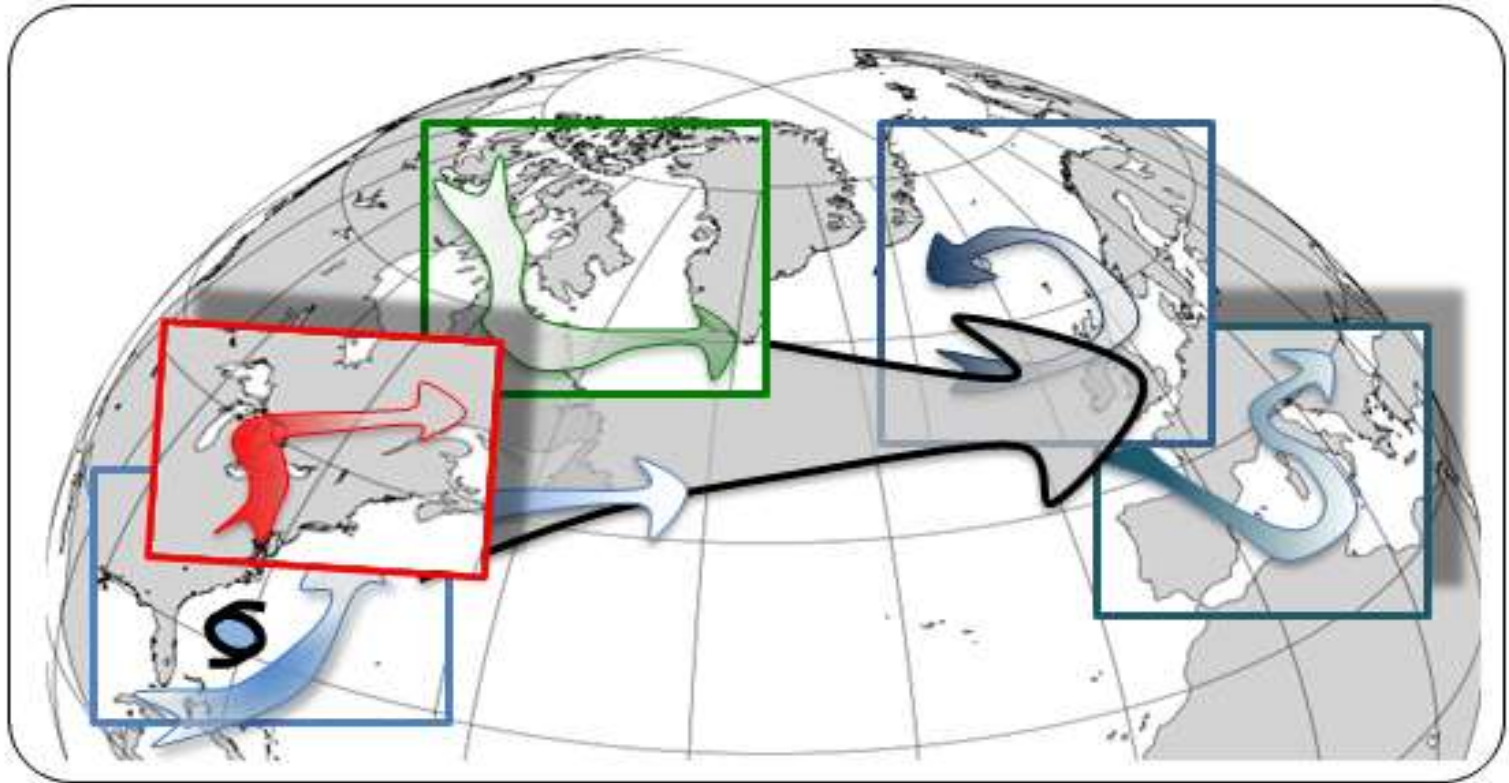


NAWDEX – Weather Discussion

20 September 2016, Keflavik 16 UTC



NAWDEX – Weather Discussion

20 September 2016, Keflavik 16 UTC

Decisions today

1. Wednesday flights

- final adjustment of tracks/go-nogo Falcon
- Dropsondes

2. Friday mission (Lagrangian match)

- Coordinates and Levels of NOTAM box needed tomorrow 12UTC
- Potential flight tracks, levels, flight times
- Saturday flight?
- Ground based observations?

3. Day off Saturday/Sunday?

NAWDEX – Weather Discussion

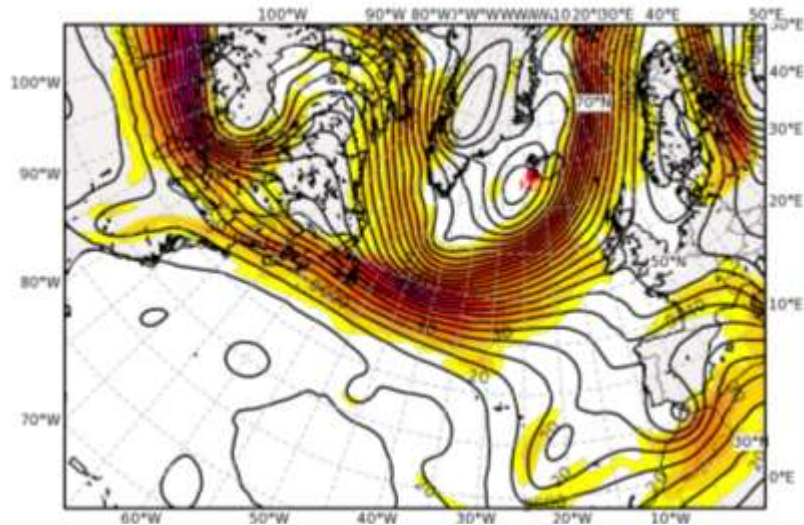
20 September 2016, Keflavik 16 UTC

- Current situation & evolution until Monday 25 September
- **Mission Wednesday 21 September**
 - Model consistency
 - Final tracks
- **Mission Friday (Sat?) 23 (24) September**
 - WCB forecasts and timing
 - Model consistency
- Preparation Mission **ET Karl and downstream cyclone**
- **Sun-Wed 25-28 September**
 - Model consistency / ccenarios

Synoptic overview

Analysis – 20 Sep 2016, 00 UTC

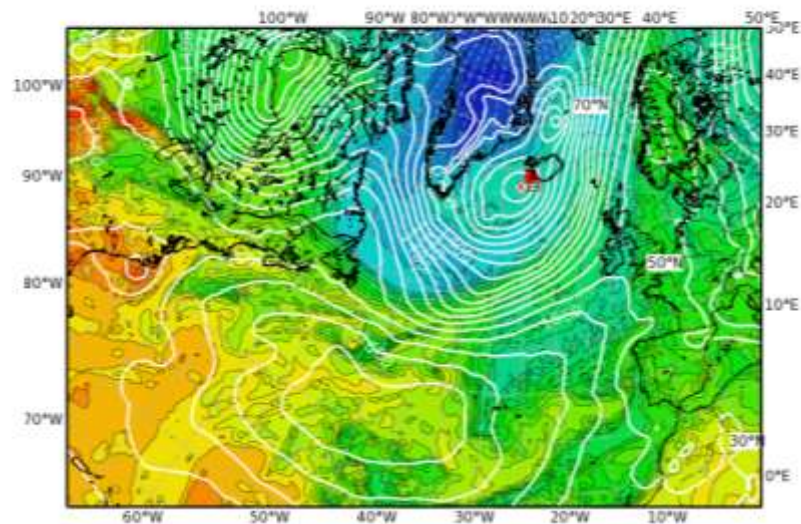
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Tue, 20 Sep 2016, 00 UTC (step 000 h from Tue, 20 Sep 2016, 00 UTC)



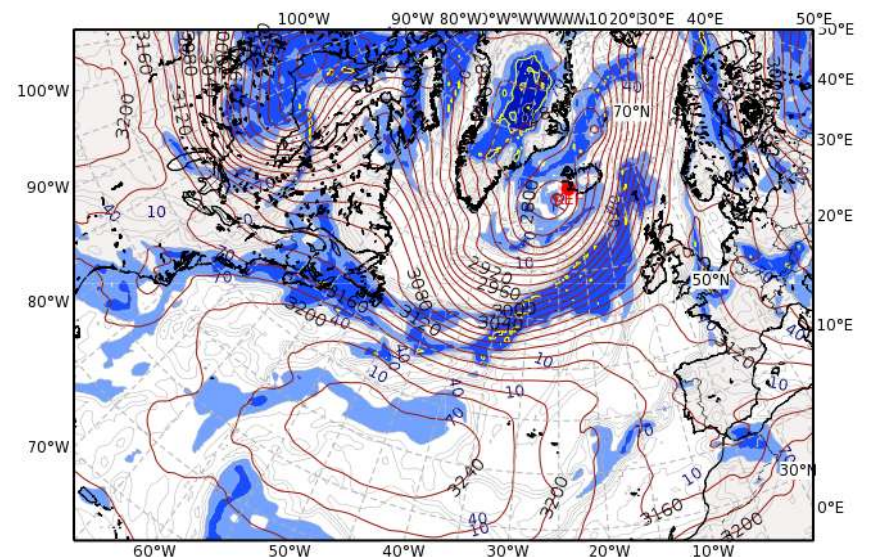
Z300, SAT
THE850, RH700



Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Tue, 20 Sep 2016, 00 UTC (step 000 h from Tue, 20 Sep 2016, 00 UTC)



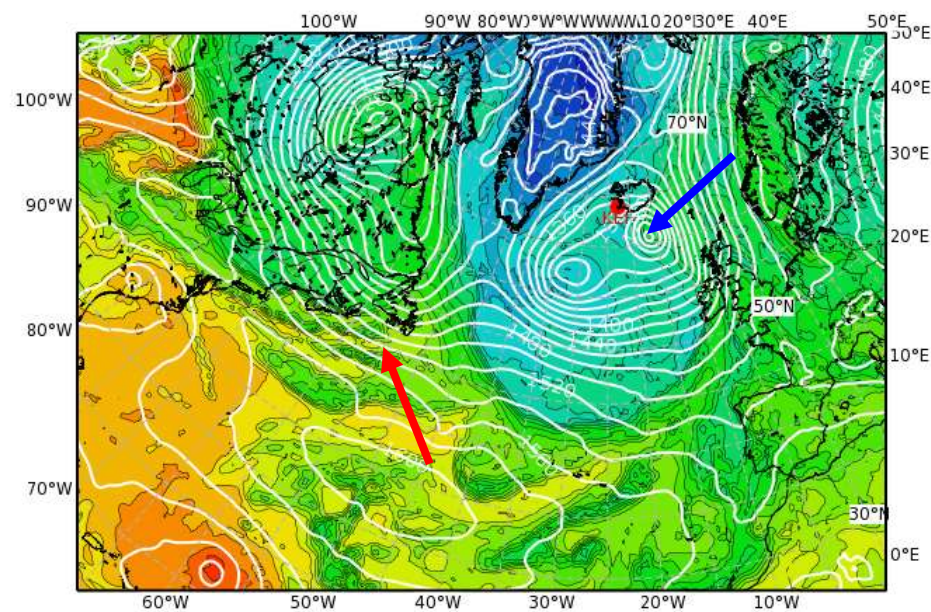
Relative Humidity (%) and Z (m) at 700 hPa
Valid: Tue, 20 Sep 2016, 00 UTC (step 000 h from Tue, 20 Sep 2016, 00 UTC)



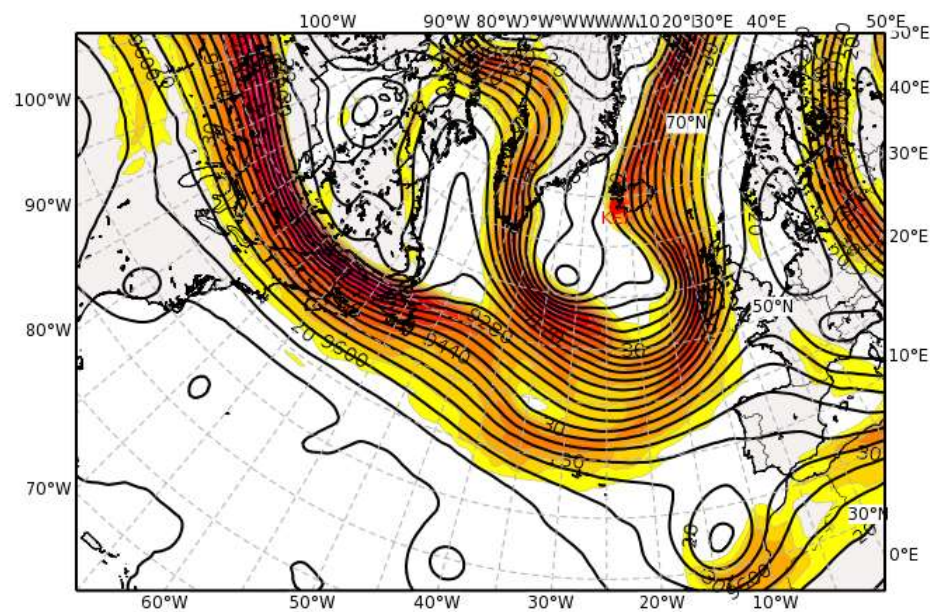
Forecast for Wed, 21 Sep 2016 12 UTC

THE850, Z300 BT20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 21 Sep 2016, 12 UTC (step 036 h from Tue, 20 Sep 2016, 00 UTC)



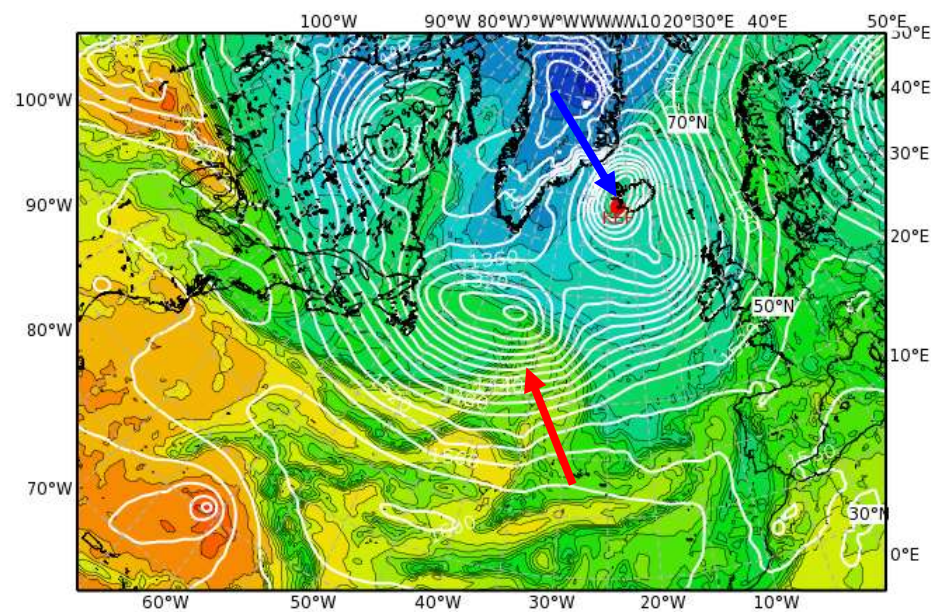
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Wed, 21 Sep 2016, 12 UTC (step 036 h from Tue, 20 Sep 2016, 00 UTC)



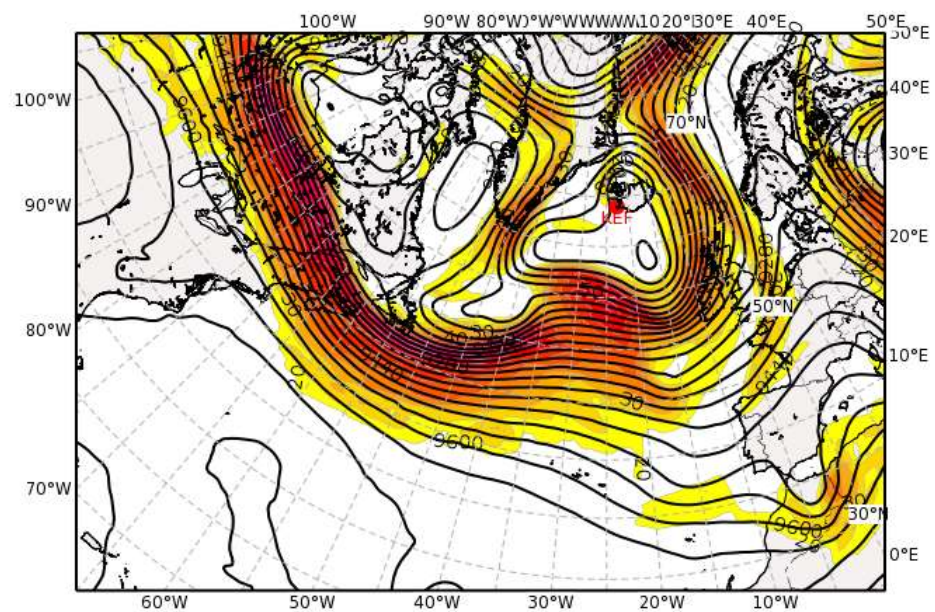
Forecast for Thu, 22 Sep 2016 12 UTC

THE850, Z300 BT20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Thu, 22 Sep 2016, 12 UTC (step 060 h from Tue, 20 Sep 2016, 00 UTC)



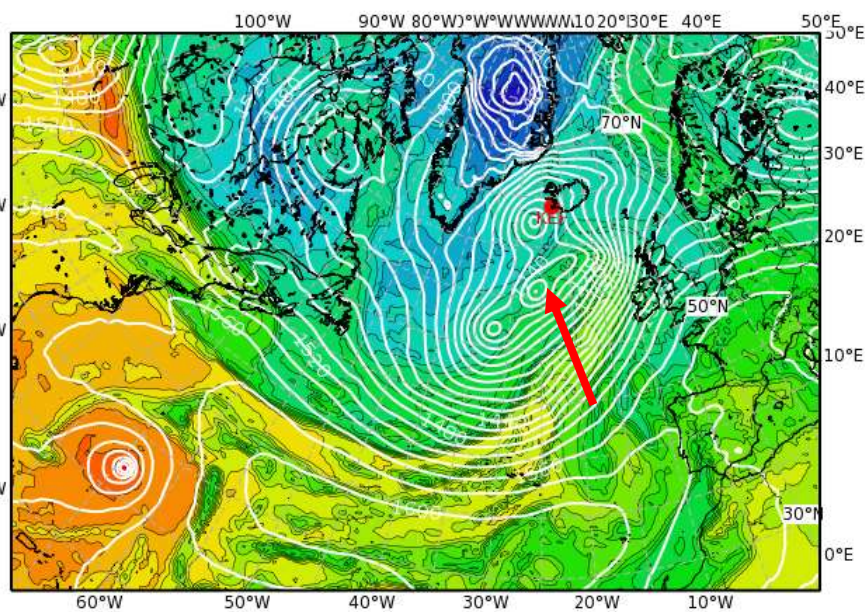
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Thu, 22 Sep 2016, 12 UTC (step 060 h from Tue, 20 Sep 2016, 00 UTC)



Forecast for Fri, 23 Sep 2016 12 UTC

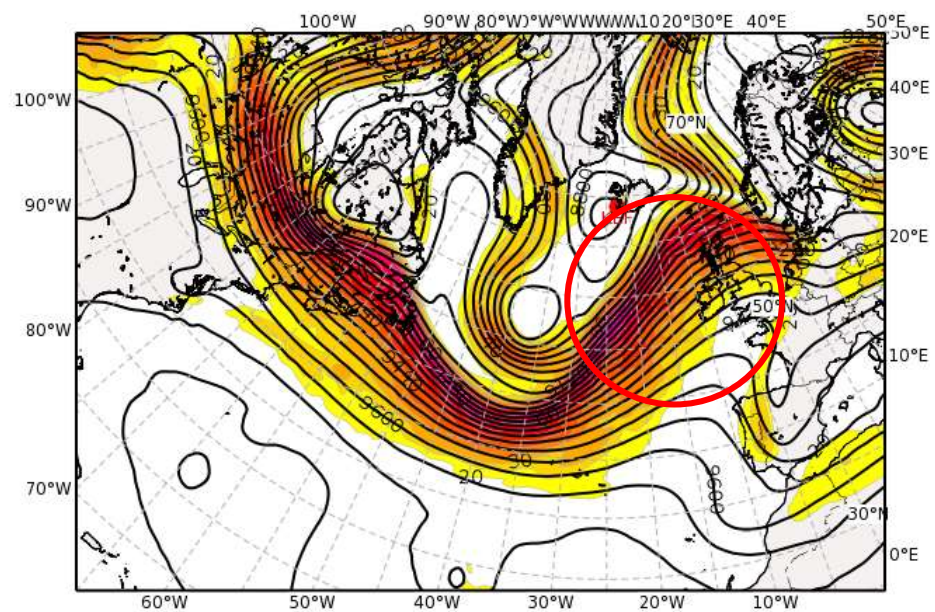
THE850, Z300 BT20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Fri, 23 Sep 2016, 12 UTC (step 084 h from Tue, 20 Sep 2016, 00 UTC)

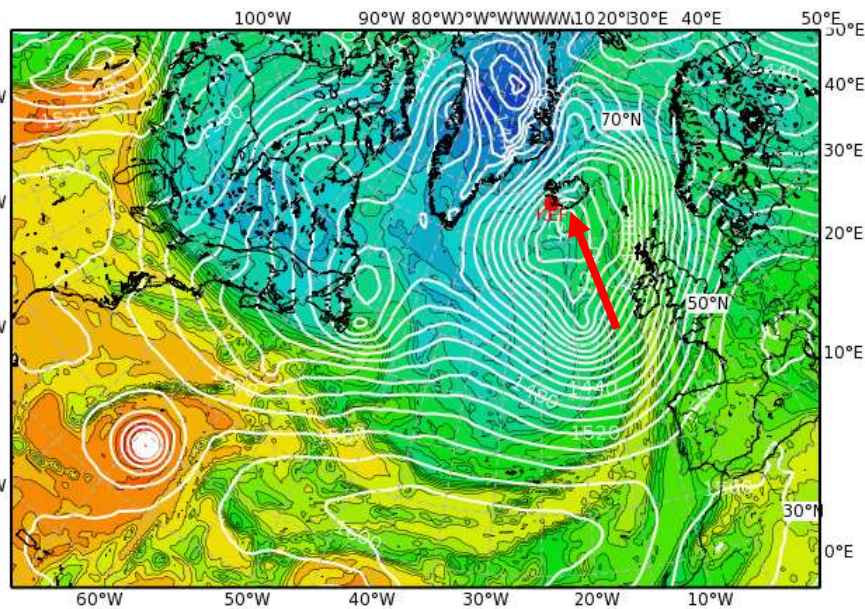


TC Karl

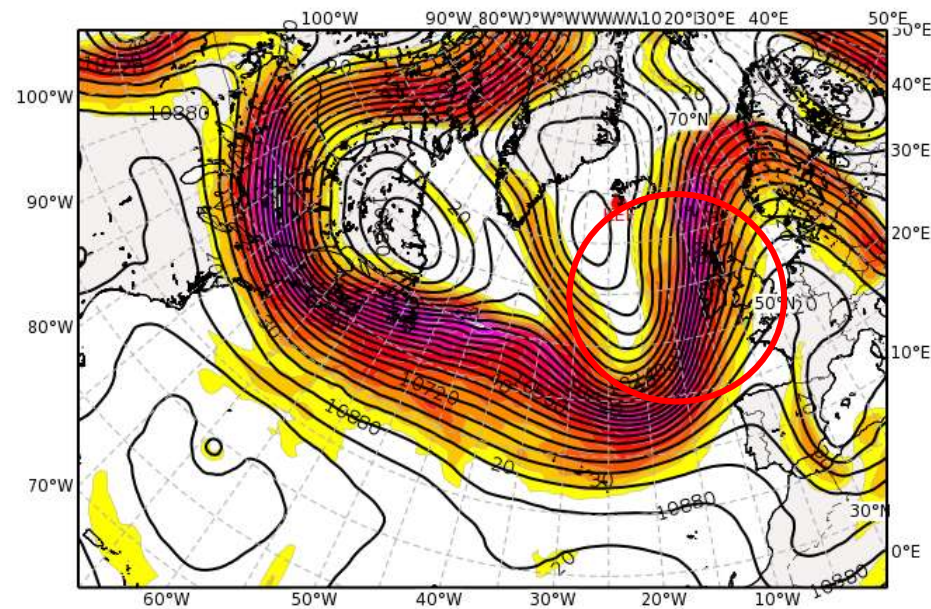
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Fri, 23 Sep 2016, 12 UTC (step 084 h from Tue, 20 Sep 2016, 00 UTC)



Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Sat, 24 Sep 2016, 12 UTC (step 108 h from Tue, 20 Sep 2016, 00 UTC)



Geopotential Height (m) & Horizontal Wind (m/s) at 250 hPa
Valid: Sat, 24 Sep 2016, 12 UTC (step 108 h from Tue, 20 Sep 2016, 00 UTC)



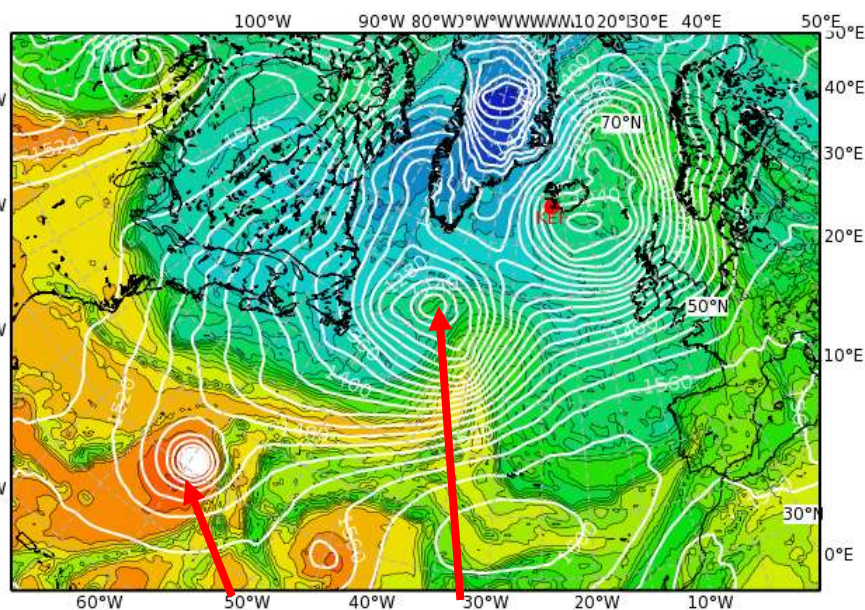
TC Karl

- Heavy precipitation & windy conditions in UK and Ireland

Forecast for Sun, 25 Sep 2016 12 UTC

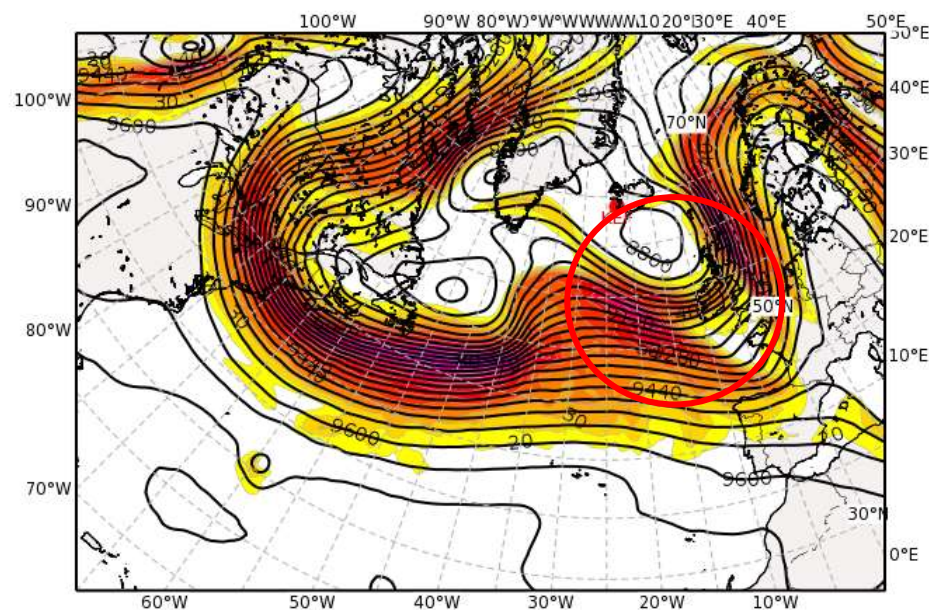
THE850, Z300 BT20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Sun, 25 Sep 2016, 12 UTC (step 132 h from Tue, 20 Sep 2016, 00 UTC)



TC Karl DS cyclone

Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Sun, 25 Sep 2016, 12 UTC (step 132 h from Tue, 20 Sep 2016, 00 UTC)

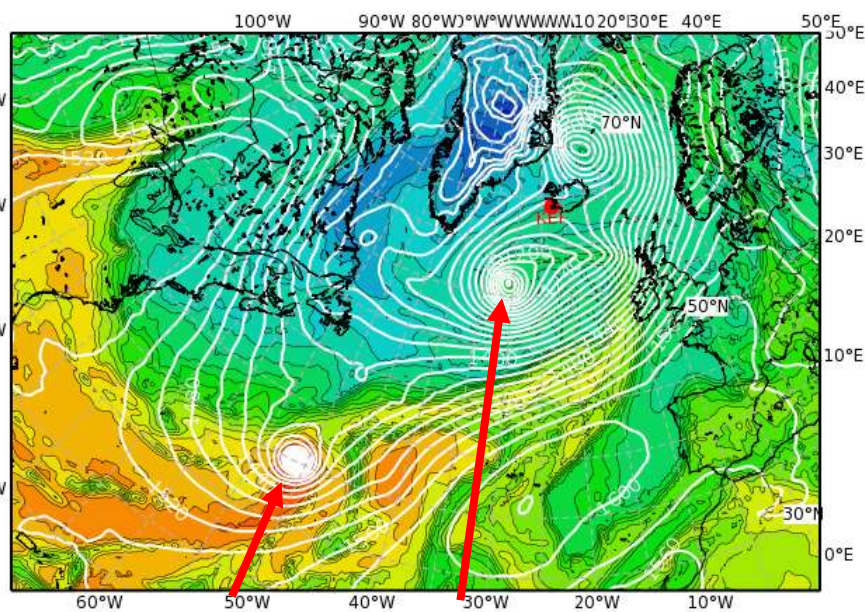


- Heavy precipitation & windy conditions in UK, Ireland, Norway coastal regions

Forecast for Mon, 26 Sep 2016 12 UTC

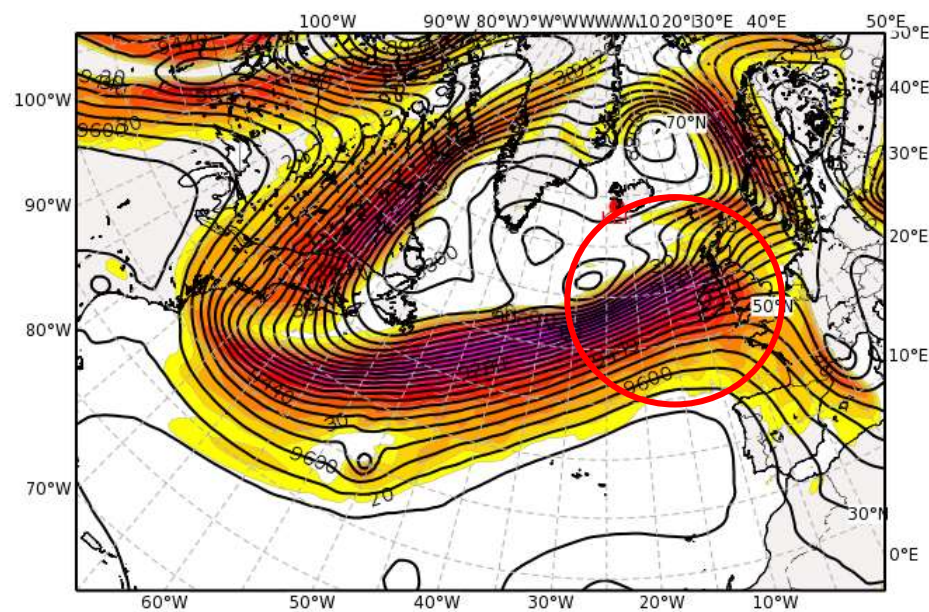
THE850, Z300 BT20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Mon, 26 Sep 2016, 12 UTC (step 156 h from Tue, 20 Sep 2016, 00 UTC)



TC Karl DS cyclone

Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Mon, 26 Sep 2016, 12 UTC (step 156 h from Tue, 20 Sep 2016, 00 UTC)



- Heavy precipitation & windy conditions in Northern UK, Ireland, Scotland
- Affecting North Sea region on Tu

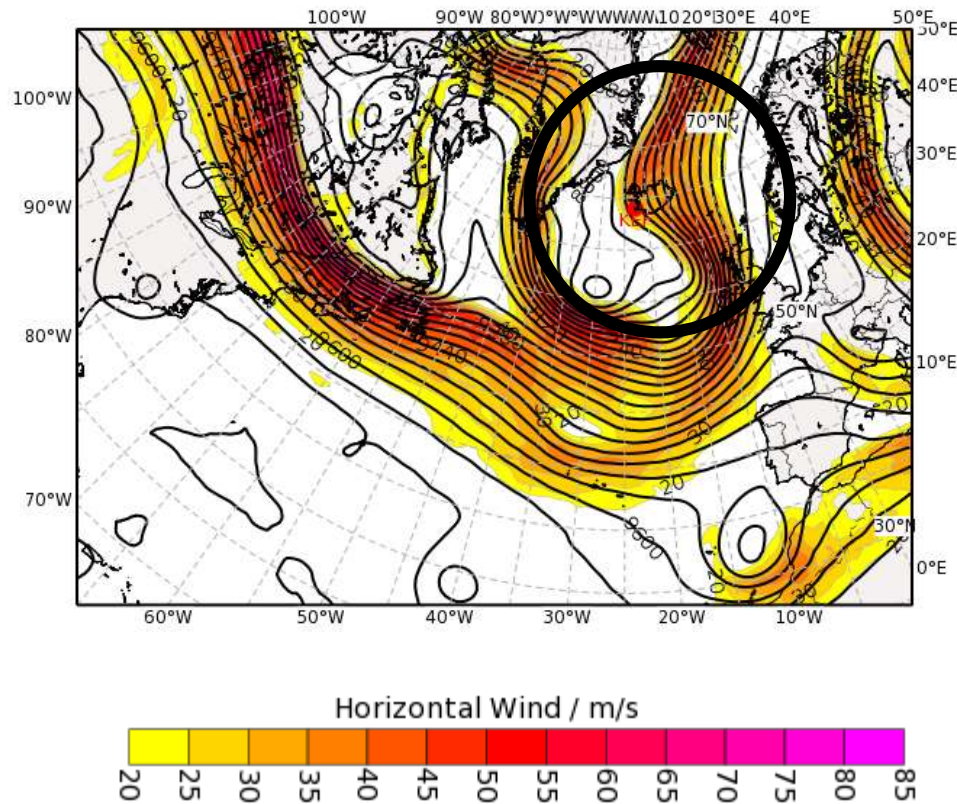
Wednesday case

Mission on Wednesday, 21 Sep 2016 15 UTC

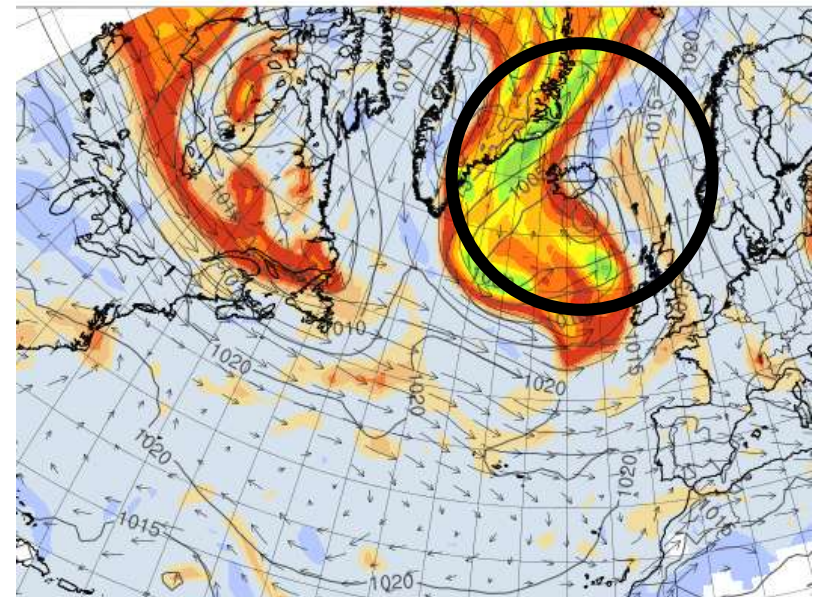
Geopotential height 300hPa and wind speed

BT20/00Z

Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Wed, 21 Sep 2016, 15 UTC (step 039 h from Tue, 20 Sep 2016, 00 UTC)



PV@315K at 20160921_15

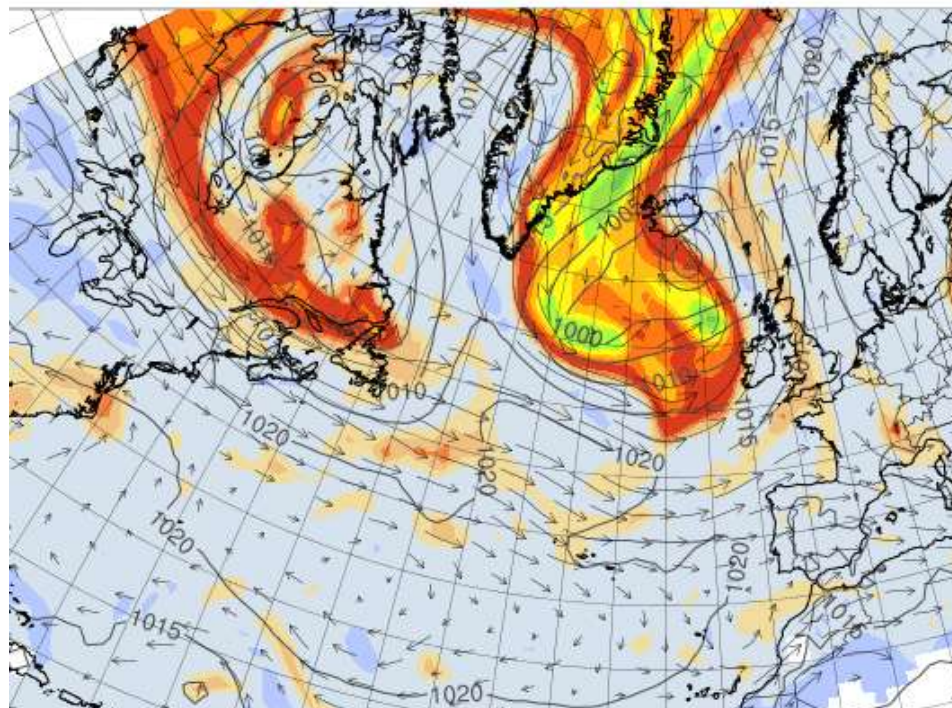


Comes potentially earlier!

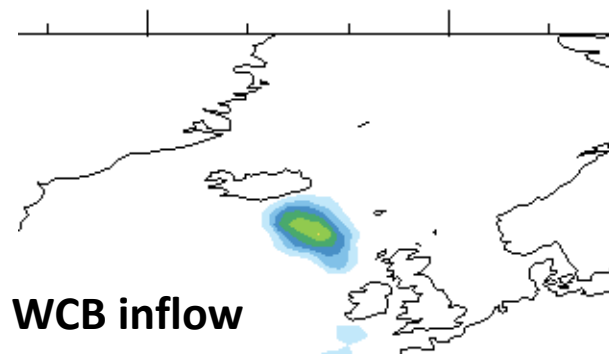
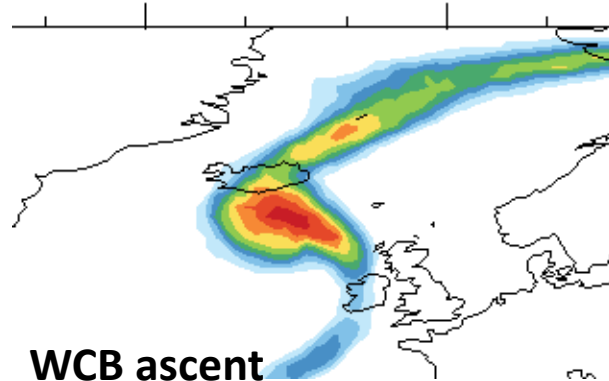
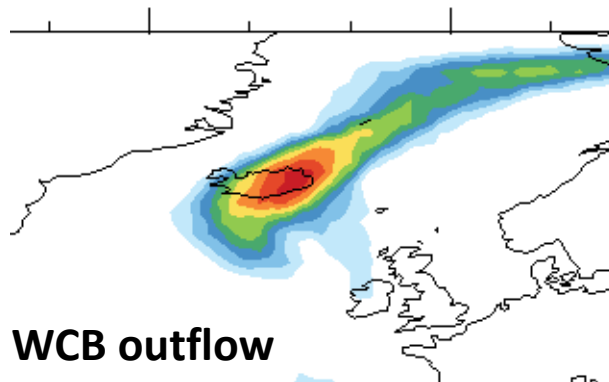
21 Sep 2016 15 UTC

BT19/12Z

PV@315K at 20160921_15



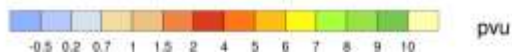
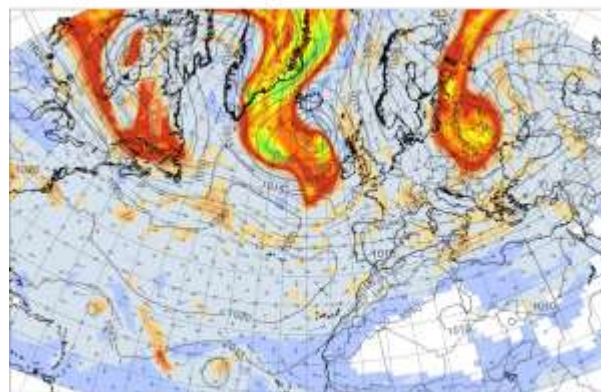
WCB probabilities 21/12UTC



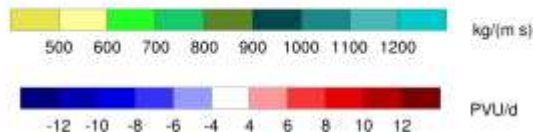
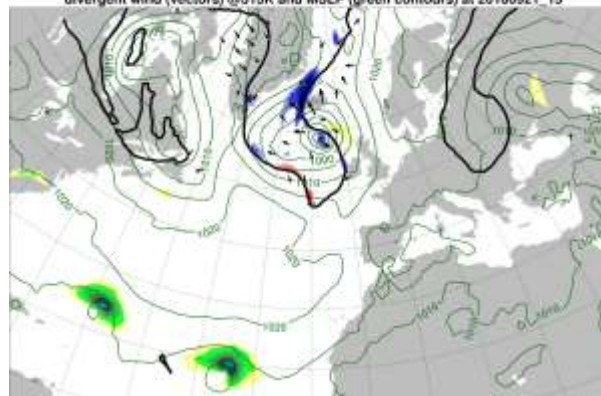
Mission on Wednesday: Model consistency 21 Sep 2016 15 UTC

BT19/00Z

PV@315K at 20160921_15

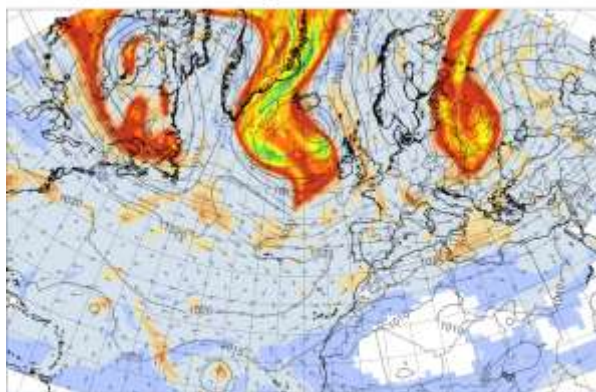


2 PVU (black contour), PV advection through divergent wind (shading), divergent wind (vectors) @315K and MSLP (green contours) at 20160921_15

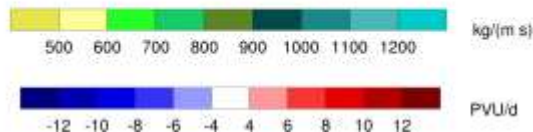
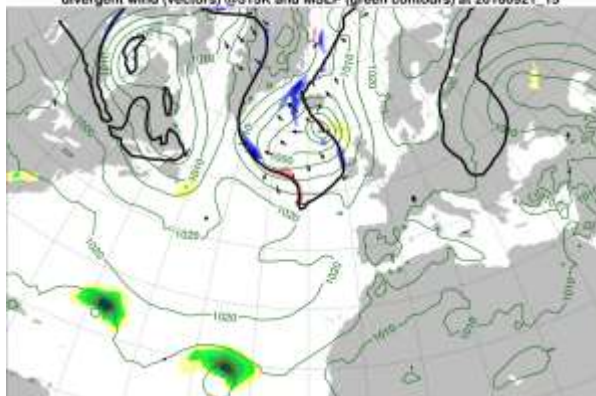


BT19/12Z

PV@315K at 20160921_15

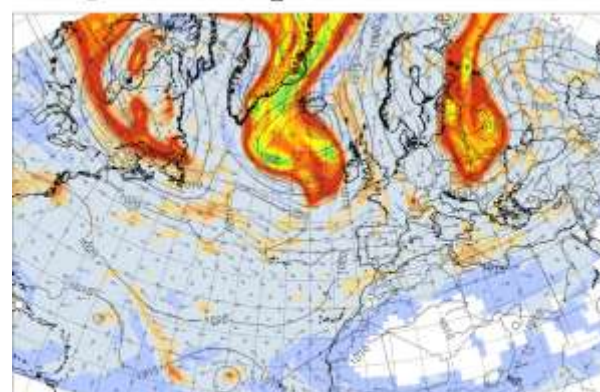


2 PVU (black contour), PV advection through divergent wind (shading), divergent wind (vectors) @315K and MSLP (green contours) at 20160921_15

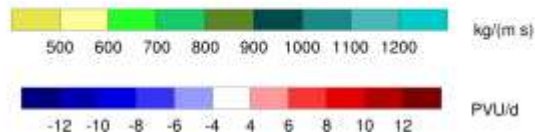
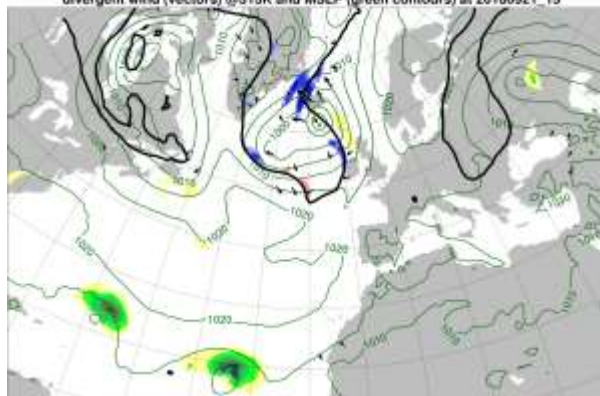


BT20/00Z

PV@315K at 20160921_15



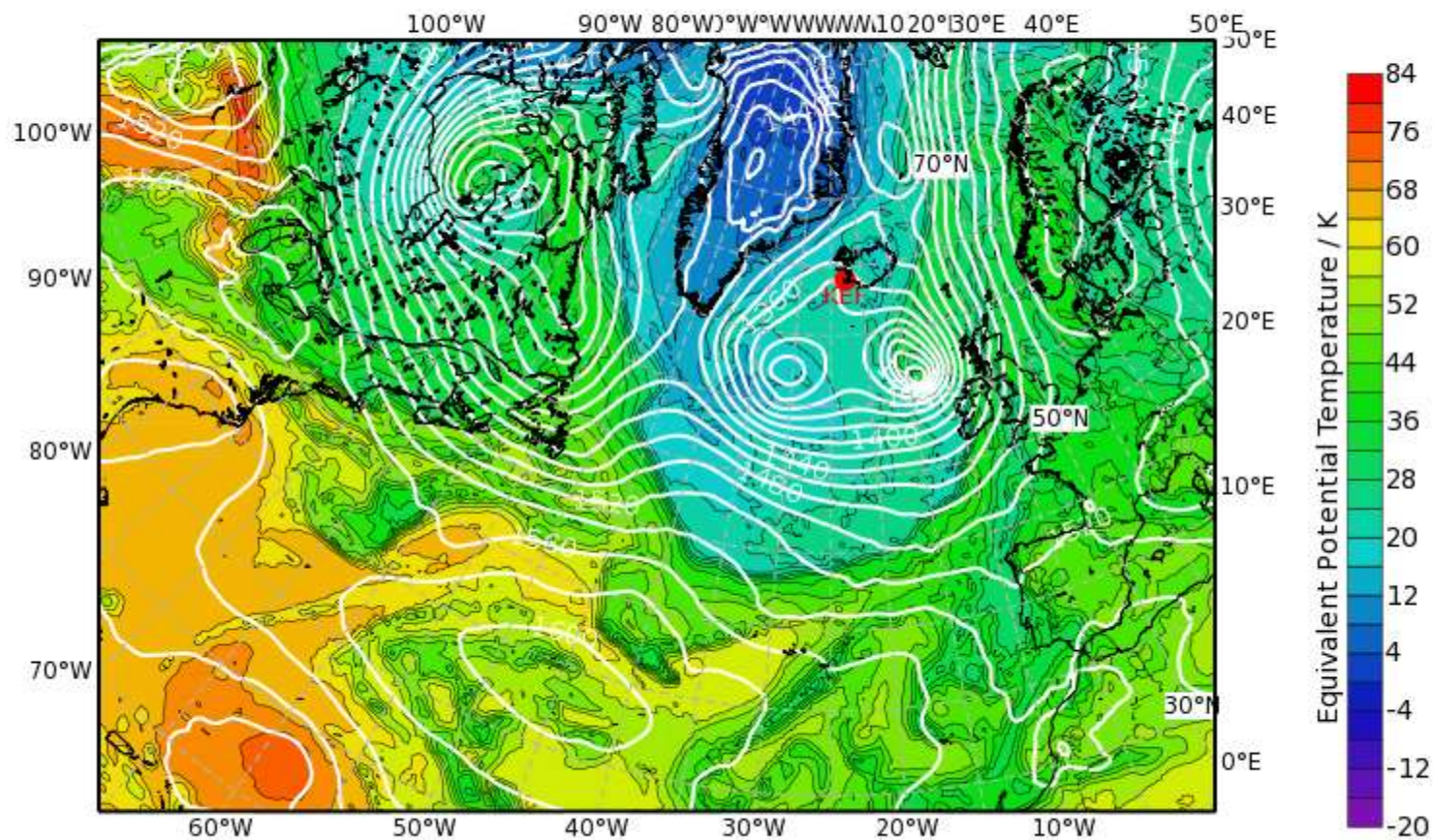
2 PVU (black contour), PV advection through divergent wind (shading), divergent wind (vectors) @315K and MSLP (green contours) at 20160921_15



Mission on Wednesday: Model consistency 21 Sep 2016 12 UTC

BT18/12Z

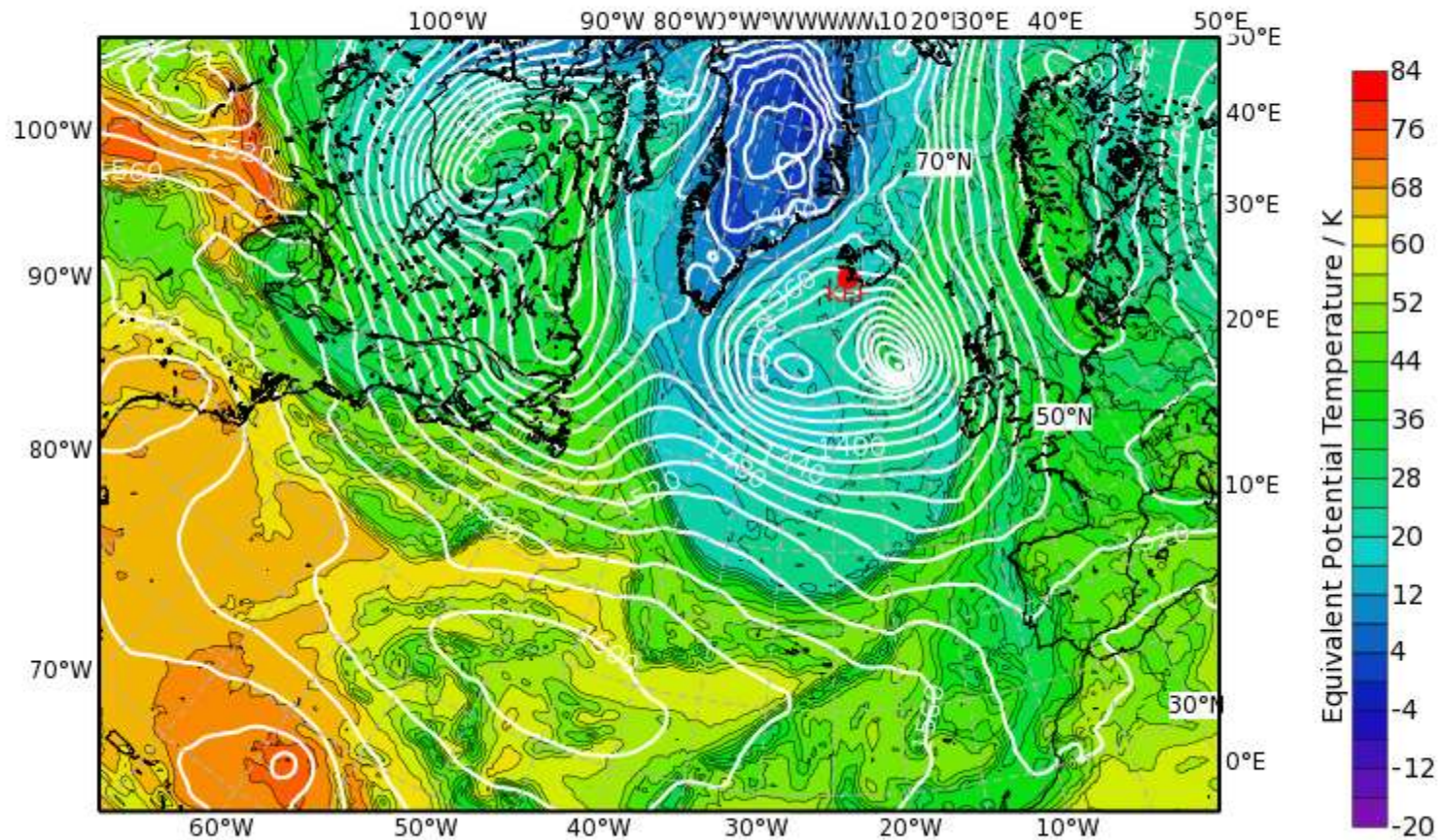
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 21 Sep 2016, 12 UTC (step 072 h from Sun, 18 Sep 2016, 12 UTC)



Mission on Wednesday: Model consistency 21 Sep 2016 12 UTC

BT19/00Z

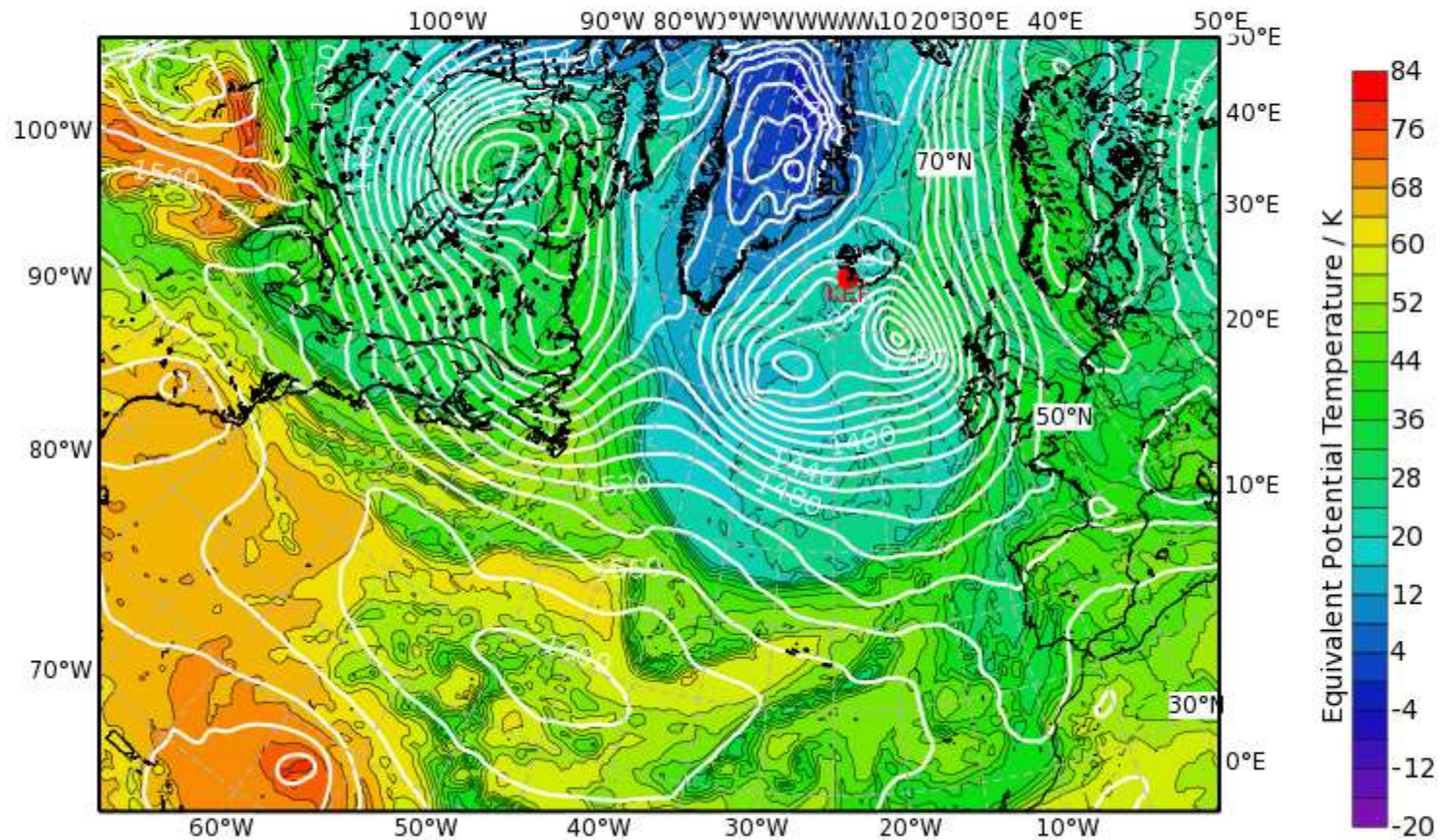
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 21 Sep 2016, 12 UTC (step 060 h from Mon, 19 Sep 2016, 00 UTC)



Mission on Wednesday: Model consistency 21 Sep 2016 12 UTC

BT19/12Z

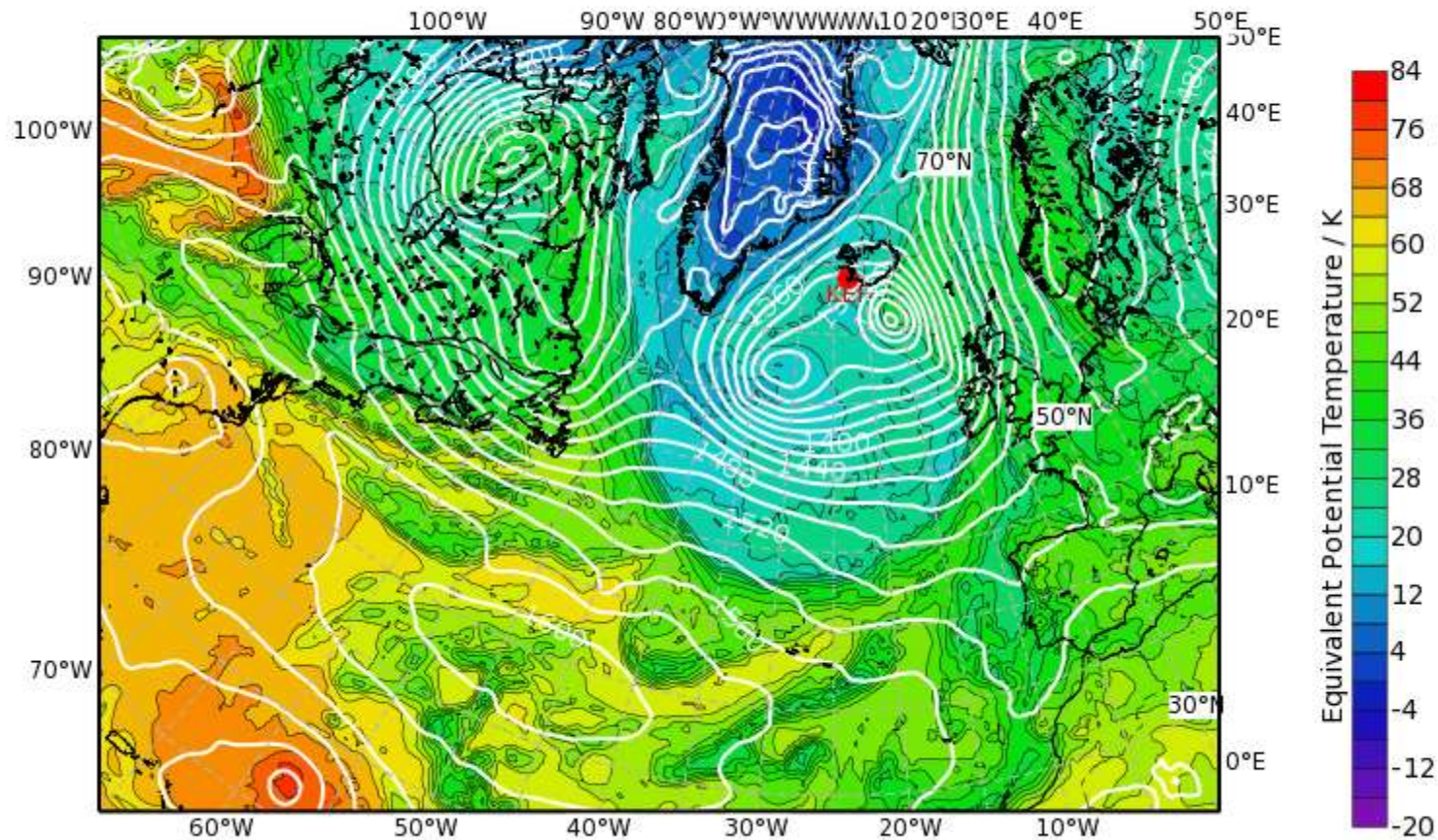
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 21 Sep 2016, 12 UTC (step 048 h from Mon, 19 Sep 2016, 12 UTC)



Mission on Wednesday: Model consistency 21 Sep 2016 12 UTC

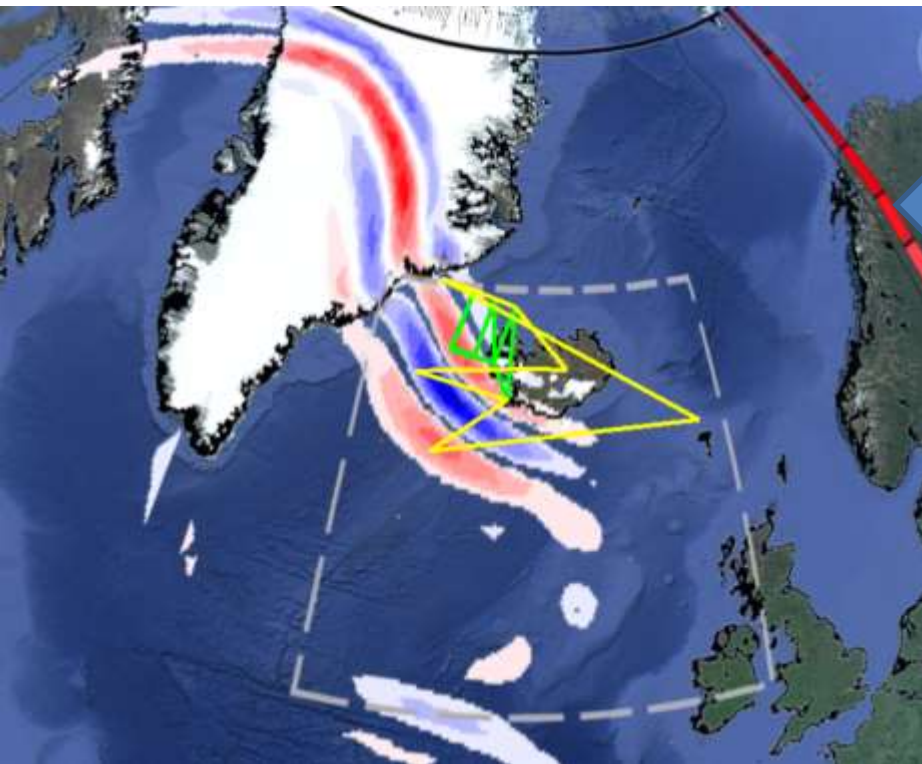
BT20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 21 Sep 2016, 12 UTC (step 036 h from Tue, 20 Sep 2016, 00 UTC)



Cyclone consistently comes closer to Iceland

250-mb vorticity Sensitivity (color shading),

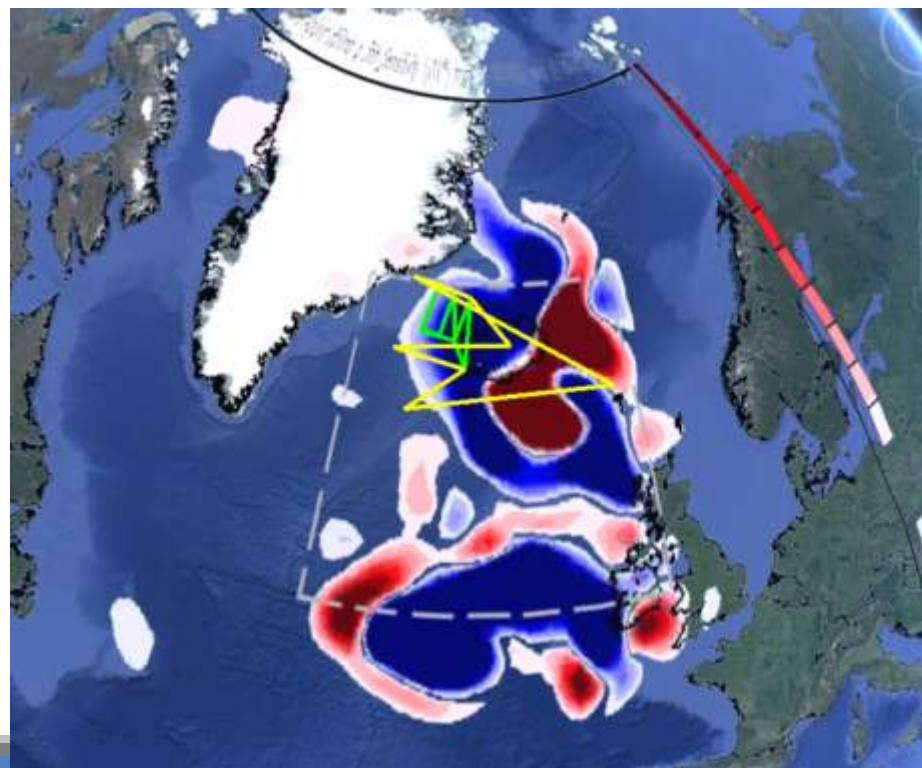


COAMPS Sensitivity (24h) Valid 18Z 21 Sep

- Maximum vorticity sensitivity at upper-levels (250-mb) extends to the NW over Greenland.
- Flight tracks will sample southern portion of sensitivity streamer

850-mb Moisture Sensitivity (color shading)

- Extensive region of moisture sensitivity
- HALO will sample some of the northern portion of the sensitivity



Kenavik, 20 September 2010

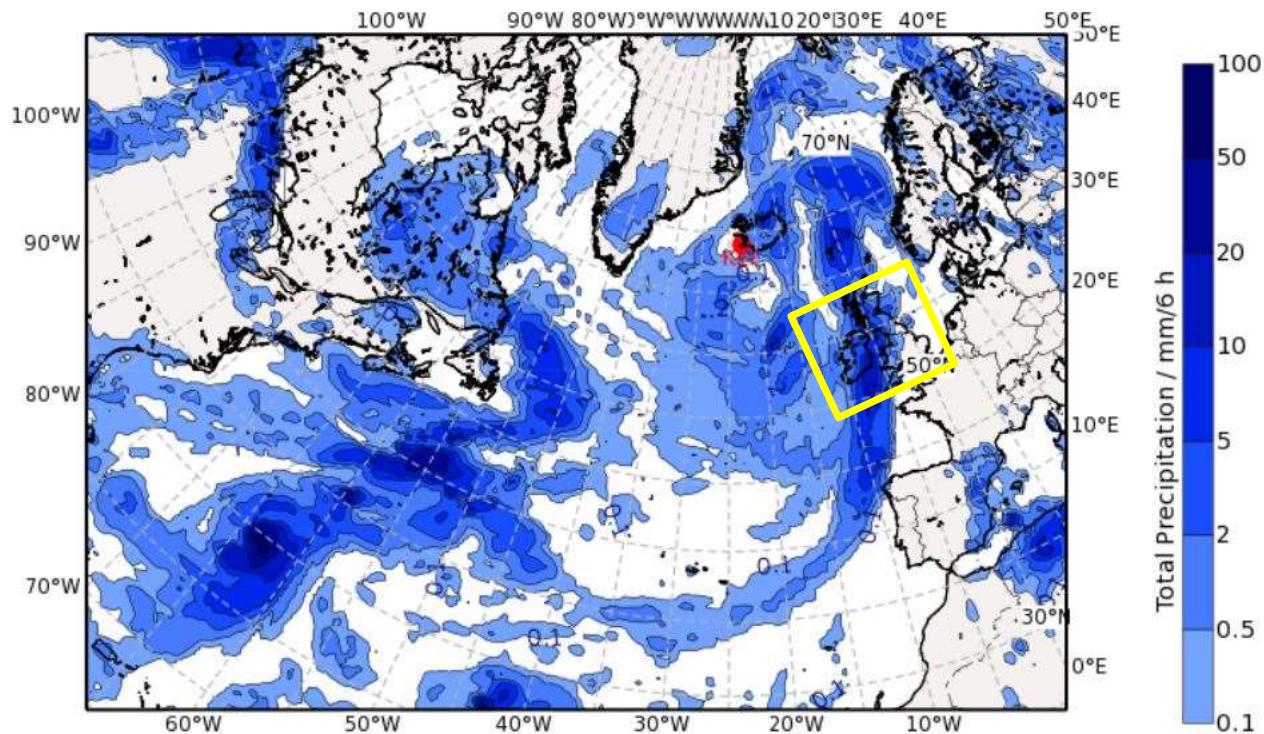
COAMPS Sensitivity Calculations for Friday (in progress...)

- For Friday's flight, we will compute the sensitivity (24h) (valid at 18Z 23 Sep) to the forecast rainfall over the UK (valid at 18Z 24 Sep)

Precipitation: (nawdex) Total at +114h

Total Precipitation, accumulated over 6 hours prior to valid time (mm)

Valid: Sat, 24 Sep 2016, 18 UTC (step 114 h from Tue, 20 Sep 2016, 00 UTC)



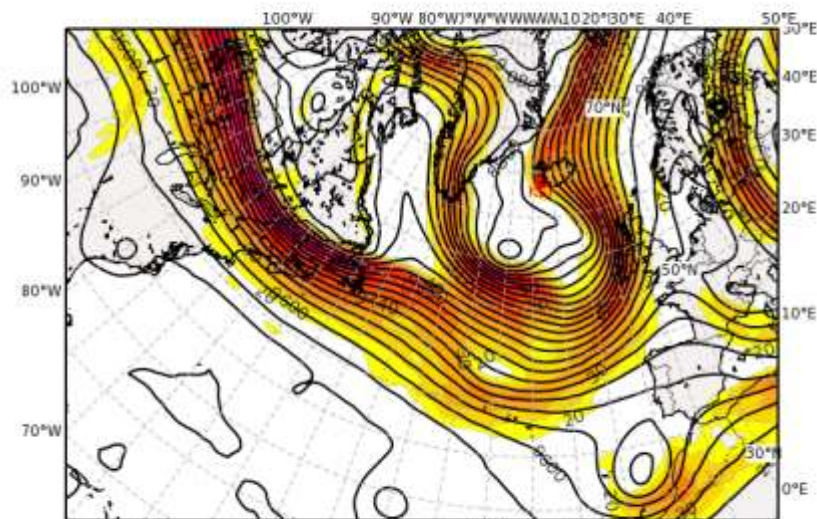
Wednesday flight planning

Forecast for Wed, 21 Sep 2016 15 UTC

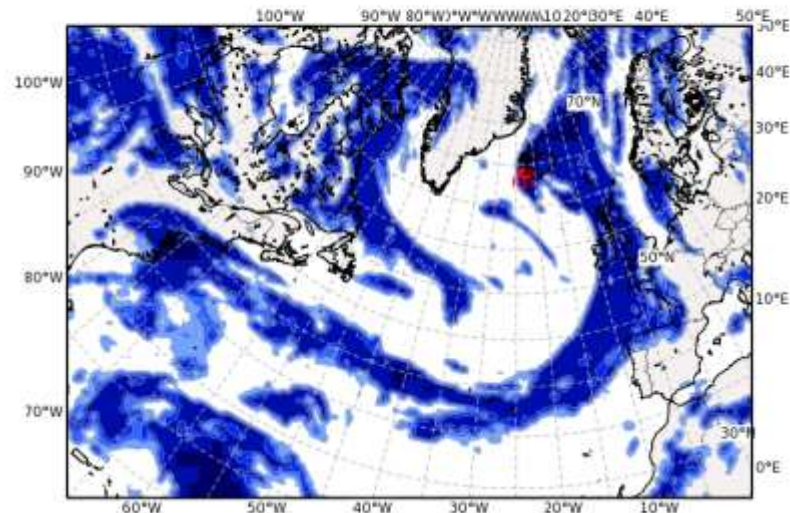
Z300, high
mid, low clouds

BT20/00Z

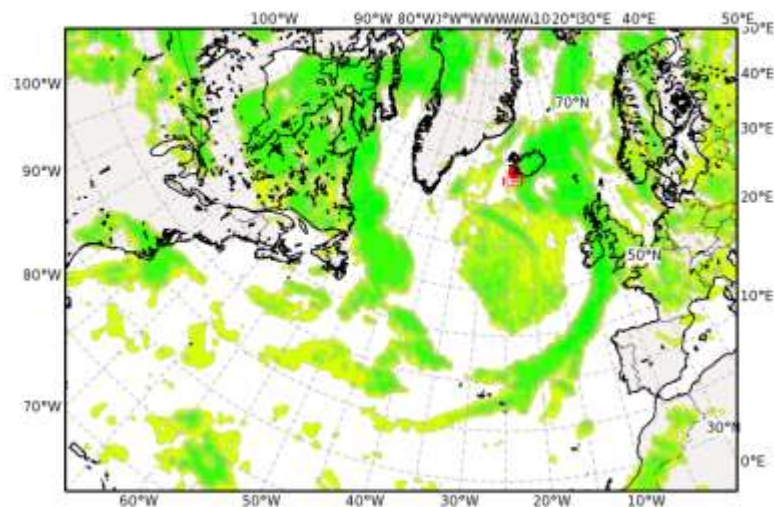
Geopotential Height (m) & Horizontal Wind (m/s) at 300 hPa
Valid: Wed, 21 Sep 2016, 15 UTC (step 039 h from Tue, 20 Sep 2016, 00 UTC)



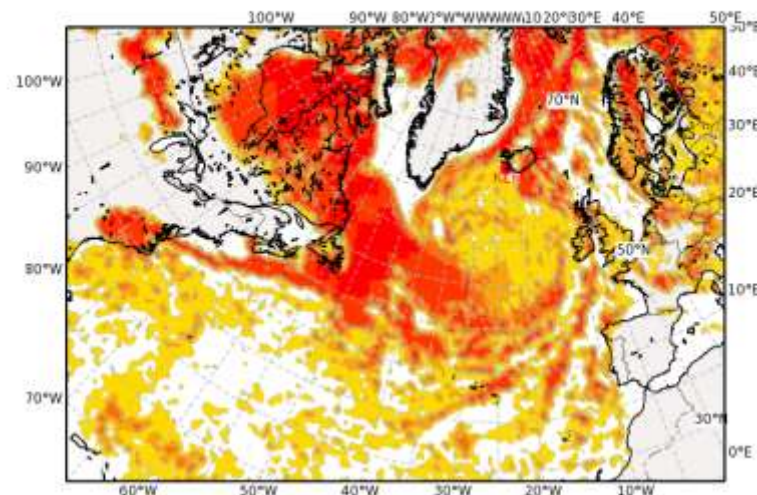
High Cloud Cover
Valid: Wed, 21 Sep 2016, 15 UTC (step 039 h from Tue, 20 Sep 2016, 00 UTC)



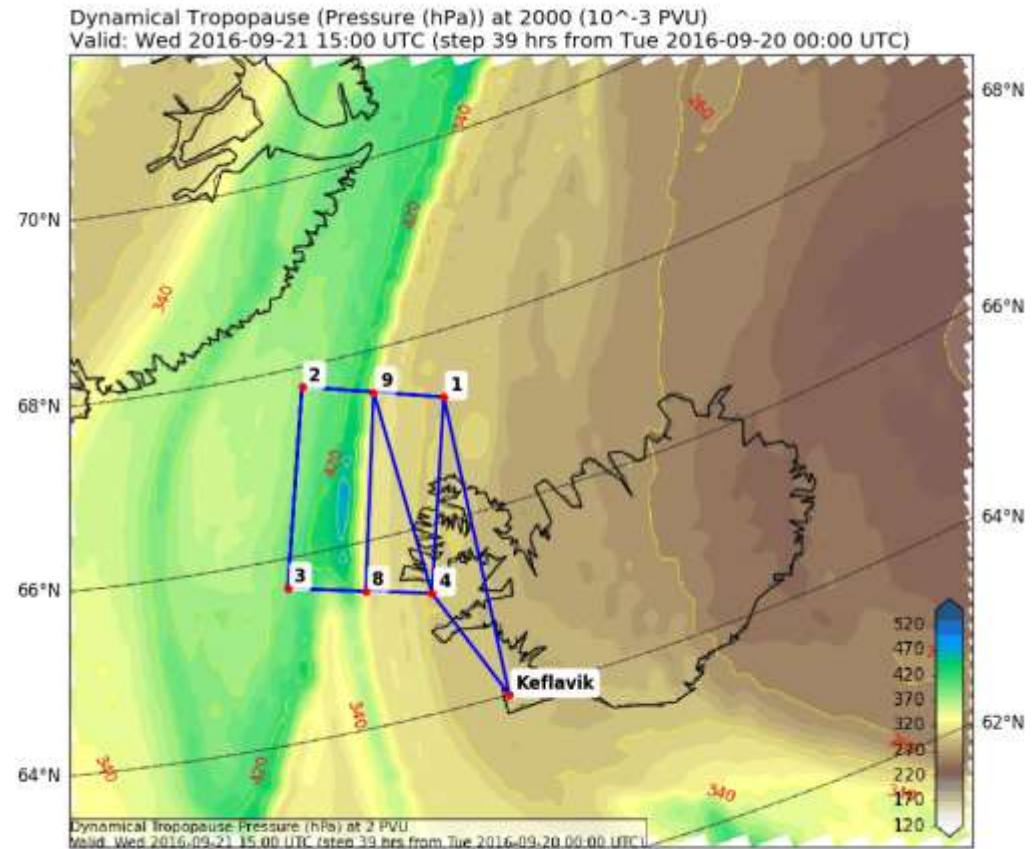
Medium Cloud Cover
Valid: Wed, 21 Sep 2016, 15 UTC (step 039 h from Tue, 20 Sep 2016, 00 UTC)



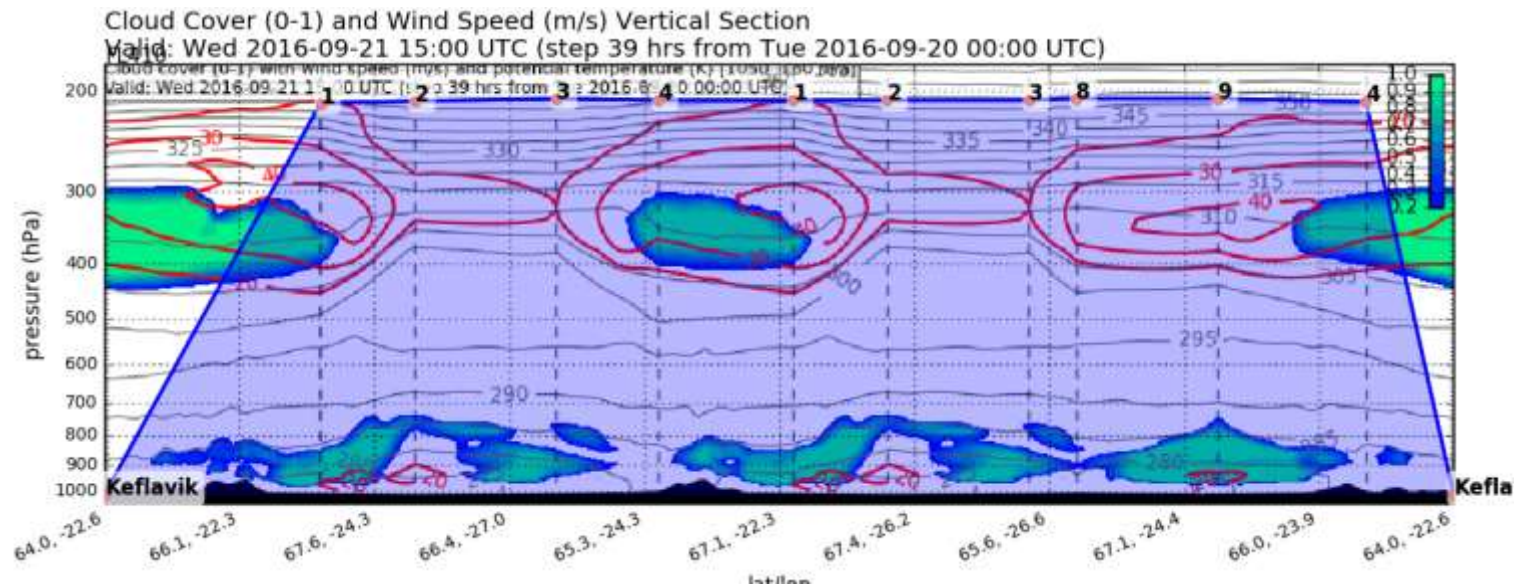
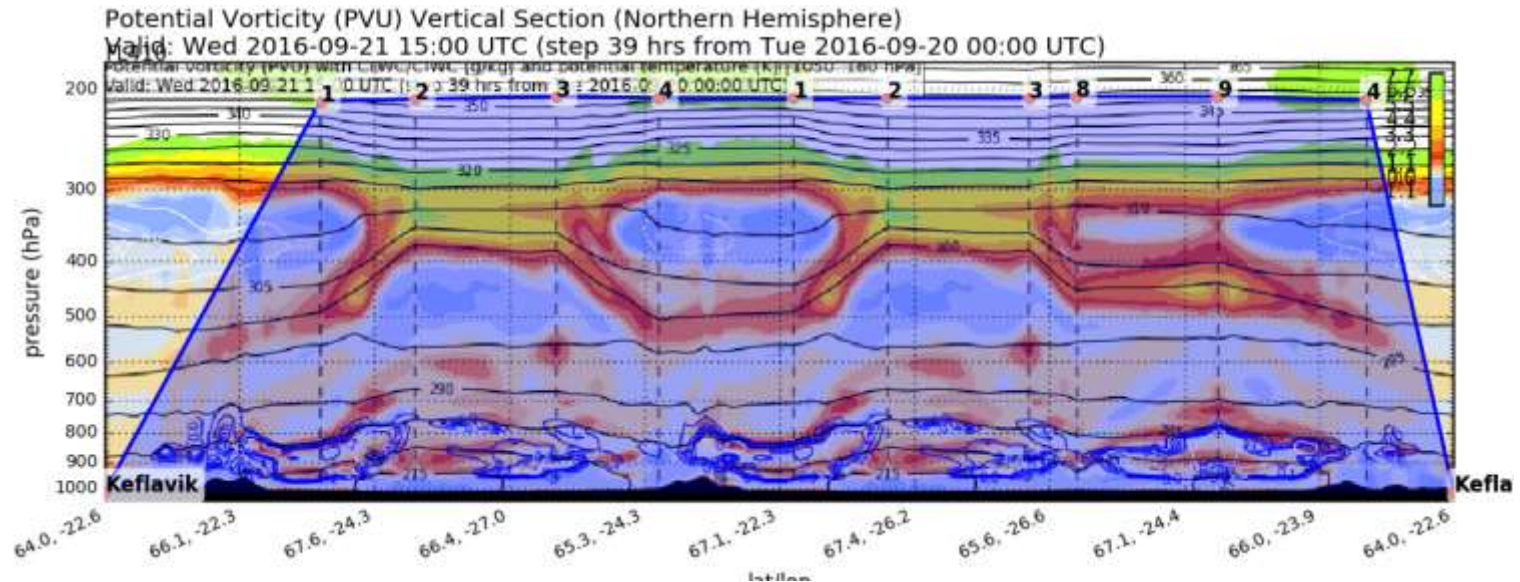
Low Cloud Cover
Valid: Wed, 21 Sep 2016, 15 UTC (step 039 h from Tue, 20 Sep 2016, 00 UTC)



FALCON

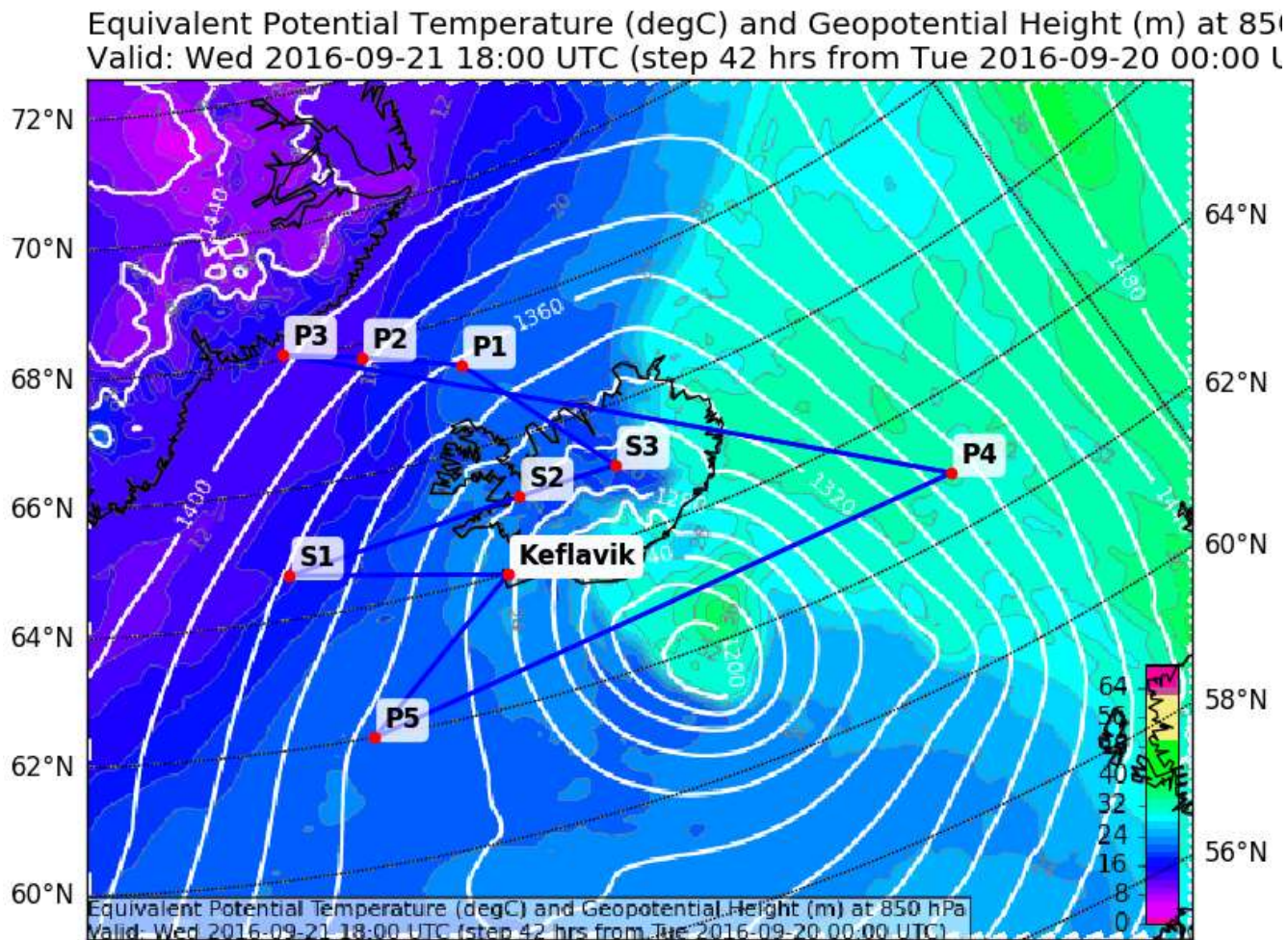


- Box pattern to sample tropopause structure and across tropopause flow. BT20/00Z
- 45min-60min “warming up” for Lidars → climb, potentially short upper-level vertical profiles
- Sampling at FL360 / FL380



Flight pattern for Wednesday 21 September, 18UTC

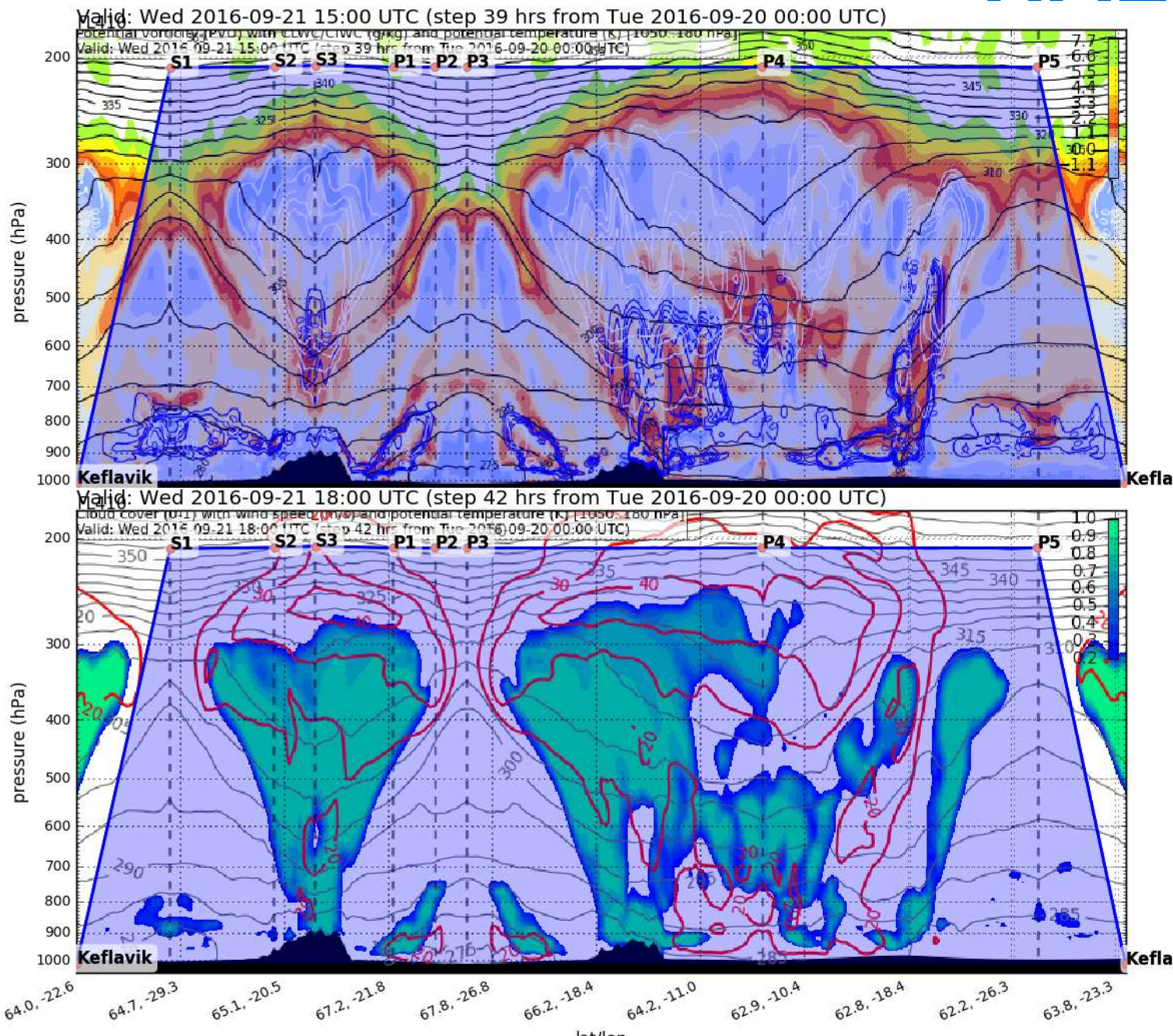
HALO



- Coordinated leg with Falcon, 5 dropsondes, sampling TP structure
- Triangle south of Iceland to sample WCB ascent region / warm sector 8 sondes

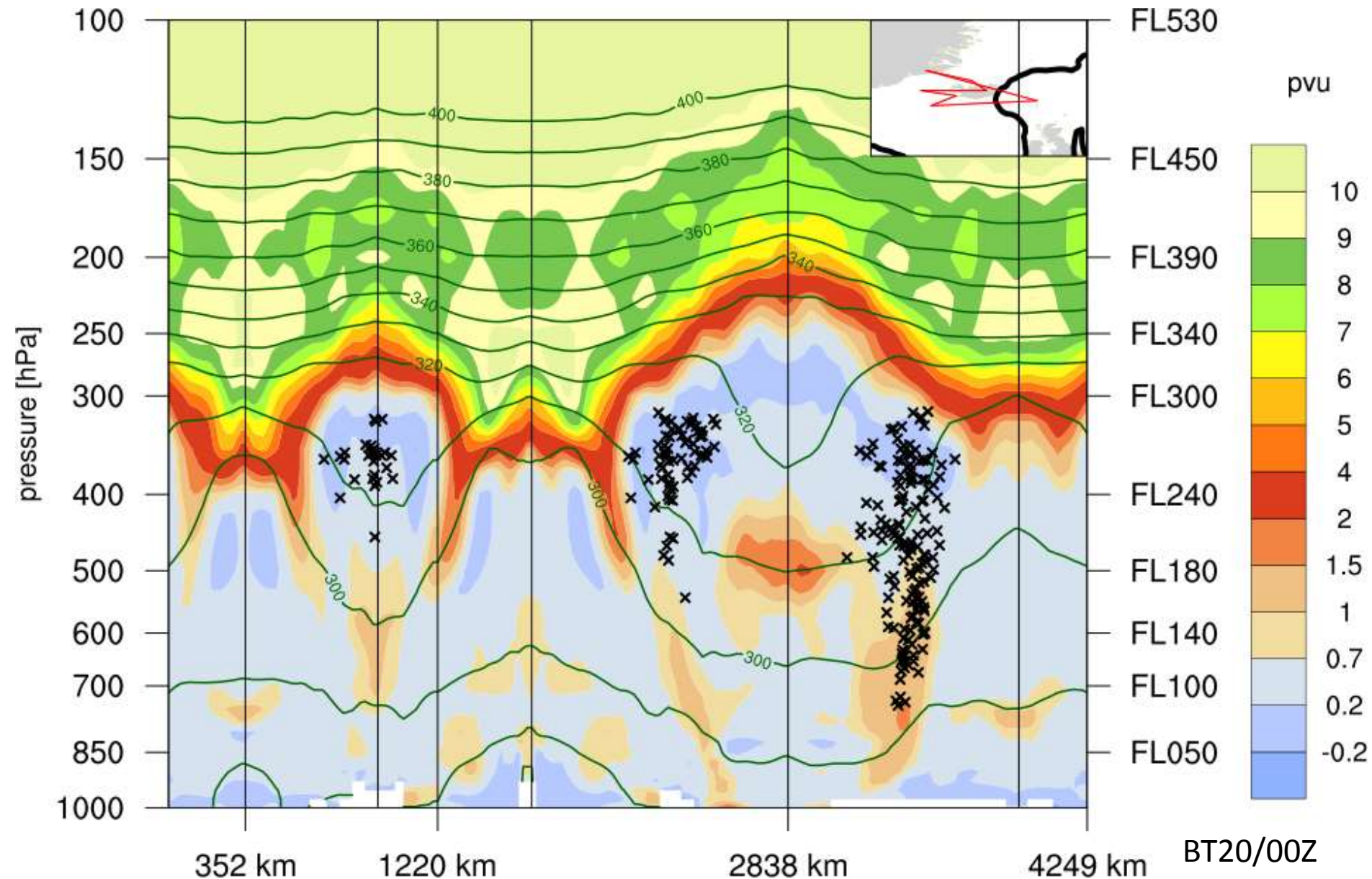
Flight pattern for Wednesday 21 September, 15UTC

HALO



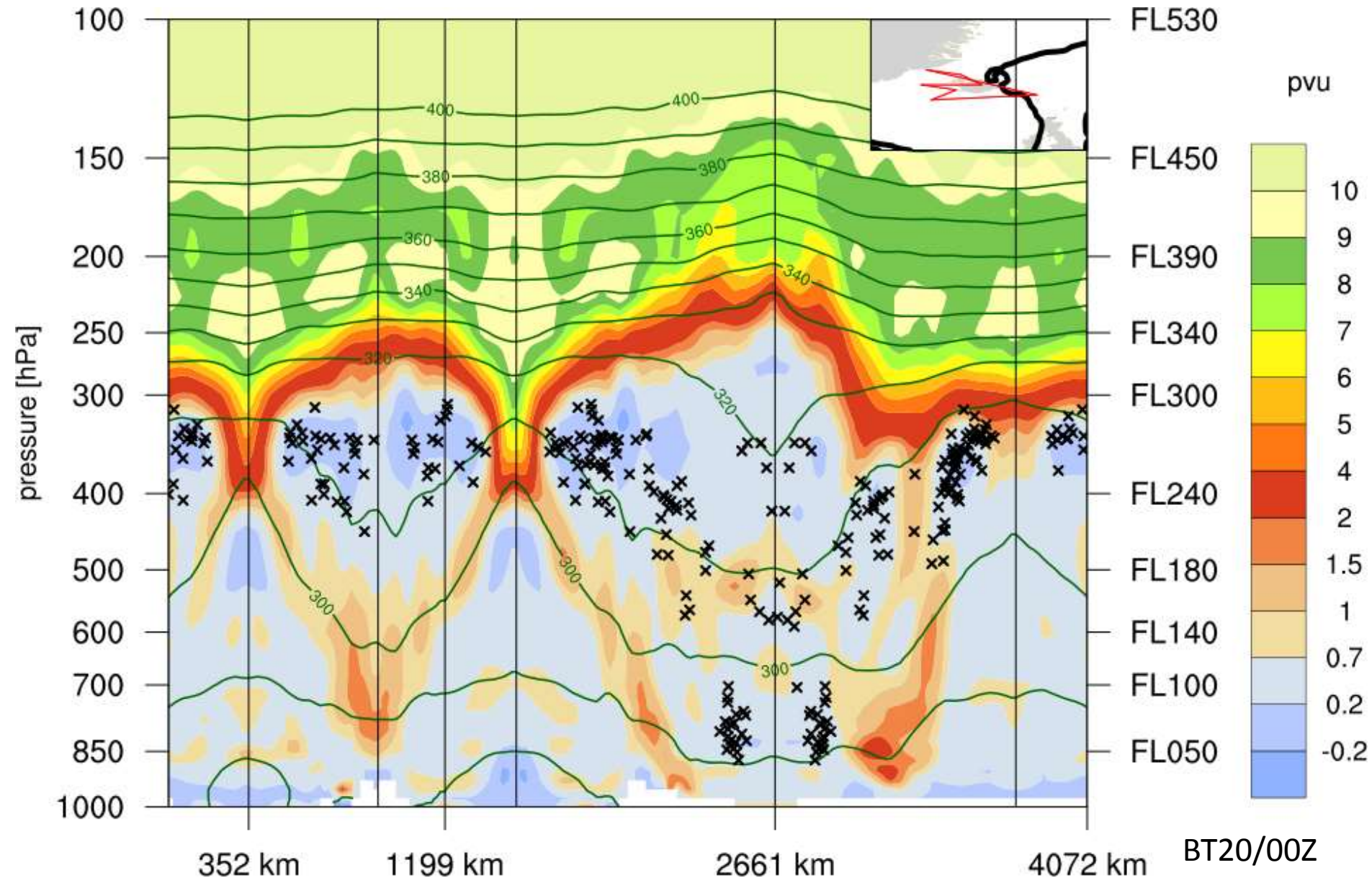
Flight pattern for Wednesday 21 September, 12UTC

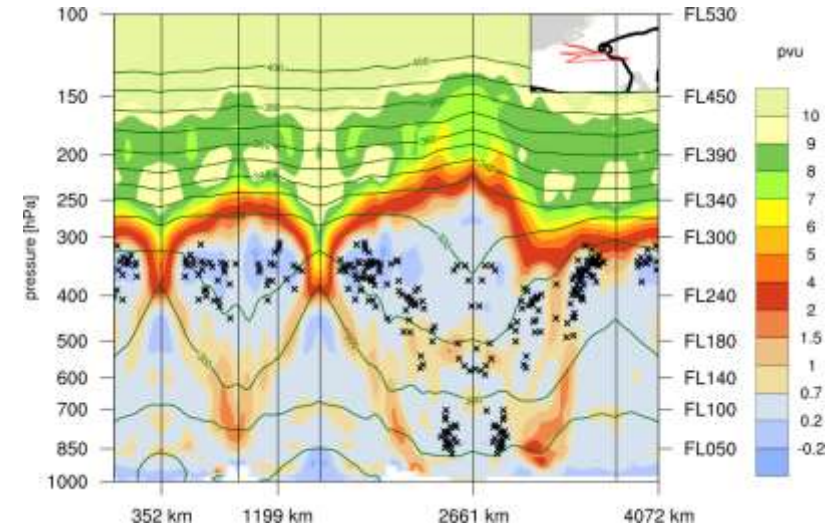
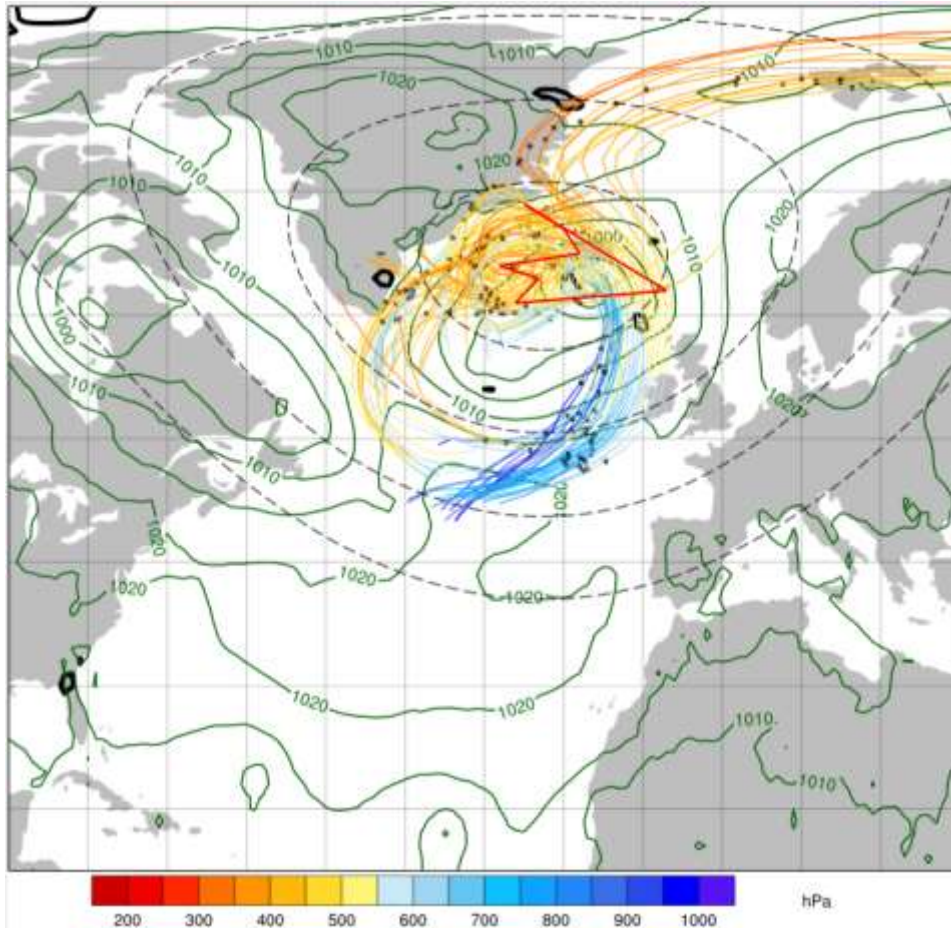
HALO



Flight pattern for Wednesday 21 September, 18UTC

HALO

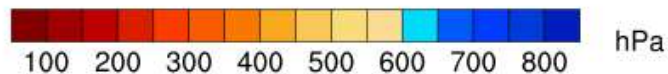
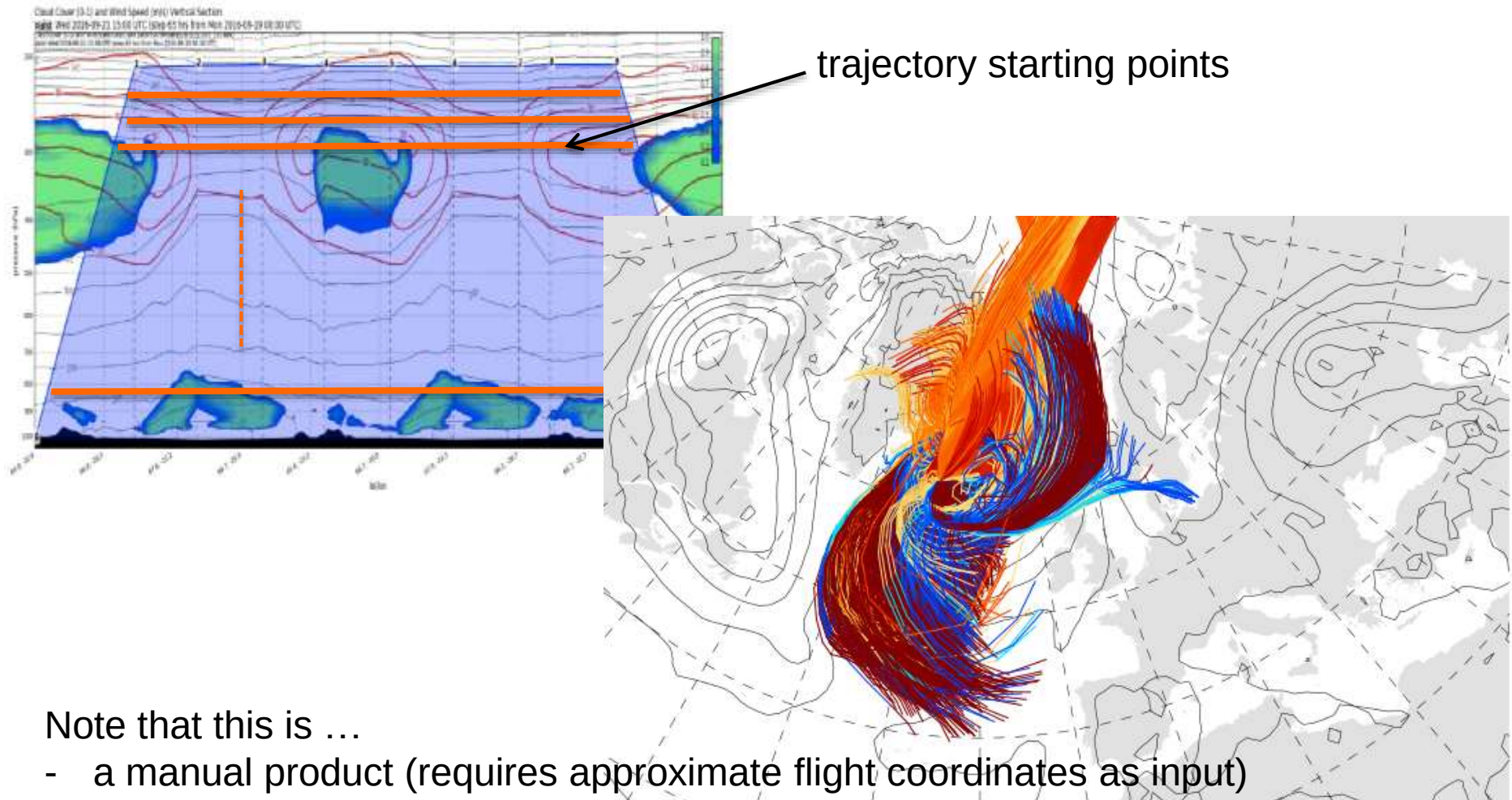




BT20/00Z

New planning product (suggested by John)

Forward trajectories from curtain below flight track

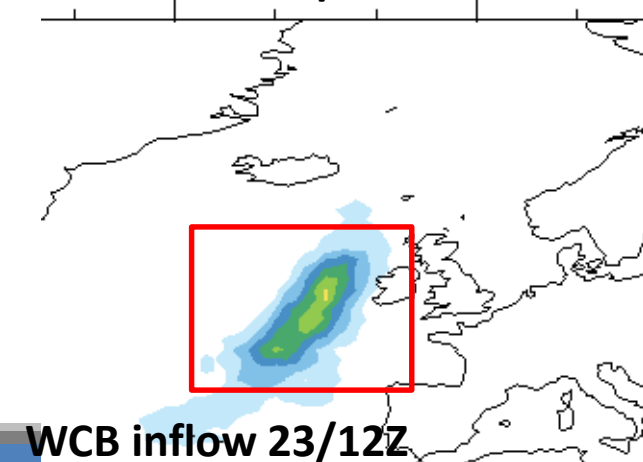
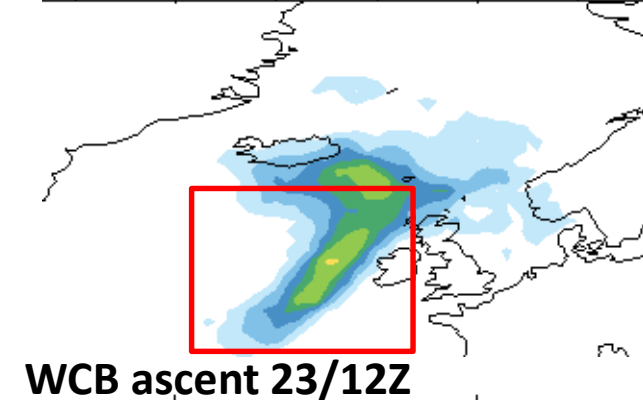
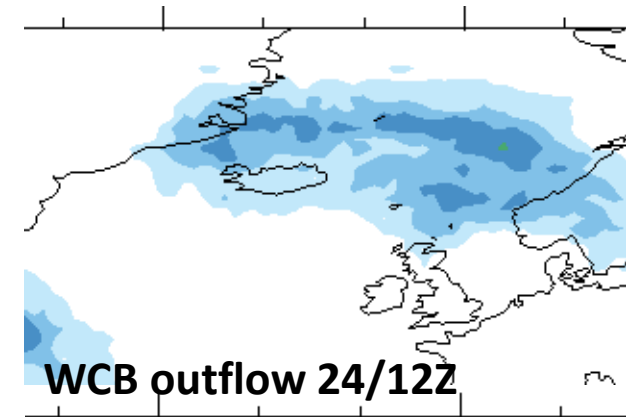
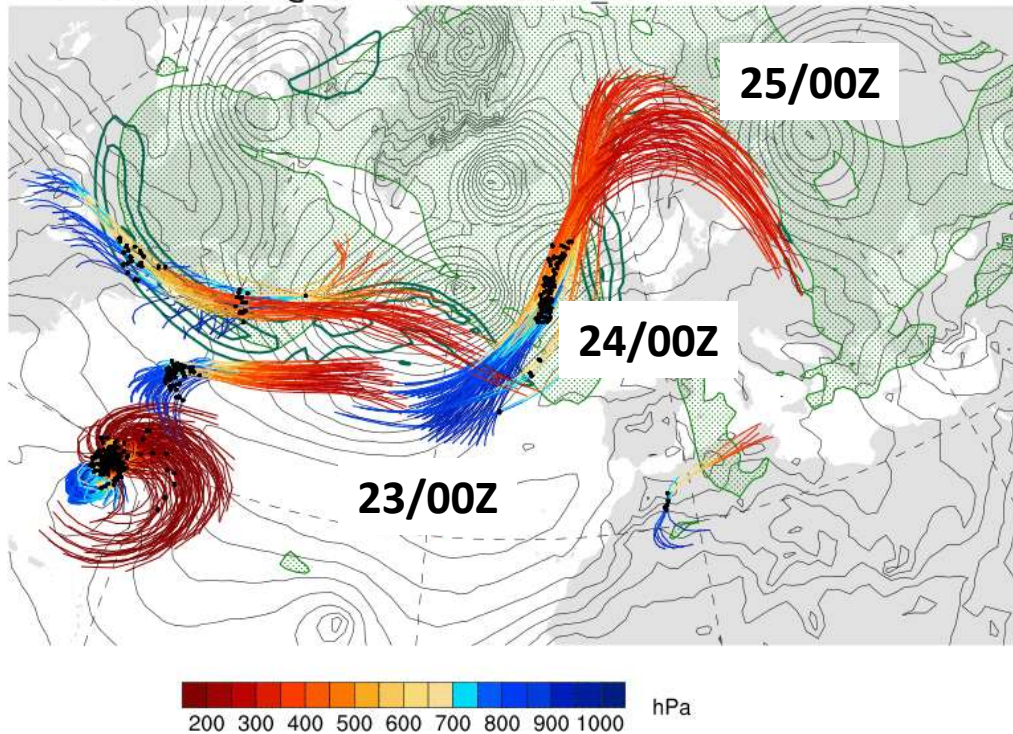


Friday case and HIW next weekend

Friday/Saturday 23/24 September: Lagrangian measurement of a WCB

WCB probabilities BT19/12Z

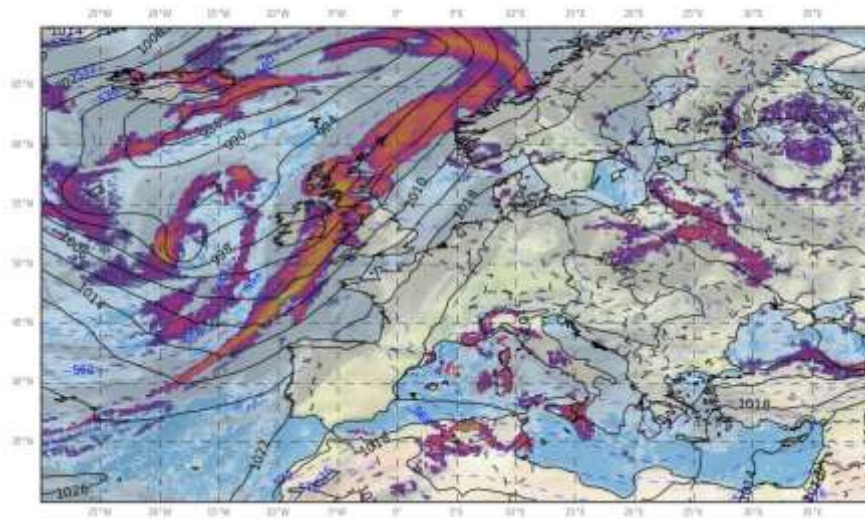
Trajectory start and SLP VT: 20160923_00
WCB outflow and PV@250hPa VT: 20160925_00



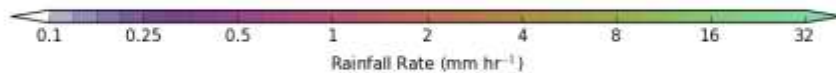
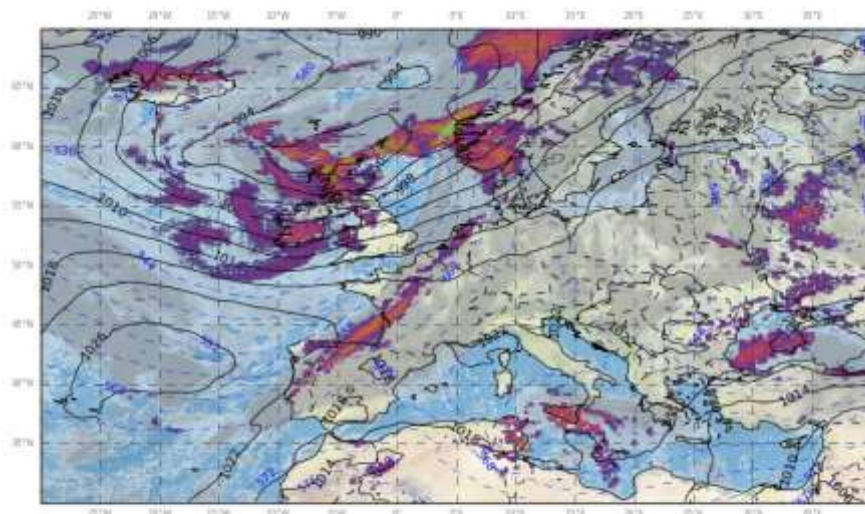
High impact weather – Sat/Sun



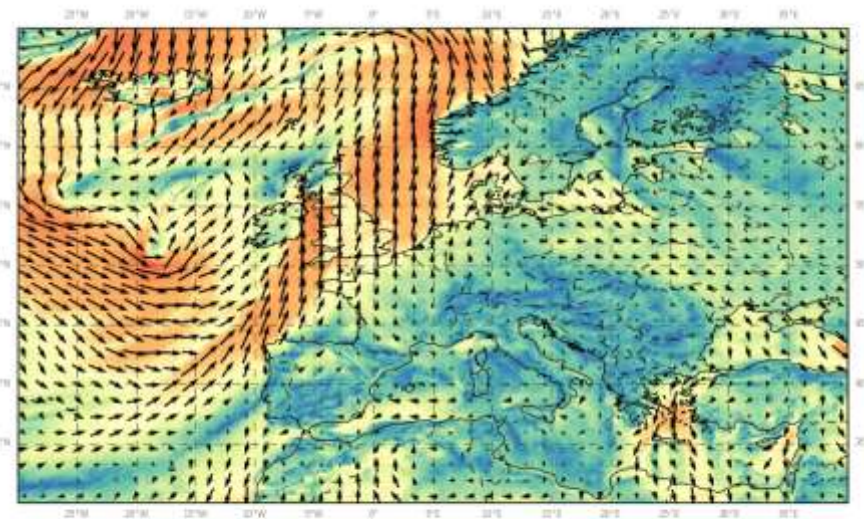
Met Office Oper. Global: P_{max}, 500hPa Thickness, Precip Rates, Cloud
2016/09/24 12Z T+108 from 2016/09/20 00Z



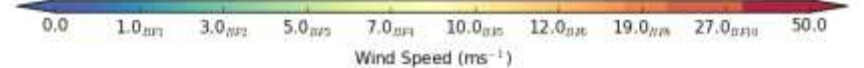
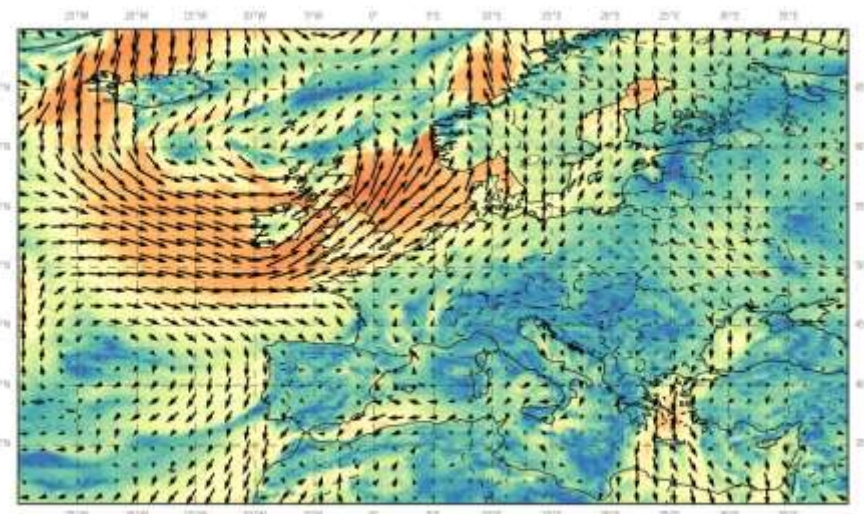
Met Office Oper. Global: P_{max}, 500hPa Thickness, Precip Rates, Cloud
2016/09/25 12Z T+132 from 2016/09/20 00Z



Met Office Oper. Global: Wind speed and direction (ms^{-1}) at 10 m
2016/09/24 12Z T+108 from 2016/09/20 00Z



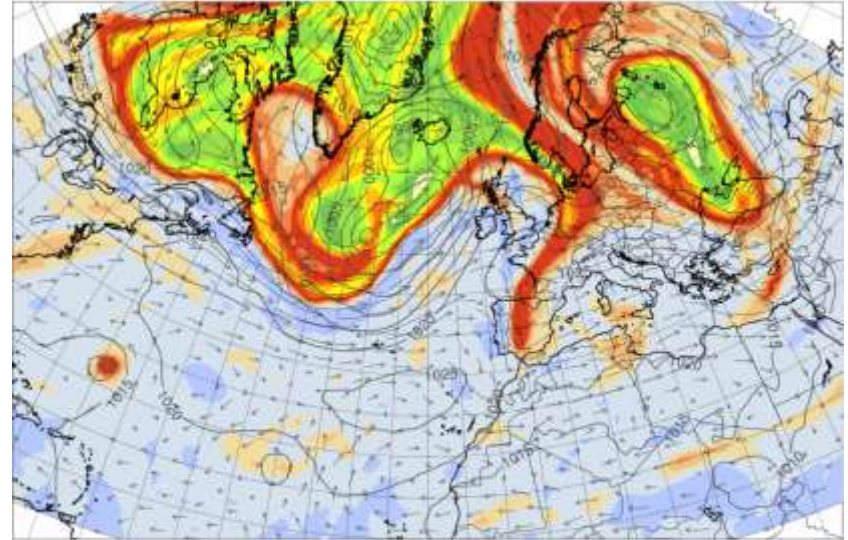
Met Office Oper. Global: Wind speed and direction (ms^{-1}) at 10 m
2016/09/25 12Z T+132 from 2016/09/20 00Z



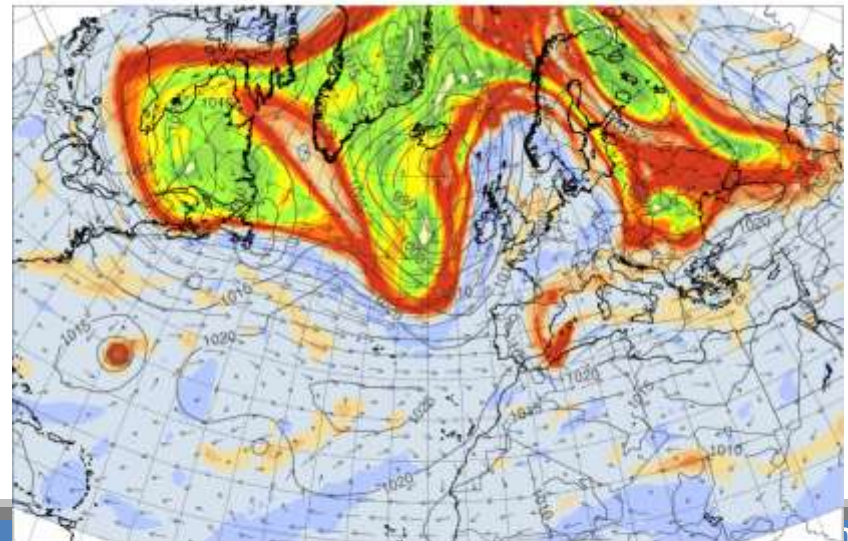
Possible Radiosonde requests for Fri 23 Sep

- In/near WCB:
 - Castor Bay, Lerwick, Torshavn, Iceland
 - 12 UTC to 12 UTC on 24
- Also Norway for outflow?

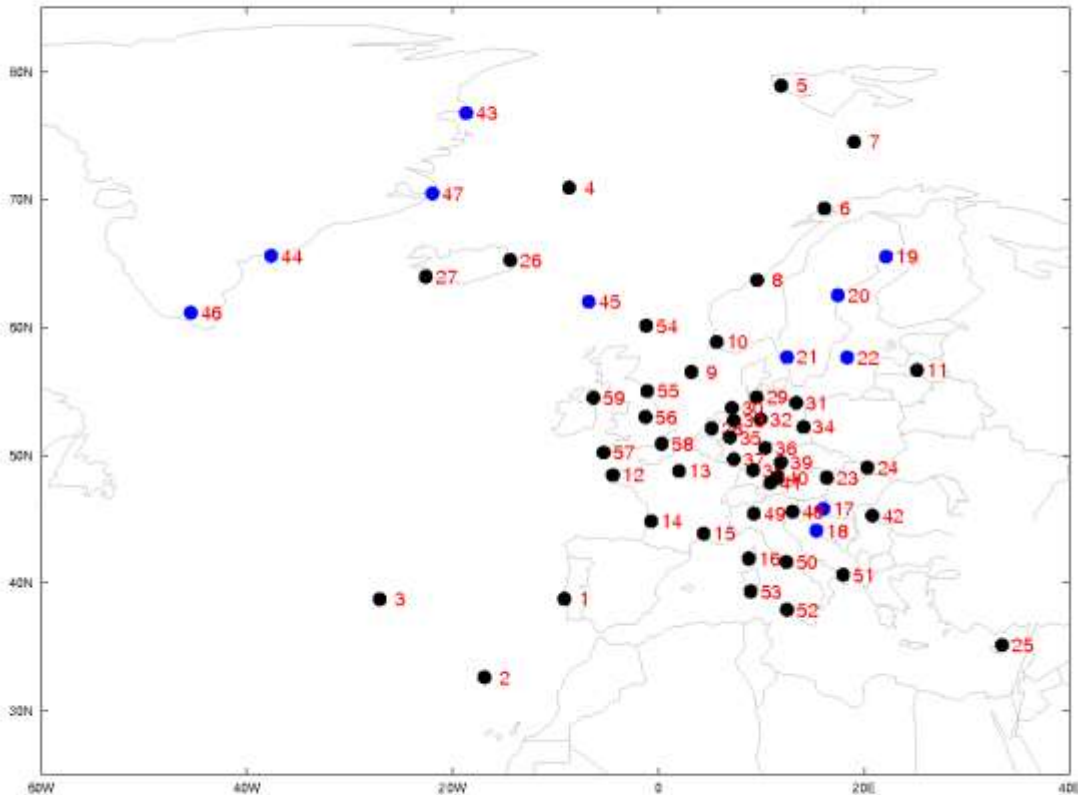
PV@325K at 20160923_12



PV@325K at 20160924_12



EUMETNET stations



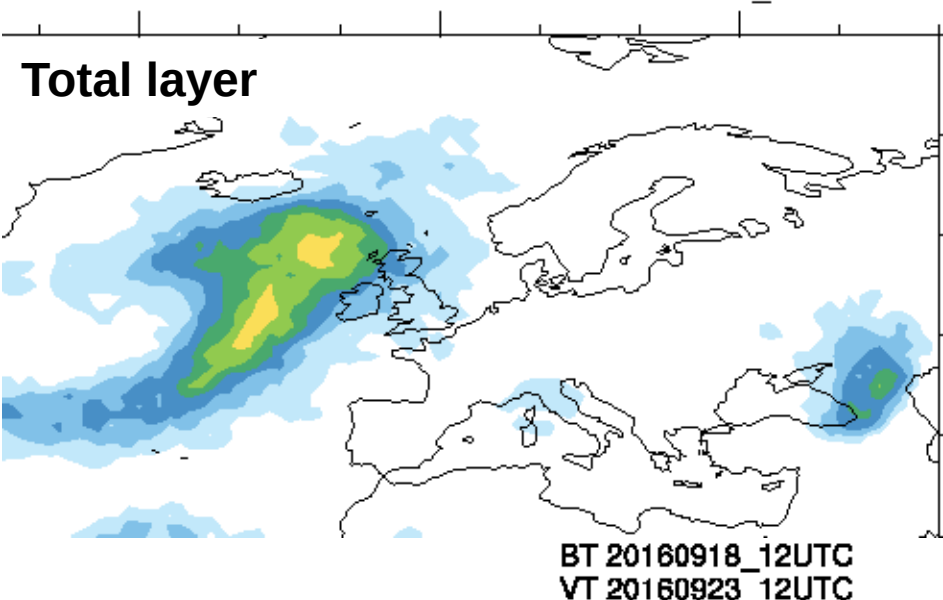
1 08579 Lisbon
 2 08522 Madeira
 3 08508 Azores
 4 01001 JAN MAYEN
 5 01004 NY-ALESUND
 6 01010 ANDOYA
 7 01028 BJORNOYA
 8 01241 ORLAND
 9 01400 EKOFISK
 10 01415 STAVANGER/SOLA
 11 26435 Sriveri each second day
 12 07110 BREST
 13 07145 TRAPPES
 14 07510 BORDEAUX
 15 07645 Nimes
 16 07761 AJACCIO
 17 14240 Zagreb
 18 14430 Zadar
 19 02185 Lulea
 20 02365 Sundsvall
 21 02527 Goteborg
 22 02591 Visby
 23 11035 Wien
 24 11952 POPRAD-GANOVCE
 25 17607 ATHALASSA
 26 04089 Egilsstadir
 27 04018 KEFLAVIK
 28 06260 DE BILT AWS
 29 10035 SCHLESWIG
 30 10113 Norderney

31 10184 Greifswald
 32 10238 Bergen
 33 10304 Meppen
 34 10393 Lindenberg
 35 10410 Essen
 36 10548 Meiningen
 37 10618 Idar-Oberstein
 38 10739 Stuttgart
 39 10771 K mmersbruck
 40 10868 Muenchen
 41 10954 Altenstadt
 42 13275 BEOGRAD /KOSUTNJAK
 43 04320 DANMARKSHAVN
 44 04360 TASILAQ (AMMASSALIK)
 45 06011 TORSHAVN
 46 04270 Narsarsuaq
 47 04339 Iltoqqortoormiit (Scoreby)
 48 16045 Udine/Rivolto
 49 16080 Milano/Linate
 50 16245 Pratica di Mare
 51 16320 Brindisi
 52 16429 Trapani/Birgi
 53 16546 Decimomannu
 54 03005 Lerwick
 55 03238 Albemarle
 56 03354 Nottingham/Watnall
 57 03838 Cambourne
 58 03882 Herstmonceaux
 59 03918 Castor Bay

Friday model consistency

Model consistency for Friday 23/12Z

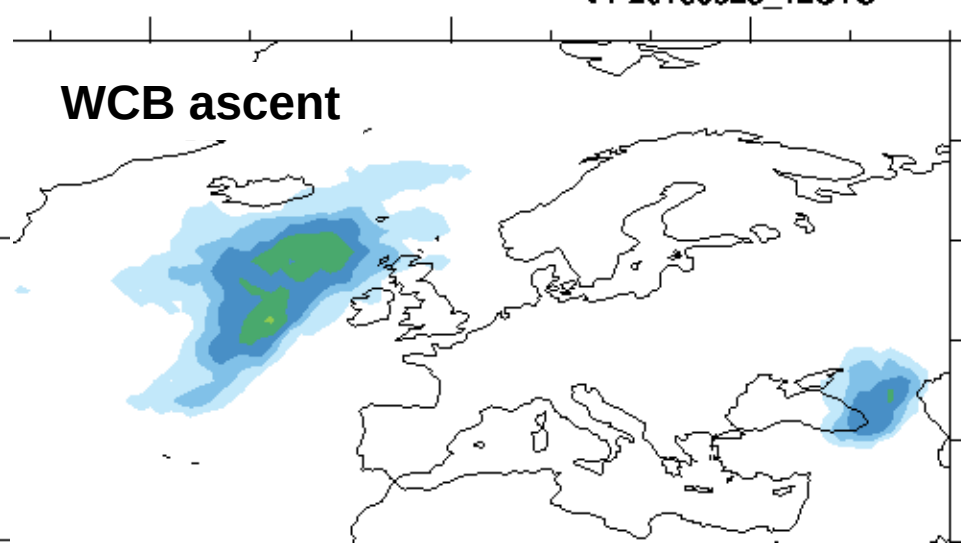
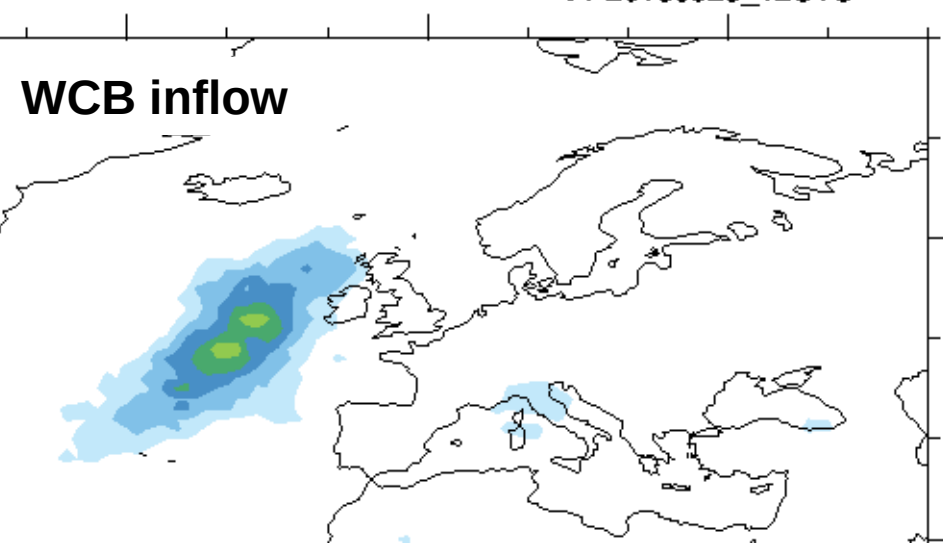
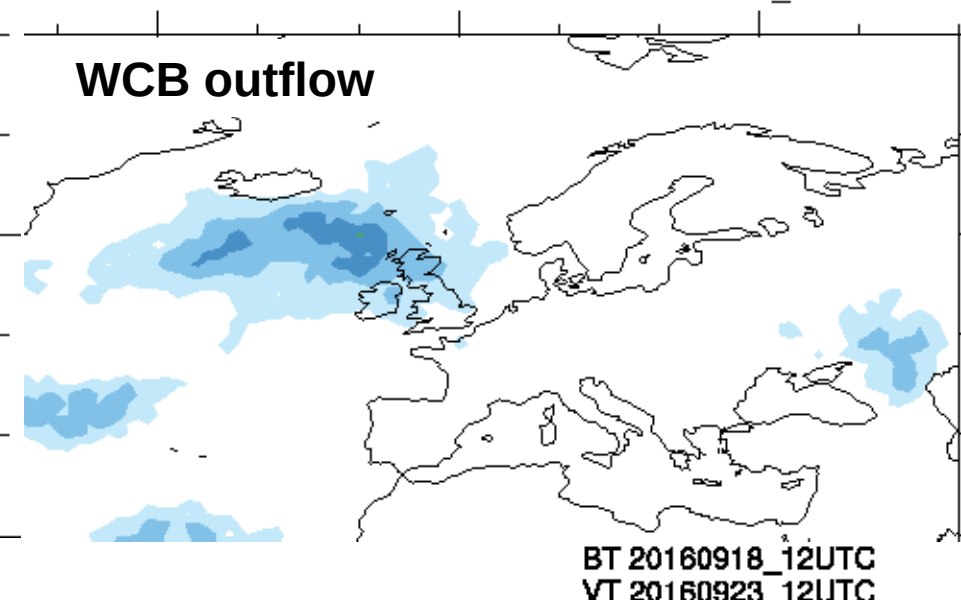
ECMWF ensemble forecast
BT 20160918_12UTC
VT 20160923_12UTC



WCB probabilities

BT 18/12Z

ECMWF ensemble forecast
BT 20160918_12UTC
VT 20160923_12UTC



Model consistency for Friday 23/12Z

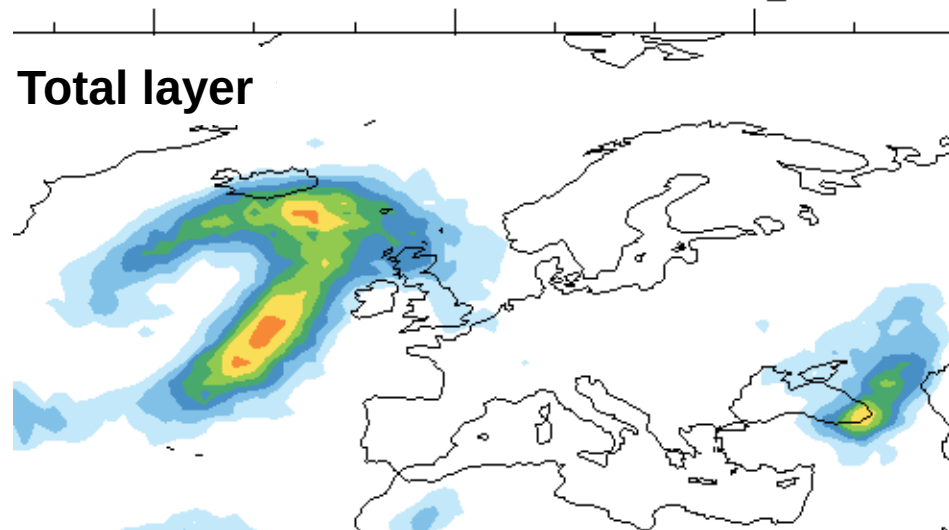
ECMWF ensemble forecast
BT 20160919_00UTC
VT 20160923_12UTC

WCB probabilities

BT 19/00Z

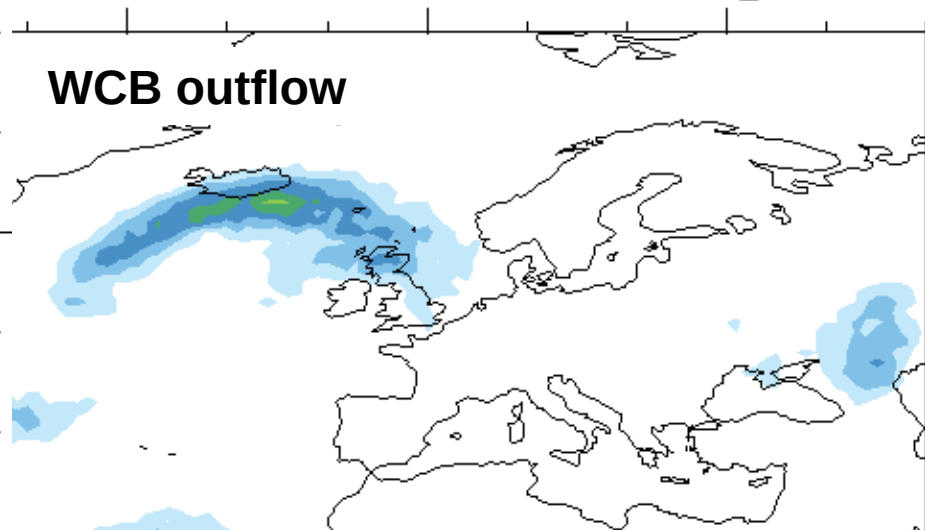
BT 20160919_00UTC
VT 20160923_12UTC

Total layer



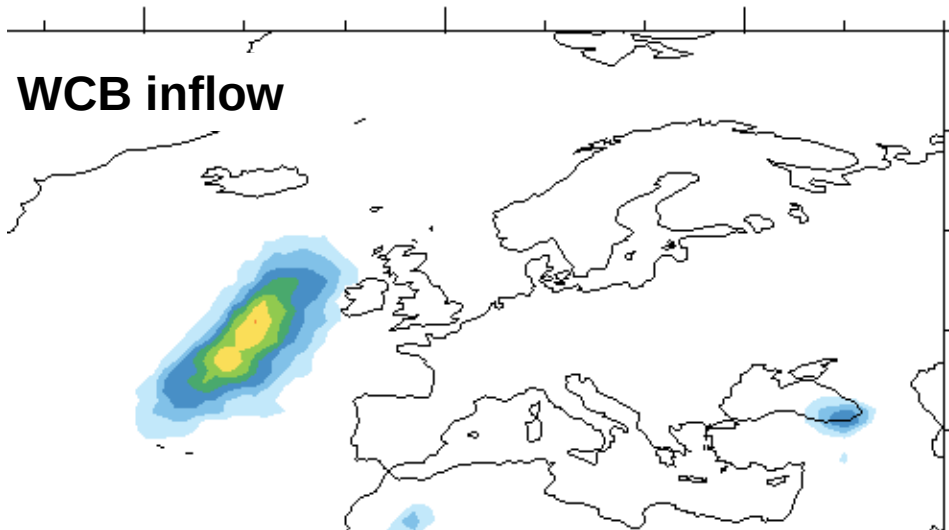
BT 20160919_00UTC
VT 20160923_12UTC

WCB outflow

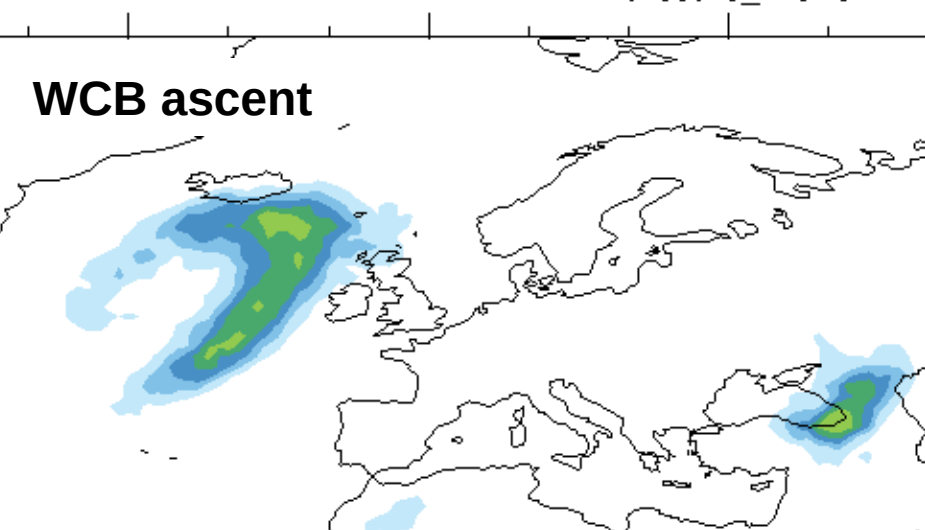


BT 20160919_00UTC
VT 20160923_12UTC

WCB inflow



WCB ascent



Model consistency for Friday 23/12Z

WCB probabilities

BT 19/12Z

BT 20160919_12UTC
VT 20160923_12UTC

BT 20160919_12UTC
VT 20160923_12UTC

Total layer

WCB outflow

BT 20160919_12UTC
VT 20160923_12UTC

BT 20160919_12UTC
VT 20160923_12UTC

WCB inflow

WCB ascent

Model consistency for Friday 23/12Z

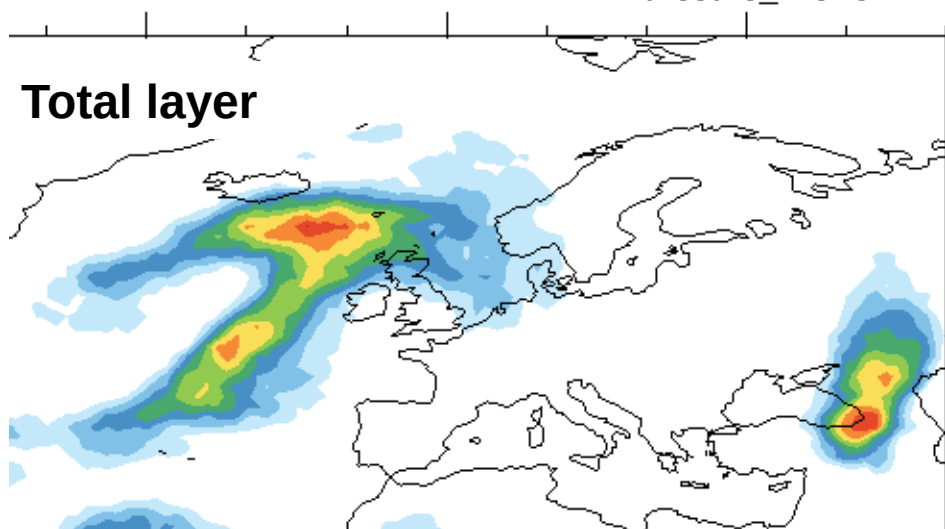
WCB probabilities

BT 20/00Z

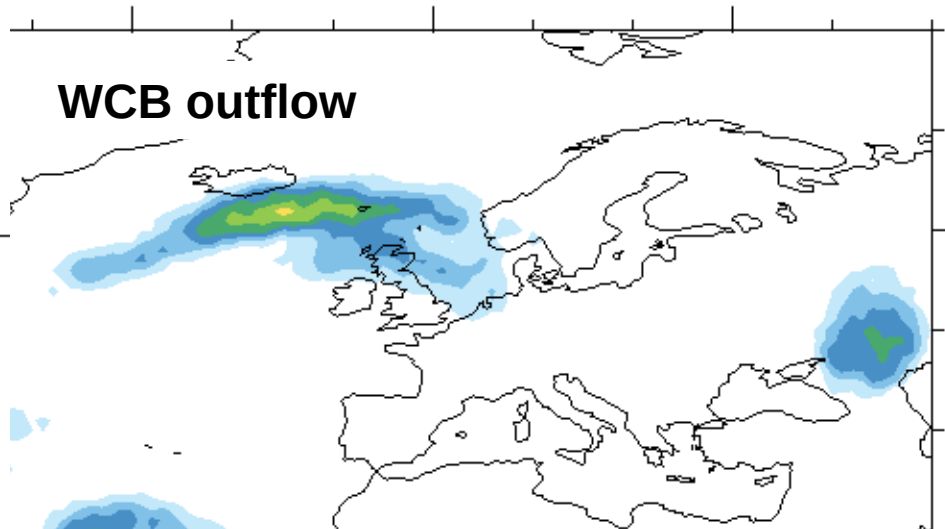
BT 20160920_00UTC
VT 20160923_12UTC

BT 20160920_00UTC
VT 20160923_12UTC

Total layer



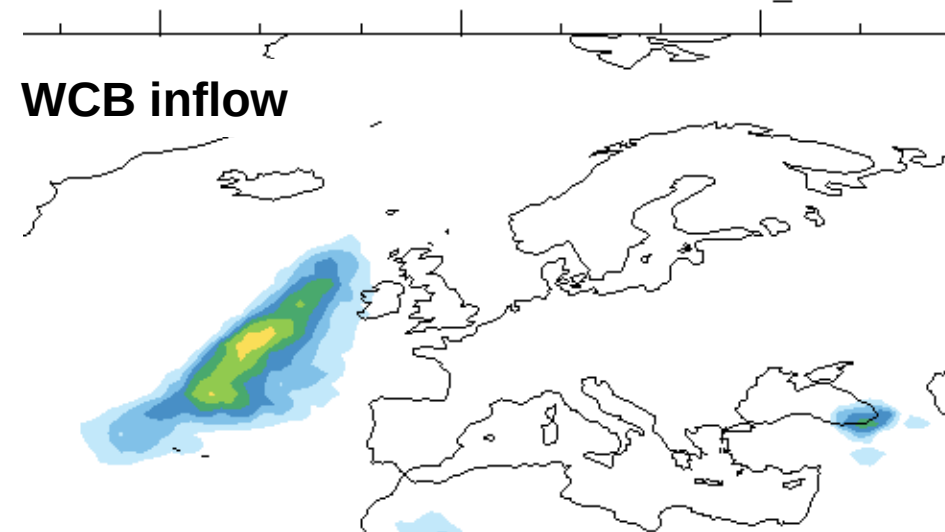
WCB outflow



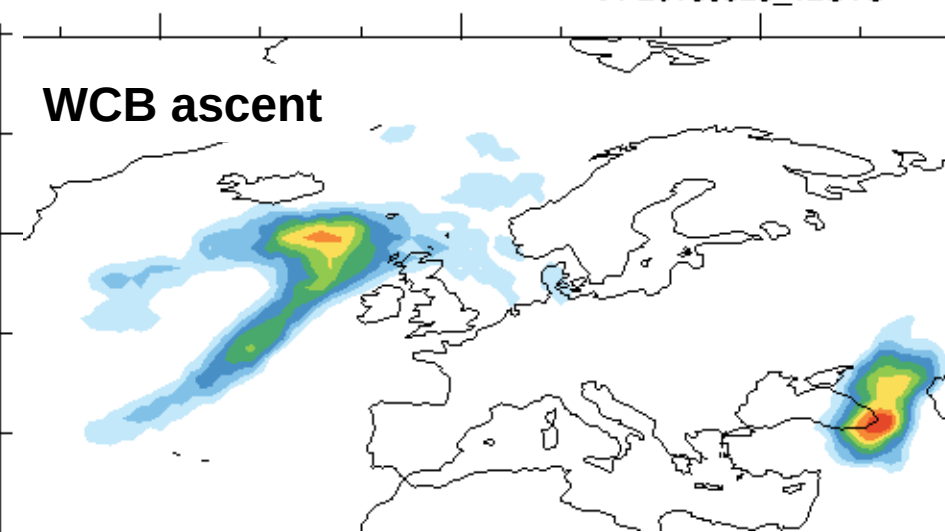
BT 20160920_00UTC
VT 20160923_12UTC

BT 20160920_00UTC
VT 20160923_12UTC

WCB inflow

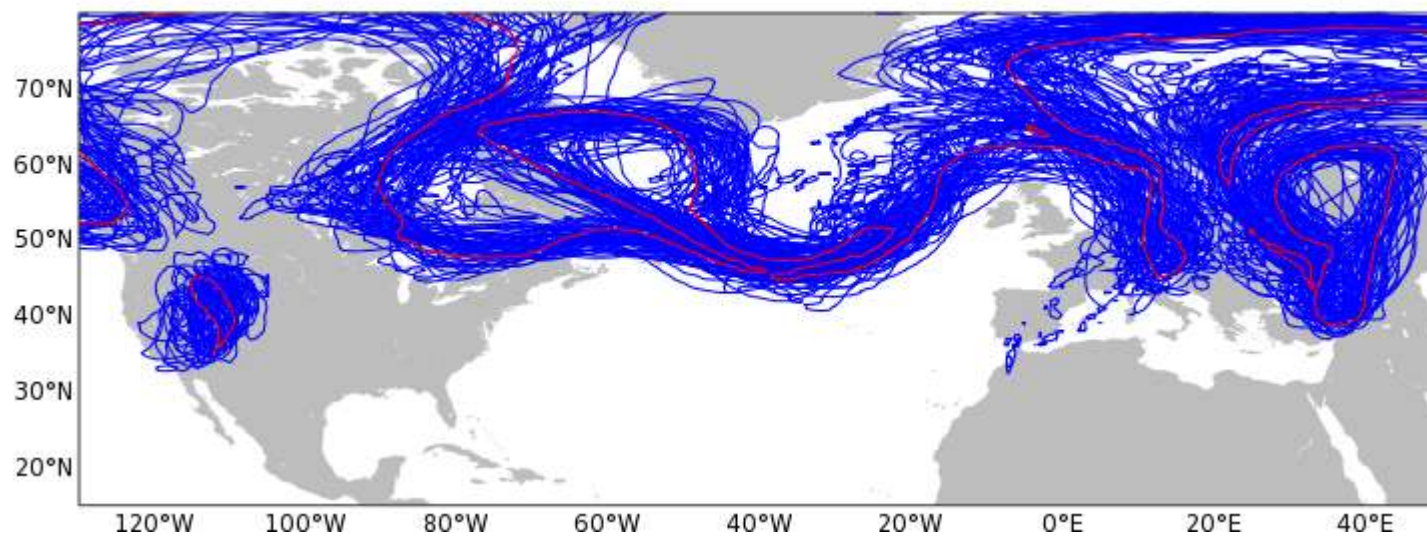


WCB ascent



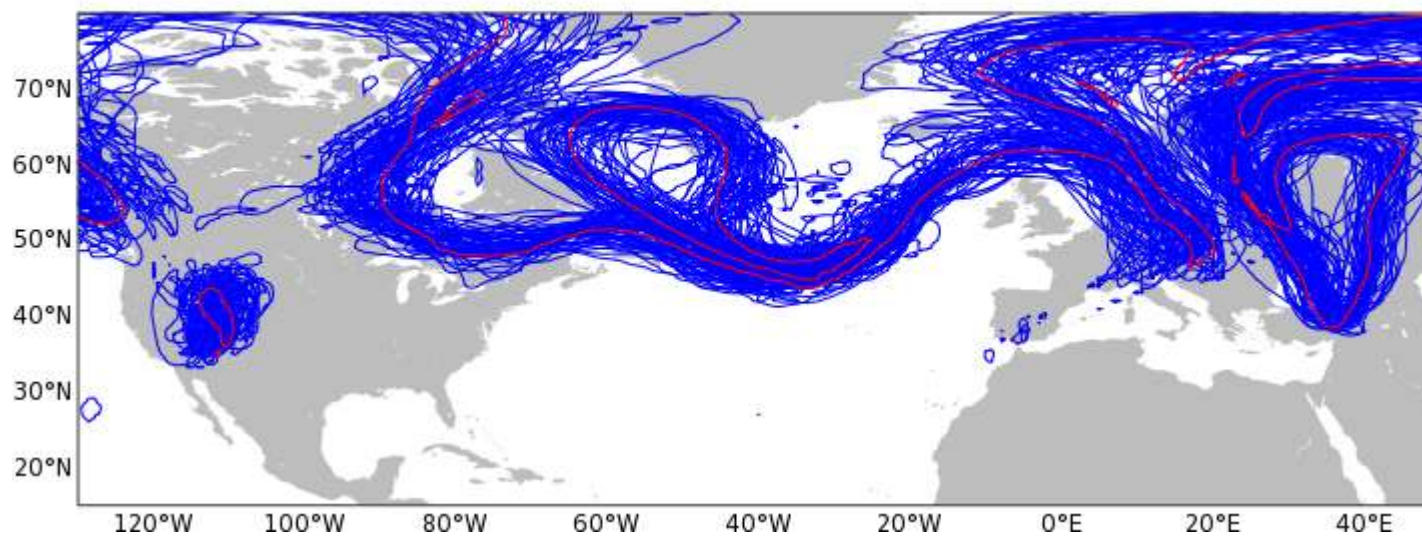
Model consistency for Friday 23/18Z

ECMWF ENSEMBLE FC
BT: 20160919 00UTC, VT: 20160923 18UTC
blue: perturbed, red: control



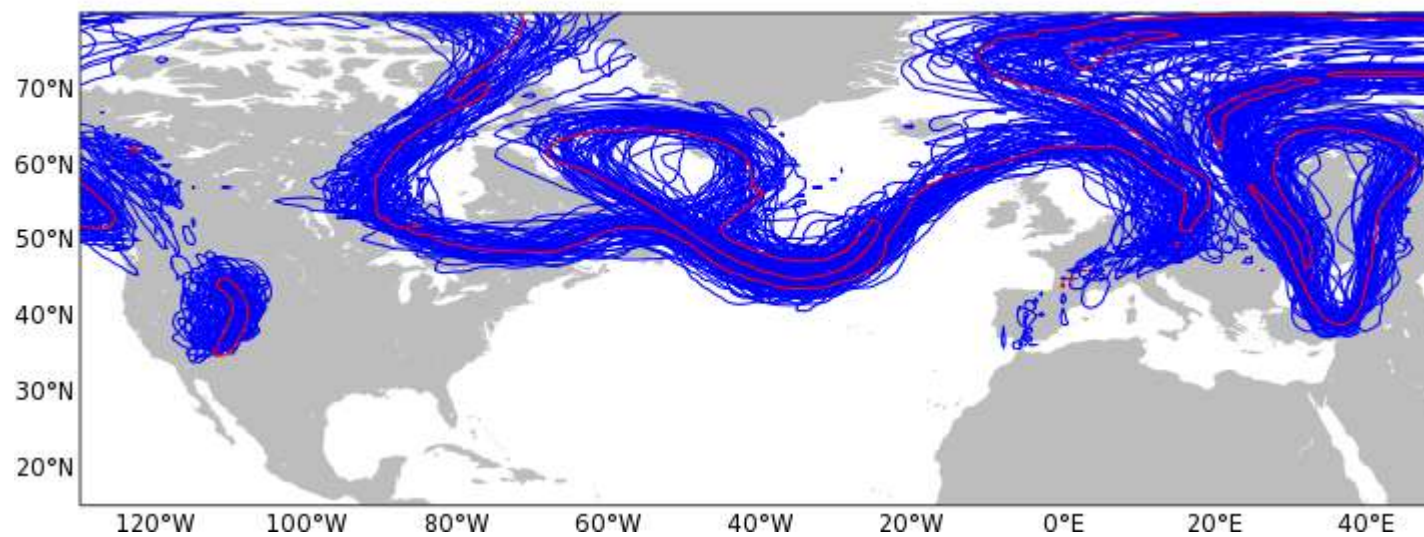
Model consistency for Friday 23/18Z

ECMWF ENSEMBLE FC
BT: 20160919 12UTC, VT: 20160923 18UTC
blue: perturbed, red: control



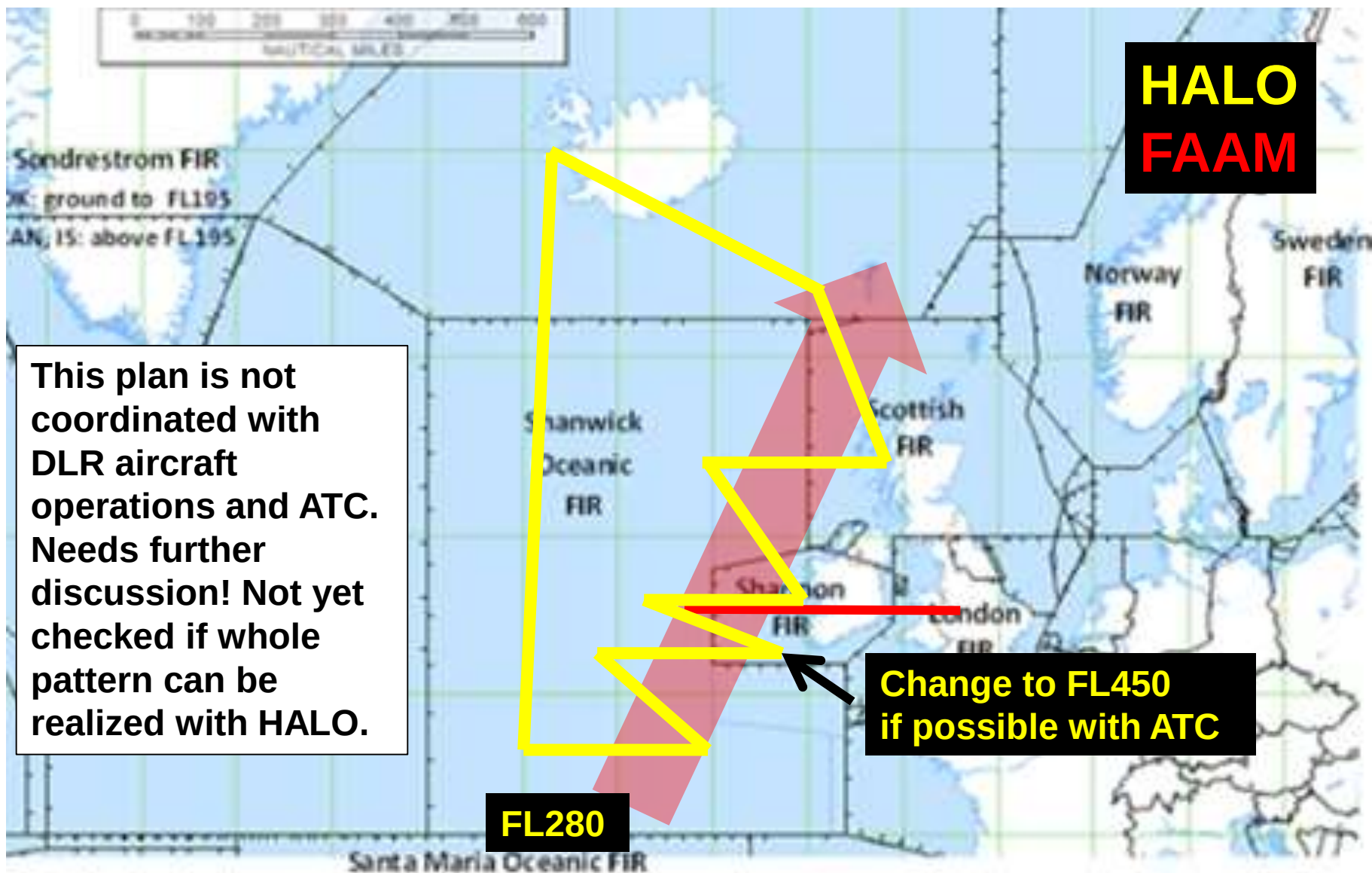
Model consistency for Friday 23/18Z

ECMWF ENSEMBLE FC
BT: 20160920 00UTC, VT: 20160923 18UTC
blue: perturbed, red: control



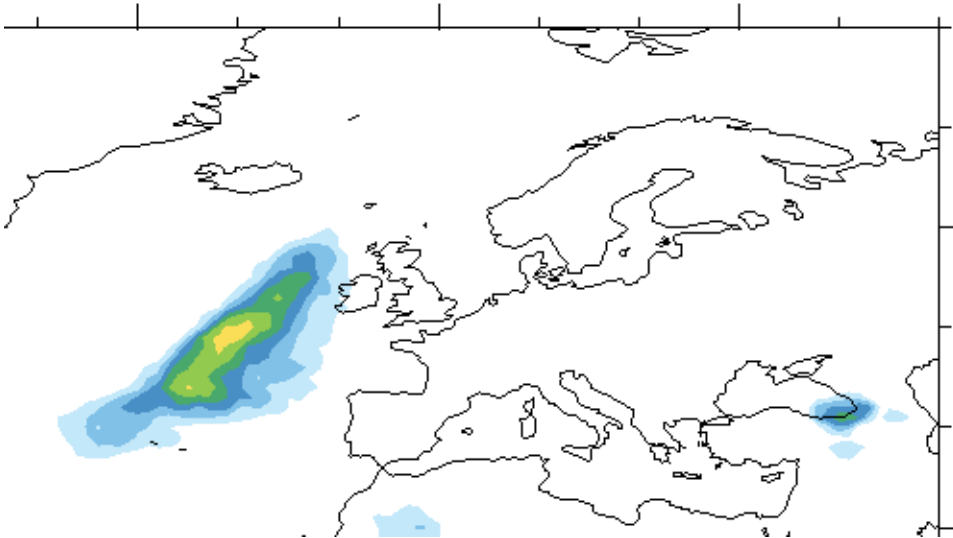
Friday flight planning

First idea for a rough flight plan for Friday 23 Sep 2016



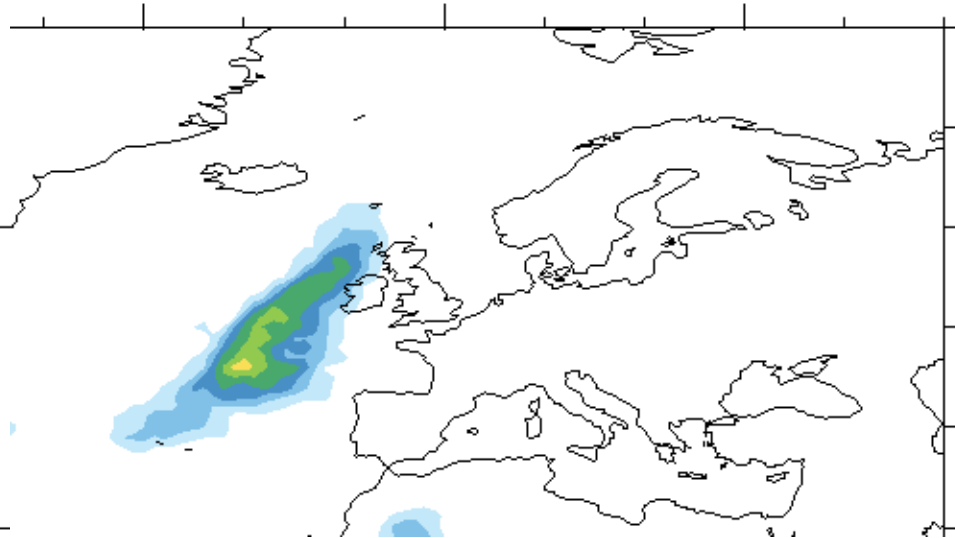
INFLOW 23/12Z to 24/06Z, BT 20/00Z

ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160923_12UTC

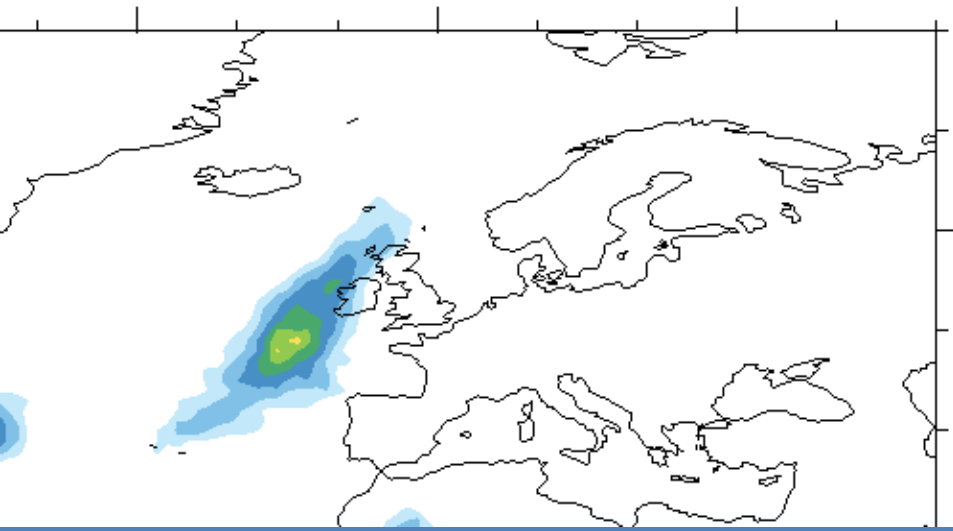


WCB probabilités

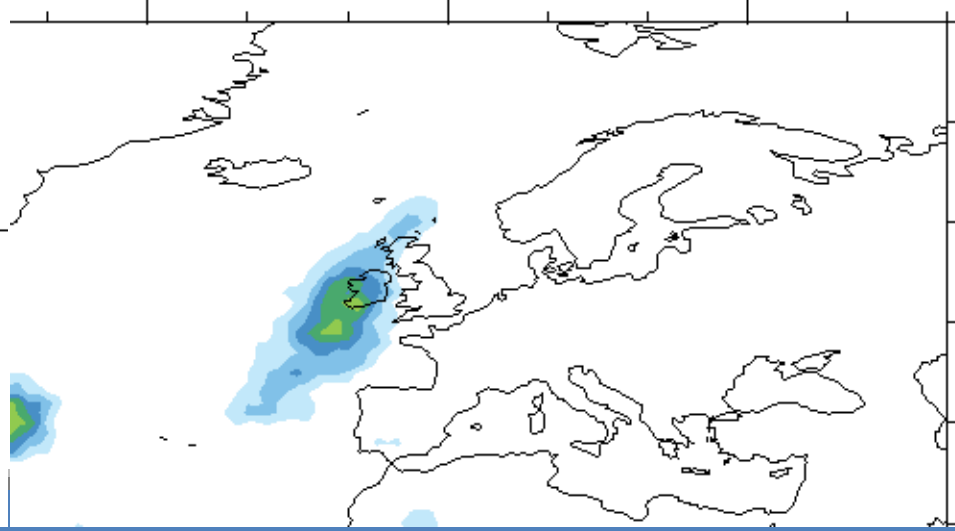
ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160923_18UTC



ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_00UTC



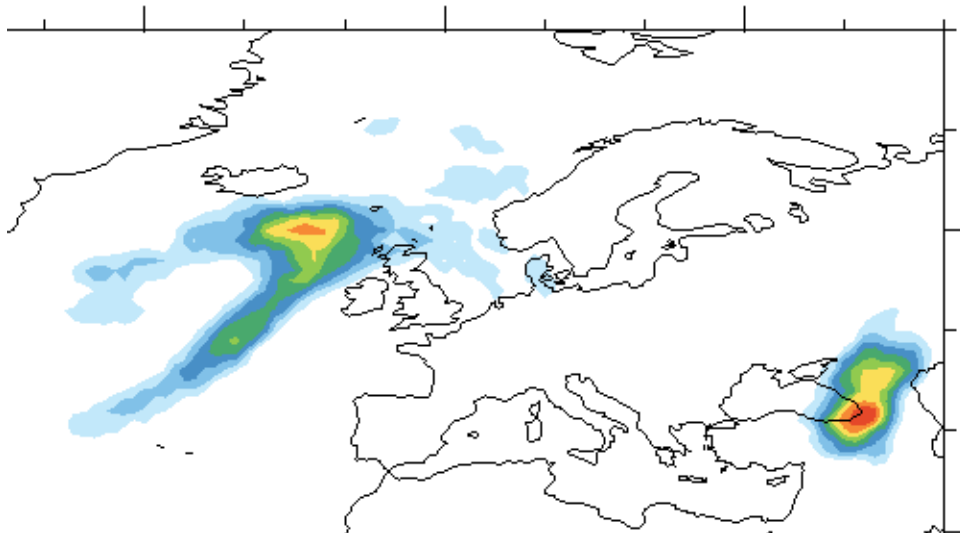
ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_06UTC



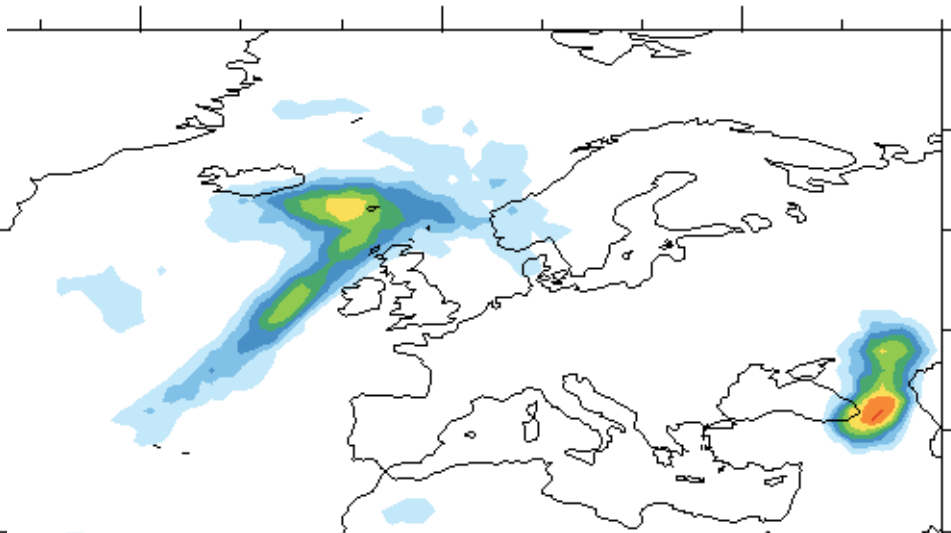
ASCENT 23/12Z to 24/06Z, BT 20/00Z

WCB probabilities

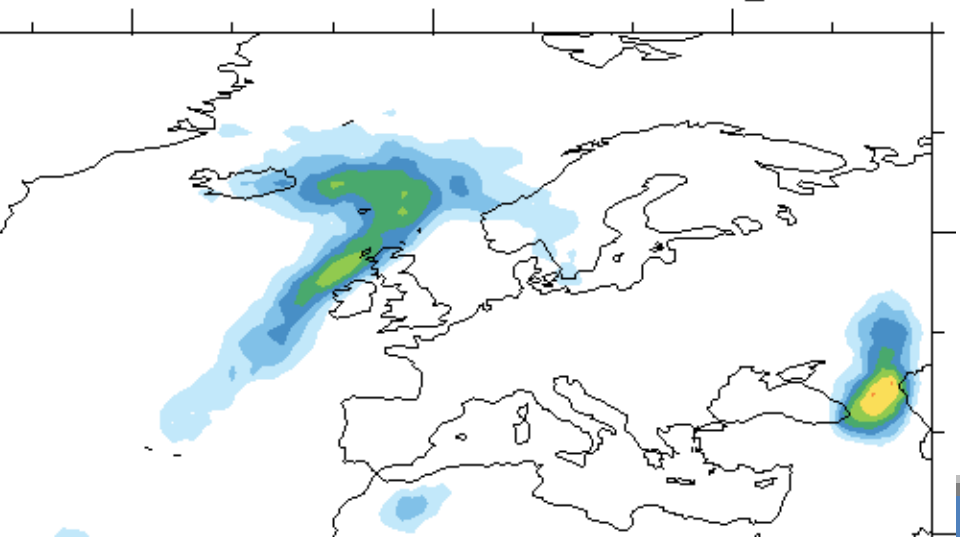
ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160923_12UTC



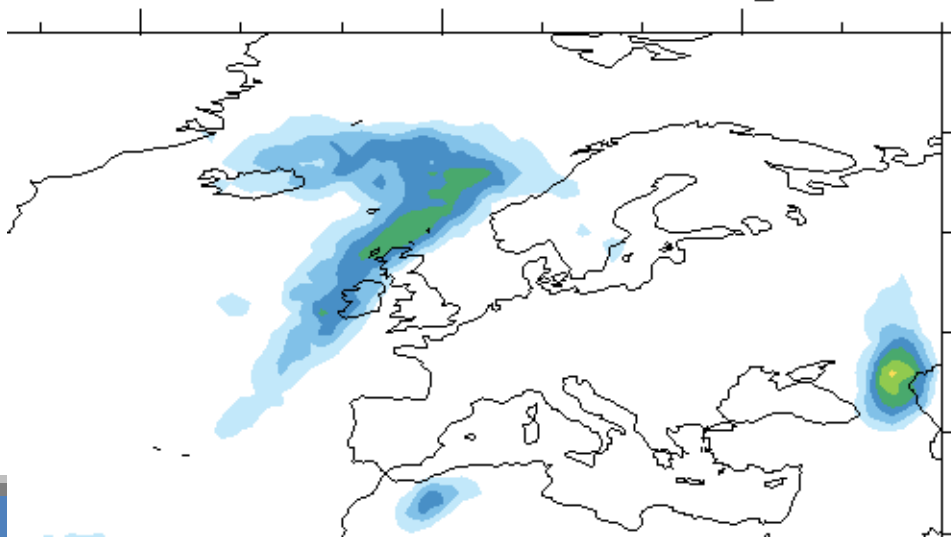
ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160923_18UTC



ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_00UTC



ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_06UTC

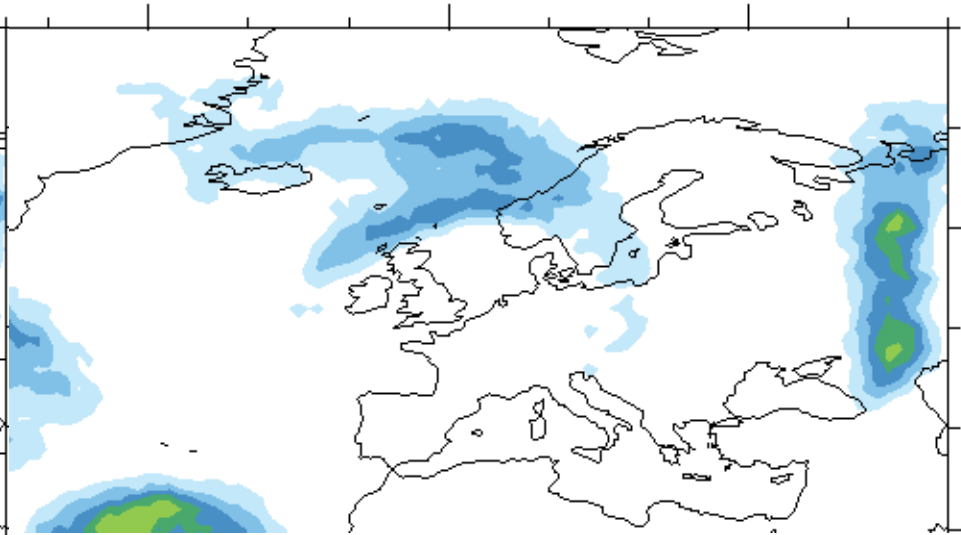
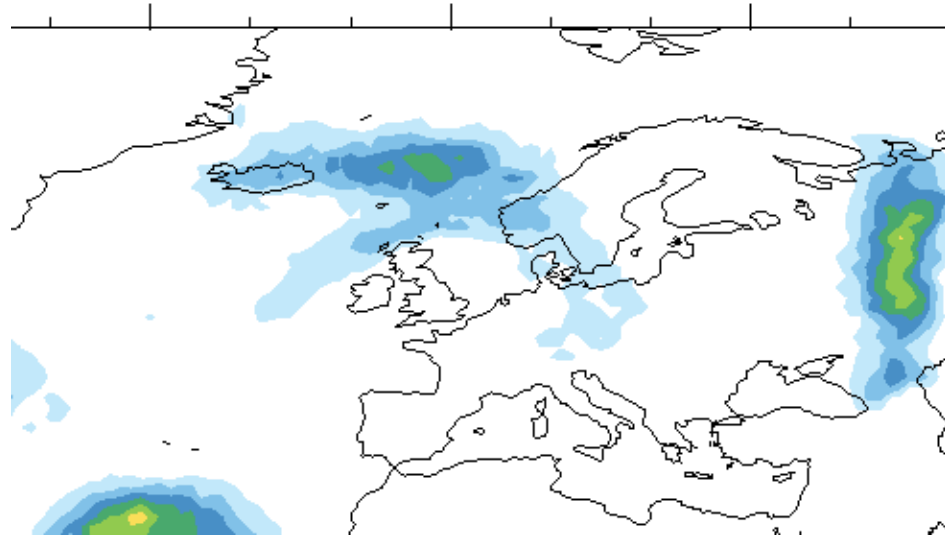


OUTFLOW 24/00Z to 24/18Z, BT 20/00Z

WCB probabilités

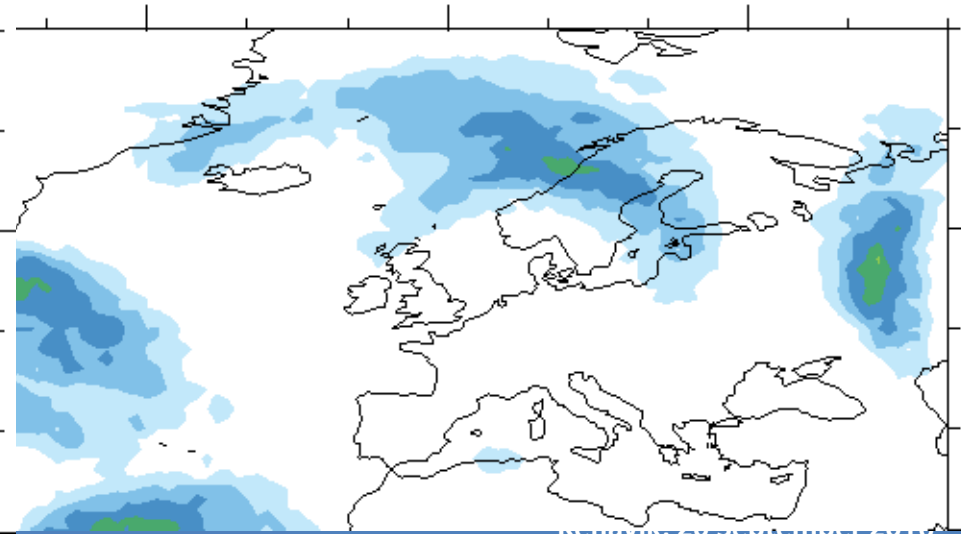
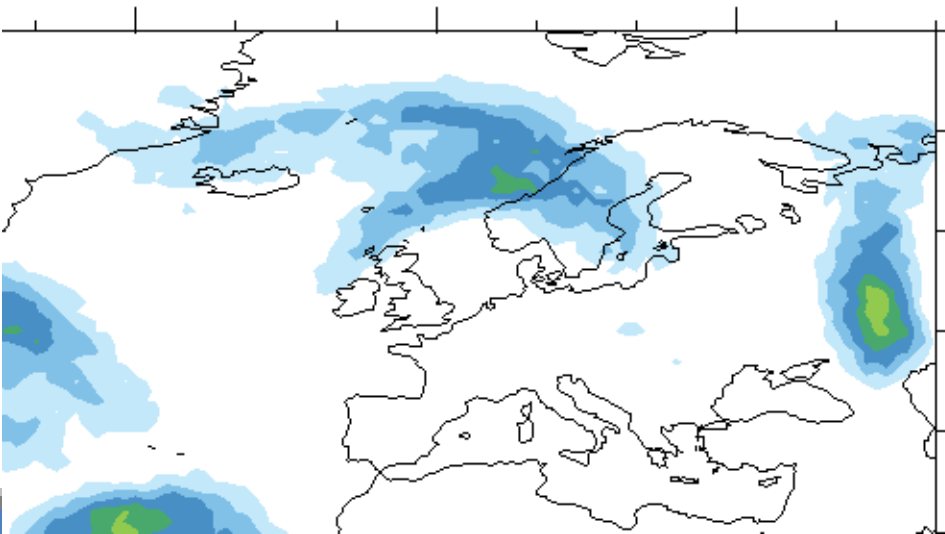
ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_00UTC

ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_06UTC



ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_12UTC

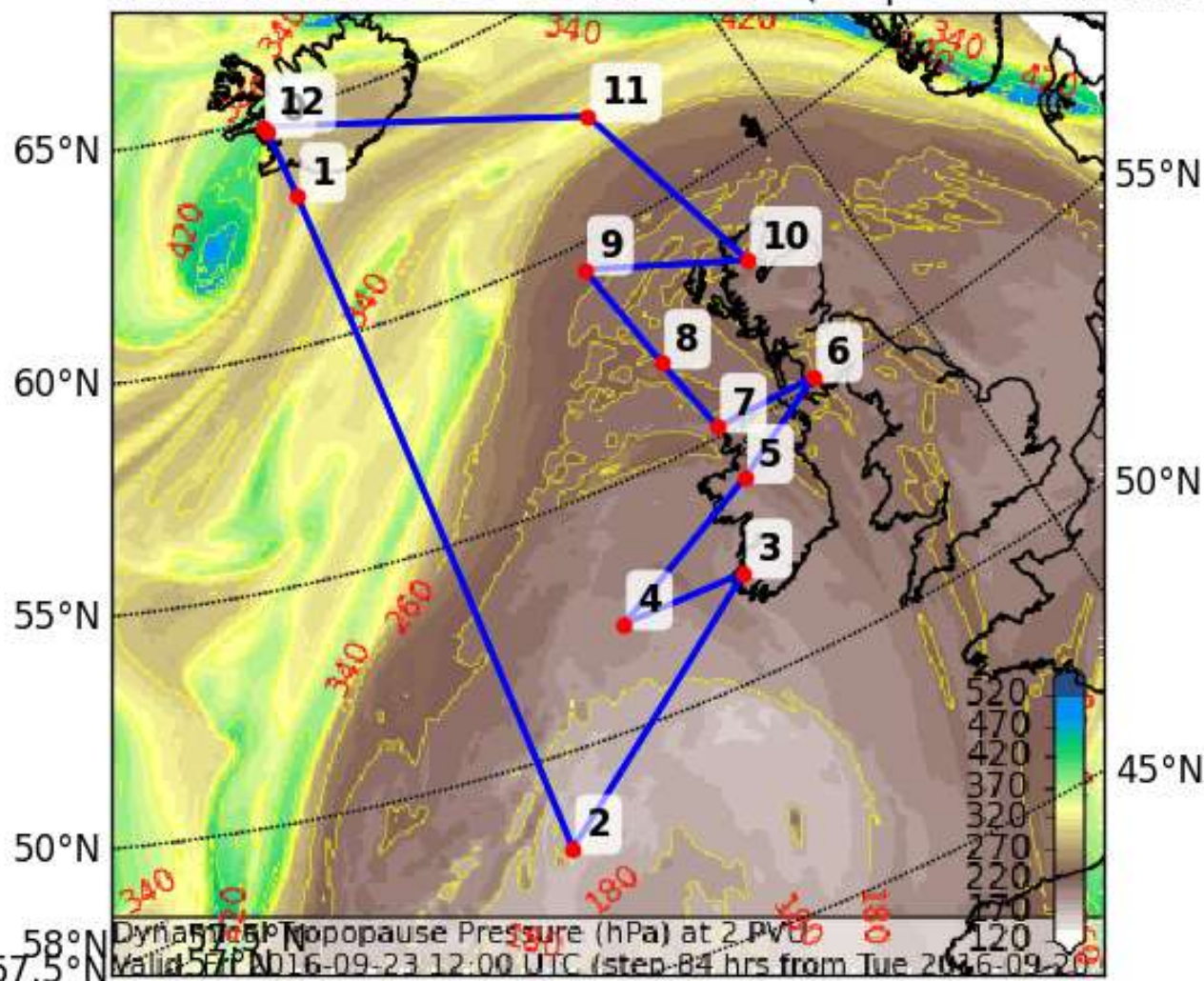
ECMWF ensemble forecast
BT 20160920_00UTC
VT 20160924_18UTC



Flight Track Sept. 23, 2016 HALO

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

Valid: Fr 2016-09-23 12:00 UTC (step 84 hrs from Di 2016-09-20 00:00 UTC)



Inflow (2-3 / 2-4)

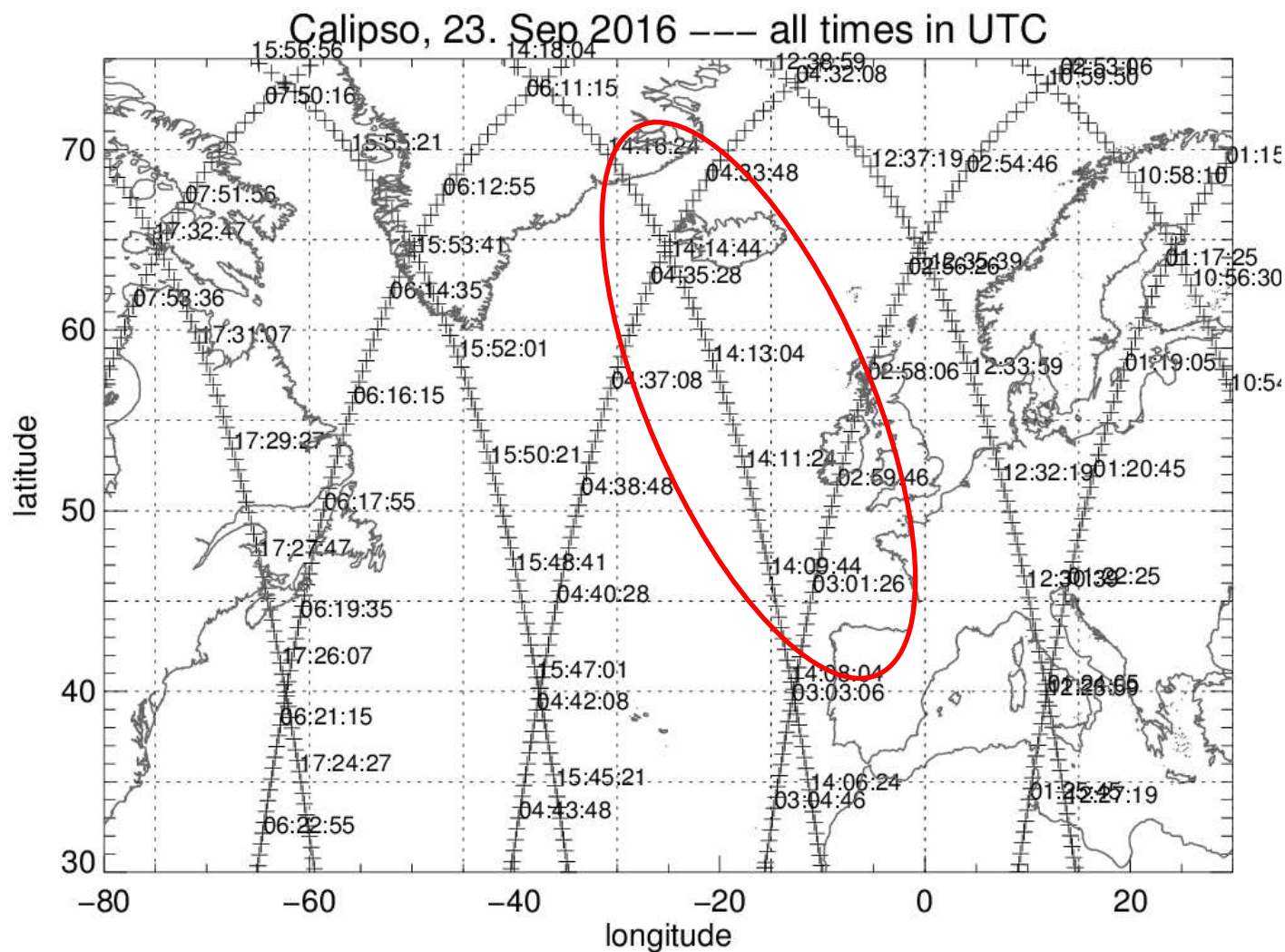
- FL 280
- Location uncertain (2-4)
- Launch dropsondes

Mid-level ascent (4-9)

- Ascent FL 280 → 450 (5-6)
[Shannon Airspace]
- Coordinated Flight FAAM Point 6-7 @ FL 450
- Descent FL 450 → 280 (7-8)
[Scottish Airspace]
- Launch dropsondes at FL 280

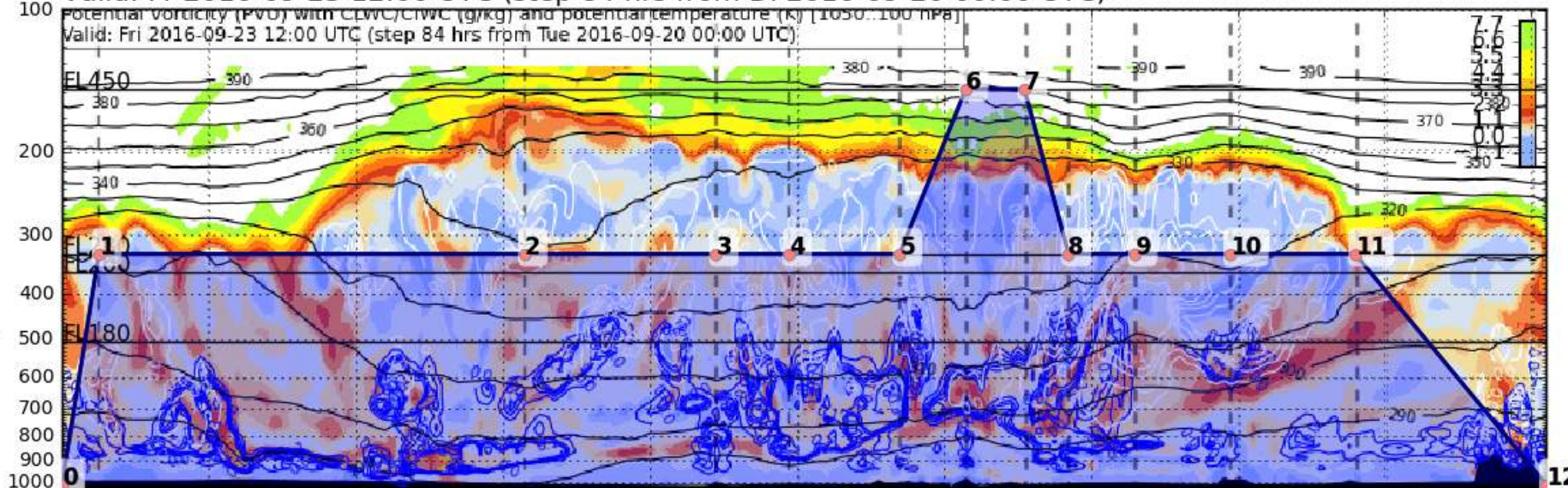
Outflow (10-12)

- Launch dropsondes



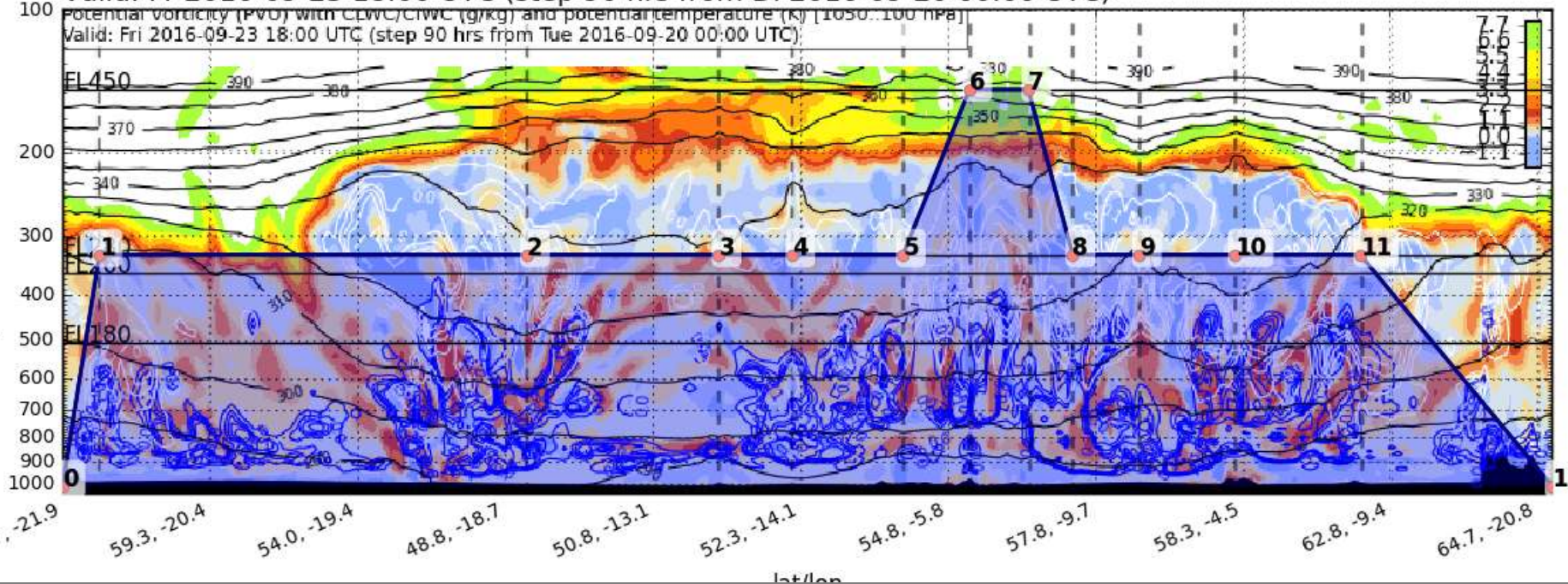
Potential Vorticity (PVU) Vertical Section (Northern Hemisphere)

Valid: Fr 2016-09-23 12:00 UTC (step 84 hrs from Di 2016-09-20 00:00 UTC)



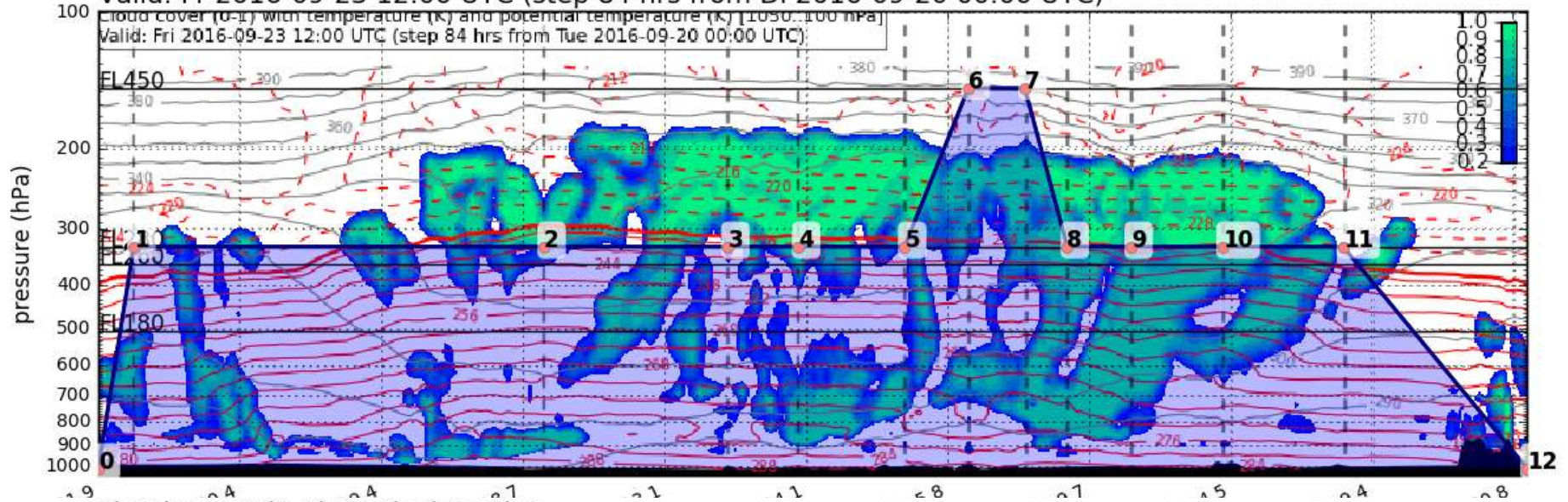
Potential Vorticity (PVU) Vertical Section (Northern Hemisphere)

Valid: Fr 2016-09-23 18:00 UTC (step 90 hrs from Di 2016-09-20 00:00 UTC)



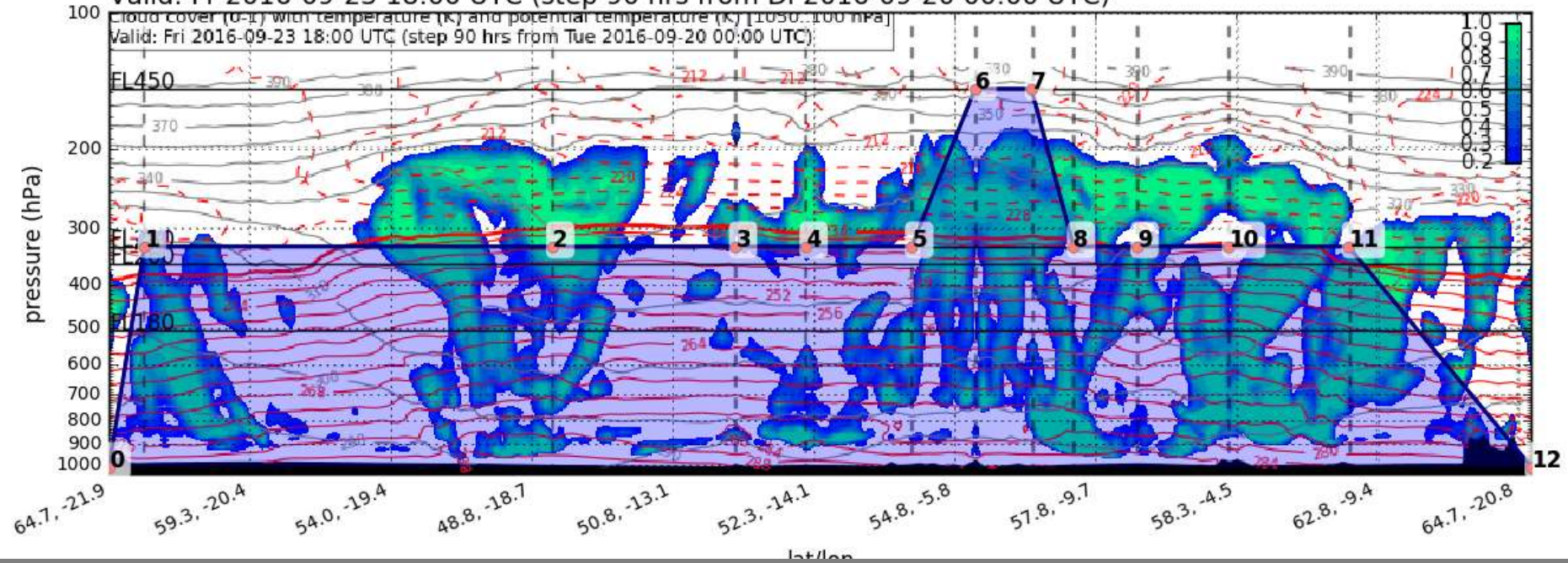
Cloud Cover (0-1) Vertical Section

Valid: Fr 2016-09-23 12:00 UTC (step 84 hrs from Di 2016-09-20 00:00 UTC)



Cloud Cover (0-1) Vertical Section

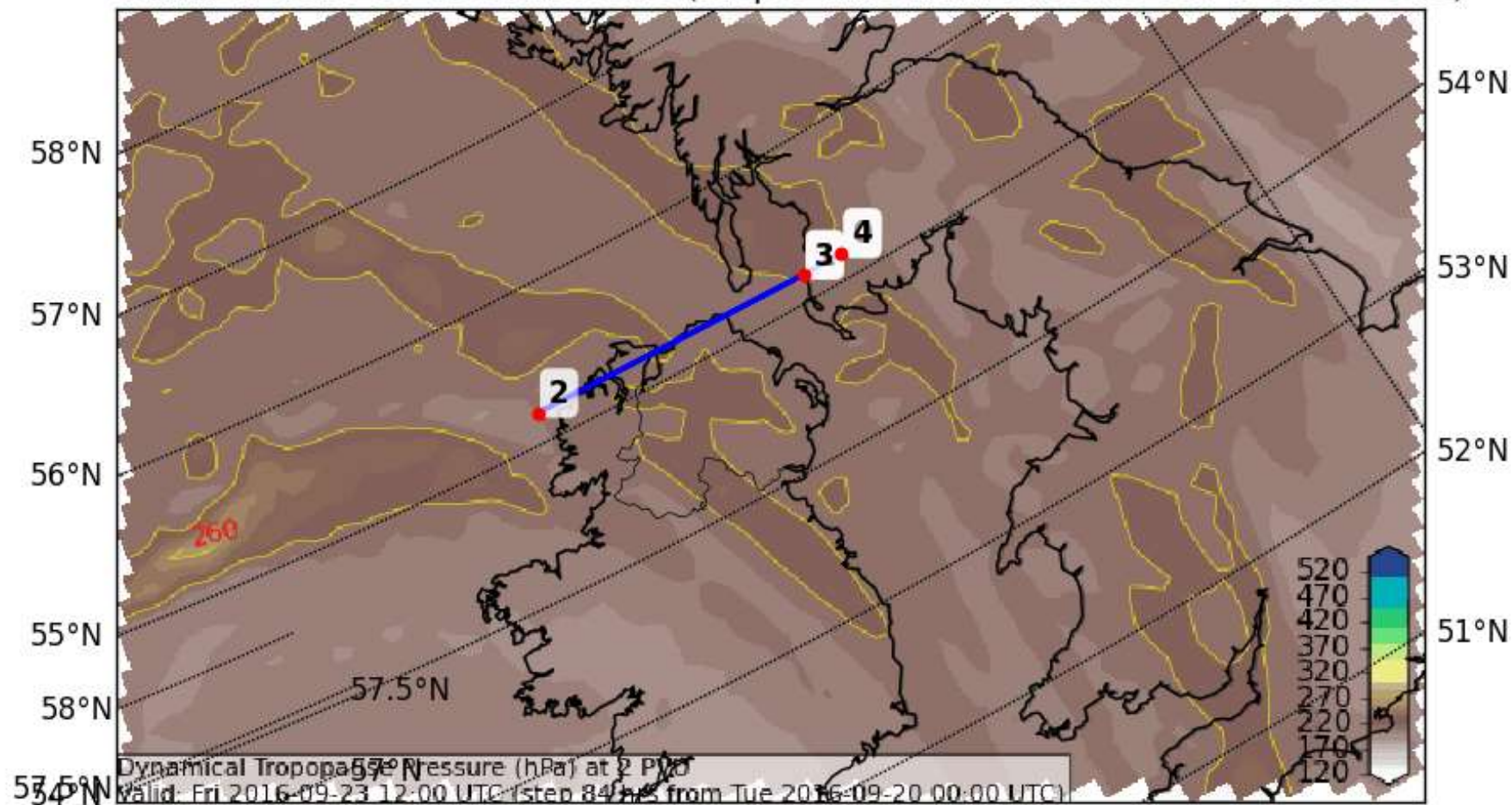
Valid: Fr 2016-09-23 18:00 UTC (step 90 hrs from Di 2016-09-20 00:00 UTC)



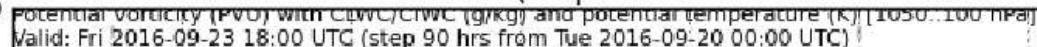
Flight Track Sept. 23, 2016 FAAM

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

Valid: Fr 2016-09-23 12:00 UTC (step 84 hrs from Di 2016-09-20 00:00 UTC)

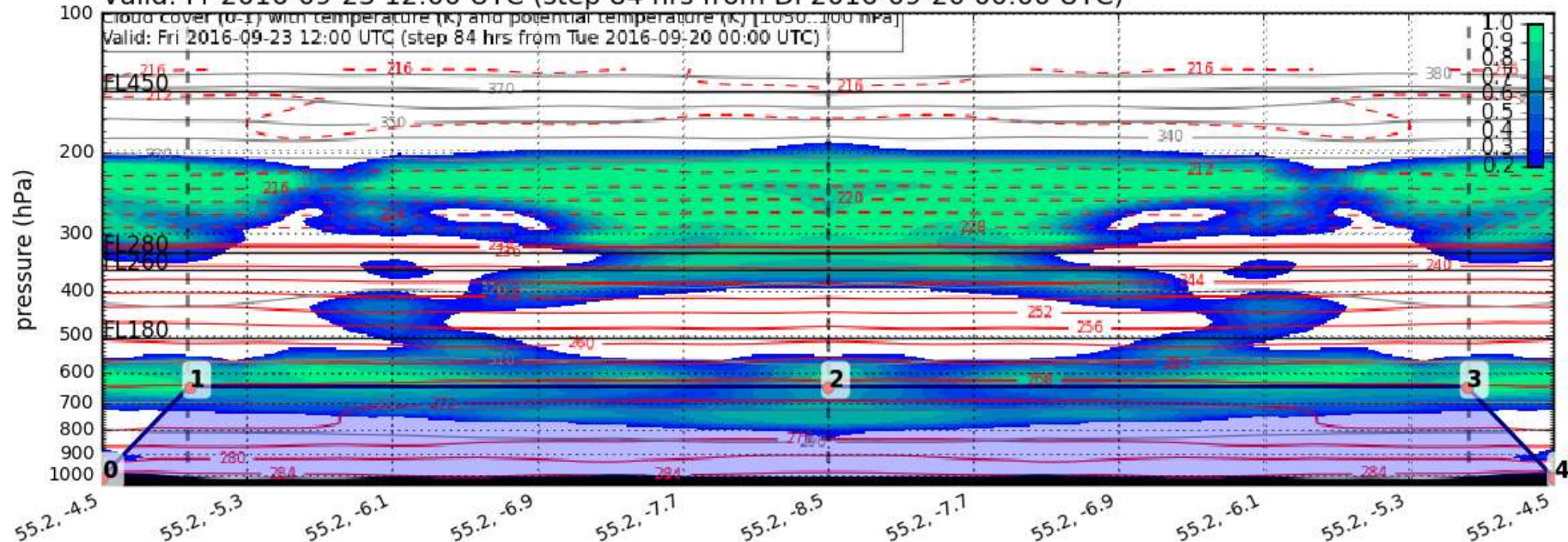


Potential vorticity (PVU) with $CLWC/CLWC$ (g/kg) and potential temperature (K) [1050-100 hPa]
Valid: Fri 2016-09-23 12:00 UTC (step 84 hrs from Tue 2016-09-20 00:00 UTC)



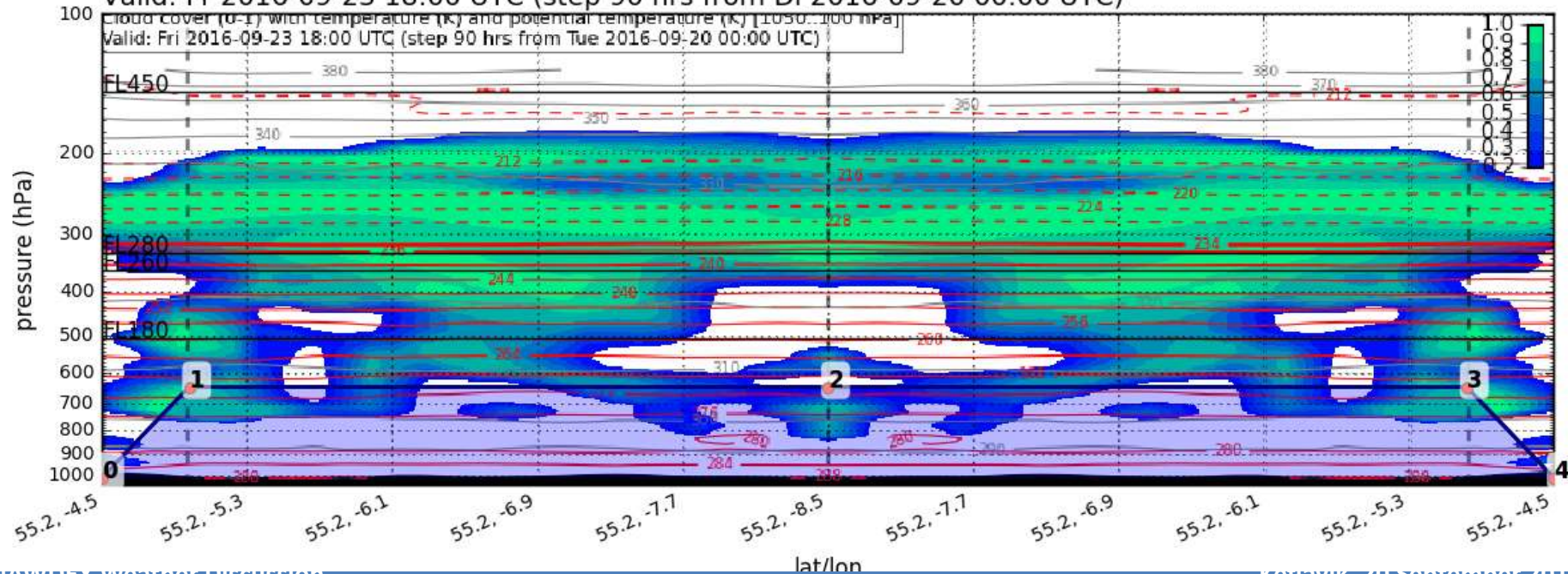
Cloud Cover (0-1) Vertical Section

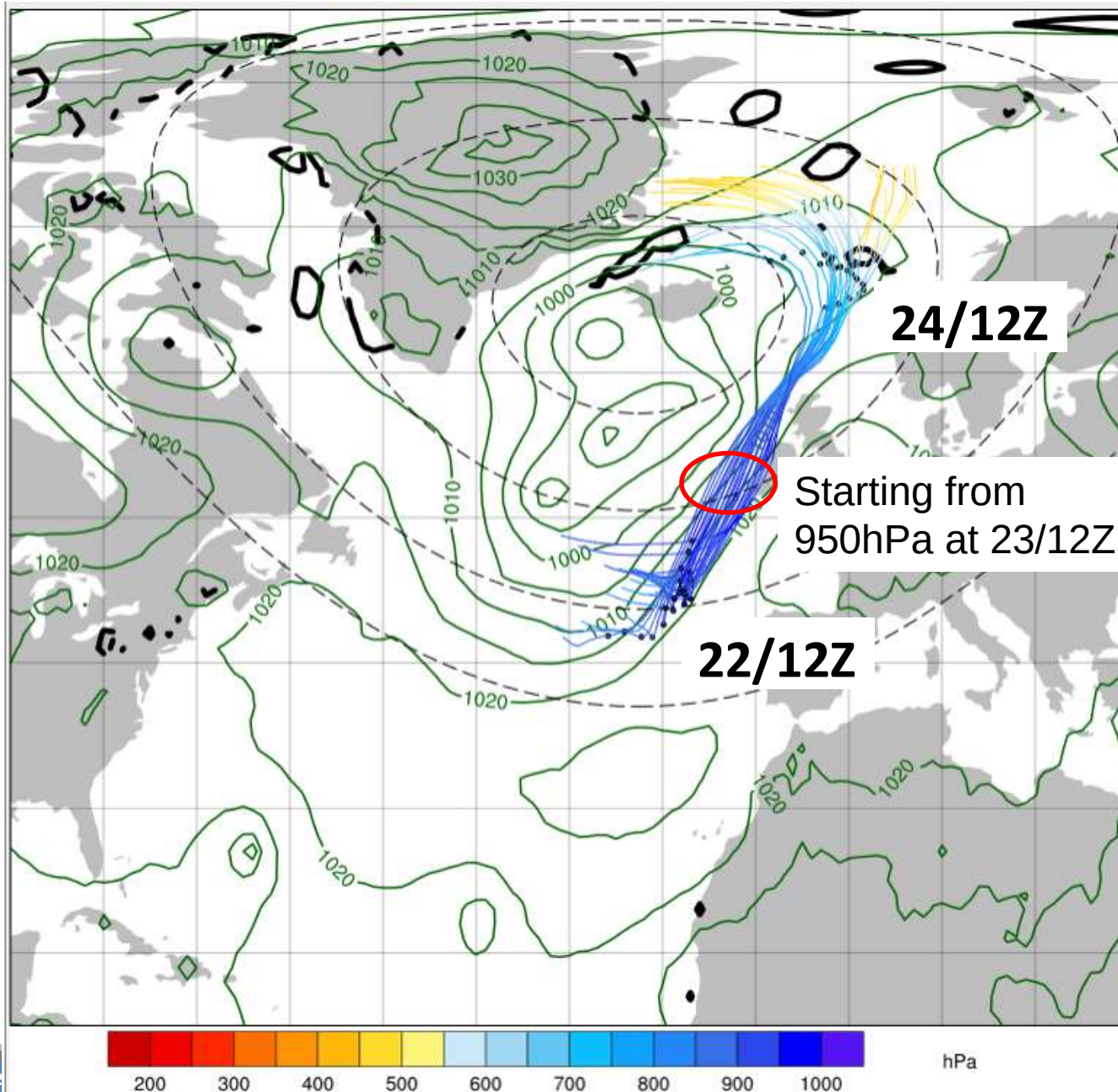
Valid: Fr 2016-09-23 12:00 UTC (step 84 hrs from Di 2016-09-20 00:00 UTC)

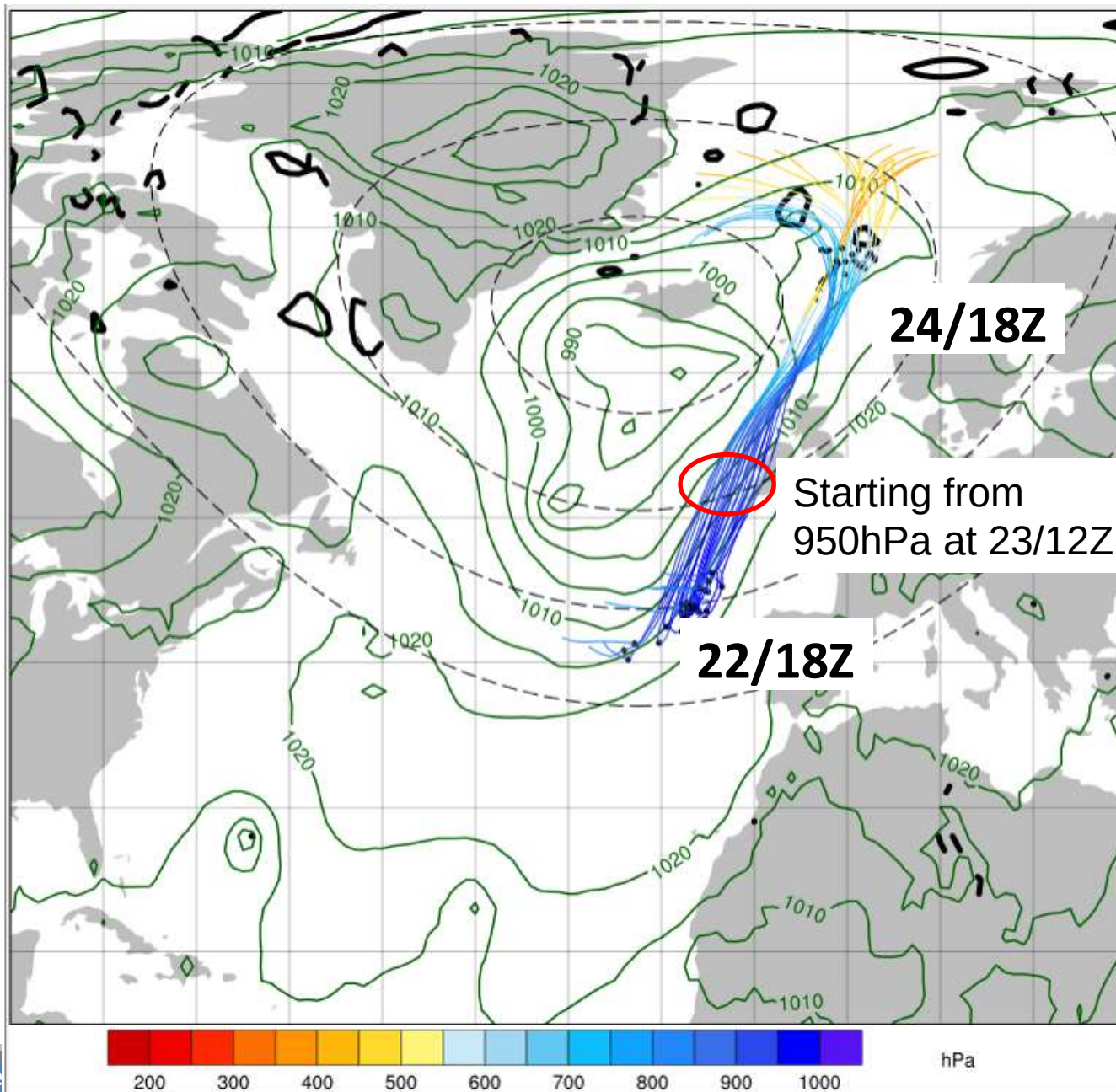


Cloud Cover (0-1) Vertical Section

Valid: Fr 2016-09-23 18:00 UTC (step 90 hrs from Di 2016-09-20 00:00 UTC)







Open Questions / Concerns

- Cloud forecast and WCB location uncertain
- Location of dropsondes (NOTAM)
- Coordination with FAAM (time restrictions)
- Instrument constraints
- Total length HALO: 6500 km (!?)
- Possible shift of Pt. 3 and 10
- Long mission! Duty time -> Flight on Saturday?
- Satellite overpasses? (**M. Mech?**)

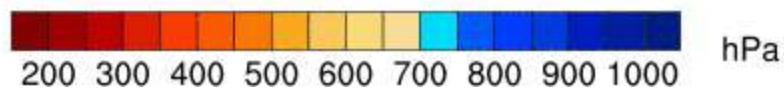
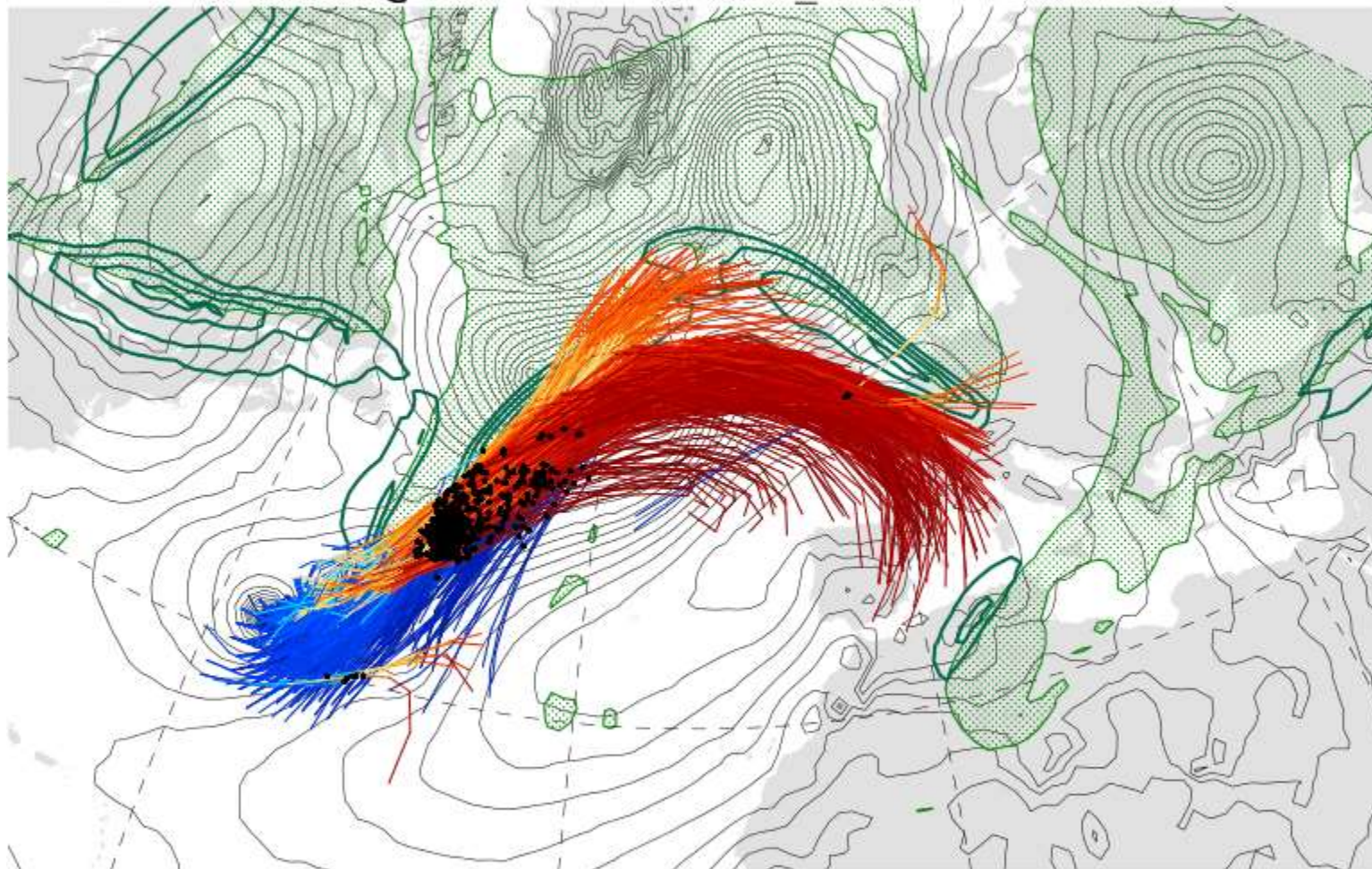
Outlook ET Karl scenario

Karl and DS cyclone in reachable distance Sun/Mon night? 28/00Z

BT20/00Z

Trajectory start and SLP VT: 20160926_00

WCB outflow and PV@250hPa VT: 20160928_00



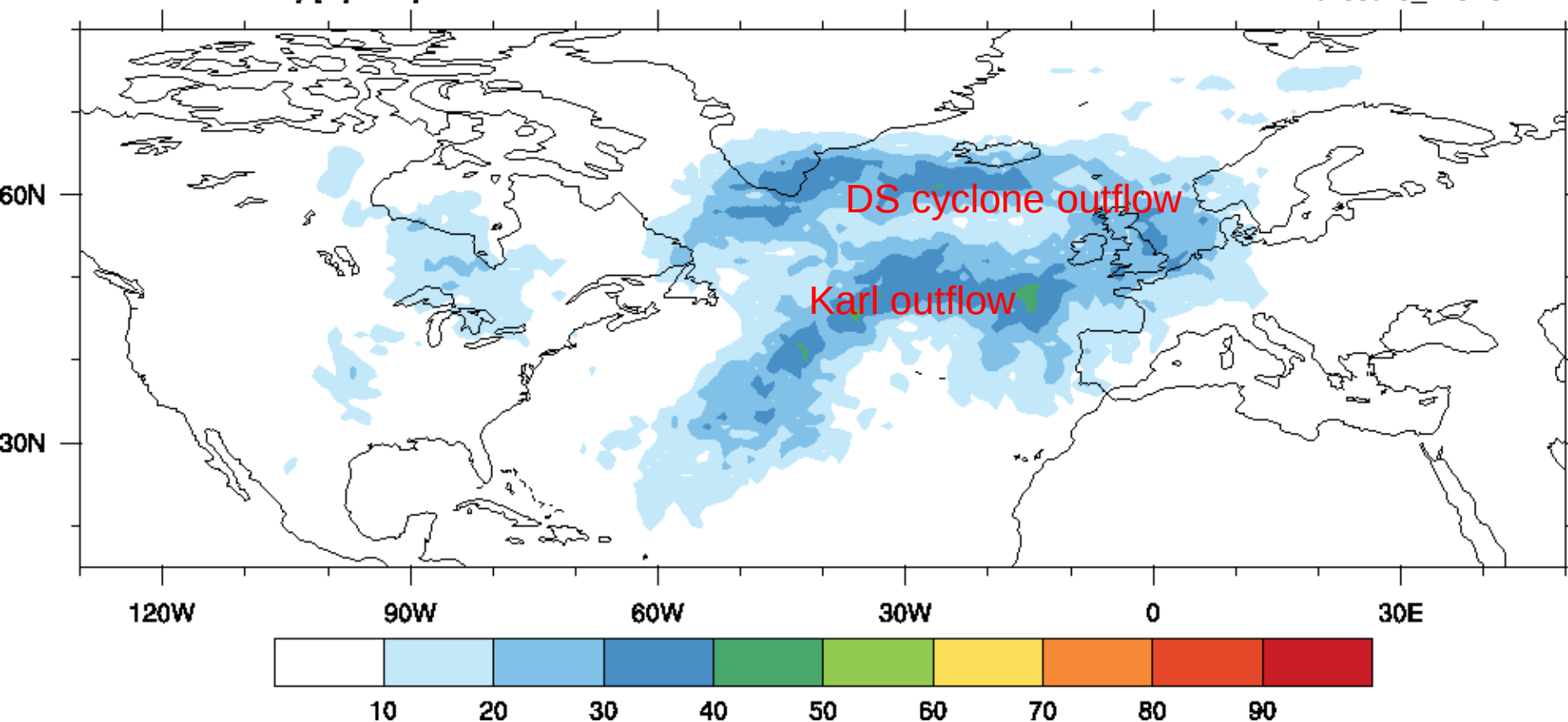
Outlook Sunday – Wednesday: extratropical transition of TC Karl

BT 19/12Z

VT Monday 26/12Z

ECMWF ensemble forecast
BT 20160919_12UTC
VT 20160926_12UTC

lt400hPa: Probability [%] of traj. occurrence in ENS



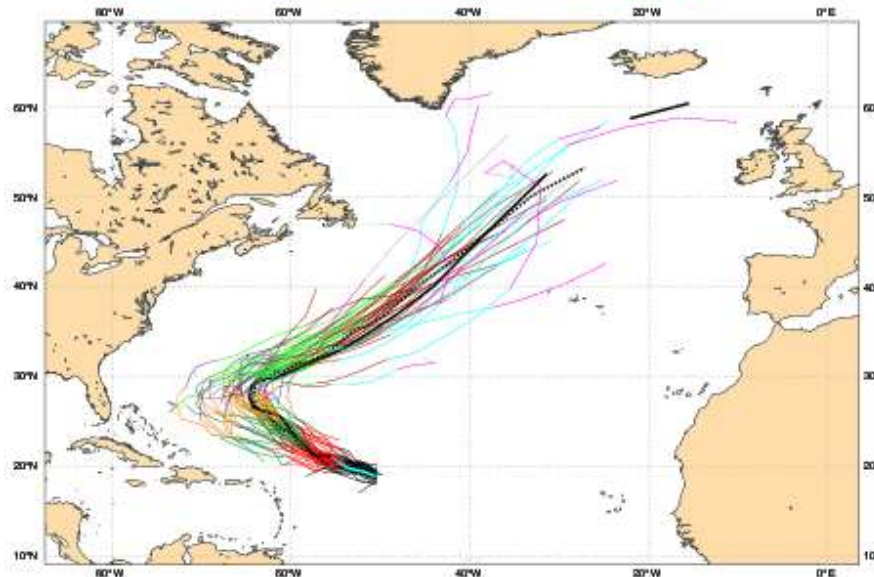
Outlook Sunday – Wednesday: extratropical transition of TC Karl

Date 20160920 00 UTC @ECMWF

Individual trajectories for **KARL** 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



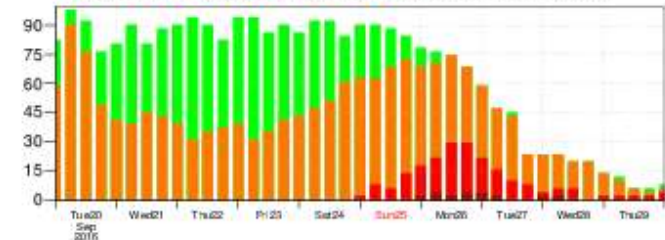
List of ensemble members numbers forecast Tropical Cyclone

Intensity category in colours: **TD**[up to 33] **TS**[34-63] **HR1**[64-82] **HR2**[83-95] **HR3**[> 95 k1]

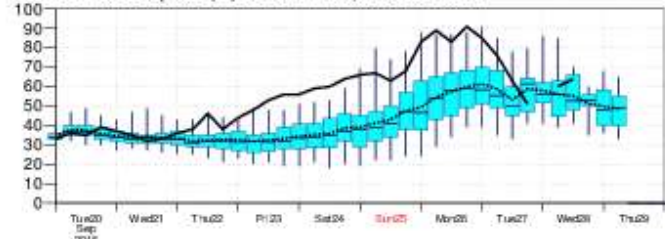


Probability (%) of Tropical Cyclone Intensity falling in each category

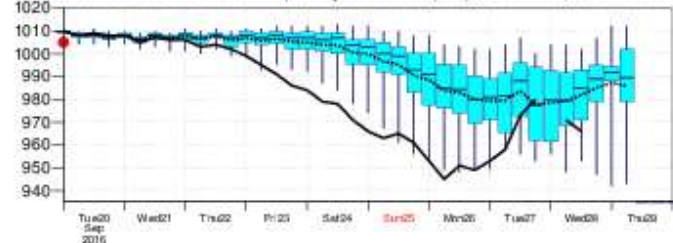
TD [up to 33] TS [34-63] HR1 [64-82] HR2 [83-95] HR3 [> 95 k]



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



Mean Sea Level Pressure in Tropical Cyclone Centre (hPa) **solid**—HRES; **dot**—En5 Mean



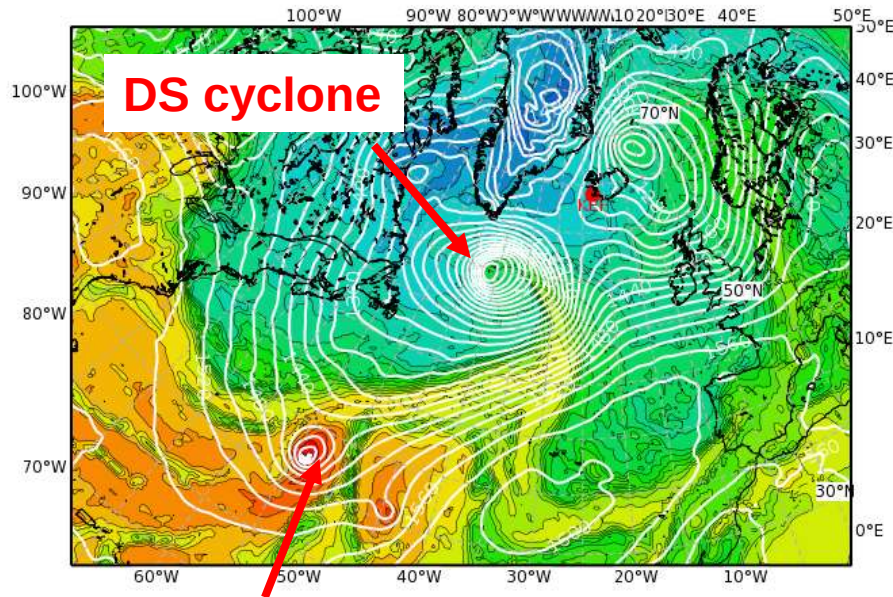
- If Karl persists it is very likely that it tracks towards Iceland between Sunday – Wednesday 25-27.9.2016
- In addition it influences the evolution of a Newfoundland cyclone, tracking to Iceland

Outlook: ET Karl scenarios

VT Mon 26/00Z

BT 19/12Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Mon, 26 Sep 2016, 00 UTC (step 156 h from Mon, 19 Sep 2016, 12 UTC)

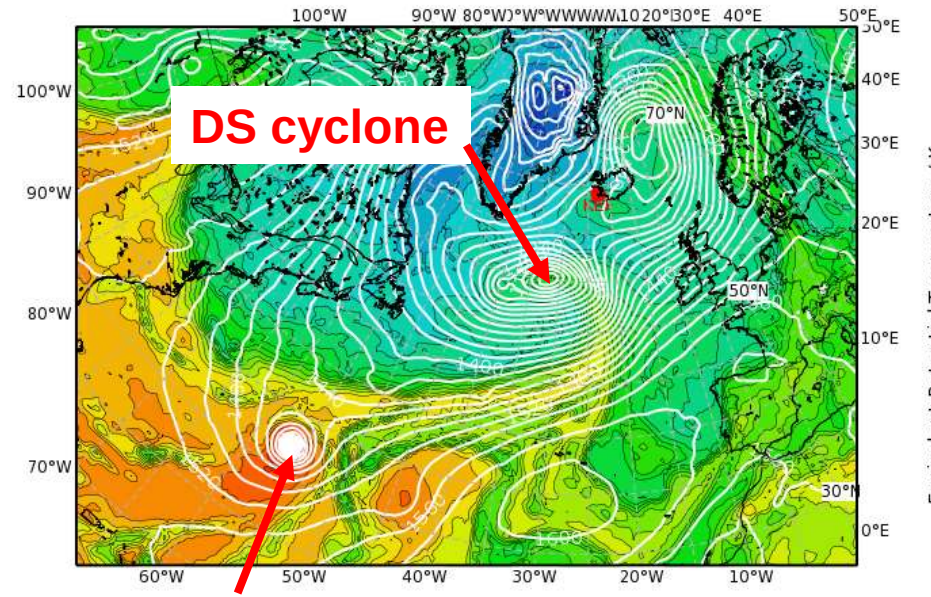


TC Karl

- DS cyclone becomes stationary South of Greenland
- Karl weaker, but “frontal wave”

BT 20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Mon, 26 Sep 2016, 00 UTC (step 144 h from Tue, 20 Sep 2016, 00 UTC)



TC Karl

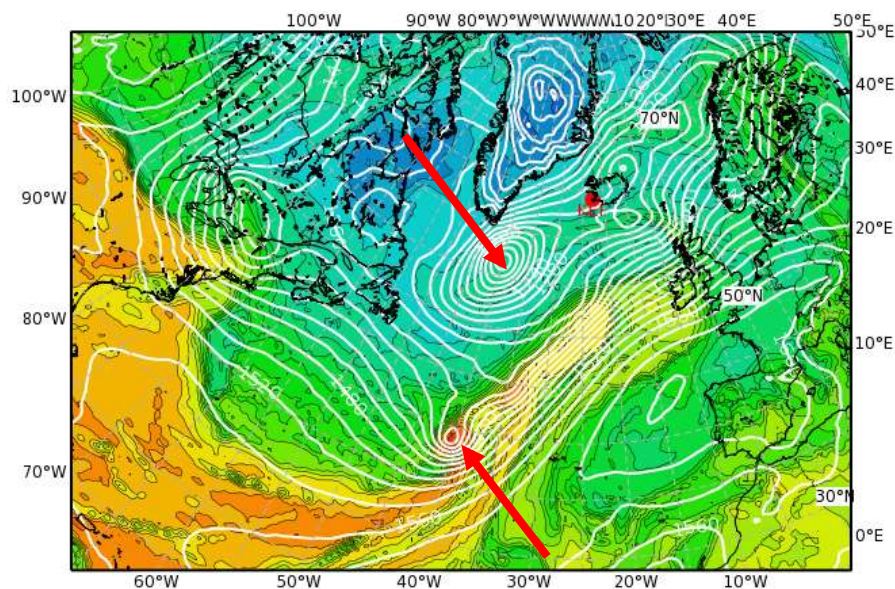
- DS cyclone moves towards Iceland
- Karl transitions in a strong EC

Outlook: ET Karl scenarios

VT Tue 27/00Z

BT 19/12Z

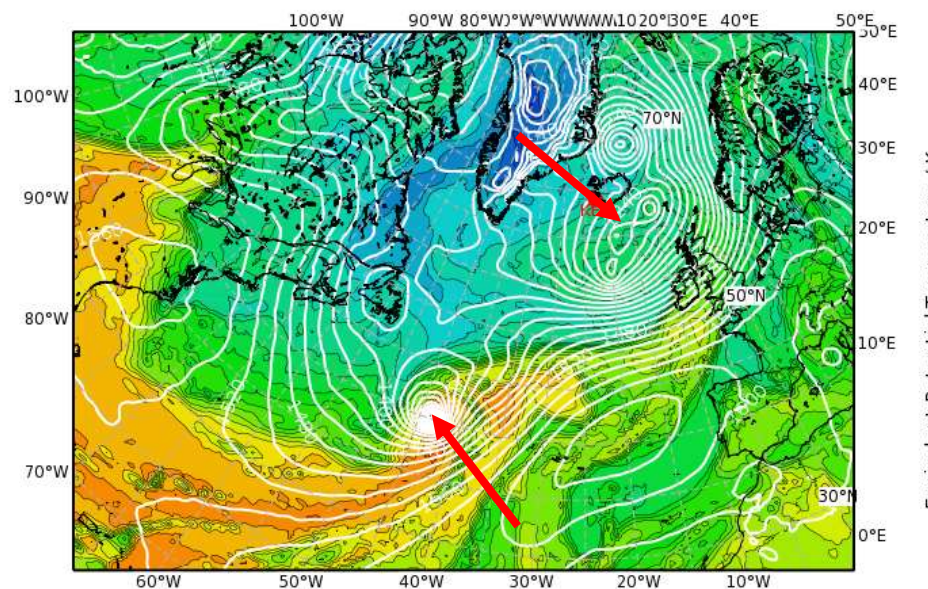
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Tue, 27 Sep 2016, 00 UTC (step 180 h from Mon, 19 Sep 2016, 12 UTC)



- DS cyclone stationary South of Greenland
- Karl weaker, but “frontal wave”

BT 20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Tue, 27 Sep 2016, 00 UTC (step 168 h from Tue, 20 Sep 2016, 00 UTC)



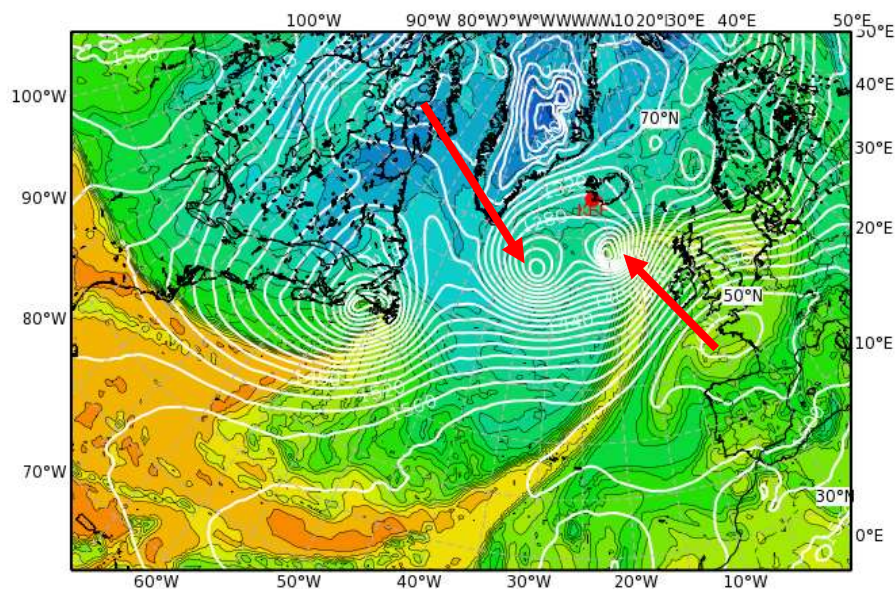
- DS cyclone hits Iceland
- Karl transitions in a strong EC

Outlook: ET Karl scenarios

VT Wed 28/00Z

BT 19/12Z

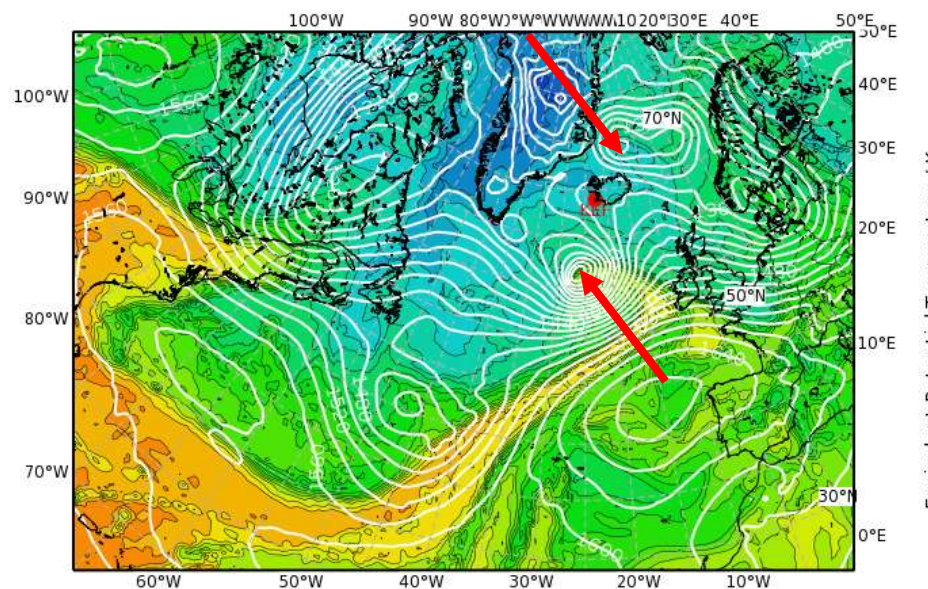
Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 28 Sep 2016, 00 UTC (step 204 h from Mon, 19 Sep 2016, 12 UTC)



- DS cyclone remains stationary, “overtaken” by Karl
- Karl explosively intensifies and hits Iceland

BT 20/00Z

Equivalent Potential Temperature (degC) & Streamlines at 850 hPa
Valid: Wed, 28 Sep 2016, 00 UTC (step 192 h from Tue, 20 Sep 2016, 00 UTC)



- Karl transitions in a strong EC

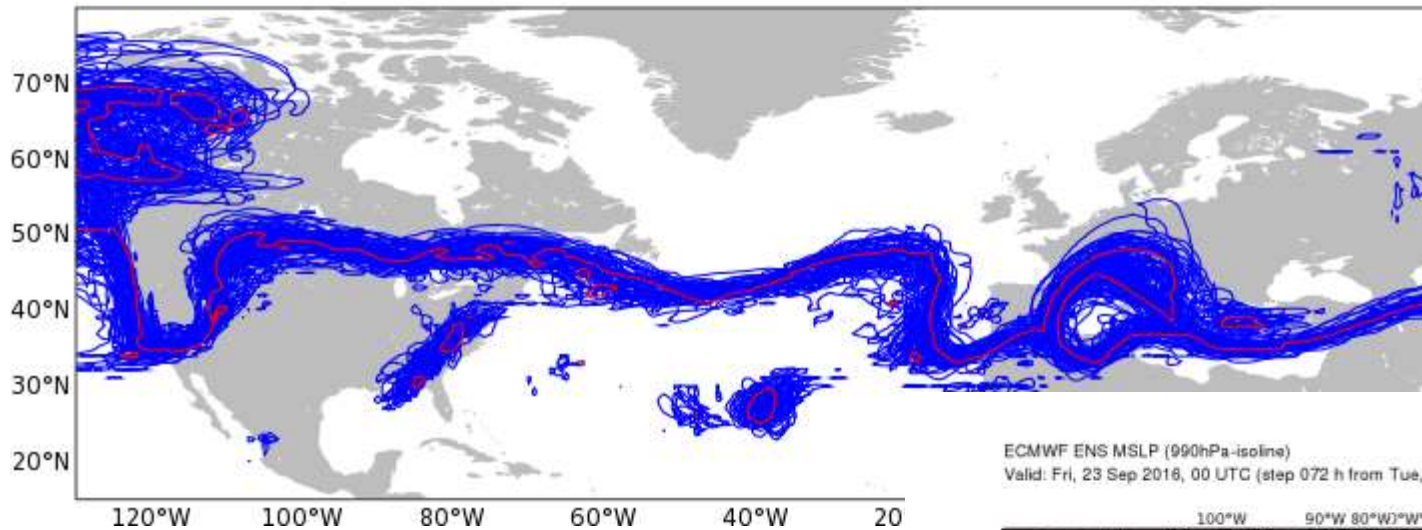
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Fri 23/00Z

ECMWF ENSEMBLE FC

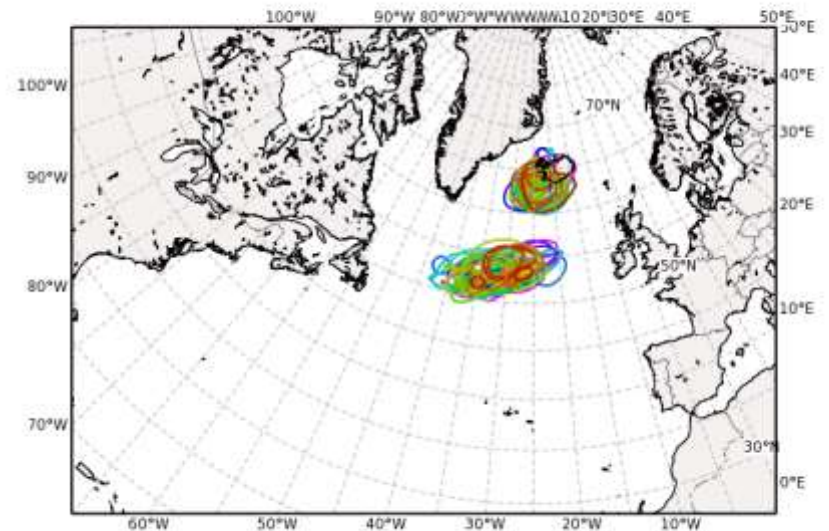
BT: 20160920 00UTC, VT: 20160923 00UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Fri, 23 Sep 2016, 00 UTC (step 072 h from Tue, 20 Sep 2016, 00 UTC)



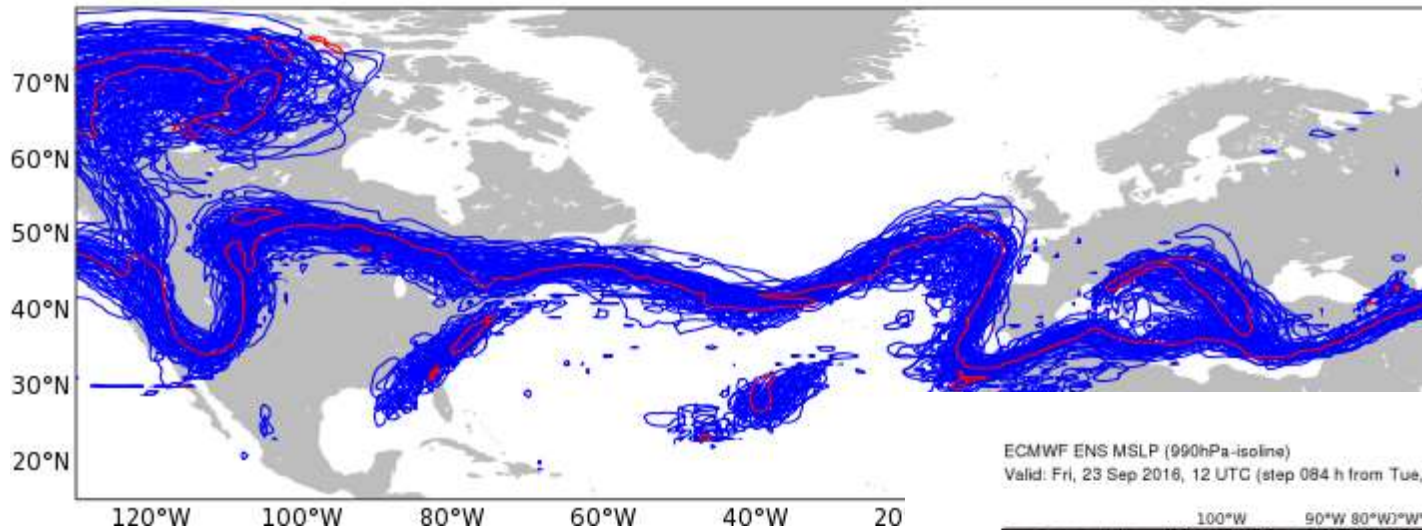
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Fri 23/12Z

ECMWF ENSEMBLE FC

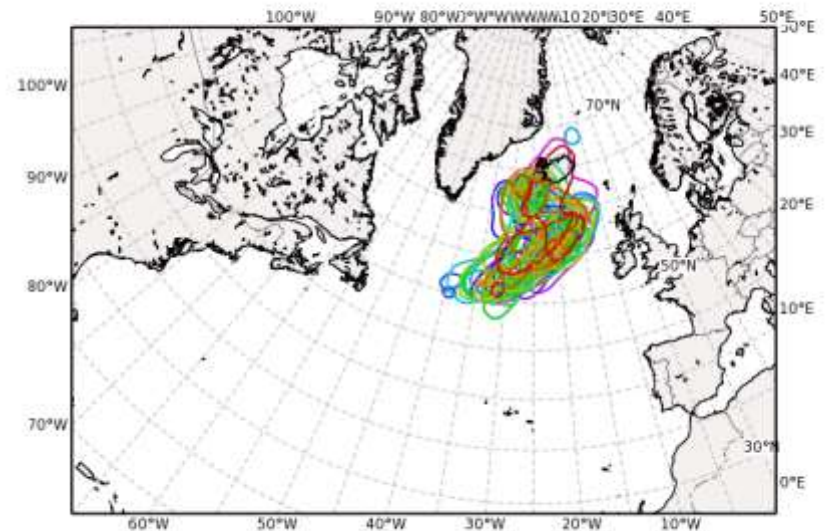
BT: 20160920 00UTC, VT: 20160923 12UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Fri, 23 Sep 2016, 12 UTC (step 084 h from Tue, 20 Sep 2016, 00 UTC)



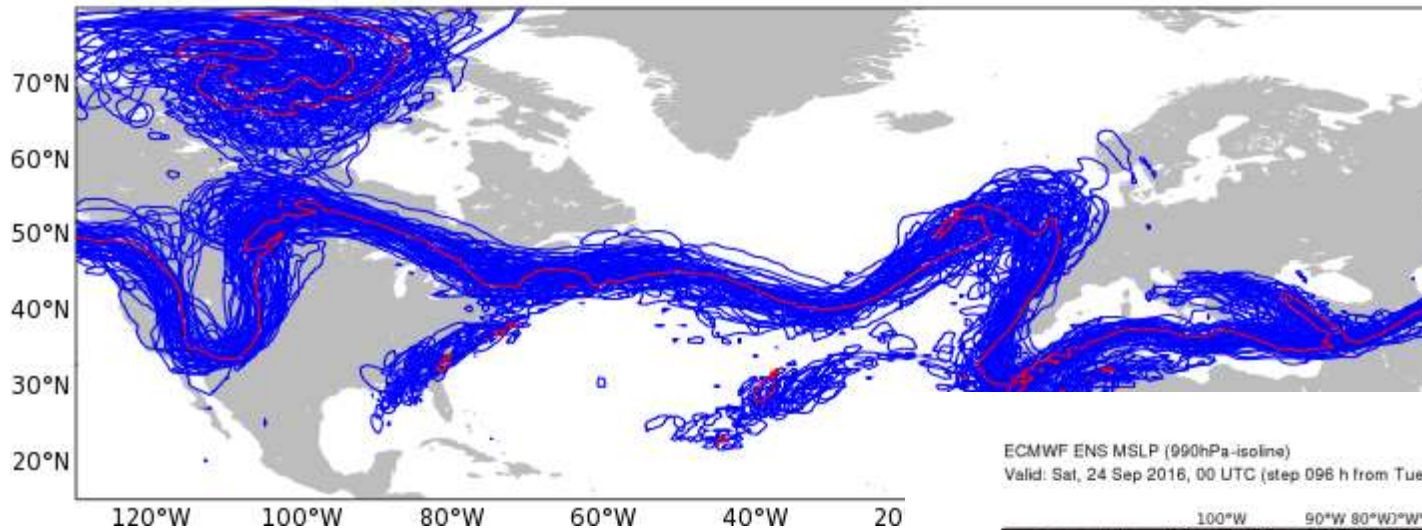
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Sat 24/00Z

ECMWF ENSEMBLE FC

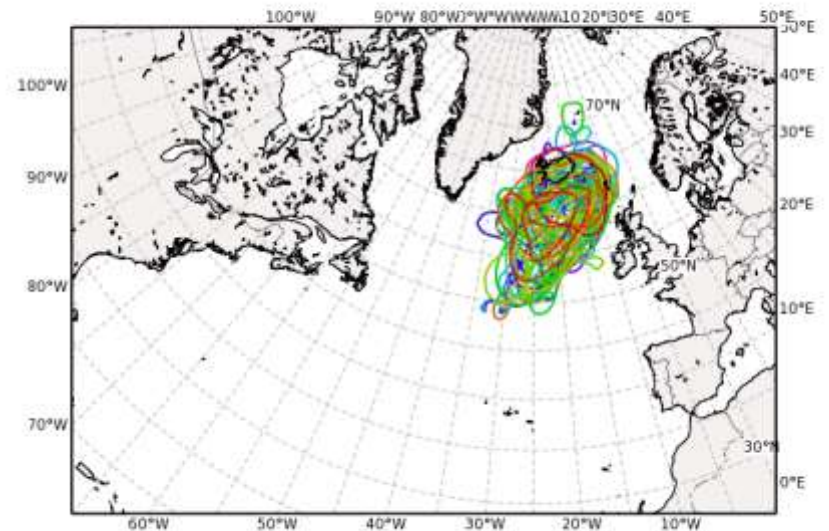
BT: 20160920 00UTC, VT: 20160924 00UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Sat, 24 Sep 2016, 00 UTC (step 096 h from Tue, 20 Sep 2016, 00 UTC)



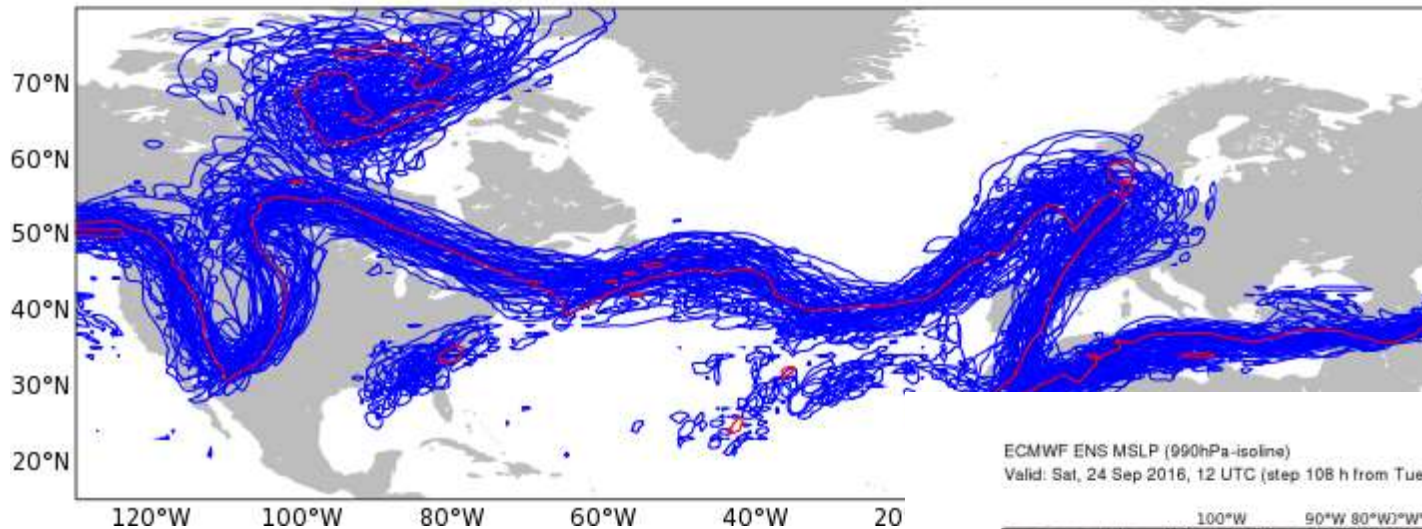
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Sat 24/12Z

ECMWF ENSEMBLE FC

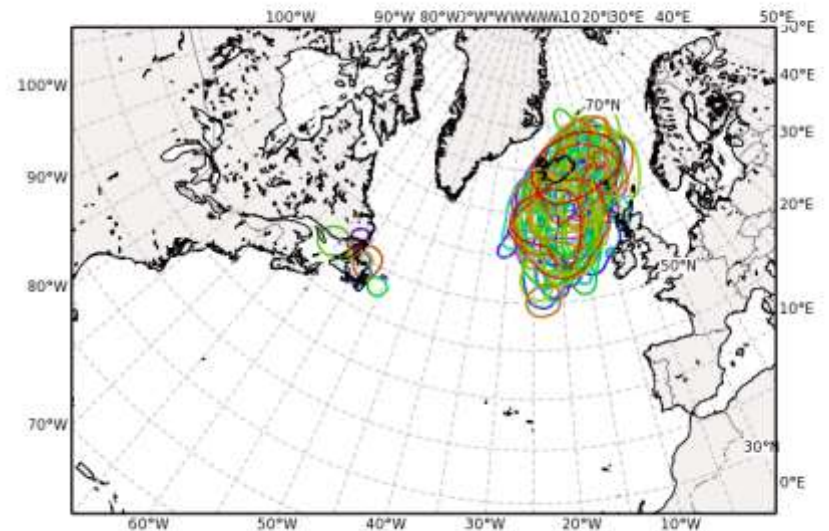
BT: 20160920 00UTC, VT: 20160924 12UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Sat, 24 Sep 2016, 12 UTC (step 108 h from Tue, 20 Sep 2016, 00 UTC)



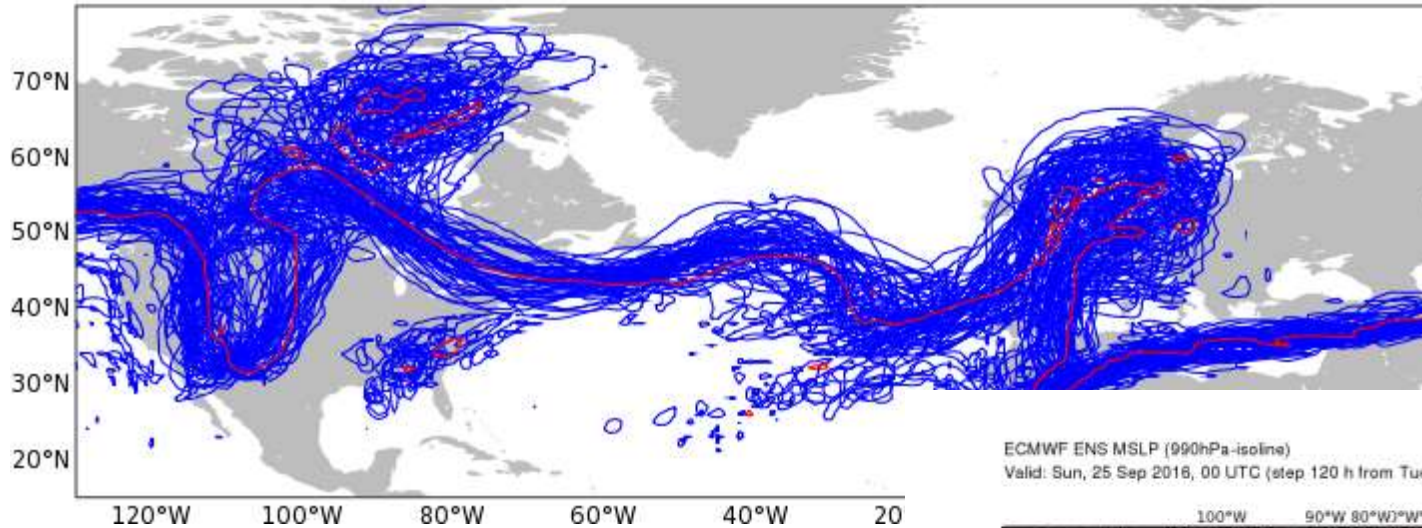
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Sun 25/00Z

ECMWF ENSEMBLE FC

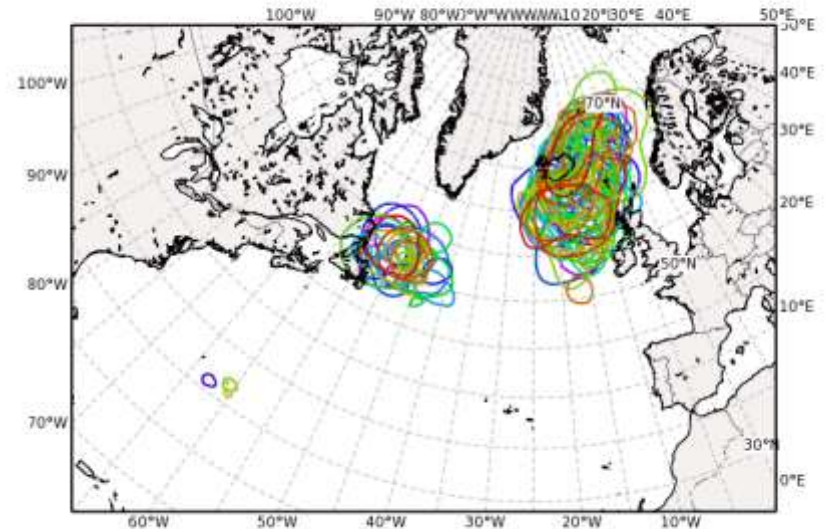
BT: 20160920 00UTC, VT: 20160925 00UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Sun, 25 Sep 2016, 00 UTC (step 120 h from Tue, 20 Sep 2016, 00 UTC)



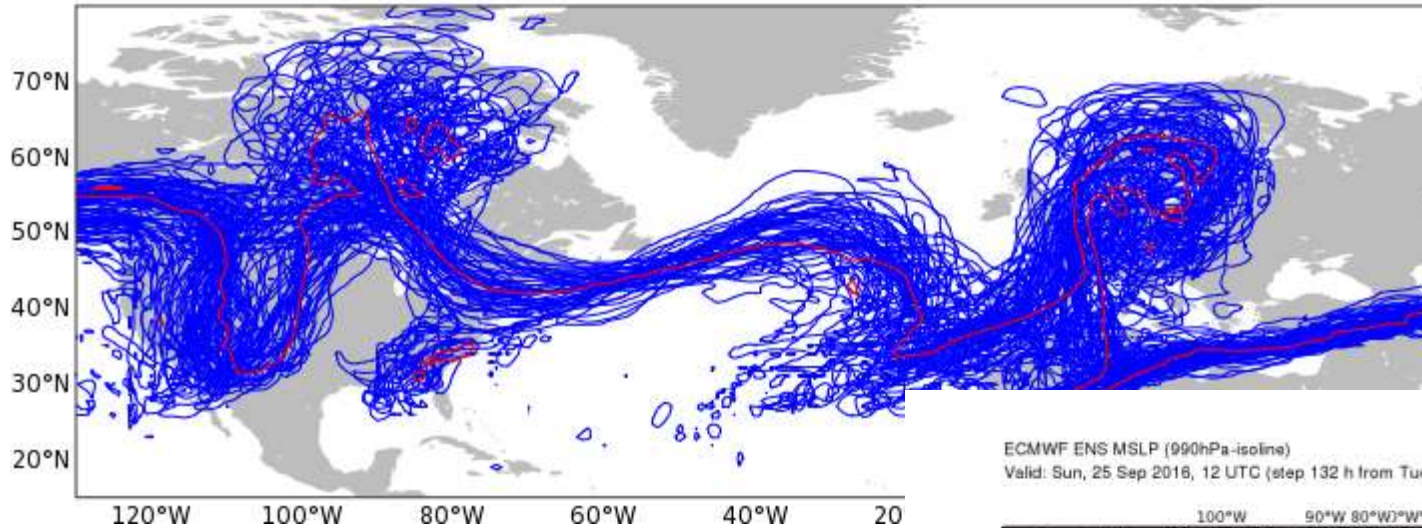
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Sun 25/12Z

ECMWF ENSEMBLE FC

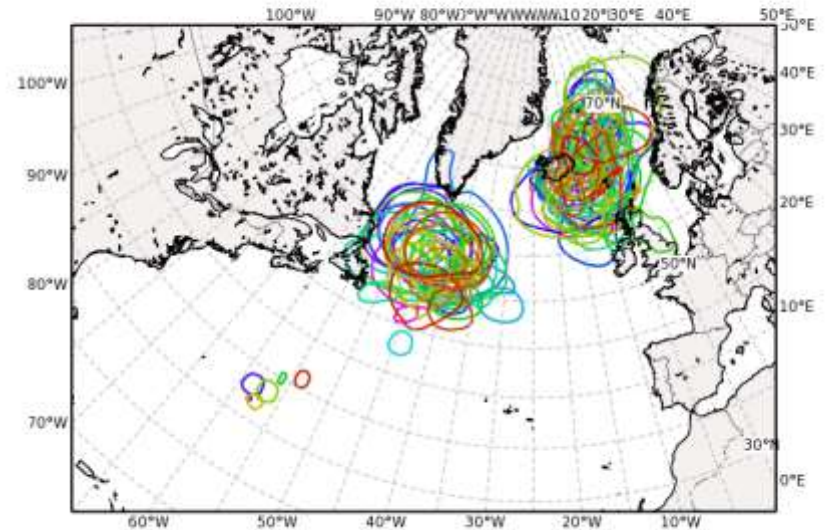
BT: 20160920 00UTC, VT: 20160925 12UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Sun, 25 Sep 2016, 12 UTC (step 132 h from Tue, 20 Sep 2016, 00 UTC)



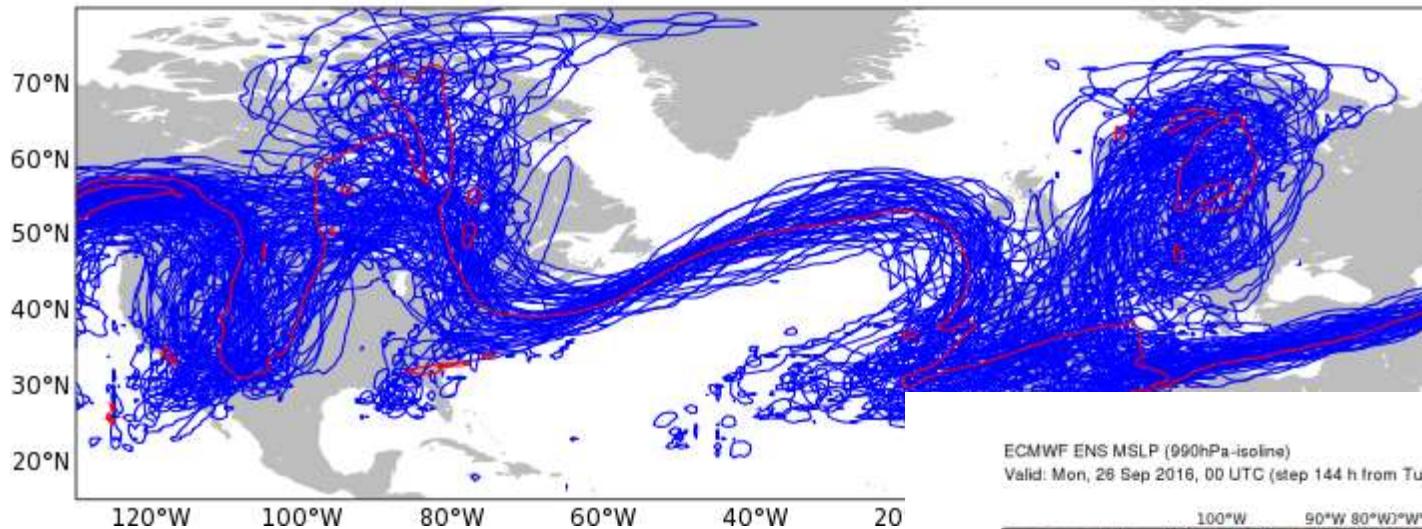
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Mon 26/00Z

ECMWF ENSEMBLE FC

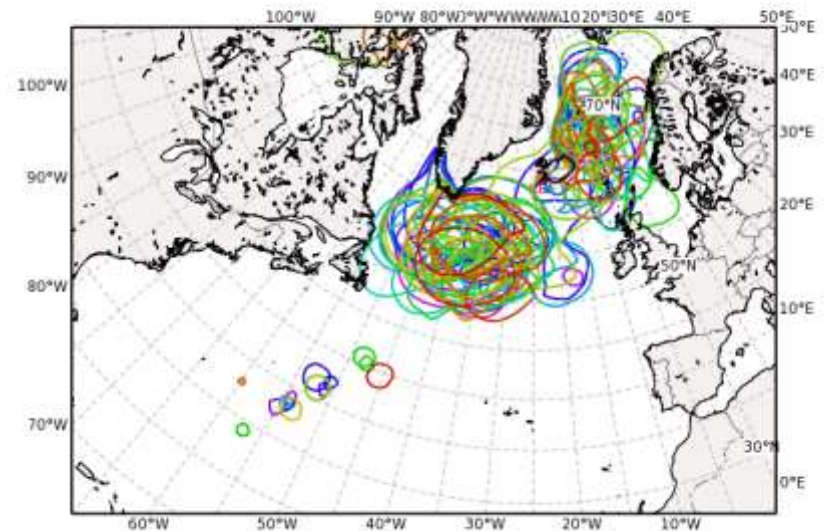
BT: 20160920 00UTC, VT: 20160926 00UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Mon, 26 Sep 2016, 00 UTC (step 144 h from Tue, 20 Sep 2016, 00 UTC)



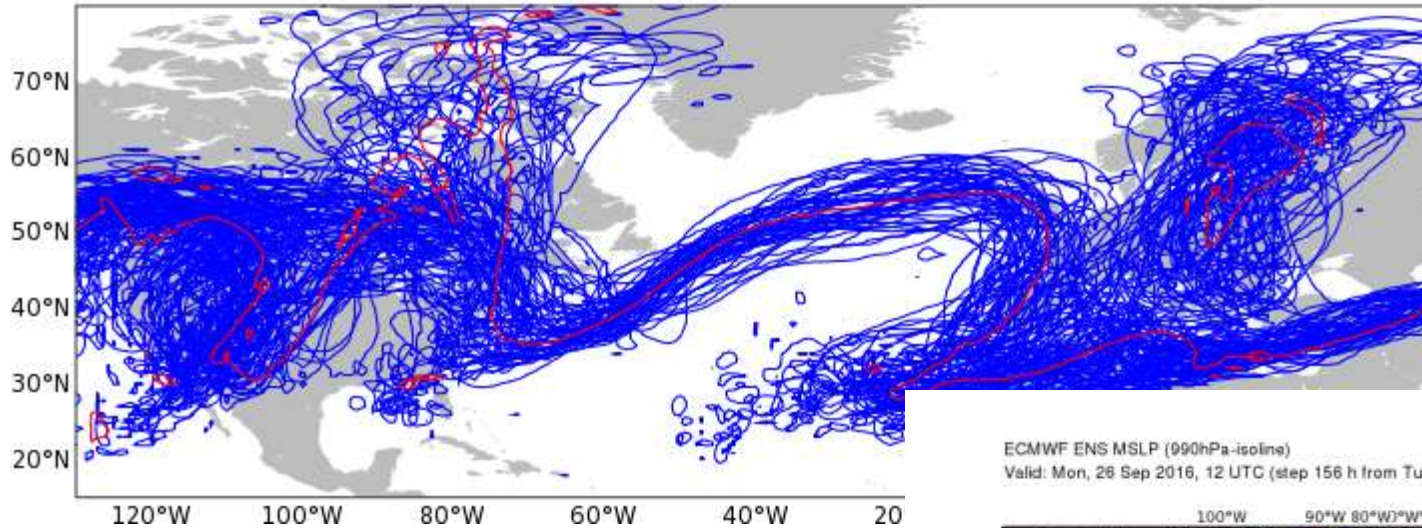
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Mon 26/12Z

ECMWF ENSEMBLE FC

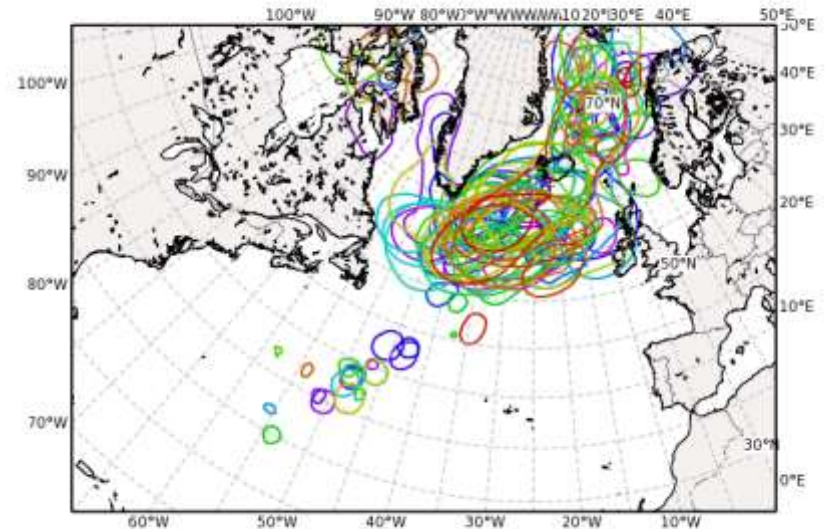
BT: 20160920 00UTC, VT: 20160926 12UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Mon, 26 Sep 2016, 12 UTC (step 156 h from Tue, 20 Sep 2016, 00 UTC)



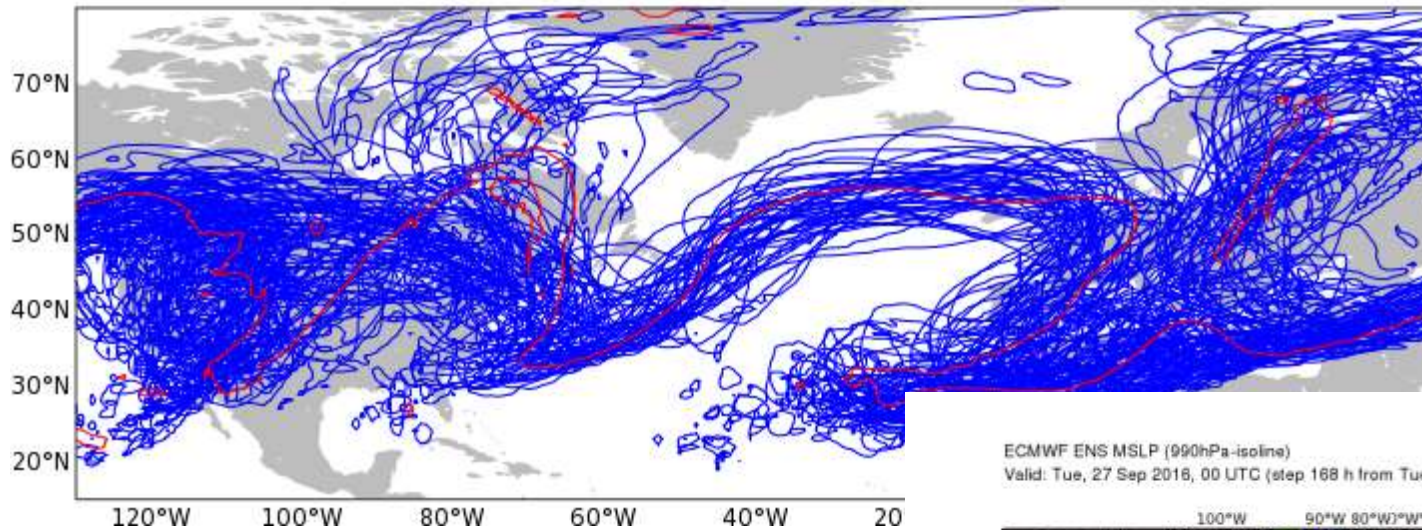
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Tue 27/00Z

ECMWF ENSEMBLE FC

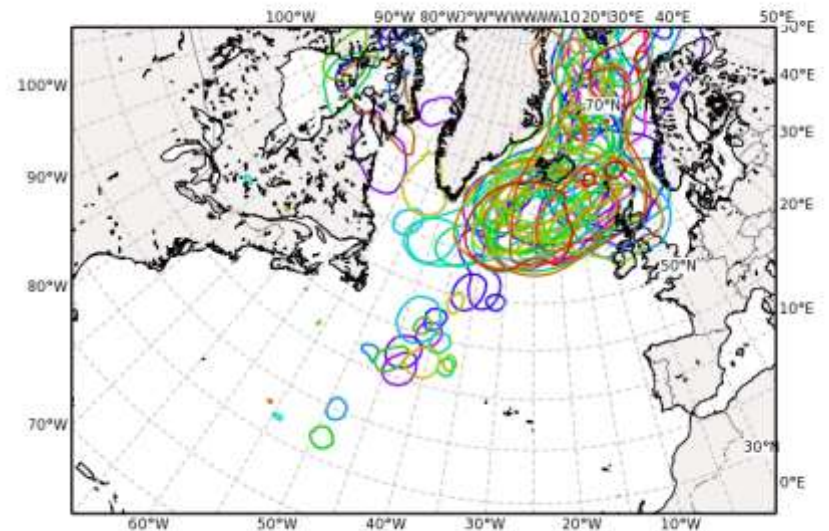
BT: 20160920 00UTC, VT: 20160927 00UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Tue, 27 Sep 2016, 00 UTC (step 168 h from Tue, 20 Sep 2016, 00 UTC)



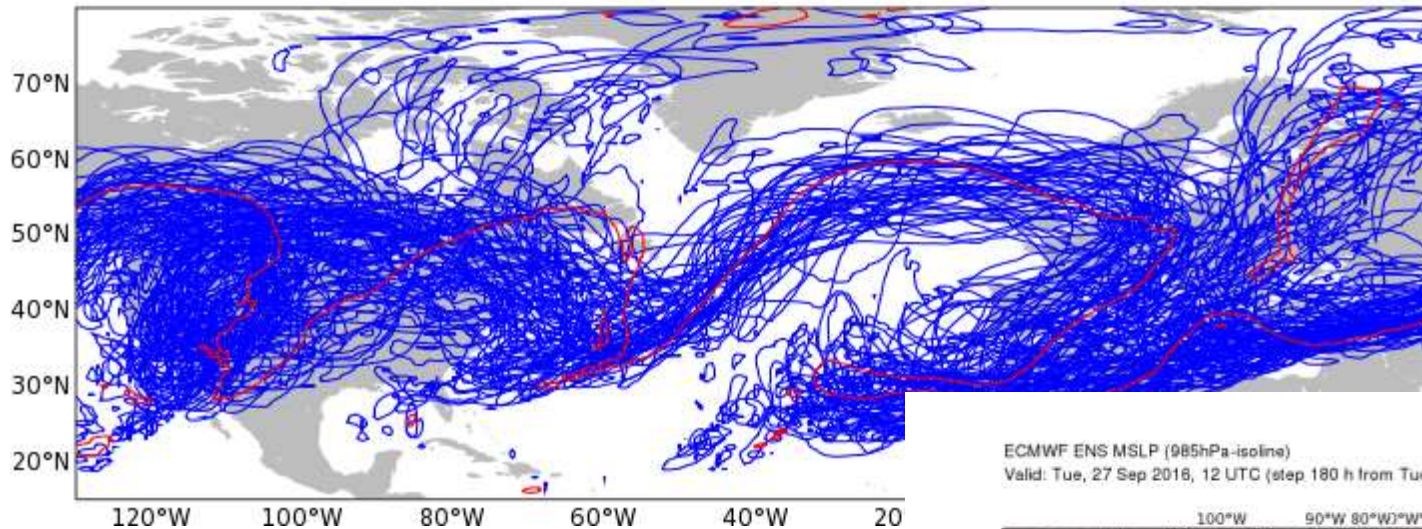
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Tue 27/12Z

ECMWF ENSEMBLE FC

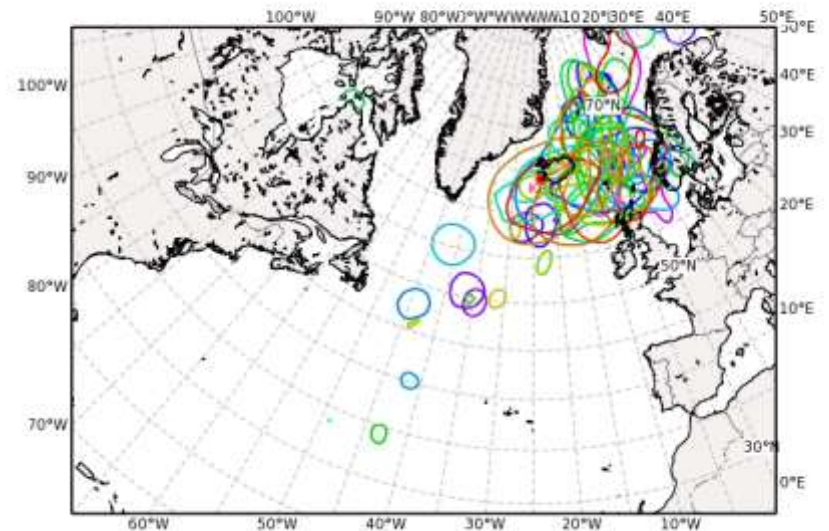
BT: 20160920 00UTC, VT: 20160927 12UTC

blue: perturbed, red: control



ECMWF ENS MSLP (985hPa-isoline)

Valid: Tue, 27 Sep 2016, 12 UTC (step 180 h from Tue, 20 Sep 2016, 00 UTC)



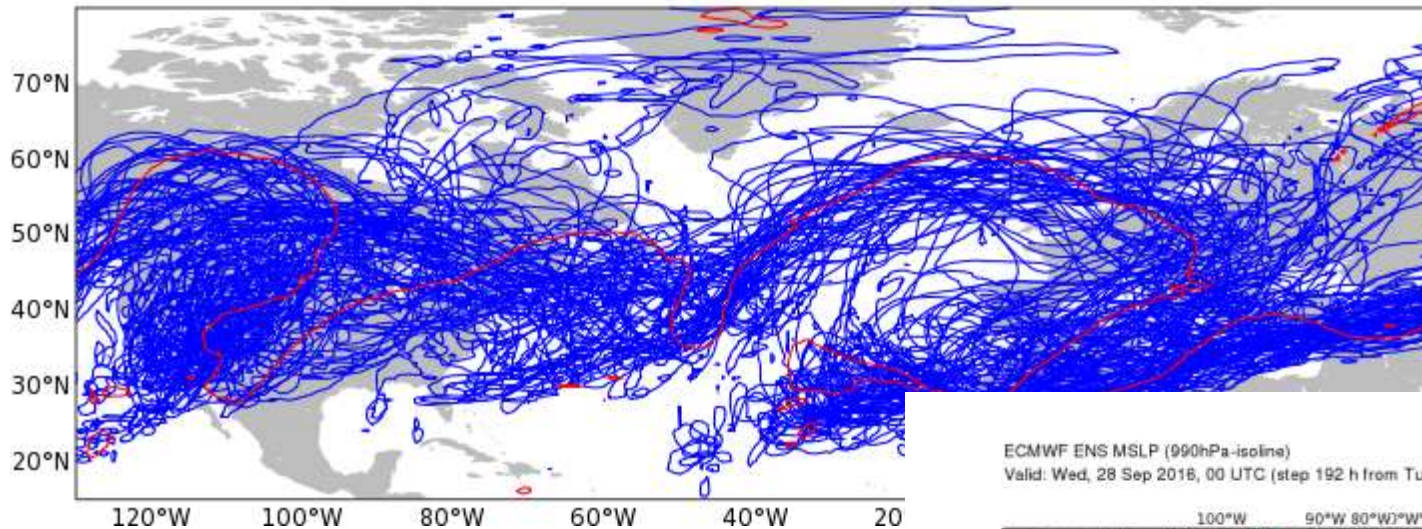
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Wed 28/00Z

ECMWF ENSEMBLE FC

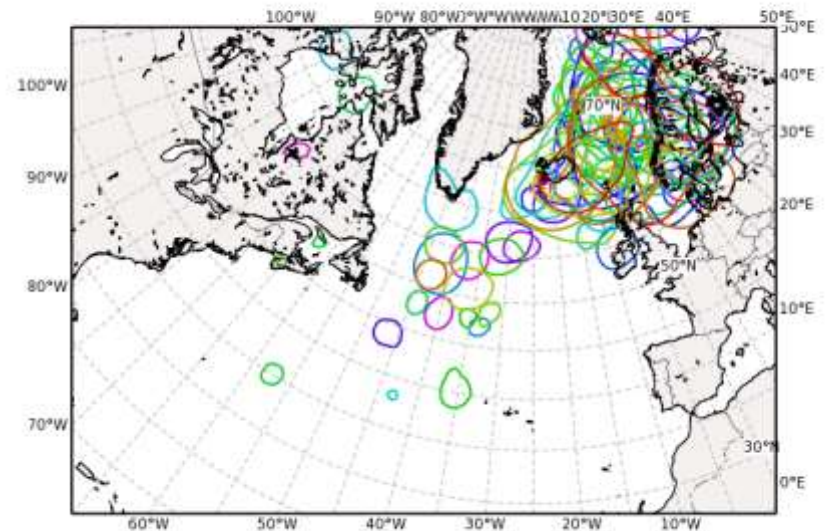
BT: 20160920 00UTC, VT: 20160928 00UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Wed, 28 Sep 2016, 00 UTC (step 192 h from Tue, 20 Sep 2016, 00 UTC)



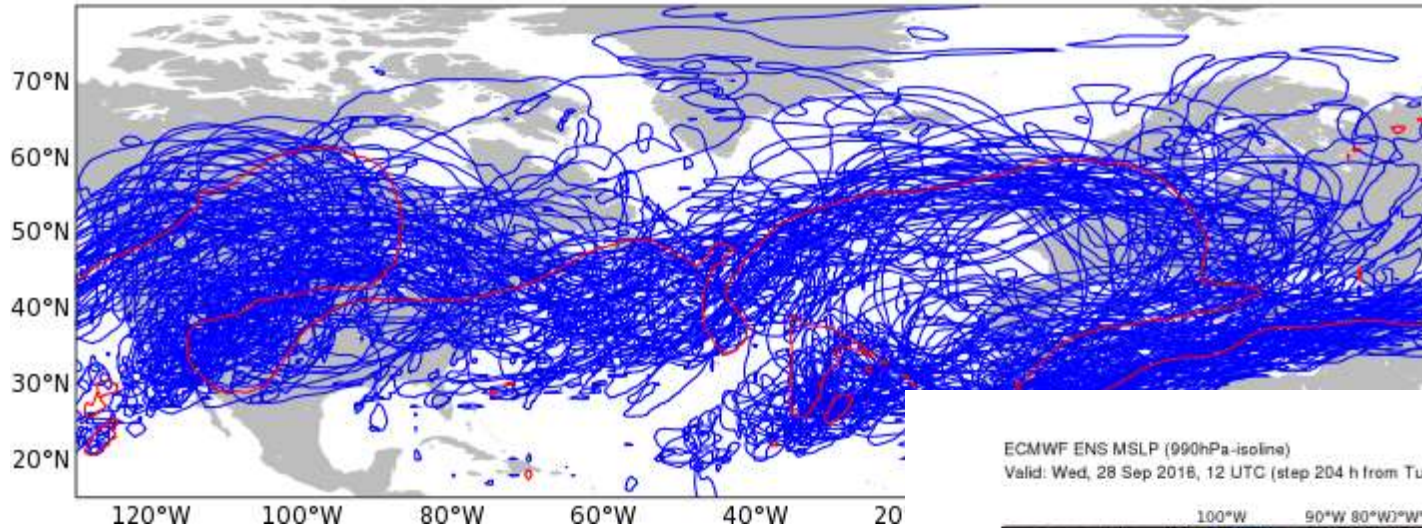
Outlook Fri 23/00Z to Wed 28/12Z : 2PVU@340K, MEAN & STDEV MLSP (based EC Ens 20/00Z)

Wed 28/12Z

ECMWF ENSEMBLE FC

BT: 20160920 00UTC, VT: 20160928 12UTC

blue: perturbed, red: control



ECMWF ENS MSLP (990hPa-isoline)

Valid: Wed, 28 Sep 2016, 12 UTC (step 204 h from Tue, 20 Sep 2016, 00 UTC)

