

Synoptic Analysis

The tropical cyclones “Matthew” and “Nicole”, a high pressure system over the western North Atlantic, a potential vorticity (PV) streamer over the central North Atlantic, and a blocking high pressure system over Scandinavia determine the large-scale flow in the NAWDEX region. The PV streamer over the central North Atlantic is associated with a cyclogenesis event. On 09 October 12 UTC, the forming low pressure centre at 45N/30W exhibits an intensity of less than 995 hPa. Low-level moisture transport on the eastern flank of this low pressure system is co-located with a warm conveyor belt (WCB) inflow region. The WCB trajectories that ascend about 12-24 hours later have their outflow in two different regions. The WCBs that have their inflow close to the low pressure centre ascend rapidly and turn anticyclonically toward the Mediterranean. The WCB trajectories that have their inflow further east, ascend northward and are predicted to reach Iceland on 11 October. Both WCBs contribute to ridge formation in downstream regions. The northward ascending WCB potentially supports the maintenance of the blocking high pressure system over Scandinavia.

Forecast Day 1 (Monday, 10/10/2016)

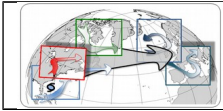
ECMWF forecast suggest a strong interaction between the remnants of TC Matthew and an upstream PV streamer on Monday 10 October. Remarkably strong moisture transport on the eastern flank of Matthew feeds WCB ascent over the western North Atlantic. The WCB outflow results in negative PV advection by the irrotational wind on the eastern flank of the upstream PV streamer. This negative PV advection indicates ridge amplification as well as a deceleration of the eastward propagation of the upstream PV streamer. The PV streamer over the central North Atlantic is expected to break apart into two cut-off systems. The northerly cut-off system is vertically aligned with the low pressure system that formed during the previous day. On 10 October 12 UTC, the upper-level cut-off and its associated low pressure system are located at 45N/25W. A WCB on the eastern flank of these two systems contributes to downstream ridge amplification. This ridge will likely reach Iceland on Tuesday, 04 October.

Forecast Day 2 (Tuesday, 11/10/2016)

The interaction between a PV streamer and the remnants of TC Matthew will likely continue on Tuesday 11 October. Low-level moisture transport is still feeding strong ascent over the western North Atlantic. The resulting upper-level divergent outflow continues to impinge on the midlatitude wave guide. A stratospheric positive PV anomaly counteracts this divergent outflow so that a downstream ridge amplification does not occur. On the southern flank of the positive PV anomaly, a closed isobar in mean sea level pressure indicates the formation of a new low pressure system – the “downstream cyclone”. The stratospheric cut-off that formed during the previous day over the central North Atlantic will likely rejoin the stratospheric PV reservoir. In its centre, the upper-level PV values exceed 10 PVU at the 325 K isentropic surface. WCB ascent on its eastern flank results in upper-level divergent winds that impinge on the wave guide.

Forecast Outlook

Forecasts for forecast day 3 and beyond are highly uncertain. Ensemble forecast suggest that this uncertainty is due to the interaction between the remnants of TC Matthew and an upstream PV streamer. This uncertainty is reflected by a bifurcation in the track forecast for Matthew. The uncertainty intensifies and propagates into downstream regions. On Wednesday, various forecast scenarios exist for the central North Atlantic. Some forecasts show a ridge building south of Greenland whereas others show a trough in the same region. This phase shift of 180° in the Rossby wave pattern makes forecasts for further flights in the Icelandic region



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extremely difficult.

Scientific Discussion

The structure of the cut-off system over the central to eastern North Atlantic is target of a HALO flight on 10 October. A further promising situation is predicted to evolve on Wednesday. However, due to forecast uncertainties a decision on further flight plans is postponed to the next day.