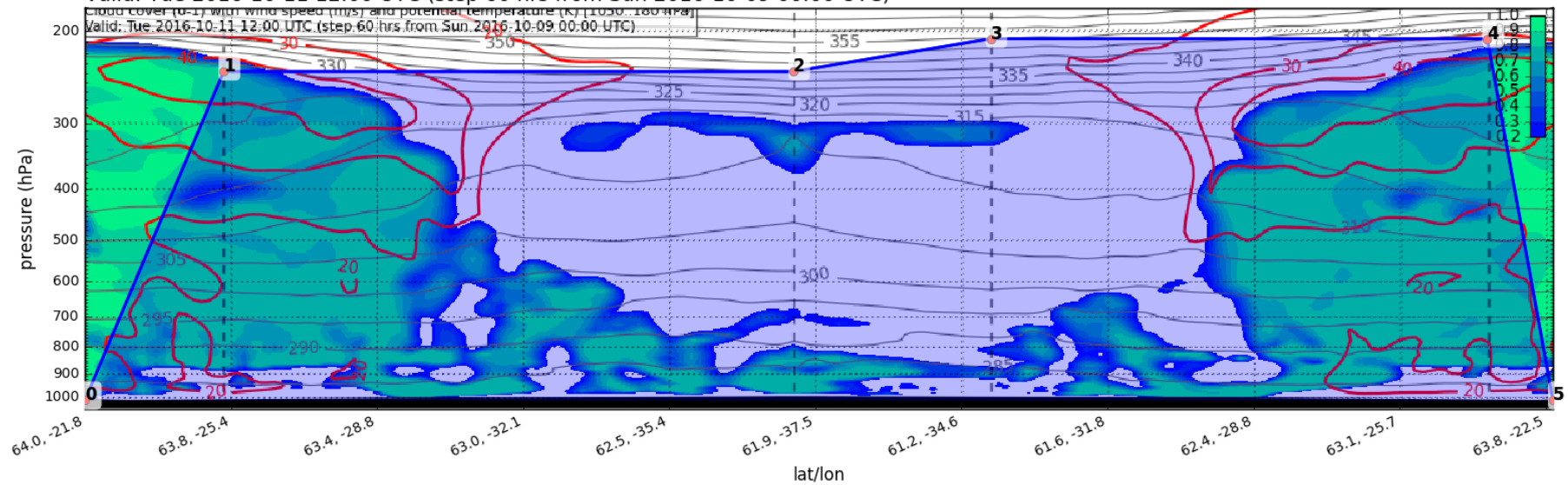
**LENGTH: ~2000km**

**FLIGHT TIME: ~2h 30min**

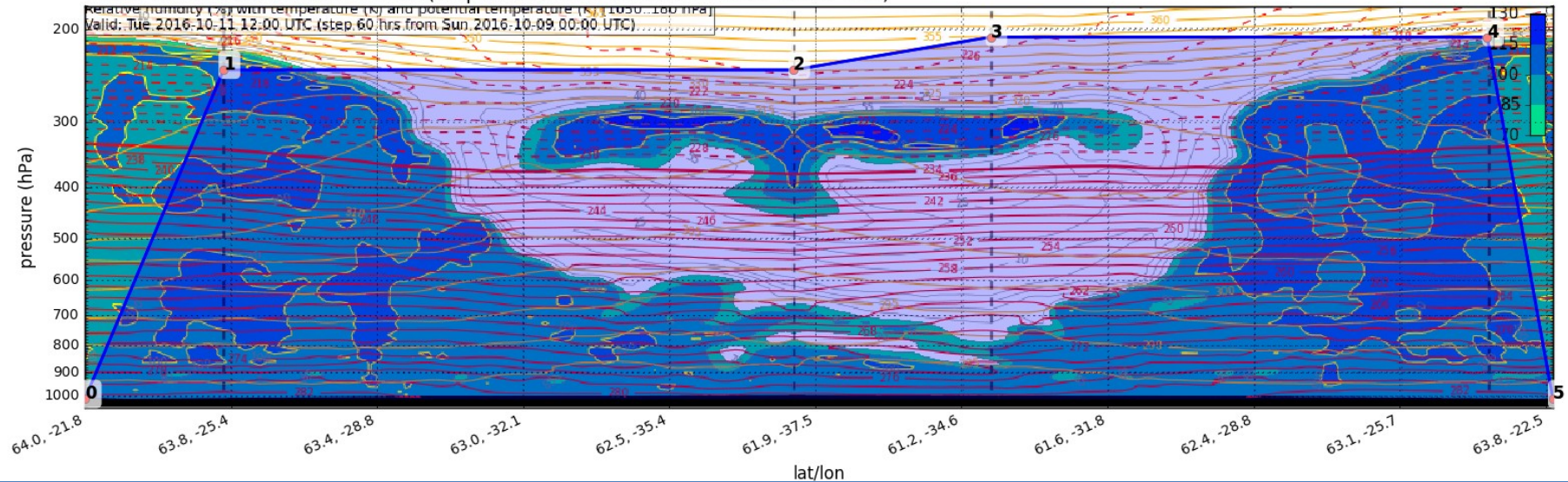


# Tue 12 12Z – DLR Falcon Plan

Cloud Cover (0-1) and Wind Speed (m/s) Vertical Section  
Valid: Tue 2016-10-11 12:00 UTC (step 60 hrs from Sun 2016-10-09 00:00 UTC)



Relative Humidity (%) Vertical Section  
Valid: Tue 2016-10-11 12:00 UTC (step 60 hrs from Sun 2016-10-09 00:00 UTC)

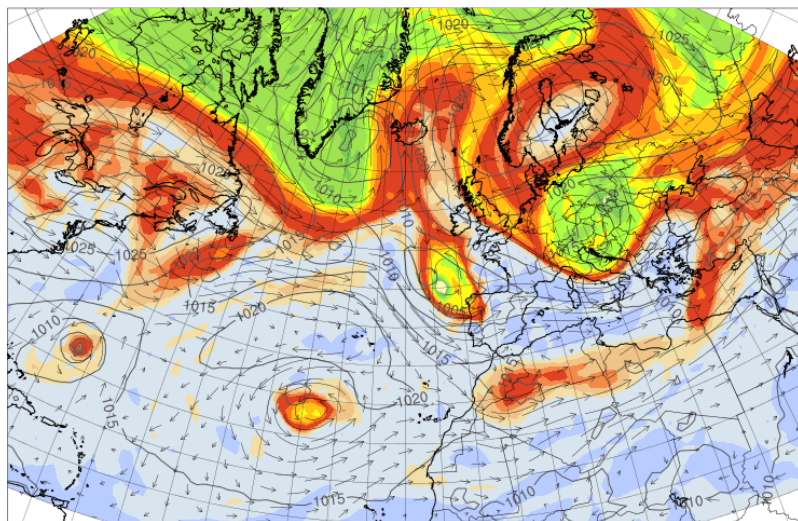


# Outlook until Friday

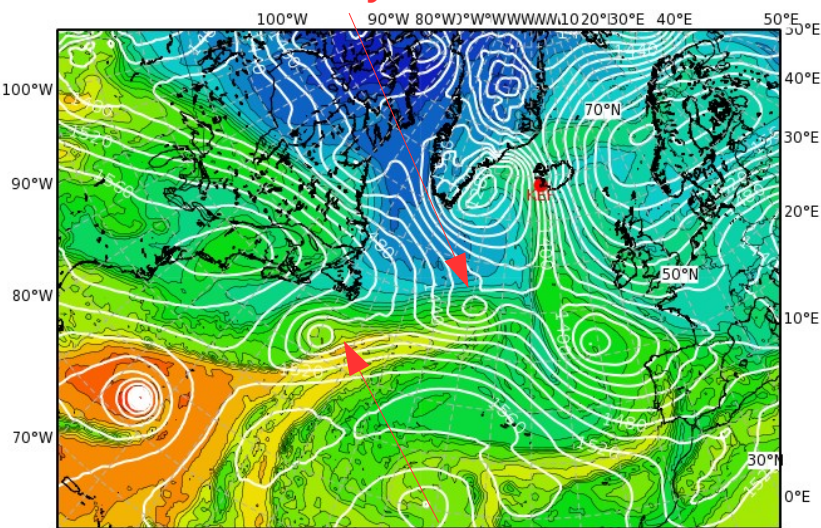


# Forecast – Wed, 12 Oct 2016, 00 UTC

PV@330K at 20161012\_00



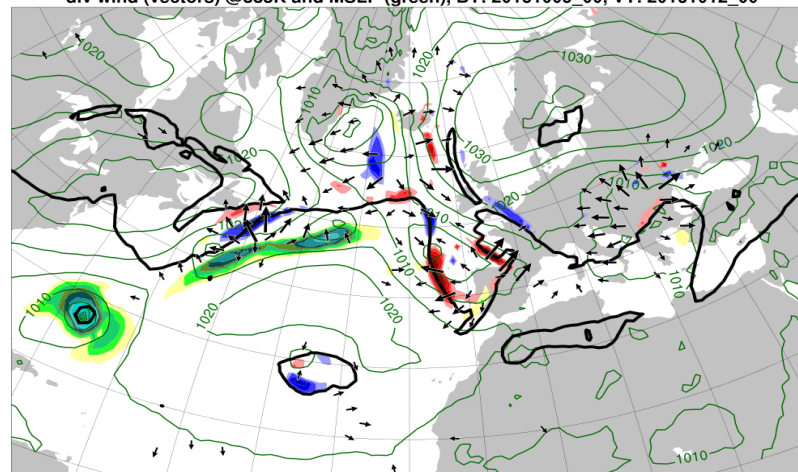
## Downstream cyclone 2



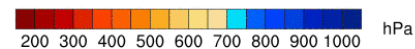
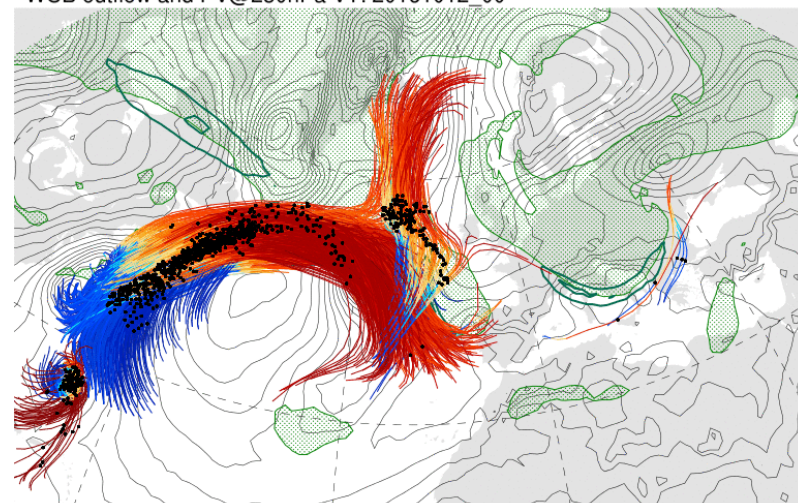
## Downstream cyclone

PV330,THE850, WCB

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009\_00, VT: 20161012\_00



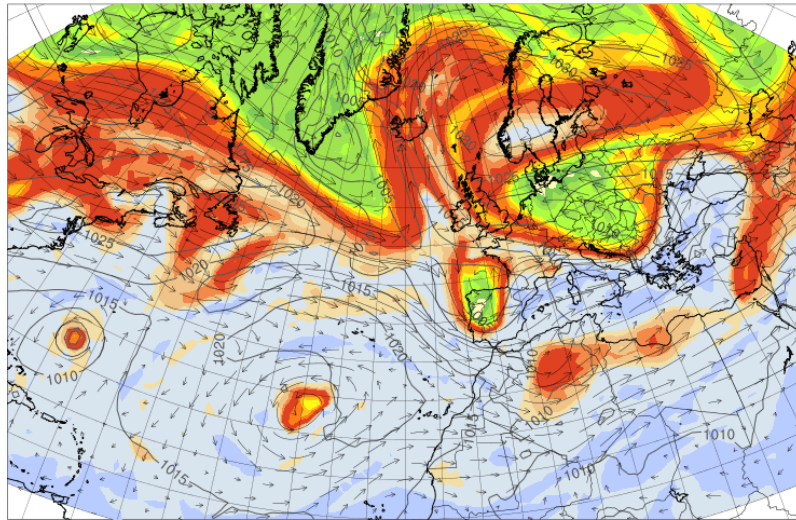
Trajectory start and SLP VT: 20161010\_00  
WCB outflow and PV@250hPa VT: 20161012\_00





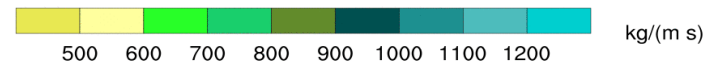
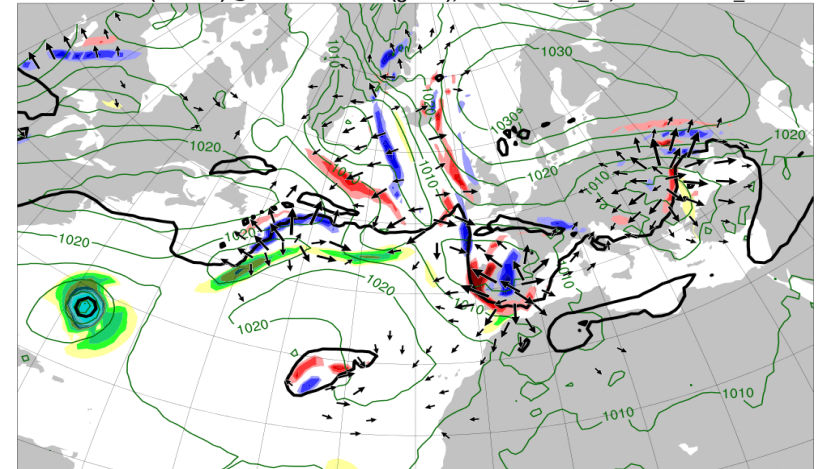
## Forecast – Wed, 12 Oct 2016, 12 UTC

**PV@330K at 20161012\_12**



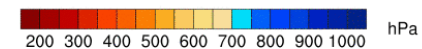
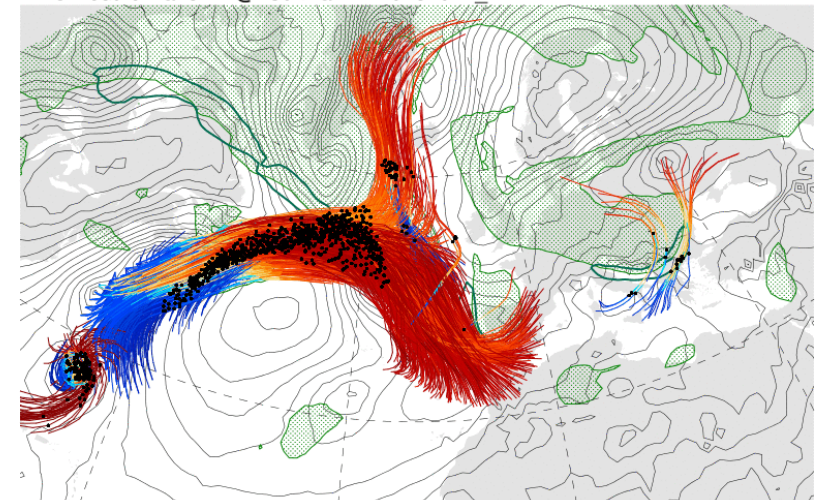
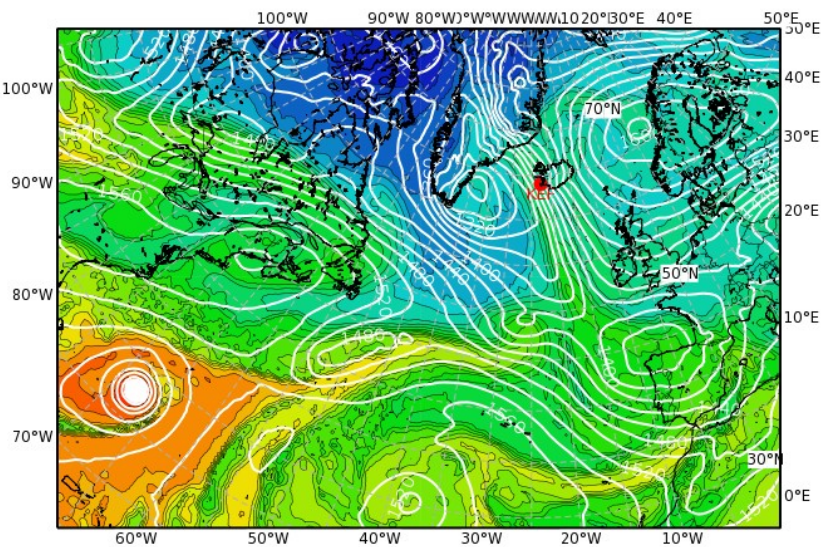
# PV330,THE850, WCB

2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009\_00, VT: 20161012\_12



Trajectory start and SLP VT: 20161010\_12

WCB outflow and PV@250hPa VT: 20161012\_12



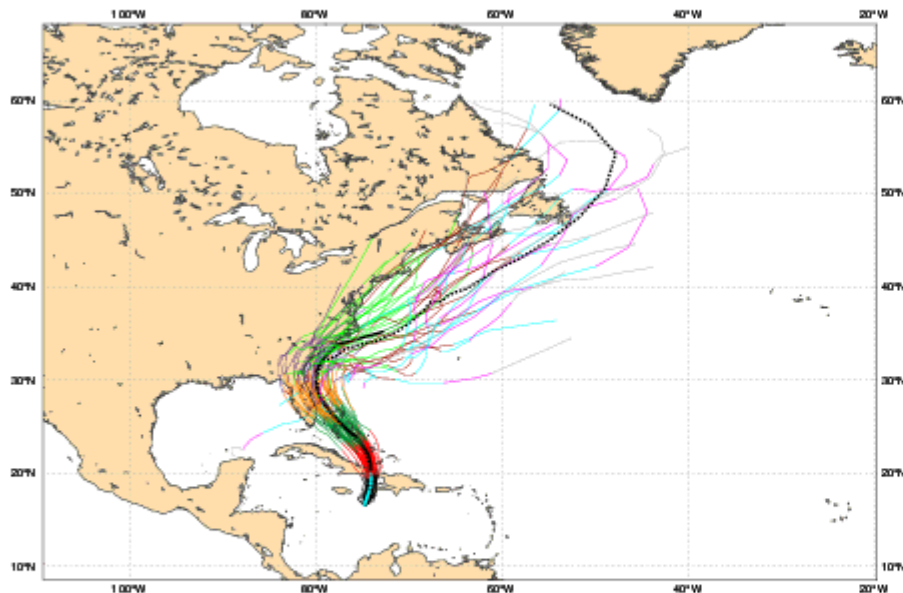
# Evolution of forecasts of TC Matthew, BT: 04 Oct, 00UTC

Date 20161004 00 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

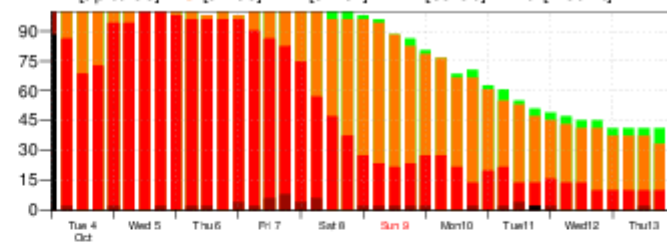


List of ensemble members numbers forecast Tropical Cyclone

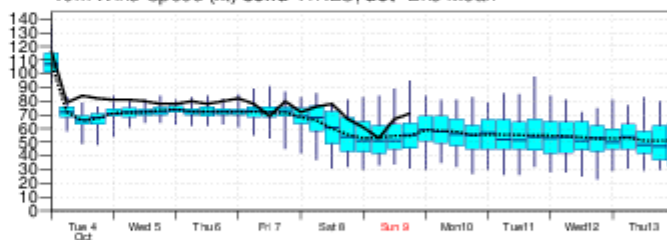
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

Time	0-24h	24-48h	48-72h	72-96h	96-120h	120-144h	144-168h	168-192h	192-216h	216-240h
+024 h	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	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	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	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	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	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	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	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	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	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								

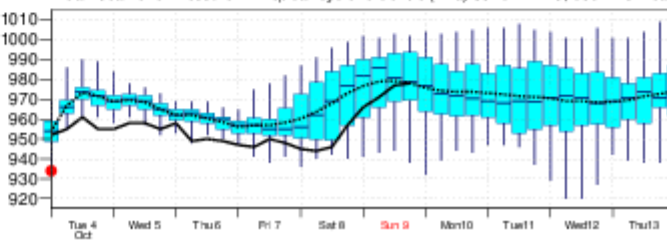
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



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



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





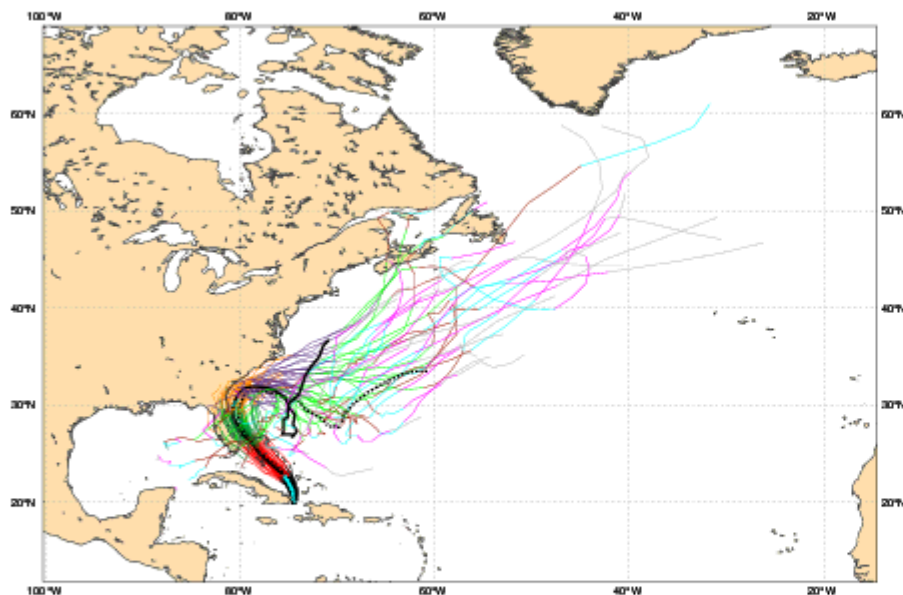
# Evolution of forecasts of TC Matthew, BT: 05 Oct, 00UTC

Date 20161005 00 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

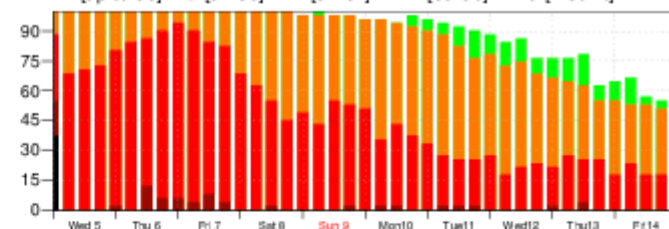


List of ensemble members numbers forecast Tropical Cyclone

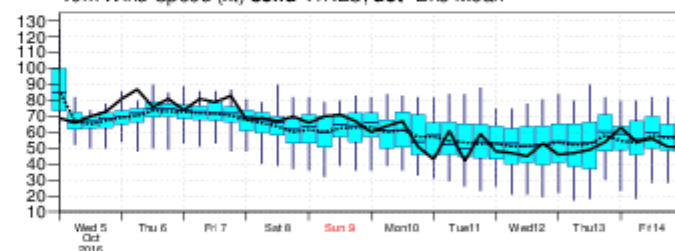
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

+024 h	hr	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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

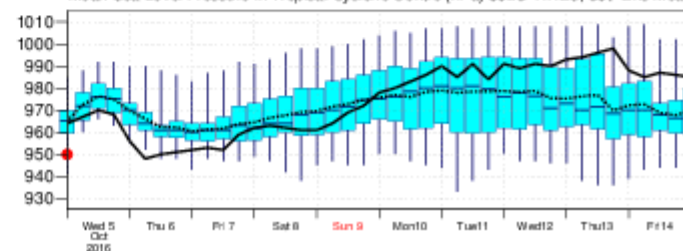
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



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



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





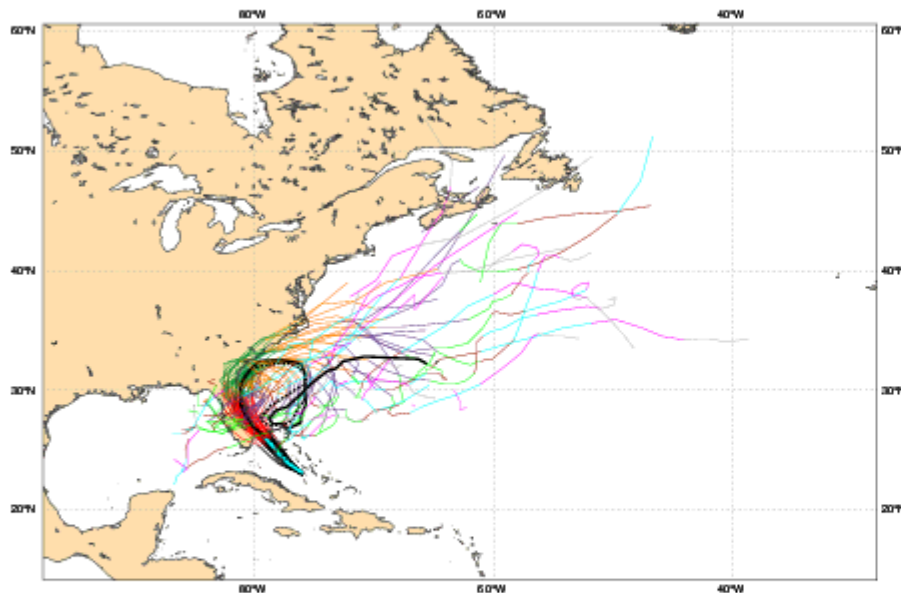
# Evolution of forecasts of TC Matthew, BT: 06 Oct, 00UTC

Date 20161006 00 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

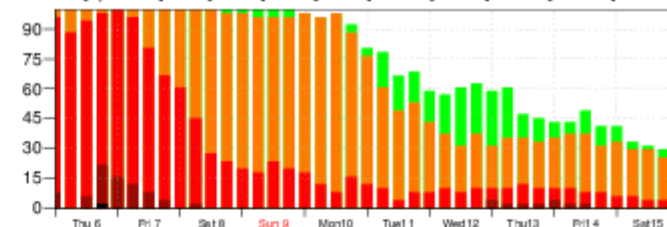


List of ensemble members forecast Tropical Cyclone

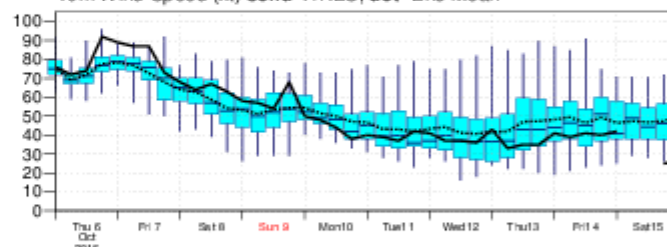
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

+024 h:lv: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:lv: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:lv: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:lv: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:lv: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:lv: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:lv: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:lv: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:lv: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:lv: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

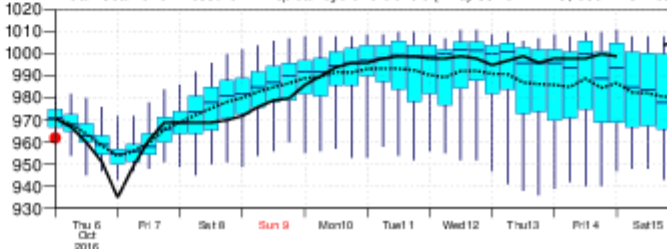
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



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



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



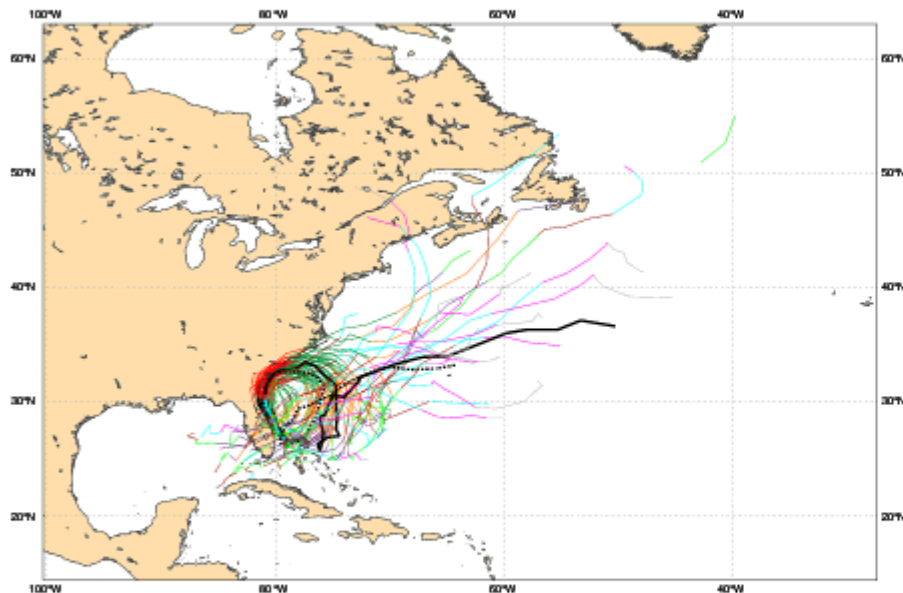
# Evolution of forecasts of TC Matthew, BT: 07 Oct, 00UTC

Date 20161007 00 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

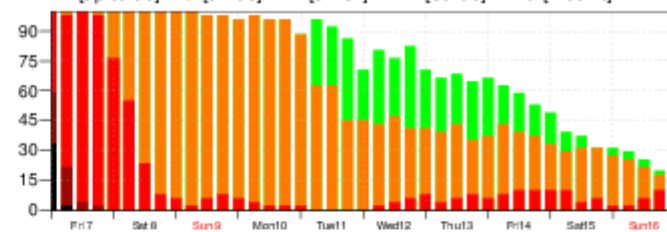


List of ensemble members numbers forecast Tropical Cyclone

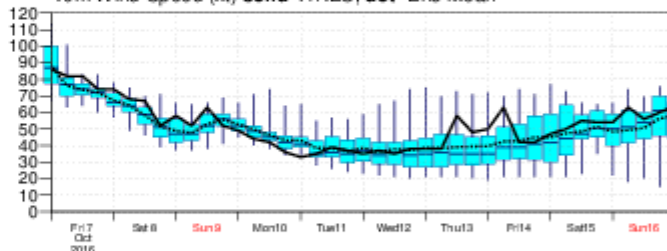
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

+024 h	hr	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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	cd	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

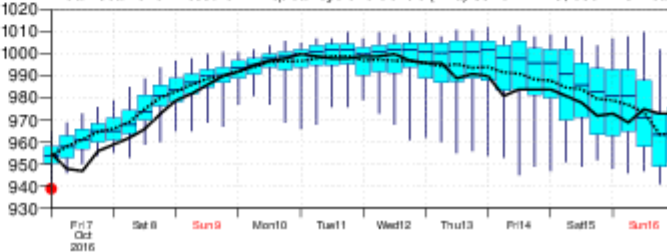
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



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



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



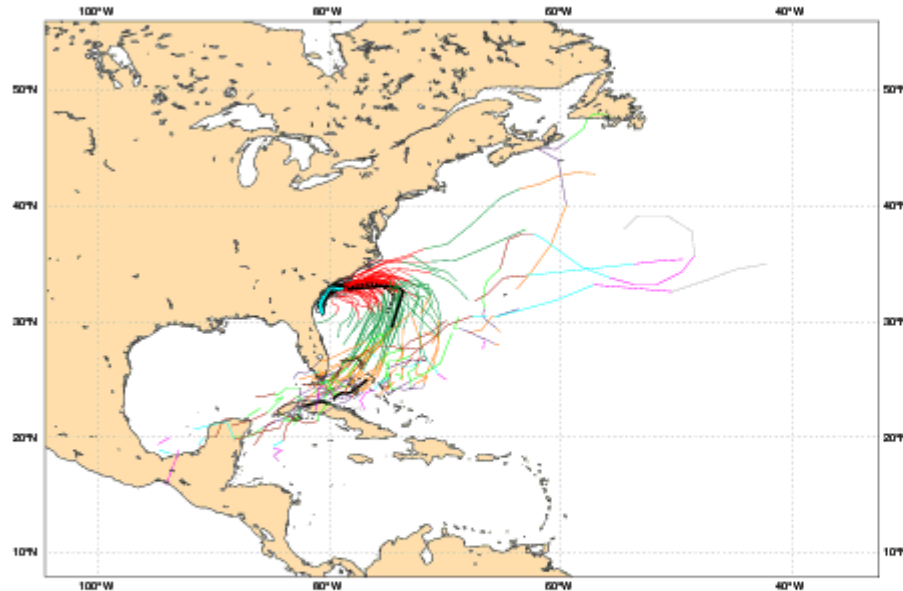
# Evolution of forecasts of TC Matthew, BT: 08 Oct, 00UTC

Date 20161008 00 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

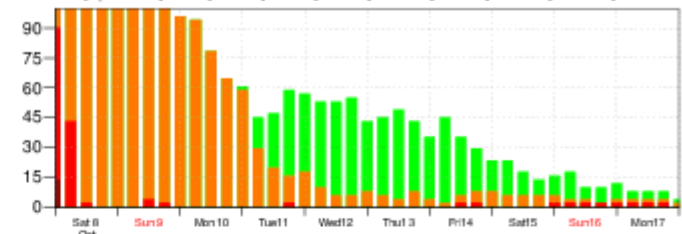


List of ensemble members numbers forecast Tropical Cyclone

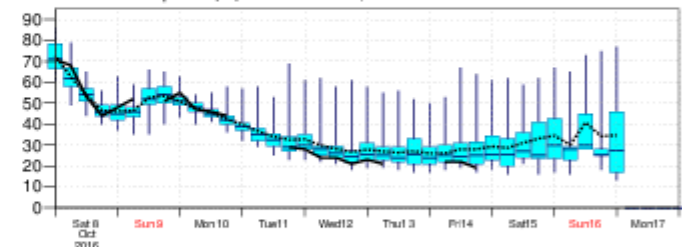
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

+024 h -	hr	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	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	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	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	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	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	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	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	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	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

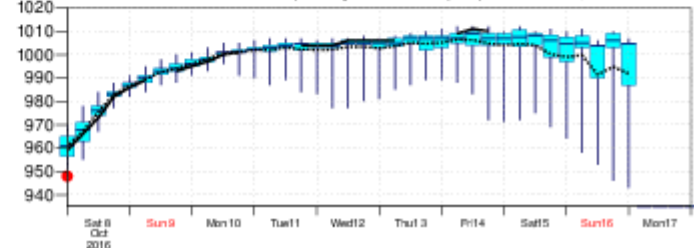
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



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



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





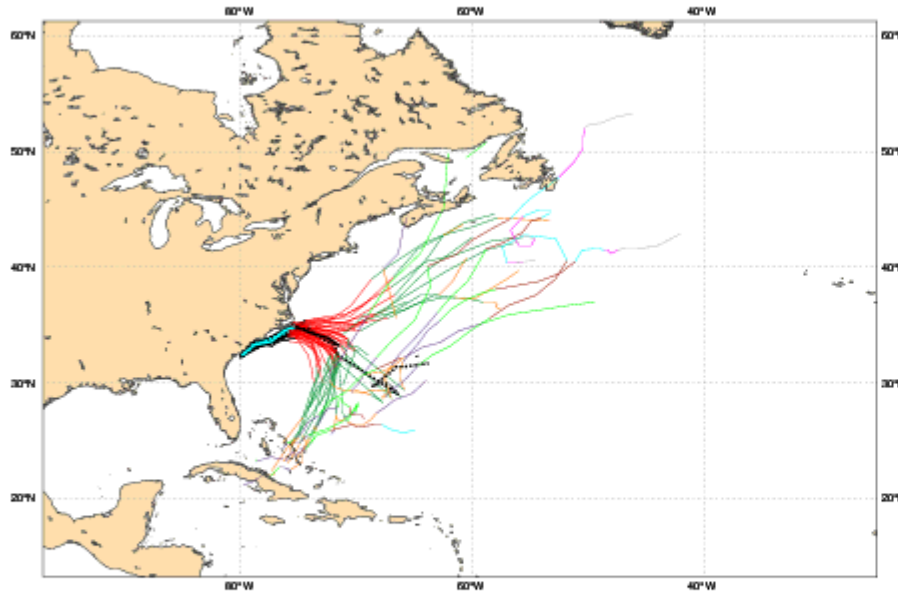
# Evolution of forecasts of TC Matthew, BT: 08 Oct, 12UTC

Date 20161008 12 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

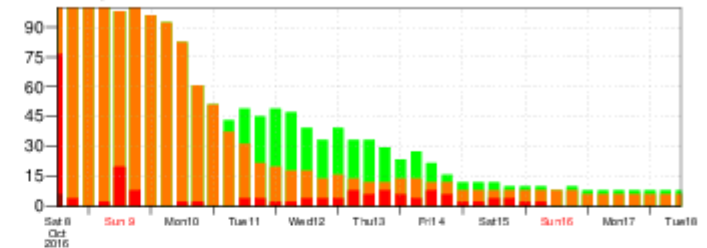


List of ensemble members numbers forecast Tropical Cyclone

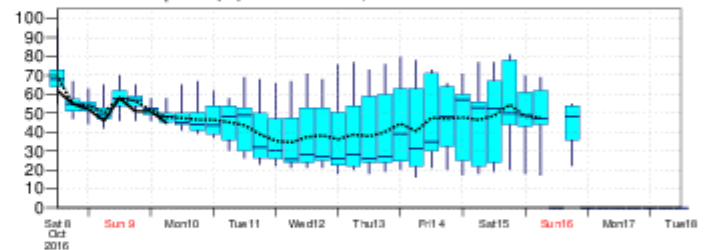
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

Time	0-24h	24-48h	48-72h	72-96h	96-120h	120-144h	144-168h	168-192h	192-216h	216-240h	
+024 h	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	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	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	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	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	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	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	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	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	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	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

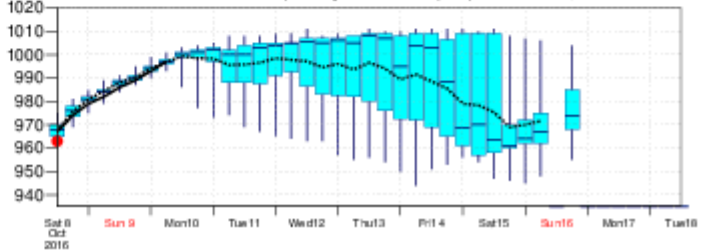
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS** [34-63] **HR1** [64-82] **HR2** [83-95] **HR3** [> 95 kt]



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



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



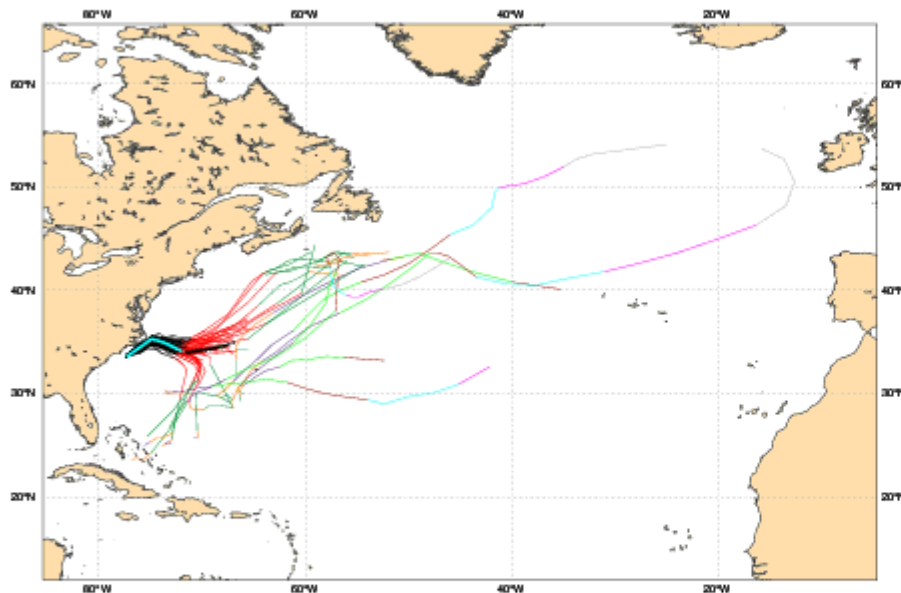
# Evolution of forecasts of TC Matthew, BT: 09 Oct, 00UTC

Date 20161009 00 UTC @ECMWF

Individual trajectories for **MATTHEW** during the next 240 hours

tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]

0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h

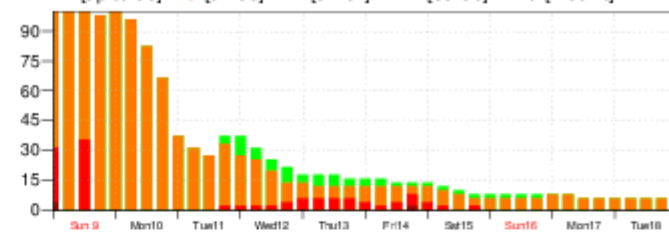


List of ensemble members forecast Tropical Cyclone

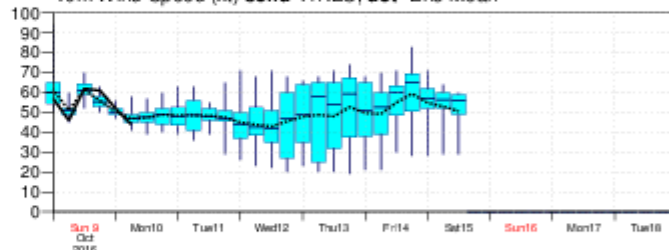
Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]

+024 h	1	2	3	4	5	6	7	8	9	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	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	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	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	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	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	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	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	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	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

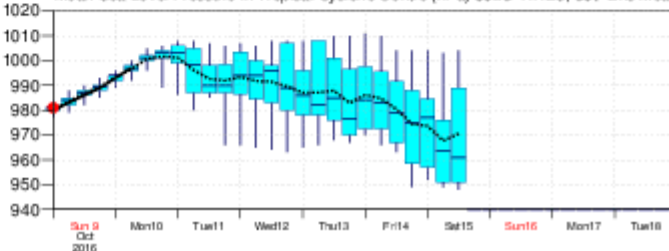
Probability (%) of Tropical Cyclone Intensity falling in each category  
**TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 kt]



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

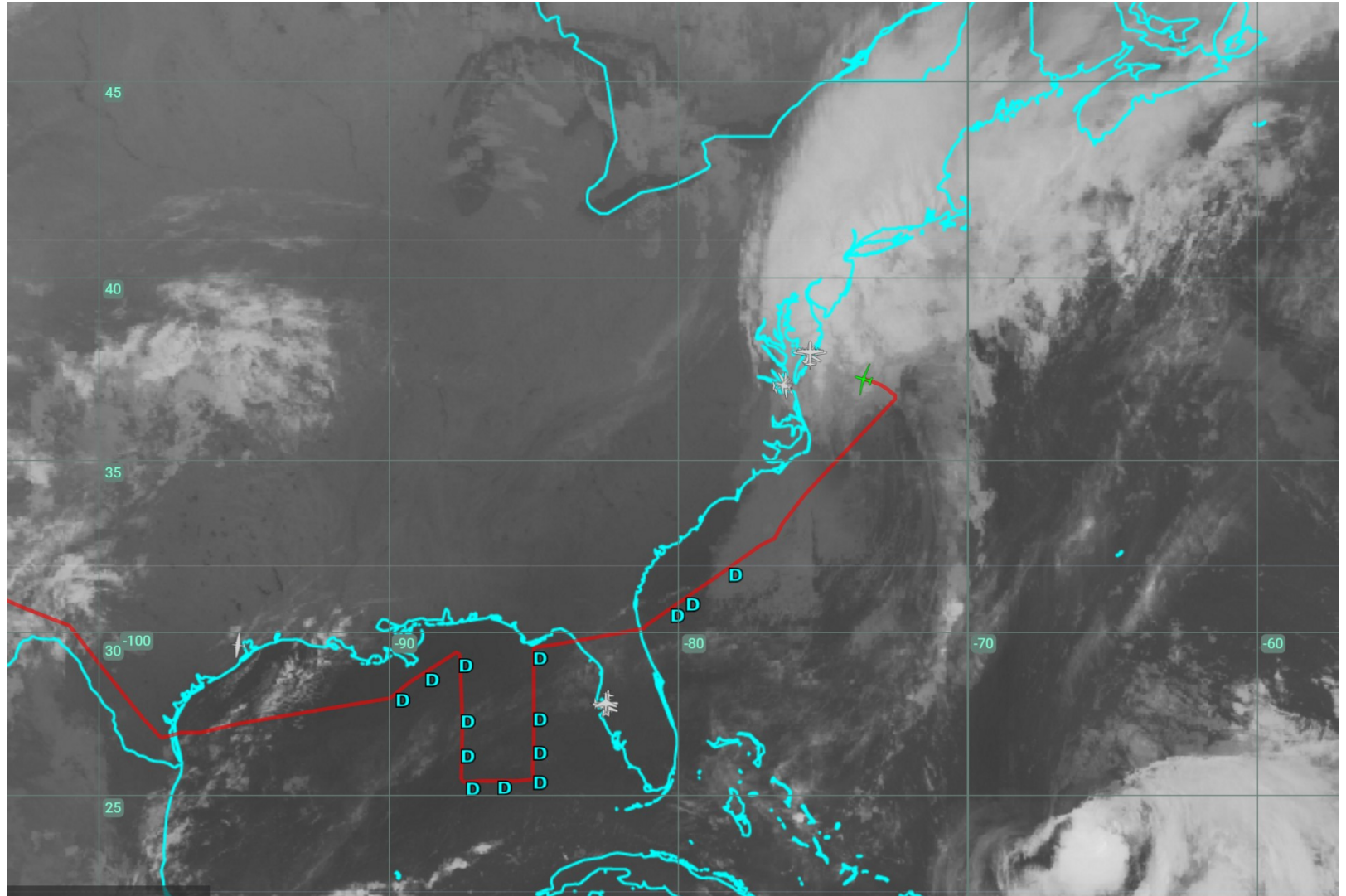


Mean Sea Level Pressure in Tropical Cyclone Centre (hPa) **solid**=HRES; **dot**=Ens Mean



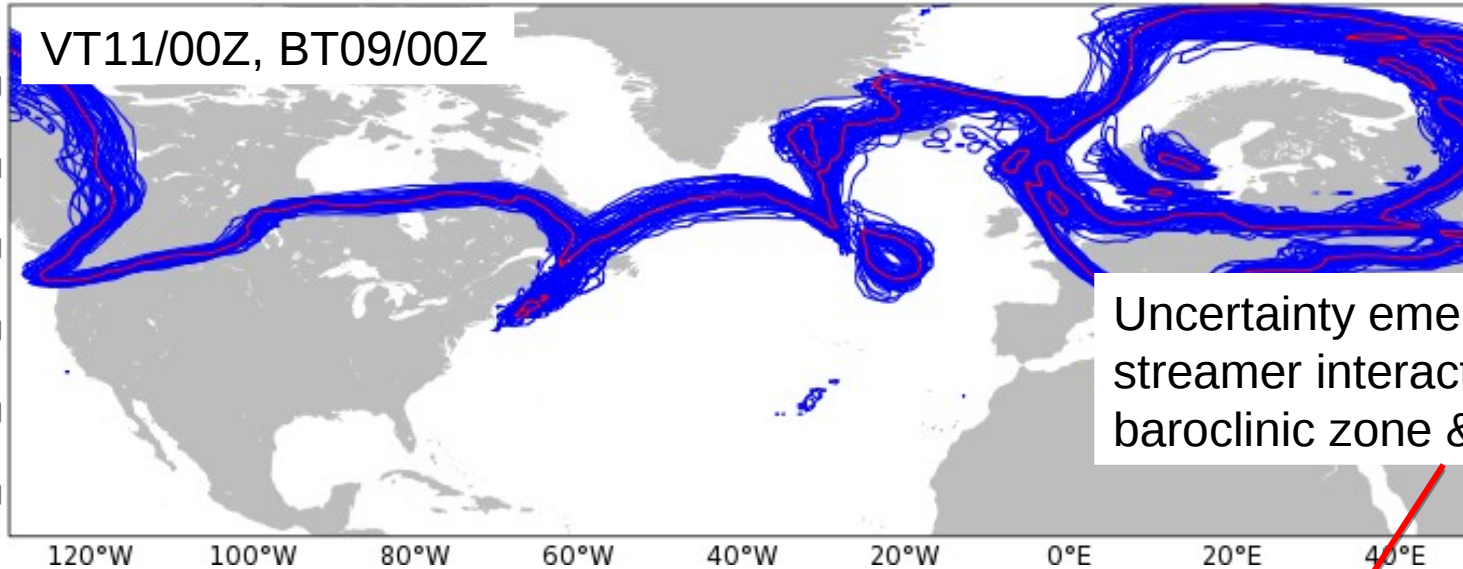
# SHOUT Global Hawk Activity

- Current Mission for GH over Matthew on 8-9 October



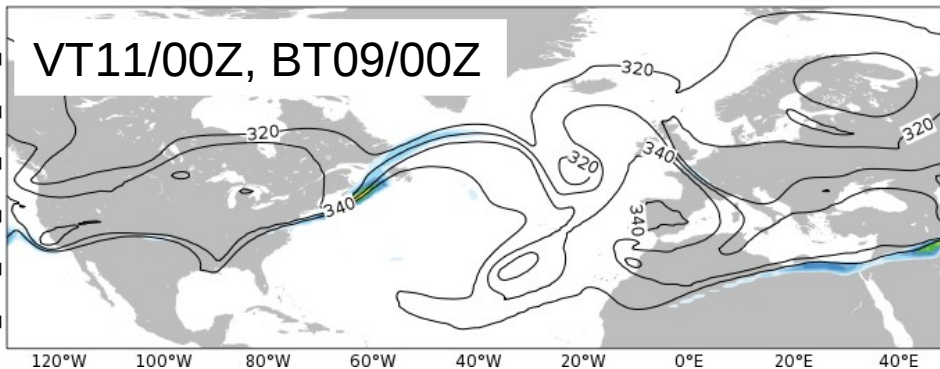
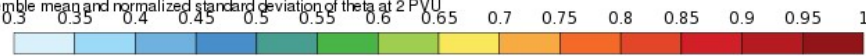


# Forecast for Tuesday, 11 Oct 2016 00 UTC: 2PVU at 320K, Ensemble spread of THE@2PVU, THE@2PVU

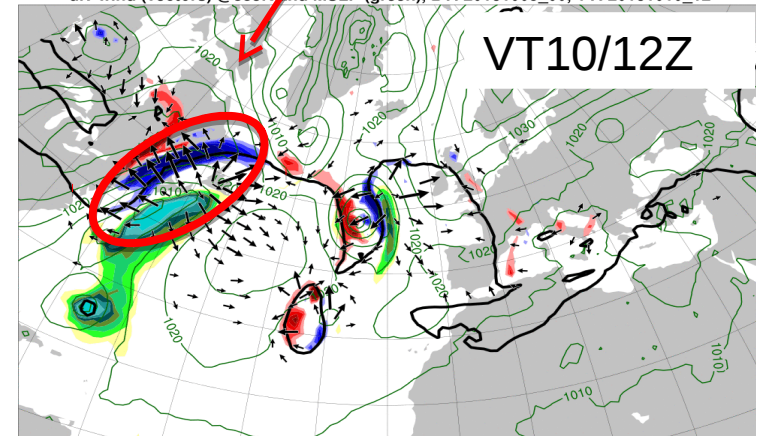


ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161011 00UTC

ensemble mean and normalized standard deviation of theta at 2 PVU



2 PVU (black), PV adv by div wind (shading),  
div wind (vectors) @335K and MSLP (green), BT: 20161009 00, VT: 20161010 12

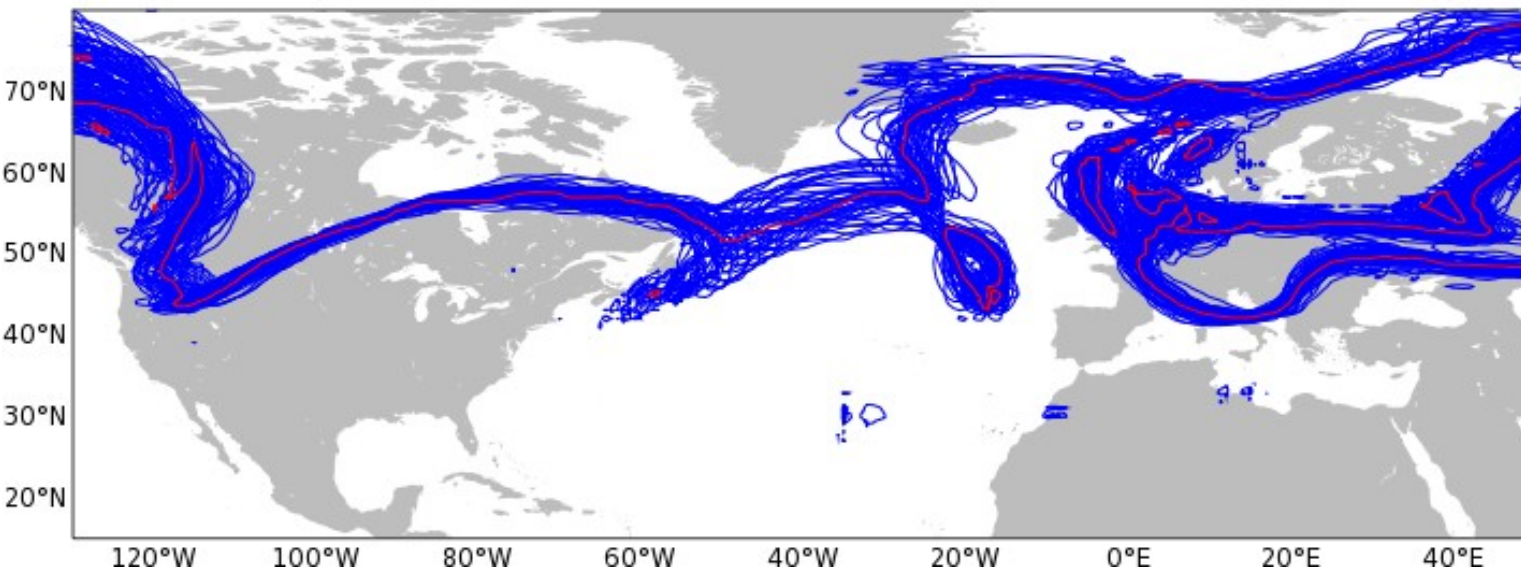


# Forecast for Tuesday, 11 Oct 2016 12 UTC: 2PVU at 320K

## Ensemble spread of THE@2PVU, THE@2PVU

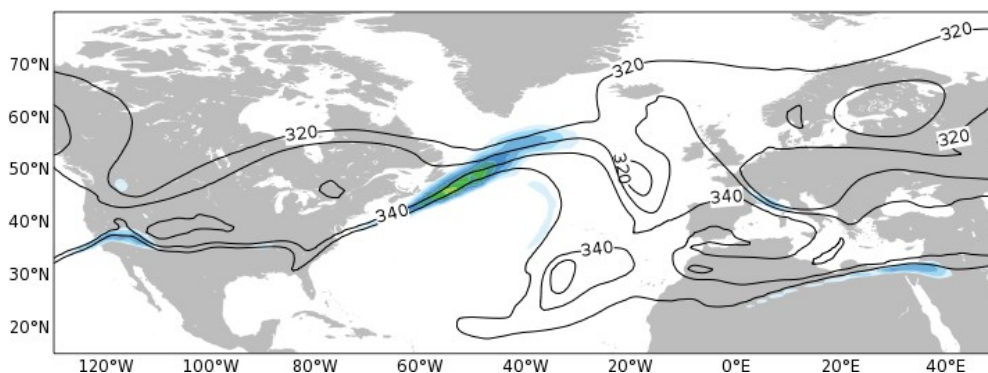
BT09/00Z

BT: 20161009 00UTC, VT: 20161011 12UTC  
blue: perturbed, red: control



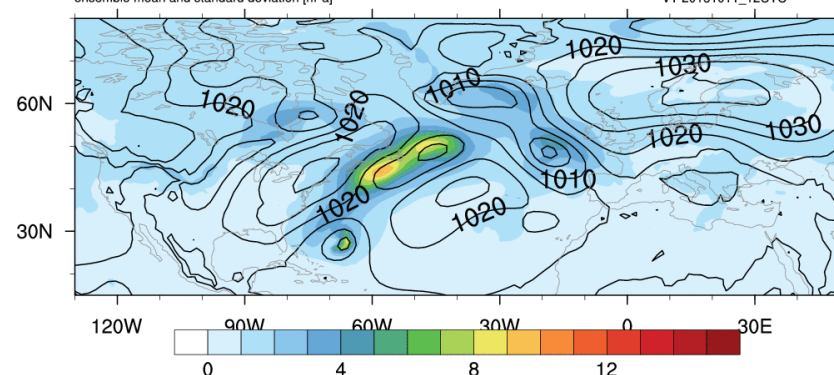
ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161011 12UTC

ensemble mean and normalized standard deviation of theta at 2 PVU



Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

ECMWF 51 member ensemble  
BT 20161009 00UTC  
VT 20161011 12UTC



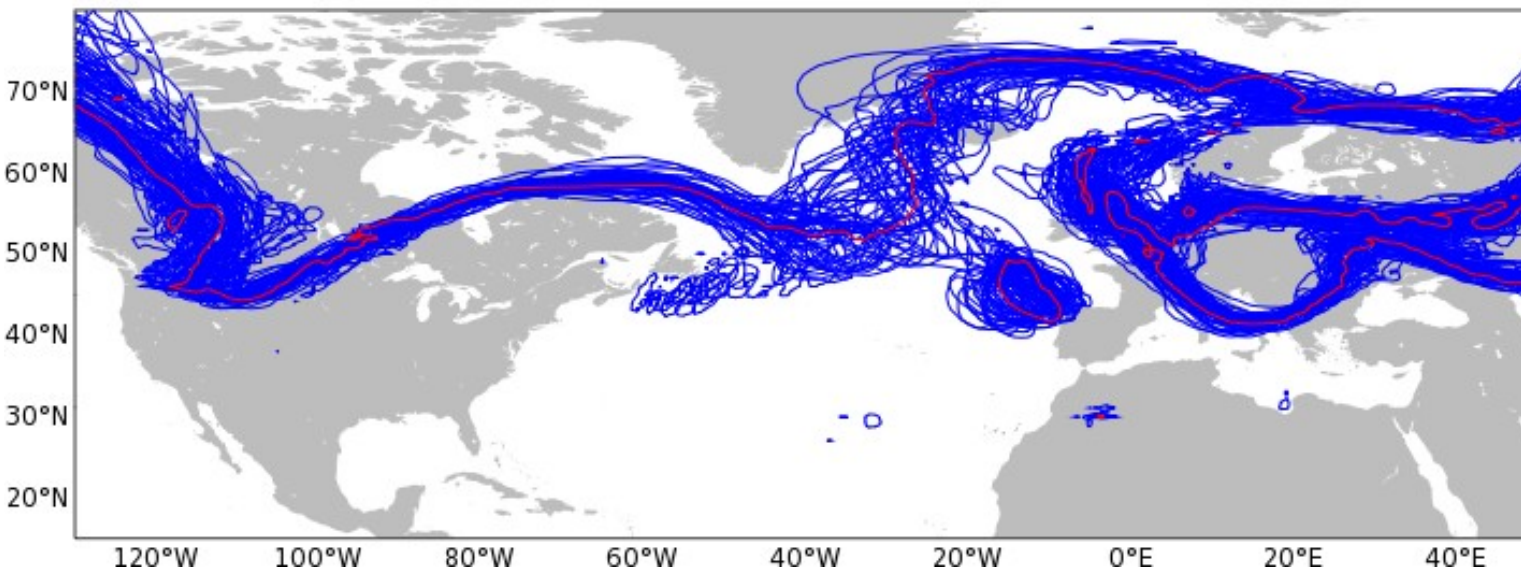


# Forecast for Wednesday , 12 Oct 2016 00 UTC: 2PVU at 320K

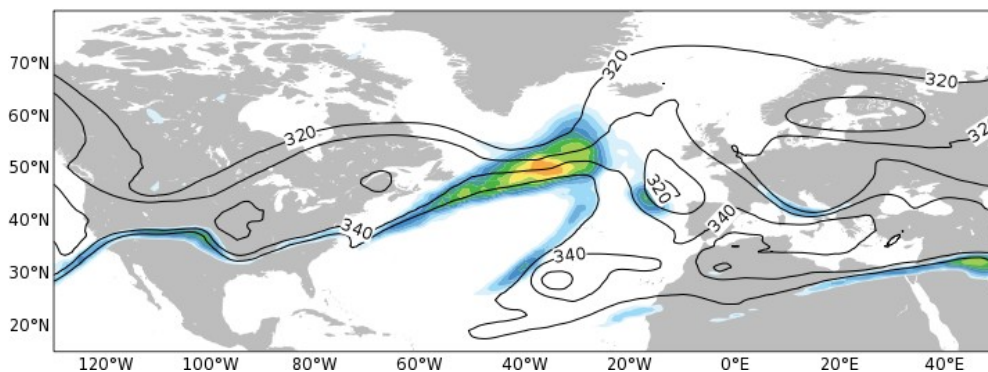
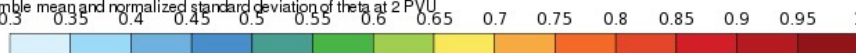
## Ensemble spread of THE@2PVU, THE@2PVU

BT09/00Z

BT: 20161009 00UTC, VT: 20161012 00UTC  
blue: perturbed, red: control

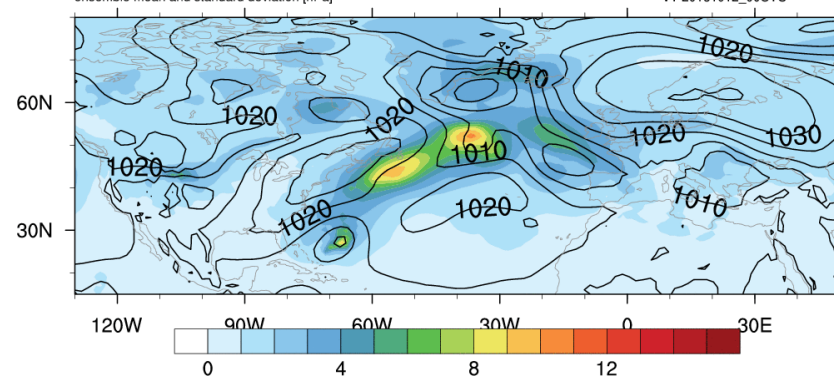


ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161012 00UTC  
ensemble mean and normalized standard deviation of theta at 2 PVU



Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

ECMWF 51 member ensemble  
BT 20161009 00UTC  
VT 20161012 00UTC



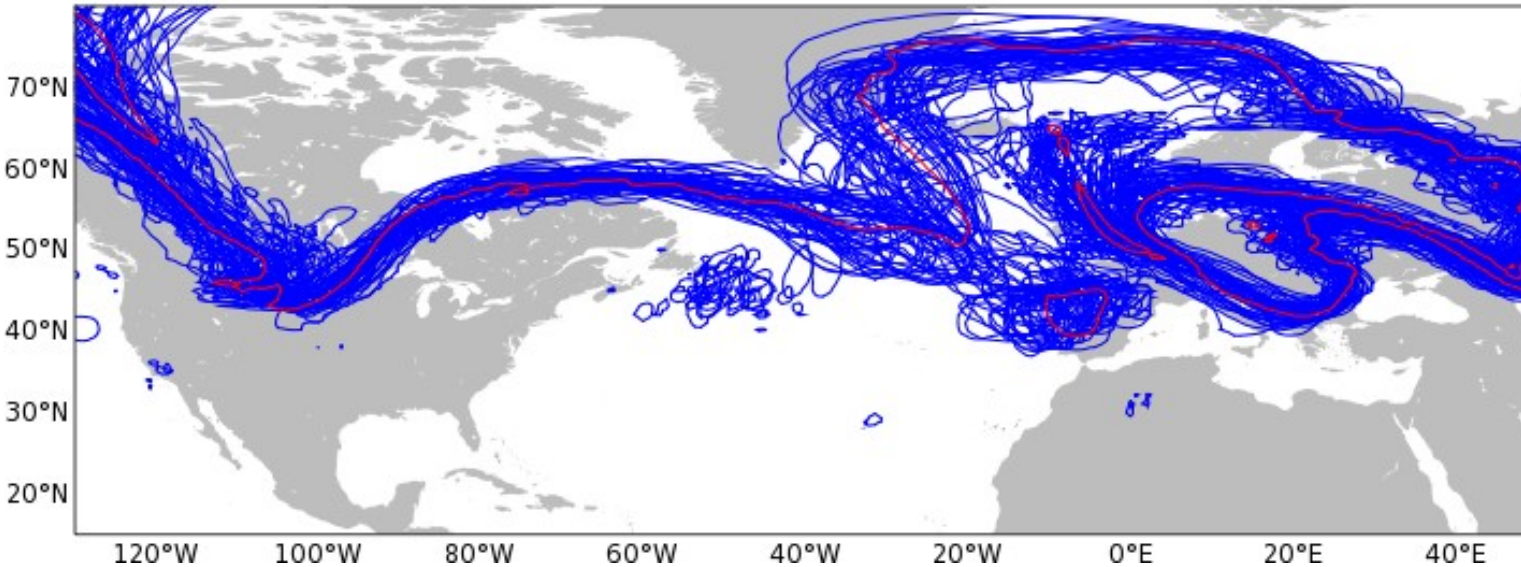


# Forecast for Wednesday, 12 Oct 2016 12 UTC: 2PVU at 320K

## Ensemble spread of THE@2PVU, THE@2PVU

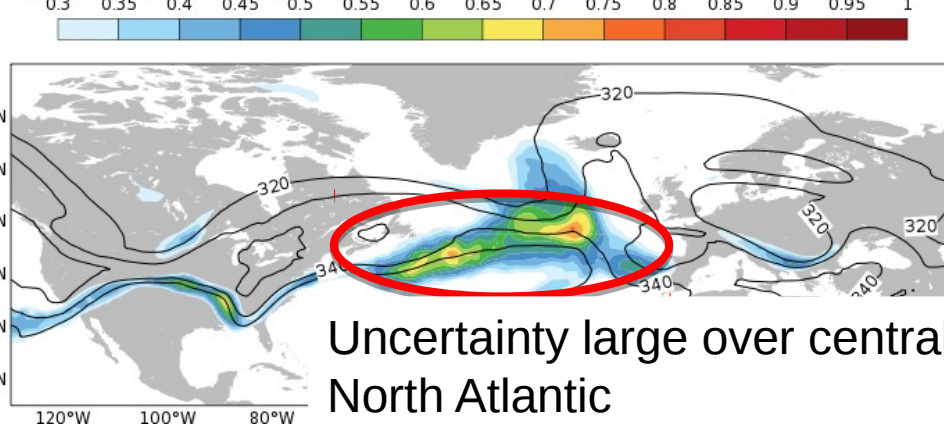
BT09/00Z

BT: 20161009 00UTC, VT: 20161012 12UTC  
blue: perturbed, red: control



ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161012 12UTC

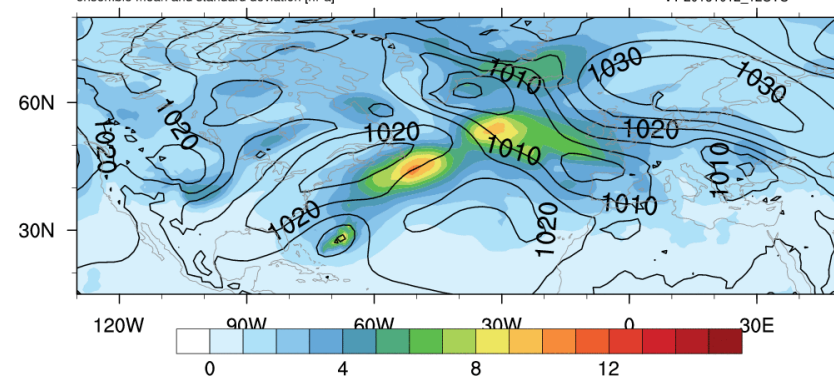
ensemble mean and normalized standard deviation of theta at 2 PVU



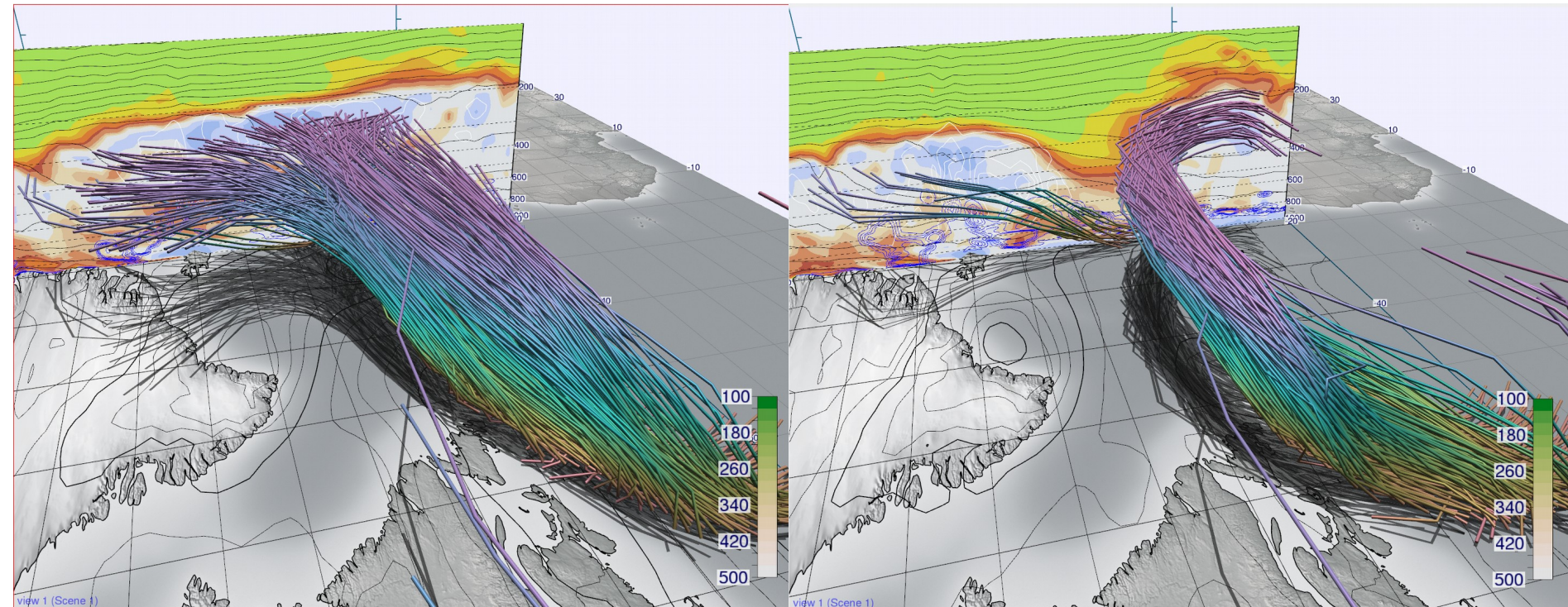
Uncertainty large over central  
North Atlantic

Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

ECMWF 51 member ensemble  
BT 20161009\_00UTC  
VT 20161012\_12UTC

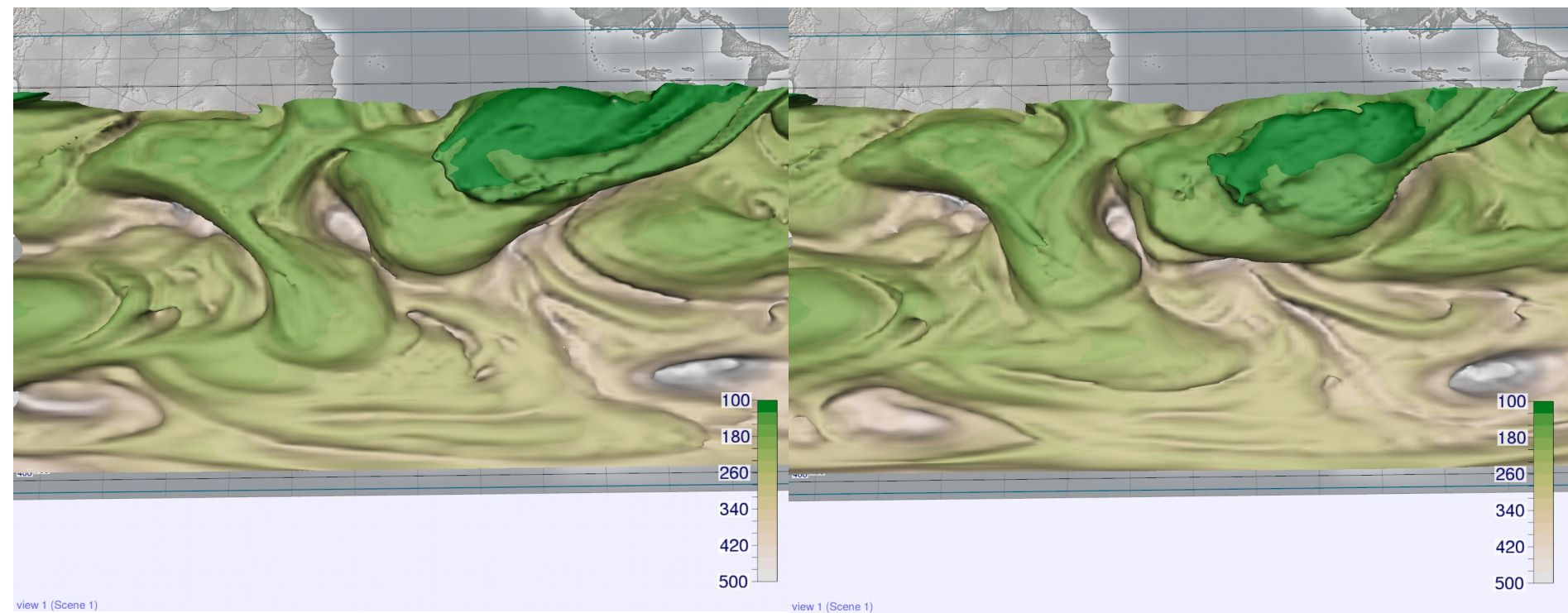


## Forecast scenarios for Wednesday, 12UTC





## Forecast scenarios for Wednesday, 12UTC



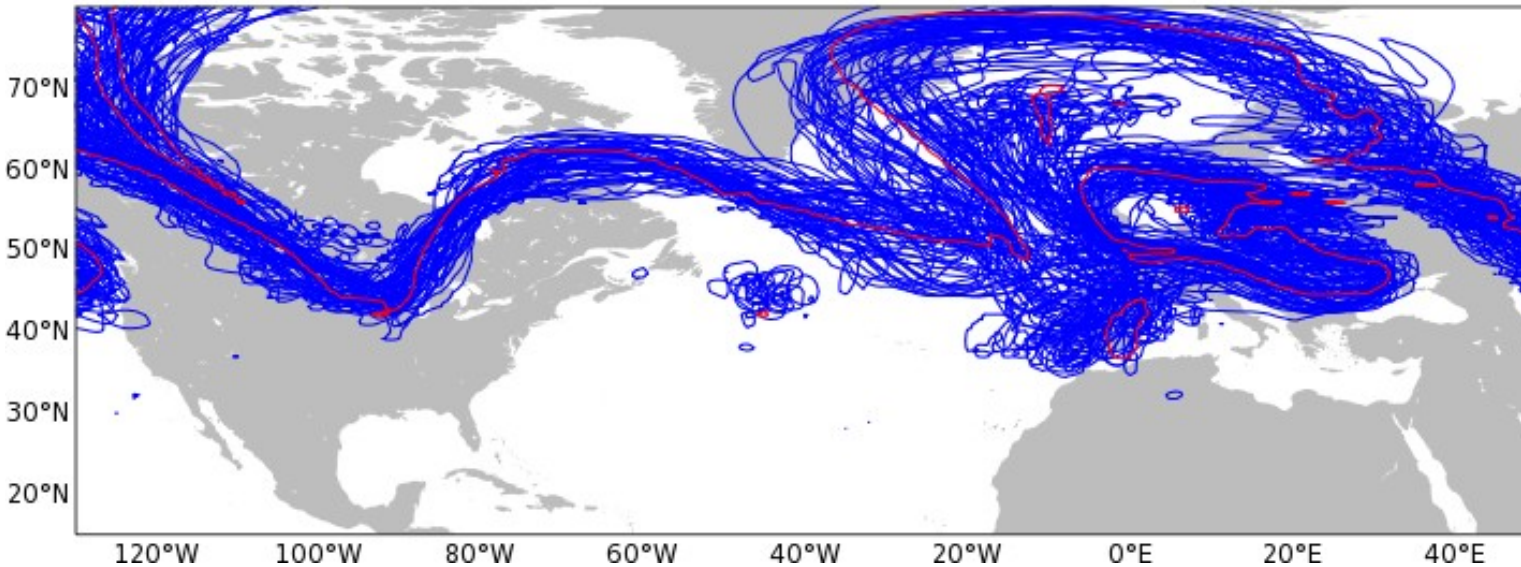


# Forecast for Thursday, 13 Oct 2016 00 UTC: 2PVU at 320K

## Ensemble spread of THE@2PVU, THE@2PVU

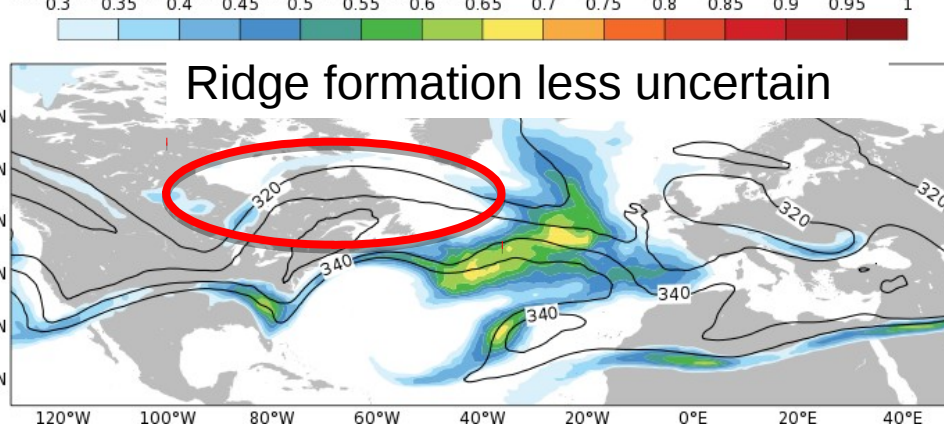
BT09/00Z

BT: 20161009 00UTC, VT: 20161013 00UTC  
blue: perturbed, red: control



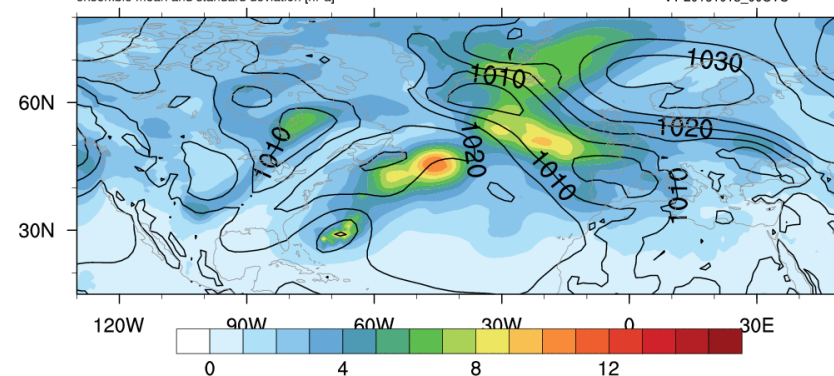
ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161013 00UTC

ensemble mean and normalized standard deviation of theta at 2 PVU



Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

ECMWF 51 member ensemble  
BT 20161009 00UTC  
VT 20161013 00UTC

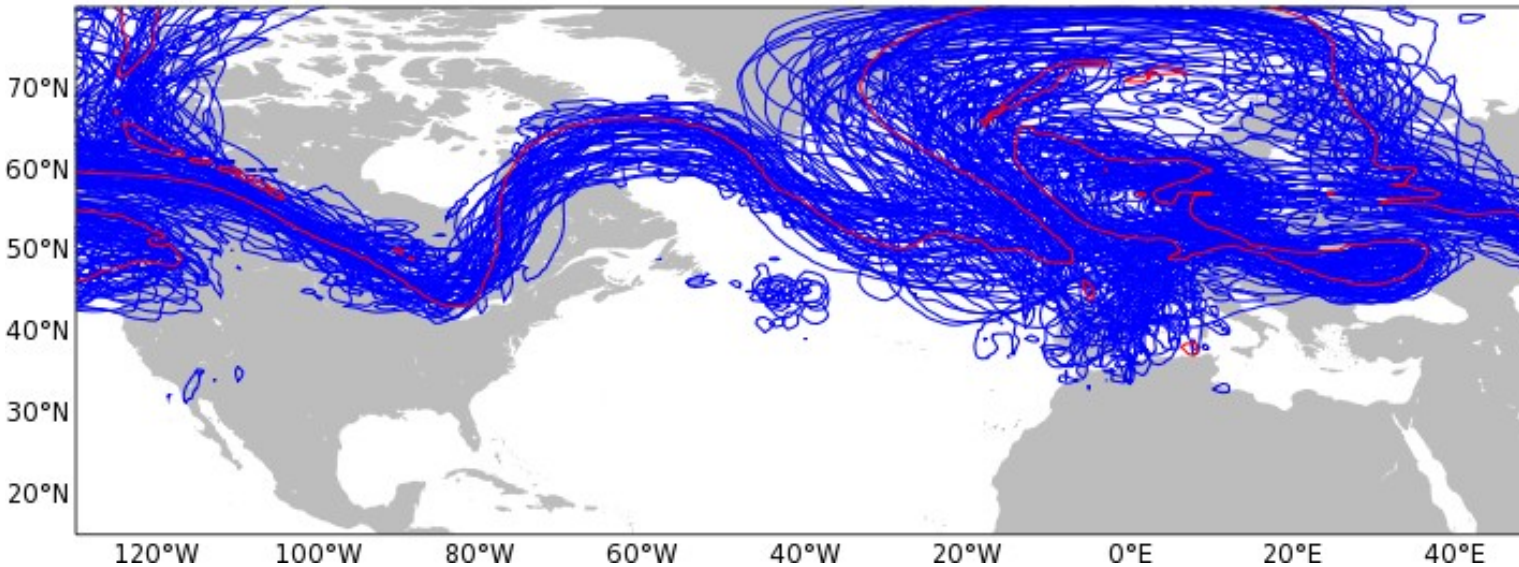


# Forecast for Thursday, 13 Oct 2016 12 UTC: 2PVU at 320K

## Ensemble spread of THE@2PVU, THE@2PVU

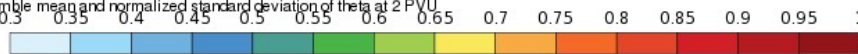
BT09/00Z

BT: 20161009 00UTC, VT: 20161013 12UTC  
blue: perturbed, red: control

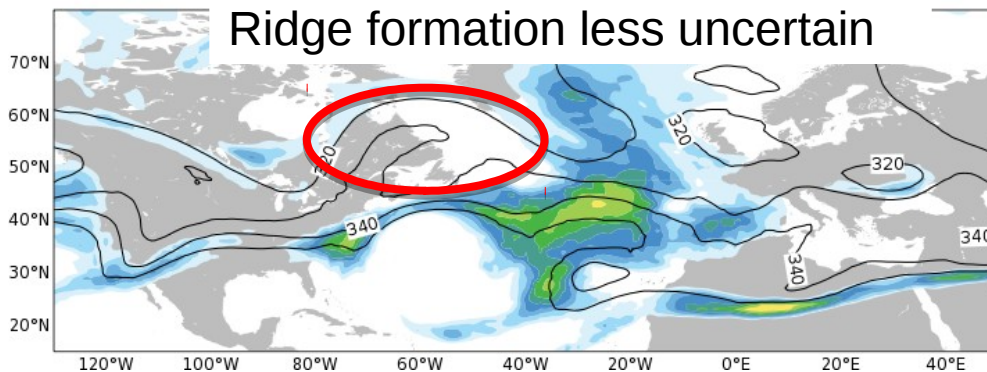


ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161013 12UTC

ensemble mean and normalized standard deviation of theta at 2 PVU

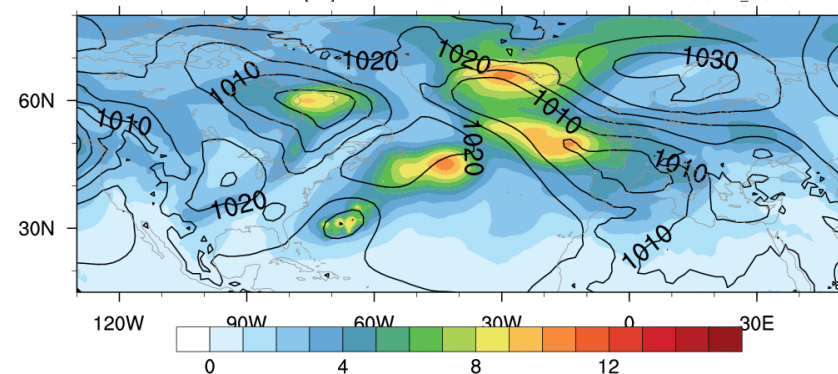


Ridge formation less uncertain



Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

ECMWF 51 member ensemble  
BT 20161009 00UTC  
VT 20161013 12UTC



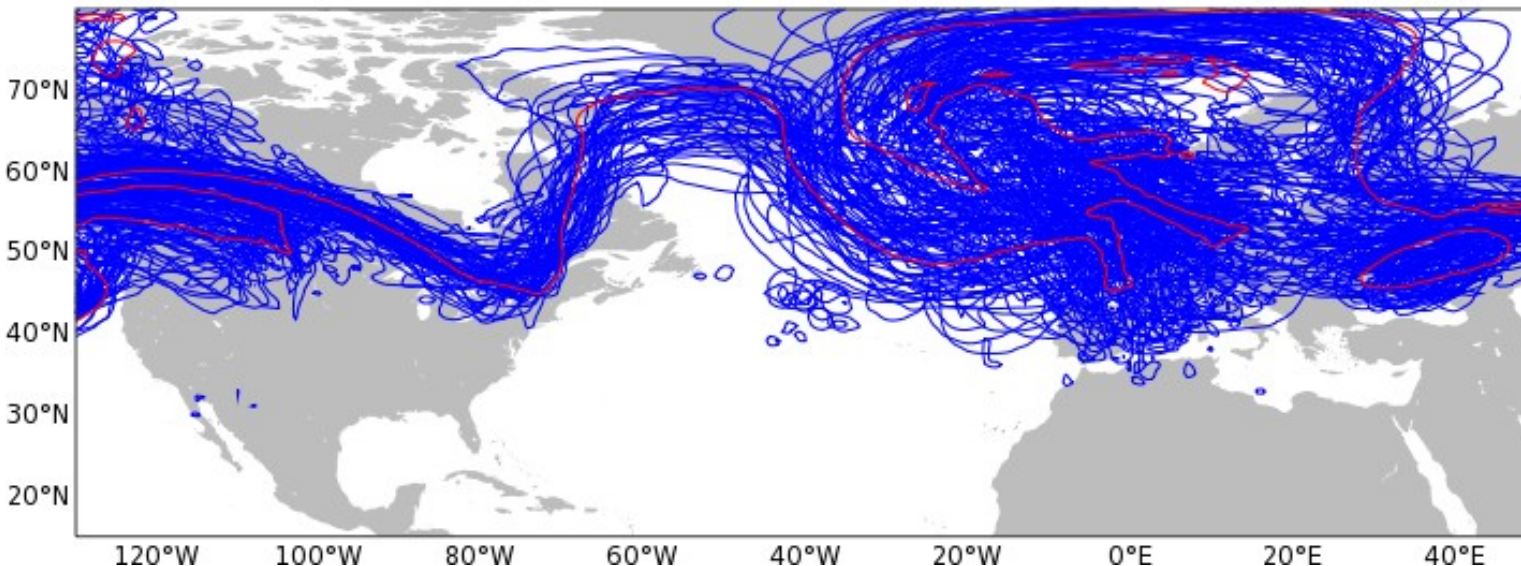


# Forecast for Friday, 14 Oct 2016 00 UTC: 2PVU at 320K

## Ensemble spread of THE@2PVU, THE@2PVU

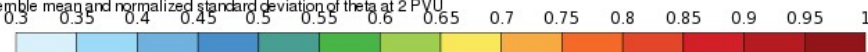
BT09/00Z

BT: 20161009 0000Z, VT: 20161014 0000Z  
blue: perturbed, red: control

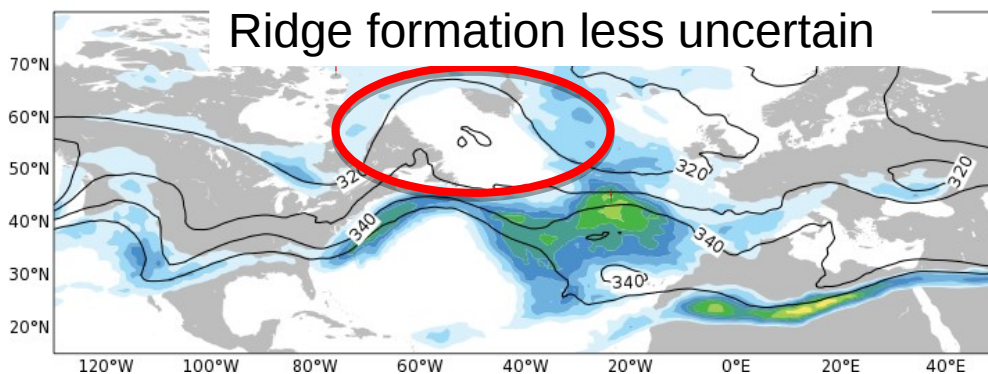


ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161014 00UTC

ensemble mean and normalized standard deviation of theta at 2 PVU

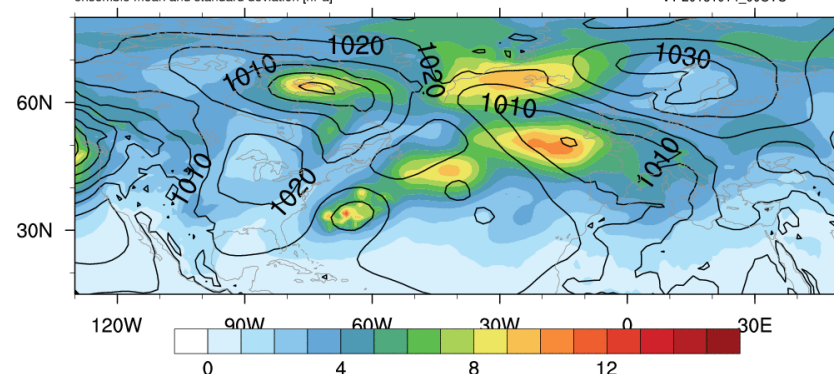


Ridge formation less uncertain



Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

ECMWF 51 member ensemble  
BT 20161009 00UTC  
VT 20161014 00UTC



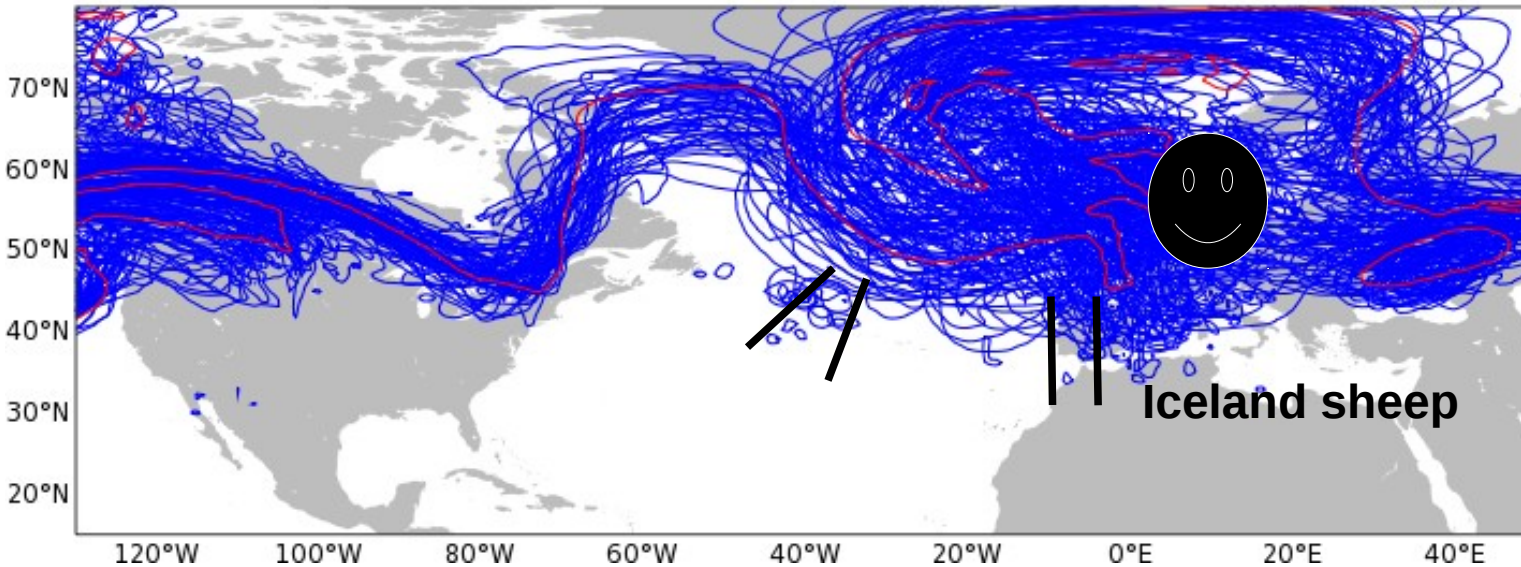


# Forecast for Friday, 14 Oct 2016 00 UTC: 2PVU at 320K

## Ensemble spread of THE@2PVU, THE@2PVU

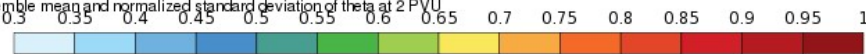
BT09/00Z

BT: 20161009 0000Z, VT: 20161014 0000Z  
blue: perturbed, red: control

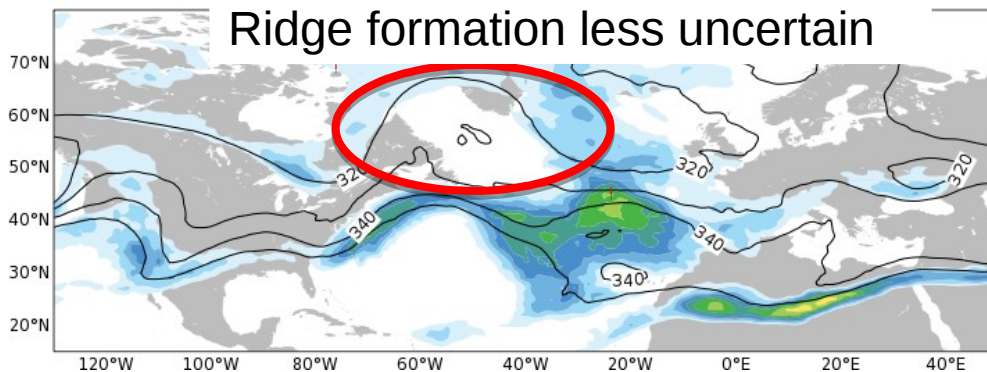


ECMWF ENSEMBLE FC  
BT: 20161009 00UTC, VT: 20161014 00UTC

ensemble mean and normalized standard deviation of theta at 2 PVU

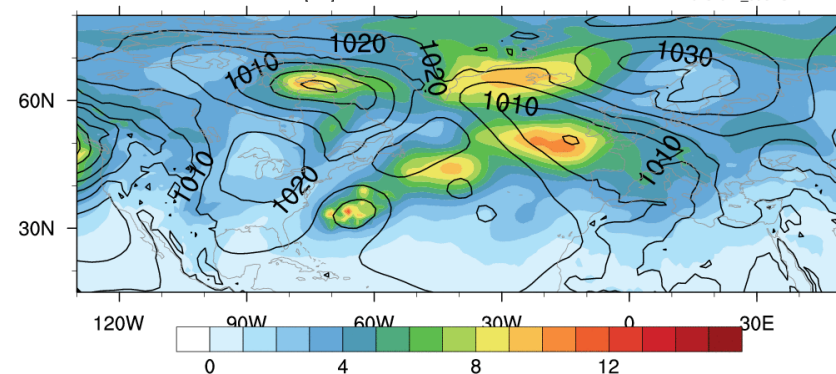


Ridge formation less uncertain



Pressure at mean sea level  
ensemble mean and standard deviation [hPa]

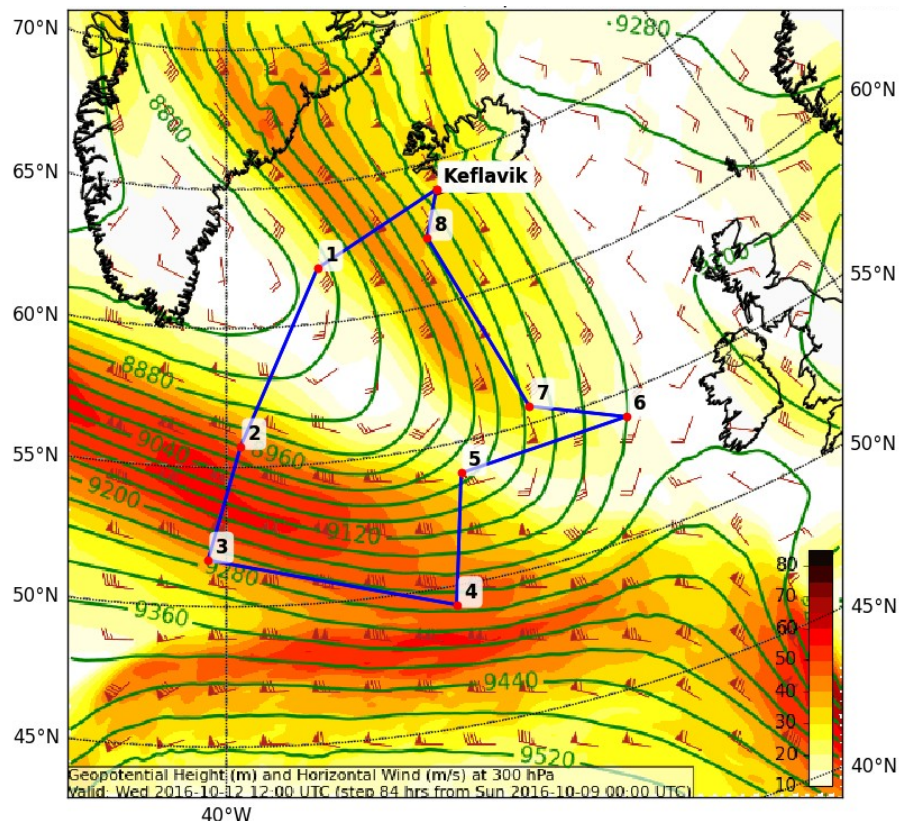
ECMWF 51 member ensemble  
BT 20161009\_00UTC  
VT 20161014\_00UTC



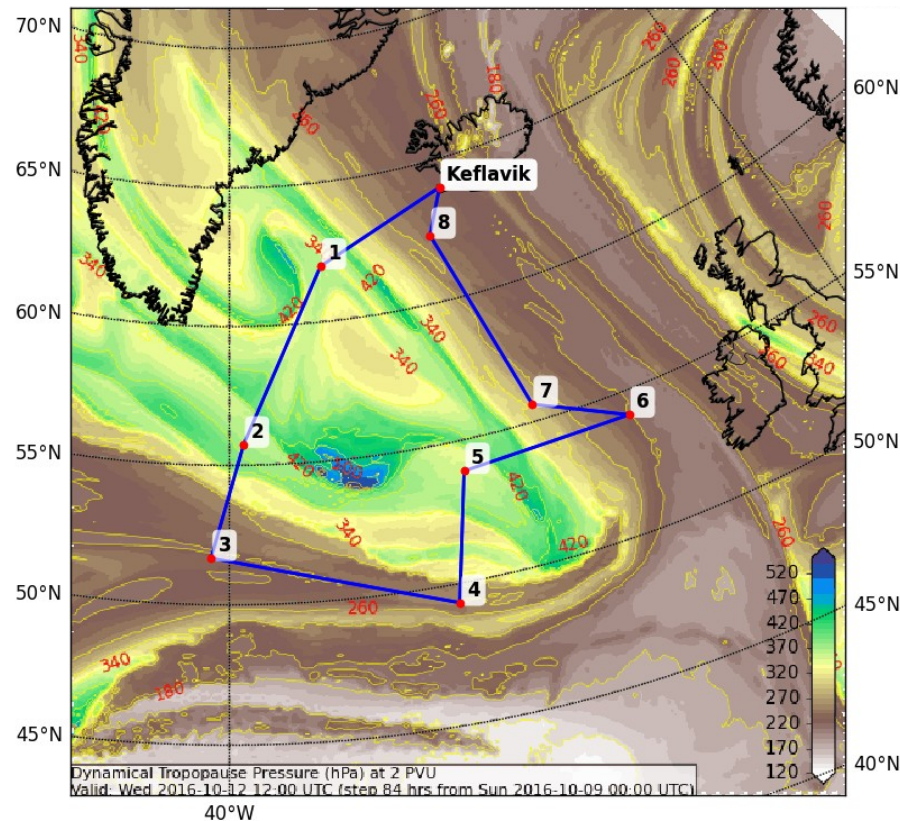
# **HALO, DLR Falcon and Safire Falcon flights on Wednesday**

# Wednesday October 12<sup>th</sup> HALO Flight 09:00 – 16:30 UTC

Geopot (m) & Hor Wind (m s<sup>-1</sup>) at 300 hPa



P (hPa) at 2 PVU



BT09/00Z VT12/12Z

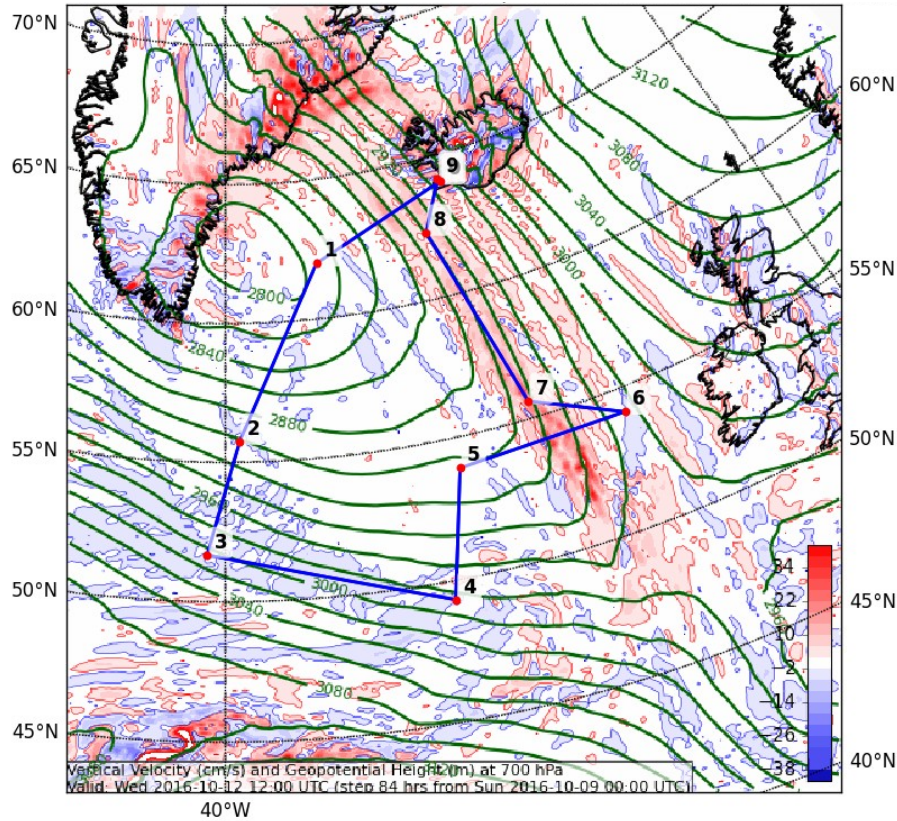
- Meet SAFIRE
- Coordinated leg (0-1): atmos. river
- Across Jet (2-3)

- Along Jet (3-4)
- Left exit region (5)
- WCB ascent (7-8)



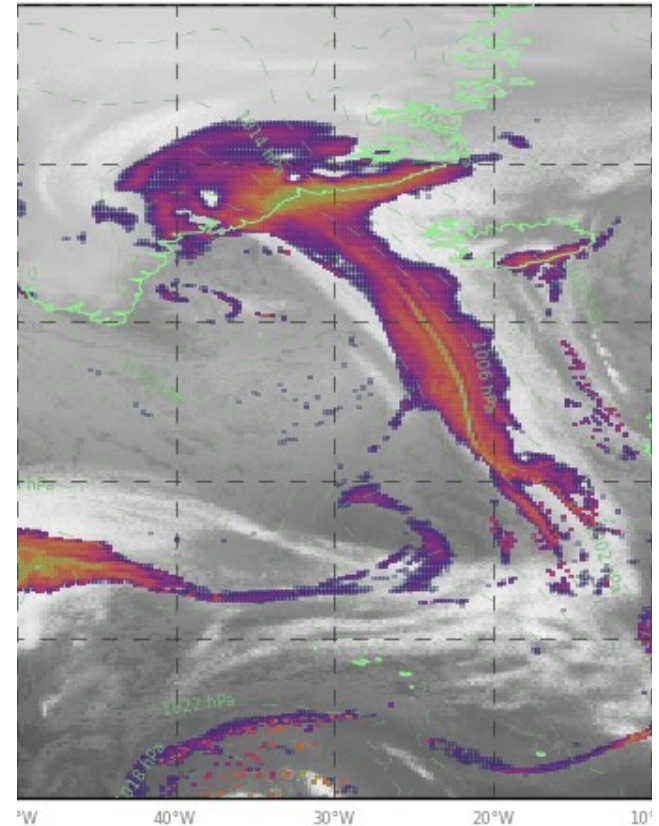
# Wednesday October 12<sup>th</sup> HALO Flight 09:00 – 16:30 UTC

Geopot (m) & Vert Velo (cm s<sup>-1</sup>) at 700 hPa



- Meet SAFIRE
- Coordinated leg (0-1): atmos. river
- Across Jet (2-3)

OLR (Wm<sup>-2</sup>) & Precip (mm hr<sup>-1</sup>)



BT09/00Z VT12/12Z

- Along Jet (3-4)
- Left exit region (5)
- WCB ascent (7-8)



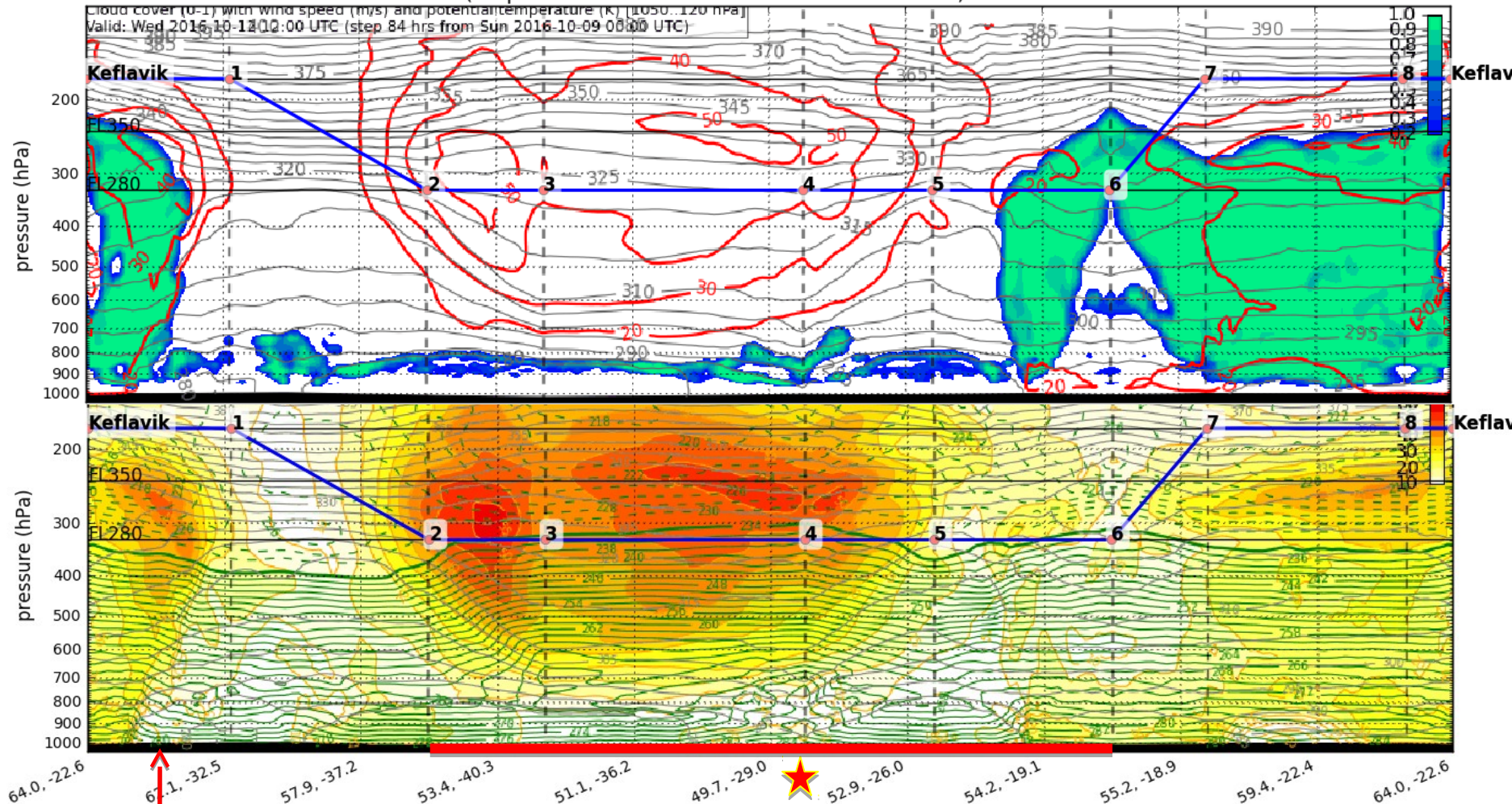
# Wednesday October 12<sup>th</sup> HALO Flight 09:00 – 16:30 UTC

BT09/00Z VT12/12Z

Cloud Cover (0-1) and Wind Speed (m/s) Vertical Section

Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)

Cloud cover (0-1) with wind speed (m/s) and potential temperature (K) [1050-120 hPa]  
Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)



+ SAFIRE

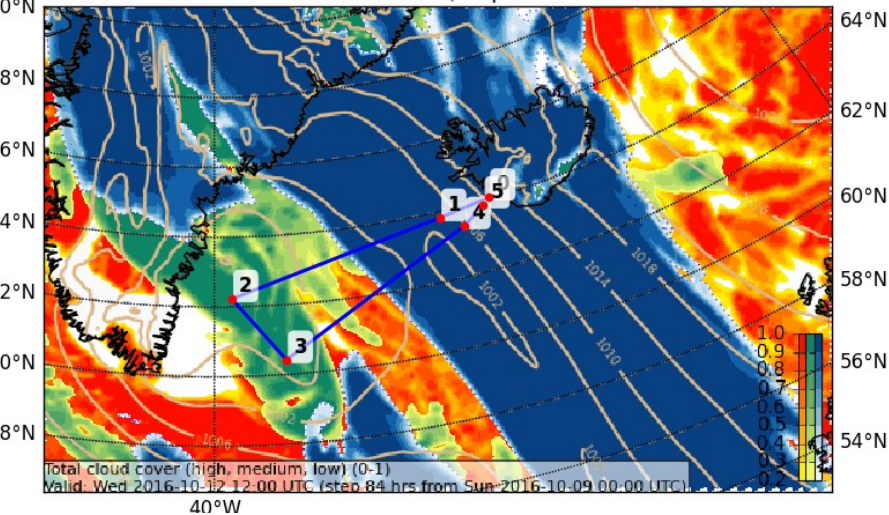
Distance: 5400 km – 2900 nml



## Wed 12 12Z – DLR Falcon Plan

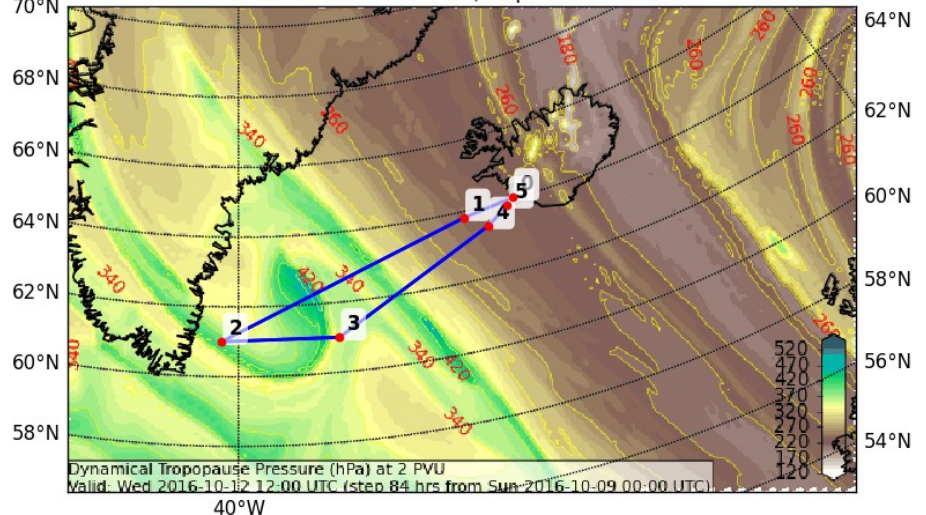
Cloud Cover (0-1) (Total Cloud Cover)

Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)



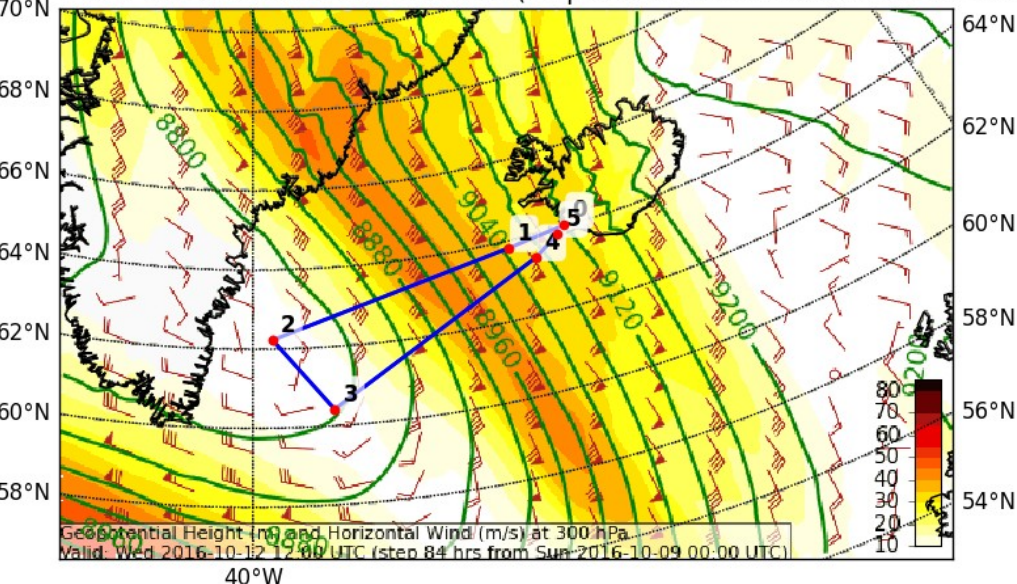
Dynamical Tropopause (Pressure (hPa)) at 2000 ( $10^{-3}$  PVU)

Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)



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

Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)



**Option on Wednesday, very similar conditions.**

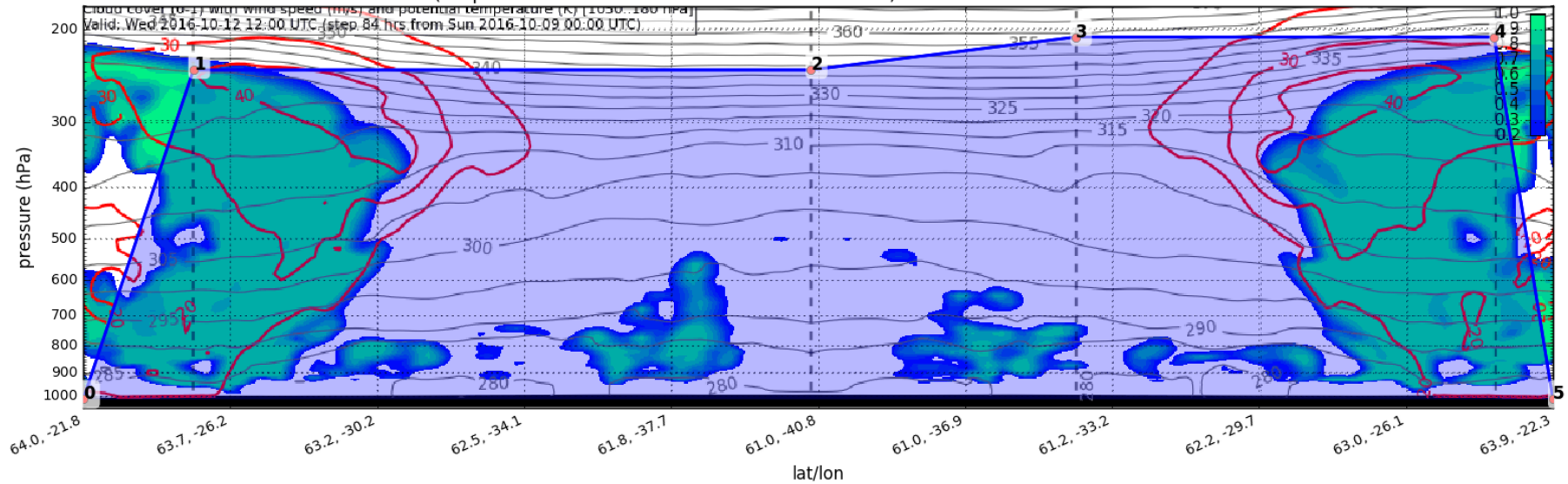
**Possible coordination with HALO.**

**Strong winds?**

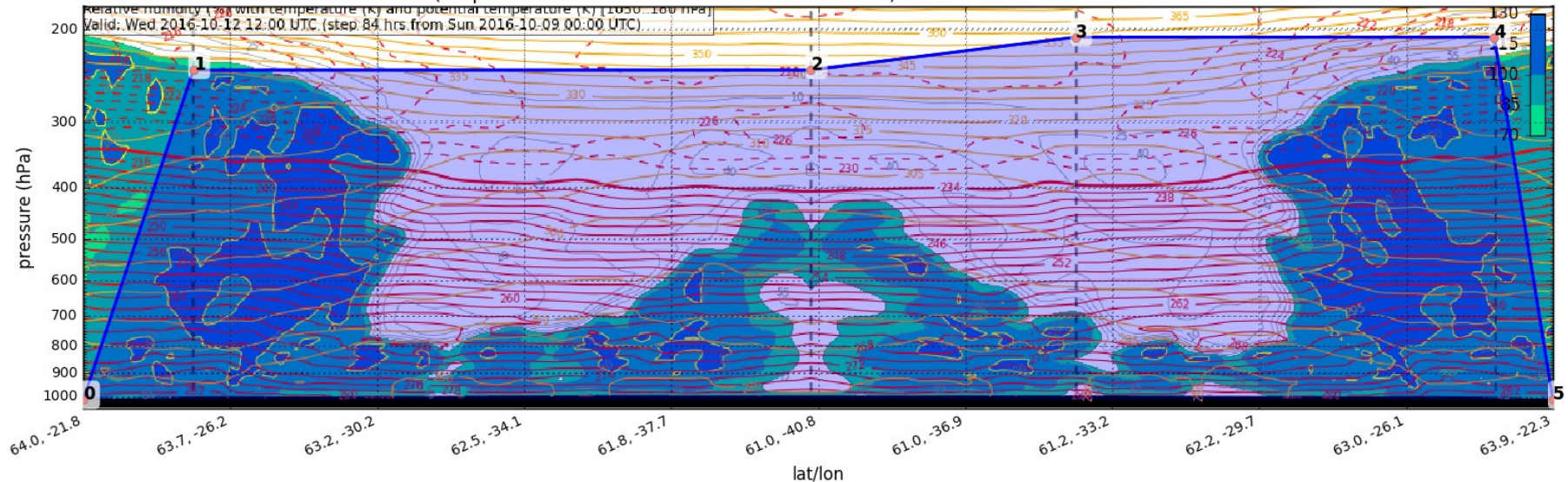


# Wed 12 12Z – DLR Falcon Plan

Cloud Cover (0-1) and Wind Speed (m/s) Vertical Section  
Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)



Relative Humidity (%) Vertical Section  
Valid: Wed 2016-10-12 12:00 UTC (step 84 hrs from Sun 2016-10-09 00:00 UTC)



# Additional radiosoundings



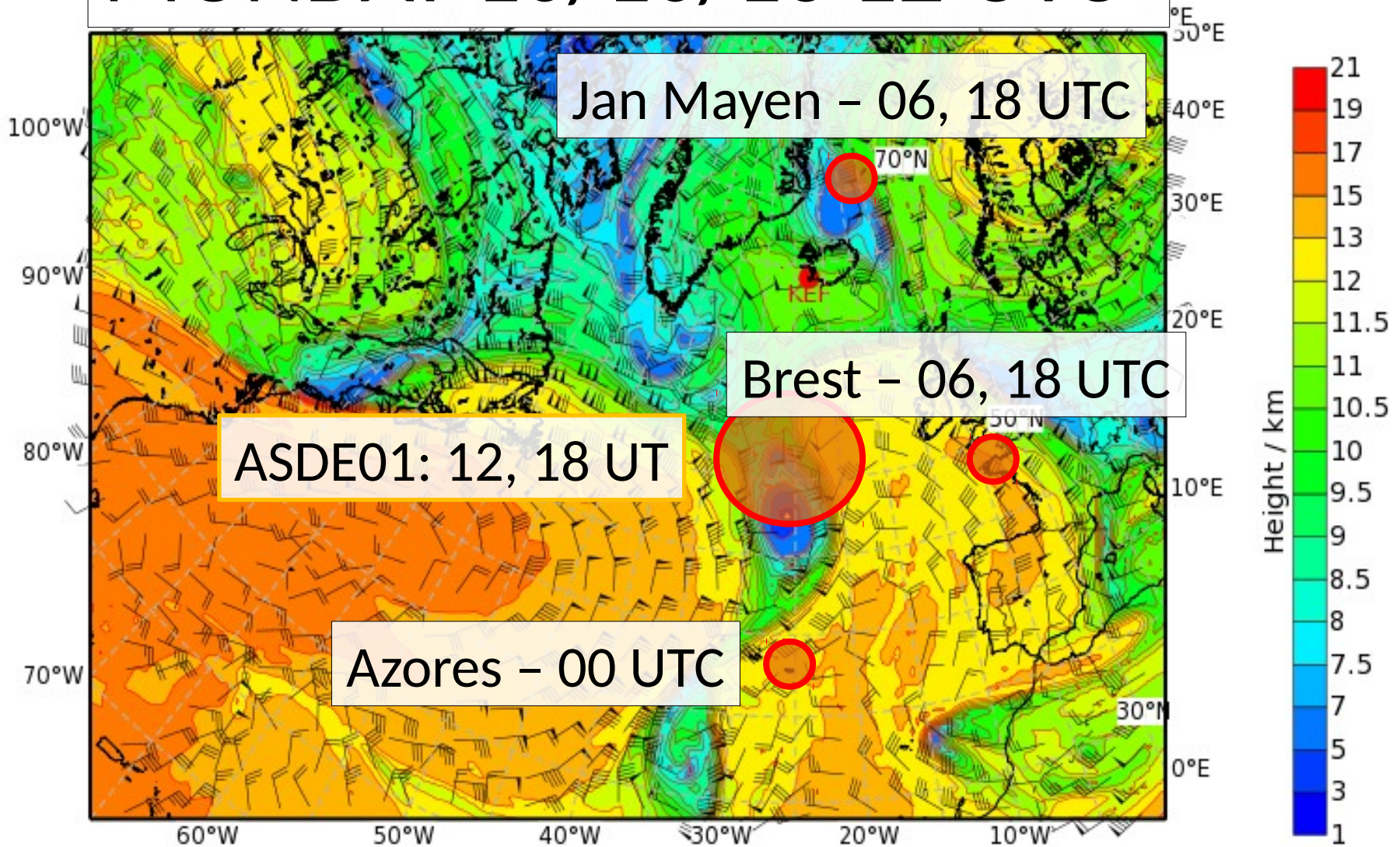
# MONDAY 10/10/16 12 UTC

Jan Mayen - 06, 18 UTC

Brest - 06, 18 UTC

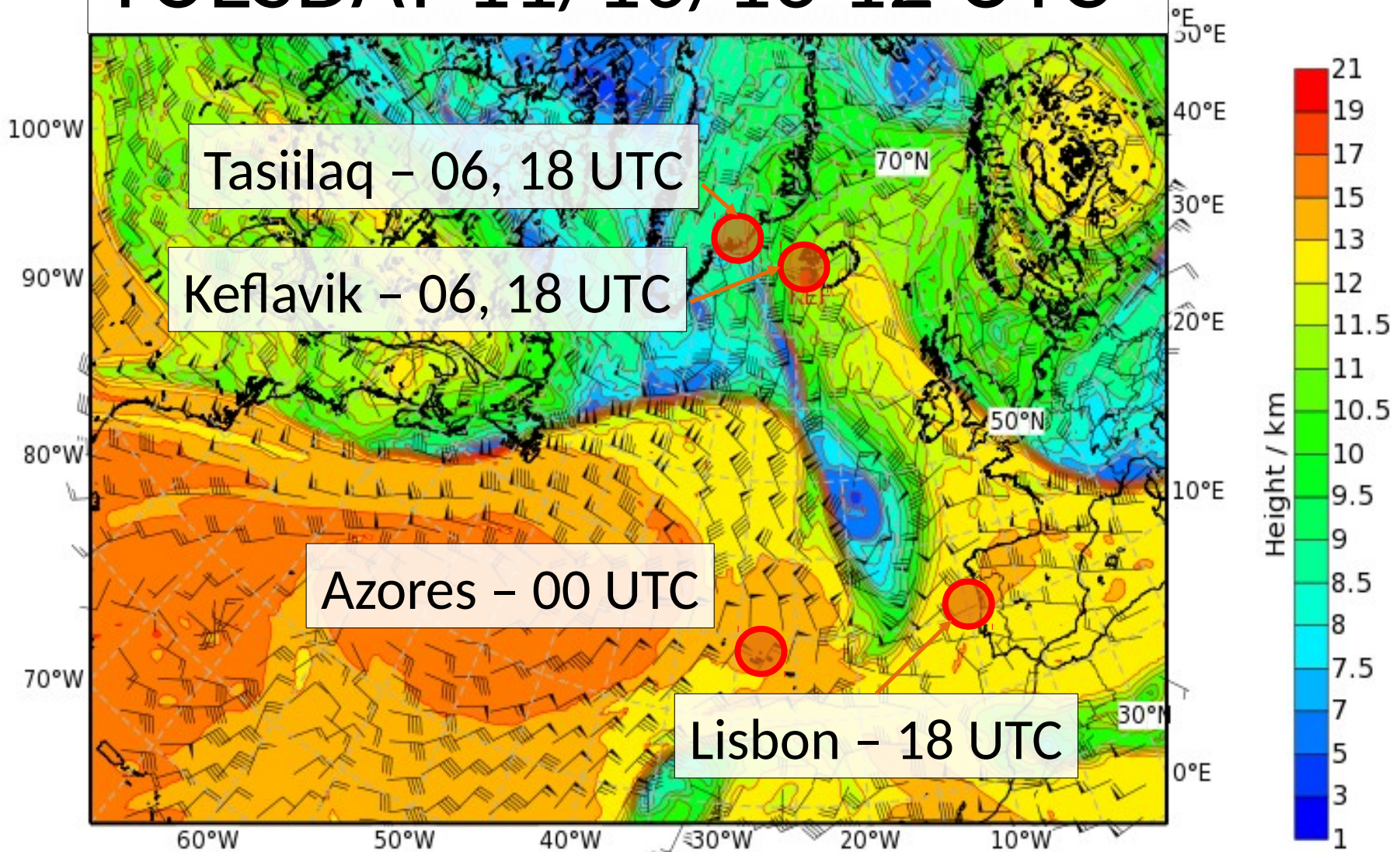
ASDE01: 12, 18 UT

Azores - 00 UTC





# TUESDAY 11/10/16 12 UTC





# Additional Radiosonds for TUESDAY 11/10/16 12 UTC

- Tasiilaq: 06, 18 UT
- Keflavik: 06, 18 UT
- Azores: 00 UT
- Lisbon: 18 UT