

	NAWDEX 2016 Weather summary	Date: 30 September 2016 Author: B. Crezee, C. Grams

Synoptic Analysis Friday, 30 September 2016

At Friday, 20 September the upper-level flow in the North Atlantic region is characterised by a broad upper-level trough extending from Iceland into Scandinavia. In the western North Atlantic between Newfoundland and Greenland the earlier day's cut-off process resulted in a complicated flow structure characterised by a split jet. A very small upper-level PV cut-off (exceeding 10 PVU at 300 hPa) becomes collocated with a surface frontal wave like cyclone over Newfoundland, that evolved at the tip of a region of enhanced subtropical warm-air. The superposition results in an explosive deepening of this cyclone, which we call "Saturday cyclone". The cyclone has developed a pronounced warm sector to the west; its center is characterised by very dry air mass. At its eastern flanks an intense WCB evolves, which will have its outflow over the entire North Atlantic region from Greenland over Iceland to Norway in the following days.

In the eastern Atlantic region cyclone "Walpurga" whose WCB inflow was measured during IOP5 is located over Scandinavia and merged into "Ex-Karl". The precipitation due to WCB and AR activity at the Norwegian Coast exceeded locally 160mm in the past 48 hours, which is a severe but not an unusual event.

Forecast Day 1 (tomorrow) Saturday, 1 October 2016

On Saturday 1 October, the large-scale upper-level trough extends southwards from Greenland and approaches the Saturday cyclone, supporting its further intensification. Air parcels rise in the warm sector of the cyclone forming a very intense WCB and instigating strong ridgebuilding to the South of Iceland. At the same time a lee cyclone develops to the east of the southern tip of Greenland, associated with the northern branch of the split jet. The flight planning for Saturday did not change.

Forecast Day 2 (day after tomorrow) Sunday, 2 October 2016

On Sunday 2 October the "Saturday cyclone" reaches its mature stage with a minimum central pressure between to 955-965 hPa, while gradually moving towards Iceland. Winds in Keflavik will start increasing on Sunday afternoon, with peak winds expected Sunday night until Monday noon. Also WCB (inflow) activity continues on the western flank of the cyclone. The WCB outflow continues strongly amplifying the ridge, which now expands from Greenland over Iceland to Scotland. On the downstream flank the ridge itself leads to a further southward protrusion of the trough now located over southern Sweden and Denmark. The adjoint model sensitivities highlight uncertainties for the evolution of the Saturday forecast, which are related to moisture transport in the south eastern quadrant of the cyclone at Saturday. The flight planning for Sunday did not change.

Forecast Outlook

On Monday 3 October, there is still strong WCB outflow into the downstream ridge. Now the trough-ridge couplet starts to break cyclonically and wraps up in the region between Iceland and Greenland. The cyclone has merged with the lee becomes stationary close to the southern tip of Greenland. The cyclone has consumed most of the moist and warm air. The marked baroclinic zone between Iceland

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and Norway has been eroded. The EFI indicates very strong winds over the Keflavik area.

On Tuesday 4 October the Saturday cyclone remains stationary at the Southern tip of Greenland.

Although the western part of the ridge was eroded by cyclonic wave breaking, ongoing WCB outflow continues amplifying the ridge to the East, which now propagates eastward. At the surface high pressure) builds up over Scandinavia. The downstream trough cuts off into the Balkans region. There is high uncertainty related to the exact position of this cut-off. However, it is very likely that it will cause heavy precipitation in some regions of Central and Eastern Europe.

Over the western North Atlantic new moisture transport emerges from subtropical regions and re-establishes a strong baroclinic zone, extending from the Halifax region to the Azores. On this baroclinic zone a new frontal wave cyclone formed which is located at about 40W, 45N at 12 UTC associated with an initial WCB.

On Wednesday 5 October, the frontal wave cyclone tracks along the baroclinic zone straight towards Iceland and strongly intensifies. A very intense WCB forms along with the strong warm air and moisture advection and ascends towards the Iceland area. The cut-off over the Balkans splits up in two parts and initiates northerly flow towards the Eastern Alps, potentially leads to heavy precipitation over the wider eastern Alpine region. The exact timing and regions affected by this HIW are still very uncertain, due to uncertainty in the position of the upper-level cut-off.

On Thursday 6 October the frontal wave cyclone has become mature and is located just west of Iceland. Still WCB ascent continues directly over Iceland. There is indication that the upstream trough cuts off into the Azores region. Hurricane Matthew might undergo extratropical transition and track into the North Atlantic region.

The entire period Sunday 2 October to Friday 7 October is characterised by warm-moist air advection towards Iceland in a strong southerly flow. This results in a multi-day period of heavy precipitation in southern Iceland.

Scientific discussion

- The nature of the “Saturday cyclone” has been discussed intensively. The small size of the upper-level cut off and its strong intensification from 00UTC to 15UTC Friday 30 Sep is surprising. The WV sat imagery shows very dry air in its centre. At the same time it is located in a complicated split jet structure and might experience upper-level forcing associated with different jet streaks. Finally the cyclone is located in a region of subtropical warm-moist air.
- The WCB associated with the “Saturday cyclone” is very intense and reaches up to 340K. It triggers ridgebuilding and the elongation of a downstream trough that cuts off early next week over Scandinavia into eastern Europe. Discussion if and how the cut-off process could be observed with extra radio sounding in Scandinavia and Central Europe.
- Downstream high impact weather associated with the Central European cut-off mid of next week.
- Uncertainty in frontal wave evolution Tue-Thu next week.