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|  | NAWDEX 2016 Weather summary | Date: 19 September 2016 Author: H.Binder, C.Grams |
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Synoptic Analysis: Monday 19 September 2016

- Stationary trough centered over Greenland and Iceland, zonally oriented upper-level jet at its southern boundary.
- Surface cyclone located between the southern tip of Greenland and south of Iceland.
- Confluence of warm subtropical air from Gulf of Mexico and Caribbean and cold polar air masses from the Labrador Sea -> formation of a surface front below the upper-level jet extending from the east of Newfoundland to the central North Atlantic, intense precipitation along front.
- Formation of a frontal wave and later an associated WCB east of Newfoundland. We aim to measure outflow of this WCB 2 days later.

Forecast Tuesday 20 September 2016

- Trough and surface cyclone remain stationary near Iceland.
- Surface front strengthens, frontal wave propagates eastward, and associated WCB inflow region moves to the south of Iceland, continuous ascent to the northeast of inflow.

Forecast Wednesday 21 September 2016

- Explosive intensification of frontal wave cyclone to the south of Iceland at about 55°N between Tuesday and Wednesday (SLP deepening by >25 hPa between valid time (VT) 20/12 UTC and VT 21/12 UTC).
- Pronounced warm sector and strong WCB ascent directly to the south of Iceland, WCB outflow over Iceland; WCB outflow associated with a cyclonic (slightly lower) and an anticyclonic branch. Ensemble shows high probabilities (80-100%) for WCB ascent and outflow locations at VT21/12 UTC.
- Strong diabatic ridge amplification by WCB outflow over Iceland, strong negative PV advection by divergent wind (strongest at 315K at valid time VT 21/18 UTC)
- Overall robust scenario. Detailed model consistency:
 - Ridge building for forecast base time (BT) 19/00 UTC is about 3-6 hours earlier compared to BT 18/00 UTC, and cyclone is 10 hPa deeper (975 hPa for BT 19/00 UTC)
 - WCB outflow reaches 325K for BT 18/00 UTC over Iceland at VT 21/18 UTC. Outflow height for BT 18/12 run the is much lower (still pronounced ridgebuilding at 315K). BT 19/00 UTC again closer to BT 18/00 UTC. WCB outflow probability over Iceland increases from 60-80% for BT 18/00 UTC to 80-100% for BT 19/00 UTC.
 - Frontal wave reaches minimum SLP at about 22/00 UTC for all three base times (18/00, 18/12 and 19/00 UTC). For BT 19/00 UTC ensemble member converge towards a very intense SLP minimum of about 980 hPa.

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Forecast Outlook

- Thursday, 22 Sep: Second cyclogenesis north of Newfoundland; again injection of tropical warm air masses in newly forming warm sector.
- Friday, 23 Sep: Strong WCB formation south and east of Iceland, WCB outflow of same system north and east of Iceland on Saturday, 24 Sep. Potential for Lagrangian measurements with HALO and Falcon aircrafts (UK FAAM Bae146).
- Model consistency: robust signature of WCB ascent in region extending from Iceland southward to 45°N on Friday, 23 Sep. BT 18/12 UTC featured slight eastward shift. Robust signature of WCB outflow north of Iceland stretching from the coast of Greenland to Scotland and Norway on Saturday, 24 Sep.
- Potential extratropical transition (ET) and midlatitude impact of TC Karl Sunday-Wednesday: Strong downstream cyclone (and a strong WCB) reaching Iceland on Monday for BT 19/00Z. ET Karl reaches Iceland on Wednesday for BT 19/00Z. Track of these cyclonic systems seems relatively certain, still high uncertainty in terms of intensity and timing.

| NAWDEX Flight Planning Matrix: <small>19 September 2016</small> | Moisture Structure in BL | Mixed phase clouds | Diabatic effects on cyclonic systems | Impacts of tropopause waveguide uncertainty on HIW events | Moisture and cloud structure 'at the tropopause | Initial Condition Sensitivity and Predictability | EarthCare related observations | ADM related observations |
|---|--------------------------|--------------------|--------------------------------------|---|---|--|--------------------------------|--------------------------|
| Wed 21 Sept 2016 (D+2) | Green | Green | Green | Yellow | Green | Green | White | White |
| Thu 22 Sept 2016 (D+3) | Yellow | Yellow | Yellow | Red | Red | Red | White | White |
| Fri 23 Sept 2016 (D+4) | Green | Green | Green | Yellow | Green | Green | White | White |
| Sat 24 Sept 2016 (D+5) | Red | Green | Yellow | Yellow | Green | Green | White | White |
| Sun 26 Sept 2016 (D+6) | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | White | White |

Scientific discussion

- Three to four missions are on the horizon in next 10 days
- Wednesday flight:
 - Exact positioning of box flight pattern for Falcon, measuring divergence vs. divergent wind. Signal of gravity waves.
 - Location and timing of additional radiosoundings
 - Jet crossing with HALO and Falcon, position of dropsondes.
 - Sensitivity regions for WCB ascent at 61N.
- Friday: coordination with UK-FAAM Bae146 aircraft for inflow measurements, activation of

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NOTAM box needed on Wednesday.

- Uncertainty for track of ET Karl and downstream cyclone, Coordination with SHOUT for ET Karl. Strong divergence and negative PV advection by irrotational wind from convection linked to atmospheric river downstream of ET Karl.
- Priorities for the many options during the next 10 days? When to take day off? Wednesday high priority, as WCB outflow is over Iceland. Friday/Saturday high priority, as it features possibility for Lagrangian measurements.
- Organisation of flight planning for ET Karl and downstream cyclone. Tentative flight plan on Friday for Monday? Day off Sunday? Skip downstream cyclone? But downstream cyclone appears more intense, and having more midlatitude impact ...