A polar low named Vera: the use of potential vorticity diagnostics to assess its development.

by

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Relative vorticity at 925 hPa 00UTC 19.11.2008
UPV1 400 hPa 00UTC 20.11.2008, contours every 1PVU

TH1 and TH2 950 hPa 00UTC 20.11.2008, contours every deg.C

LPV1 800 hPa 00UTC 20.11.2008, contours every 0.2 PVU
LPV at 800 hPa and 6 h prec. At 00UTC 20.11.2008
Contribution from cyclonic UPV anomaly +24h, valid 00UTC 20.11.2008

Contribution from cyclonic LPV anomaly +24h, valid 00UTC 20.11.2008
Contribution from warm anomaly +24h, valid 00UTC 20.11.2008

Contribution from cold anomaly +24h, valid 00UTC 20.11.2008
Contribution from residual PV anomaly
+24h, valid 00UTC 20.11.2008
Table 1. Contribution to 900 hPa geopotential height at polar low center

<table>
<thead>
<tr>
<th>Time</th>
<th>00</th>
<th>06</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
<th>42</th>
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<tr>
<td>UPV</td>
<td>-25</td>
<td>-27</td>
<td>-15</td>
<td>-45</td>
<td>-88</td>
<td>-111</td>
<td>-105</td>
<td>-57</td>
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<tr>
<td>LPV</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
<td>-31</td>
<td>-51</td>
<td>-64</td>
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<td>-47</td>
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<tr>
<td>TH1</td>
<td>-9</td>
<td>-9</td>
<td>-20</td>
<td>-37</td>
<td>-6</td>
<td>-6</td>
<td>-16</td>
<td>-13</td>
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<tr>
<td>TH2</td>
<td>64</td>
<td>63</td>
<td>36</td>
<td>11</td>
<td>12</td>
<td>17</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>RESIDUE</td>
<td>-63</td>
<td>-50</td>
<td>-32</td>
<td>75</td>
<td>48</td>
<td>48</td>
<td>11</td>
<td>19</td>
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<tr>
<td>TOTAL</td>
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<td>-34</td>
<td>-27</td>
<td>-86</td>
<td>-116</td>
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<td>-76</td>
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PV on 300K, 00UTC
19.11.2008
Backwards trajectories
Starting at +36h at 12UTC 20.11.2008

PV on 300K, 00UTC
20.11.2008
Backwards trajectories
Starting at +36h at 12UTC 20.11.2008
Change of upper level PV at 295K, location of cross section C-D
36 h simulation of mslp operational HIRLAM, valid 12 UTC 20.11. Synoptic analysis at the same time in dashed (red) contours.

36 h control simulation of mslp in dashed (red) contours, valid 12 UTC 20.11.

36 h rerun simulation based on initial modified PV in solid (blue) contours.
PV difference at 295K (~400 hPa over northern Greenland) between control and rerun. Initial (a), +24 h (b) and +42h (c)
Conclusions

- Piecewise potential vorticity inversion (PPVI) allows quantitative assessment of impact from selected PV anomalies on the polar low (PL).

- In the Vera case upper level PV over northern Greenland appeared to be a very important contribution to the development of the PL, shown by PPVI and sensitivity study.

- Low level PV important for PL development, also in the case of the Vera PL.
QUESTIONS AND COMMENTS ?