

Summary

Nudging of Surface Pressure

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The assimilation of surface pressure information is still unsatisfactory in extremely explosively developing mesoscale cyclones such as the December 1999 storms despite some improvements implemented since then. Therefore, tests have been done with increasing, and in particular doubling, the forcing towards these data. Due to a slight negative impact in the upper-air verification against radiosondes in 2 one-week parallel assimilation cycle and forecast experiments, additional tuning experiments have been performed with respect to the temperature correction and the geostrophic wind correction. As a result, the geostrophic wind correction has been slightly and height-dependently decreased in the new version in addition to the enhanced forcing. Furthermore, an upper limit for each individual geostrophic wind increment has been relaxed.

In comparison to the operational version, the new version verifies neutrally in the parallel cycle experiments (slightly negative for +6h forecasts, slightly positive thereafter in the upper-air verification). For the extreme mesoscale cyclone events such as the Danish storm 1999, however, significant improvements are found in the analyses and forecasts of the surface pressure fields.

Consequence: The new version is to be applied operationally as soon as possible.

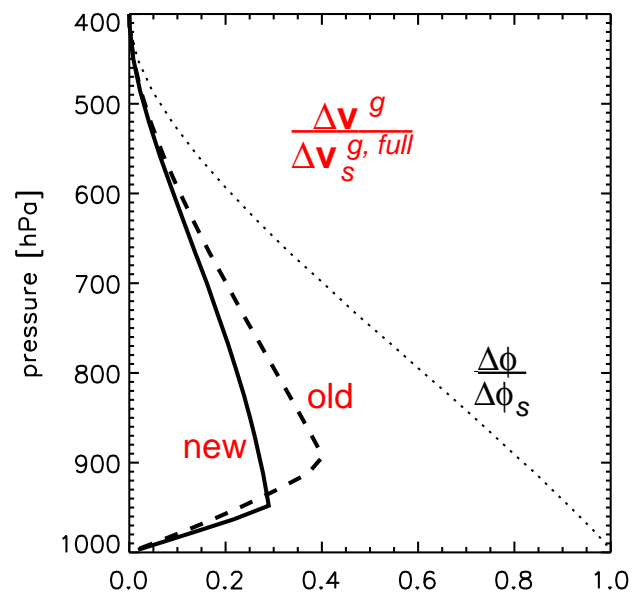
Nudging of Surface Pressure

★ nudging coefficient : increase from $6 \cdot 10^{-4} s^{-1}$ to $12 \cdot 10^{-4} s^{-1}$

★ geostrophic wind correction :

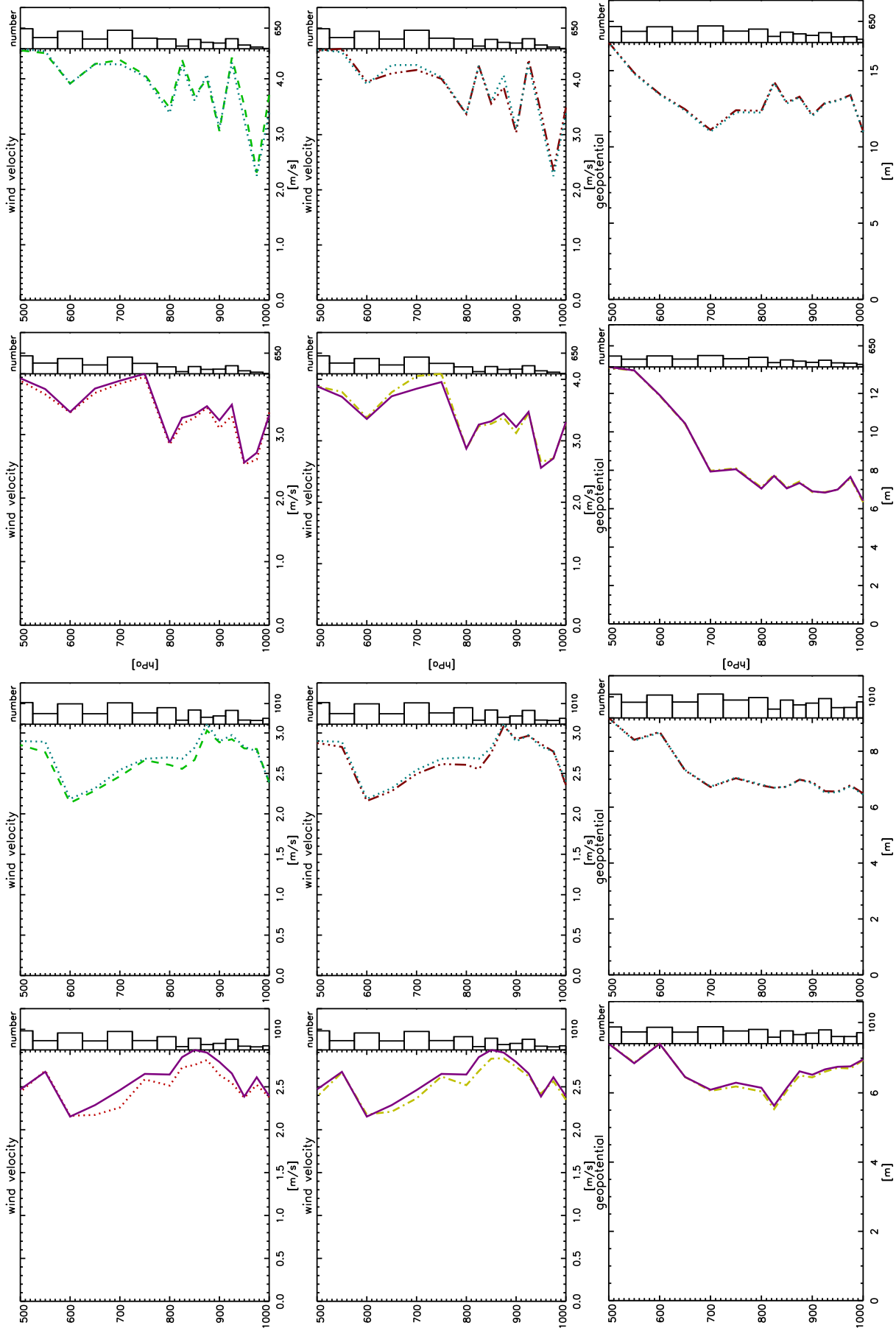
→ modify vertical profile
of geostrophic weighting

→ increase upper limit
for total hourly
wind correction
from $2.5 m/s$ to $10 m/s$



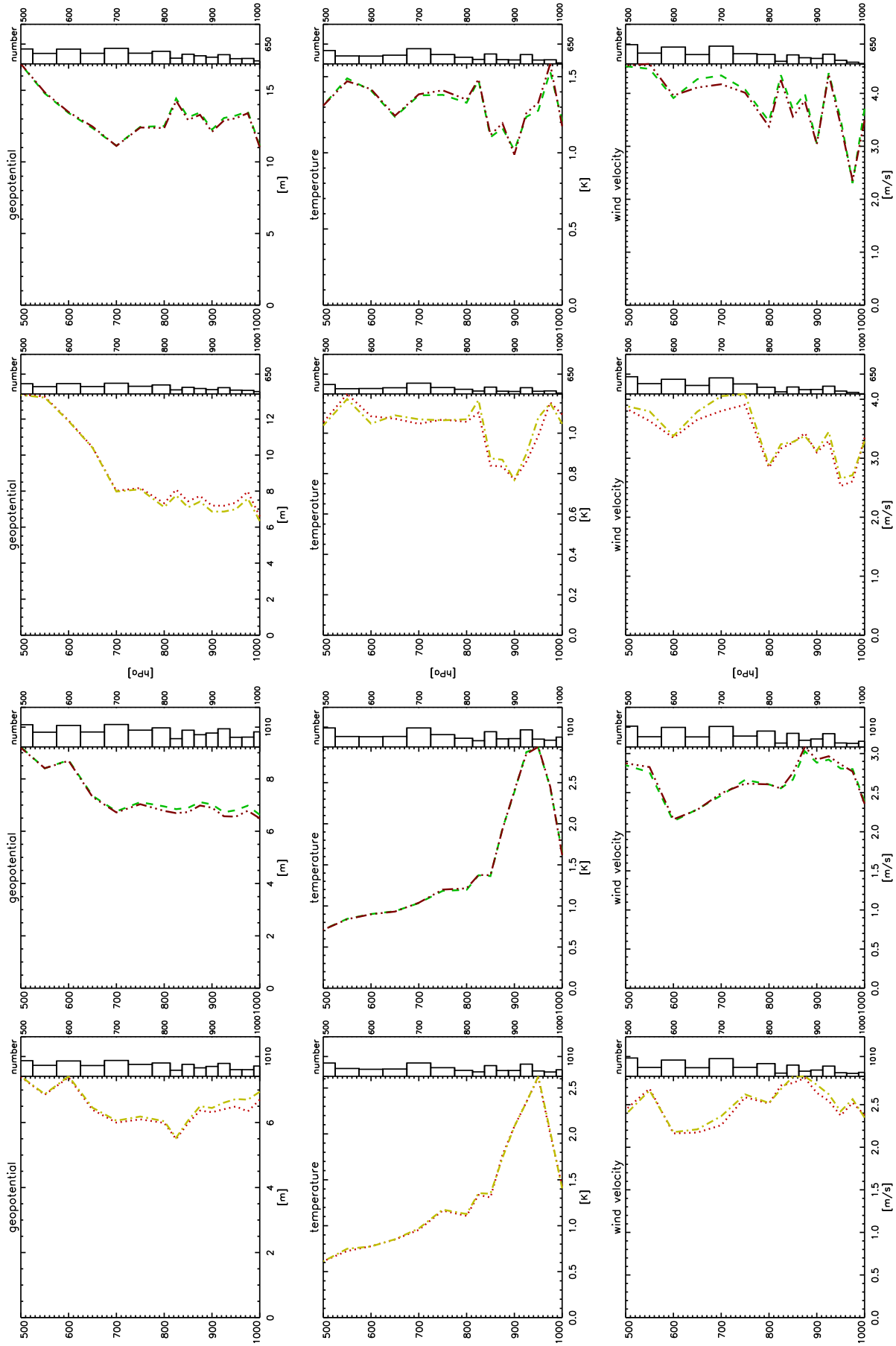
..... p_s coeff.: $6 \cdot 10^{-4} \text{ s}^{-1}$; geostrophic correction: 0.5 - - -
——— $+6 \text{ h}$ p_s coeff.: $12 \cdot 10^{-4} \text{ s}^{-1}$; geostrophic correction: 0.5 $+12 \text{ h}$
- - - p_s coeff.: $12 \cdot 10^{-4} \text{ s}^{-1}$; geostrophic corr.: 0.3 - 0.5 - - -

19-12, 12 UTC - 25-12-2000, 0 UTC TEMP verif 29-10, 6 UTC - 4-11-2000, 0 UTC
 'inner-domain', RMSE near cyclones



+6 h p_s coeff.: $6 \cdot 10^{-4} \text{ s}^{-1}$; geostrophic correction: 0.5 - - - +12 h
+6 h - - - p_s coeff.: $12 \cdot 10^{-4} \text{ s}^{-1}$; geostrophic corr.: 0.3 - 0.5 - . - . -

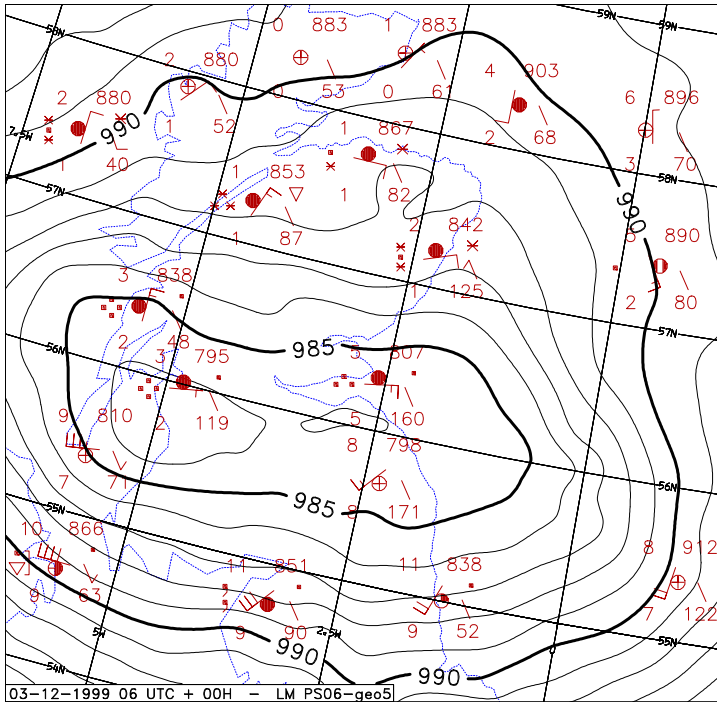
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 'inner-domain', RMSE near cyclones



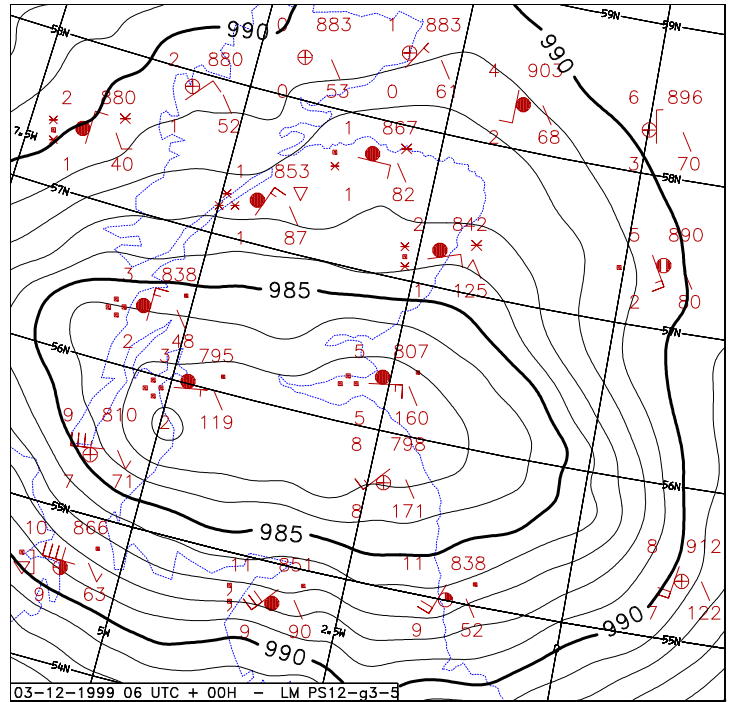
msl pressure of LM runs and surface observations

LM analyses valid for 3 December 1999, 6 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

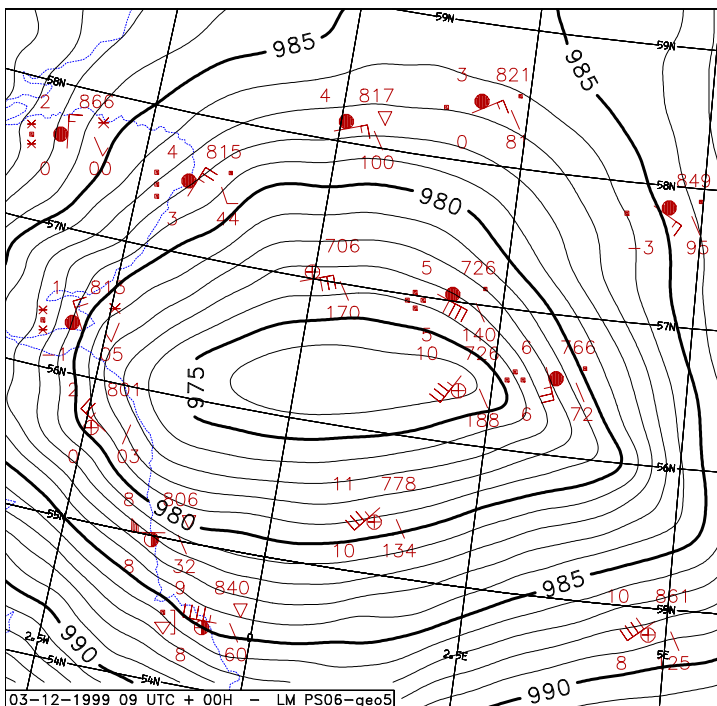


$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$

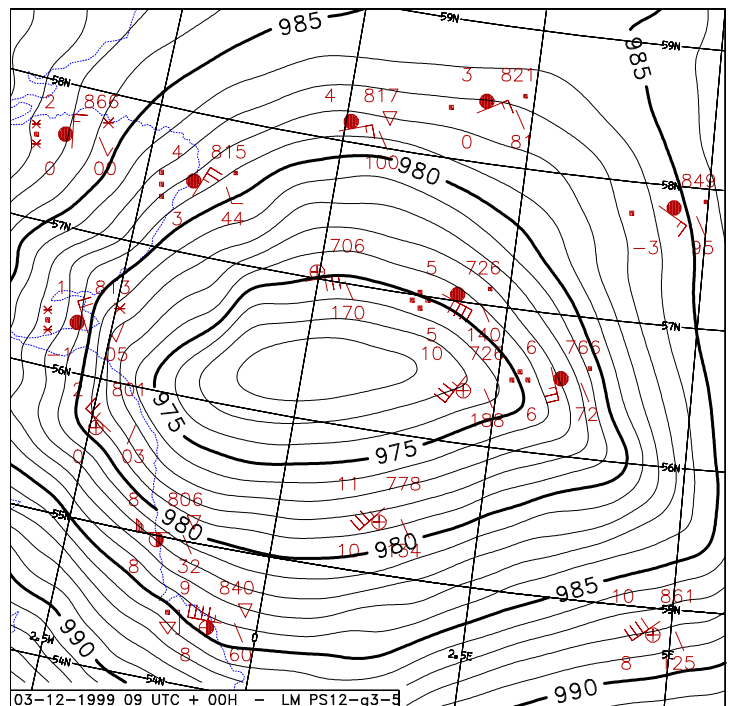


LM analyses valid for 3 December 1999, 9 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$



$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



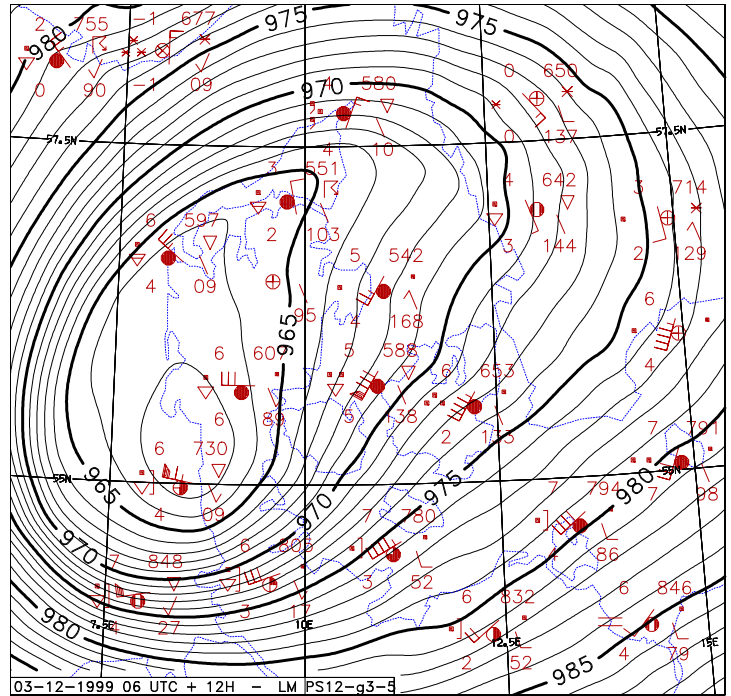
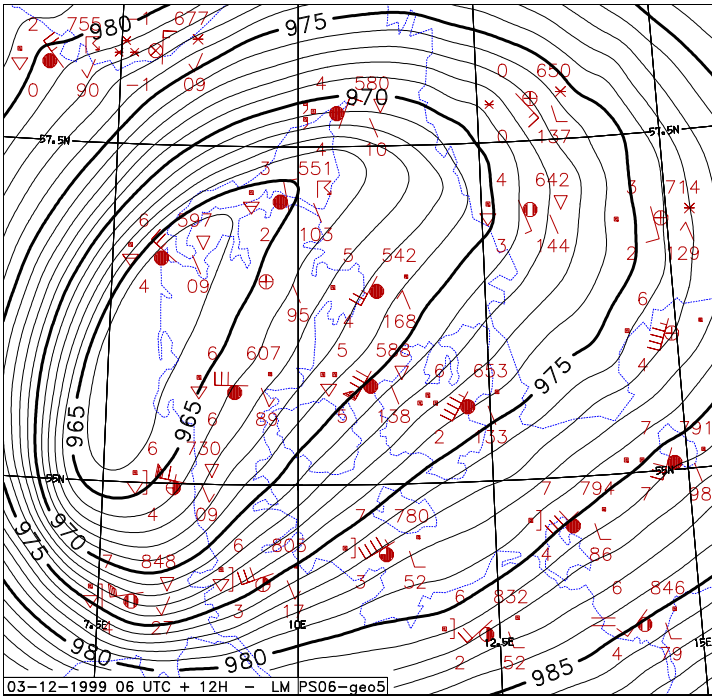
G_{p_s} : nudging coefficient for surface pressure

msl pressure of LM runs and surface observations

LM 12-h forecasts valid for 3 December 1999, 18 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

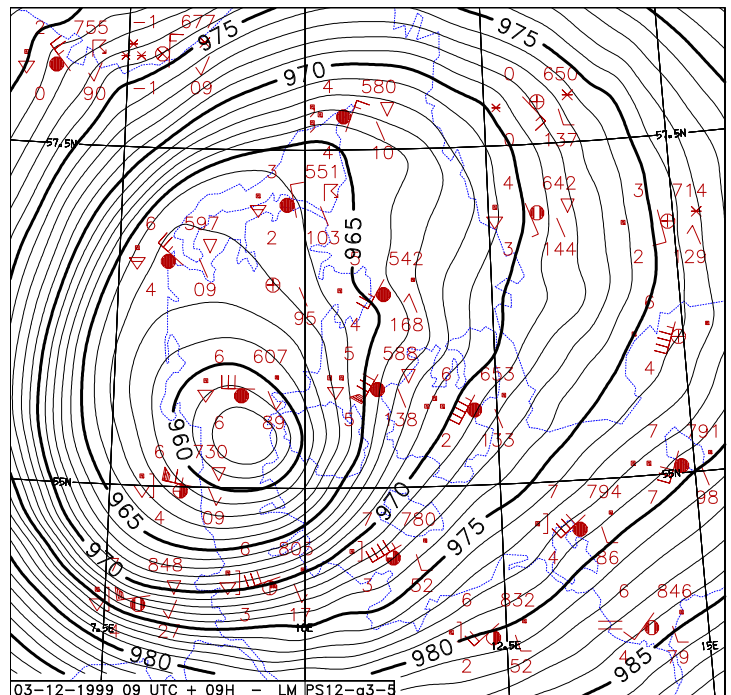
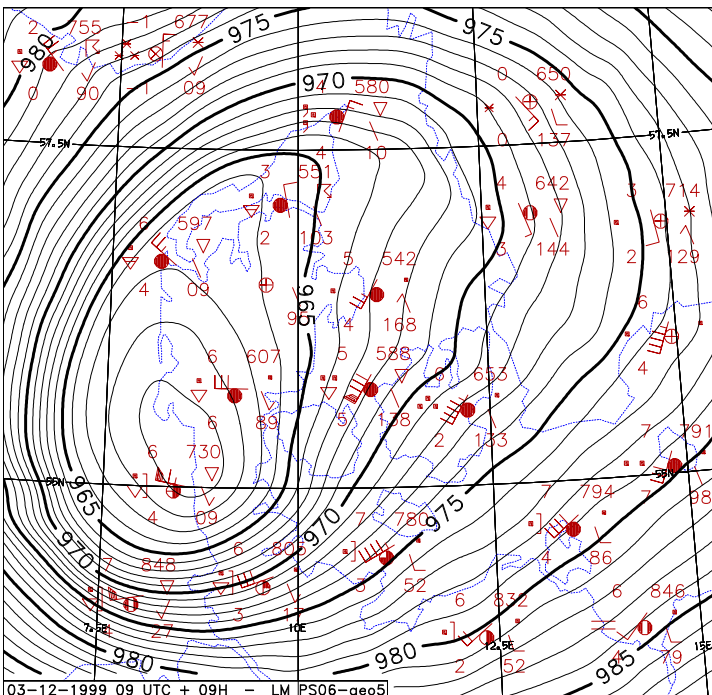
$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



LM 9-h forecasts valid for 3 December 1999, 18 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



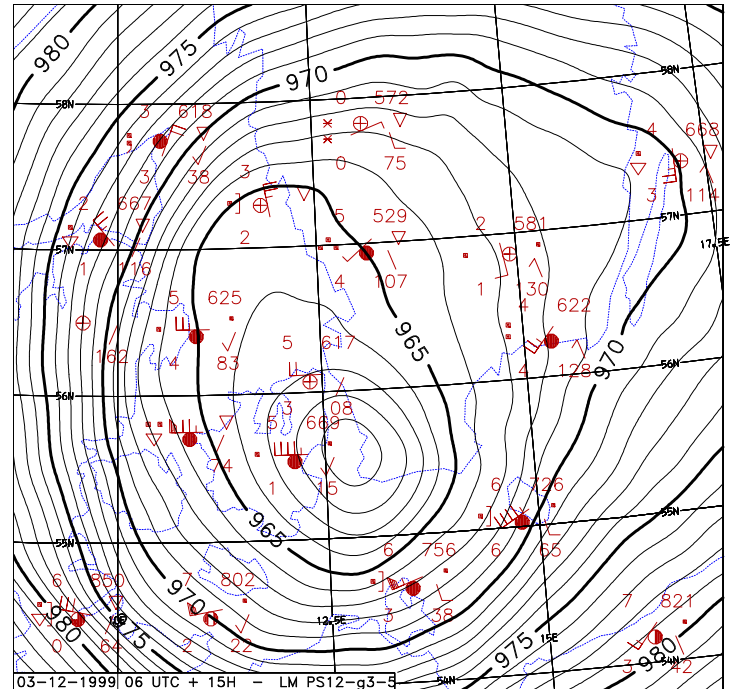
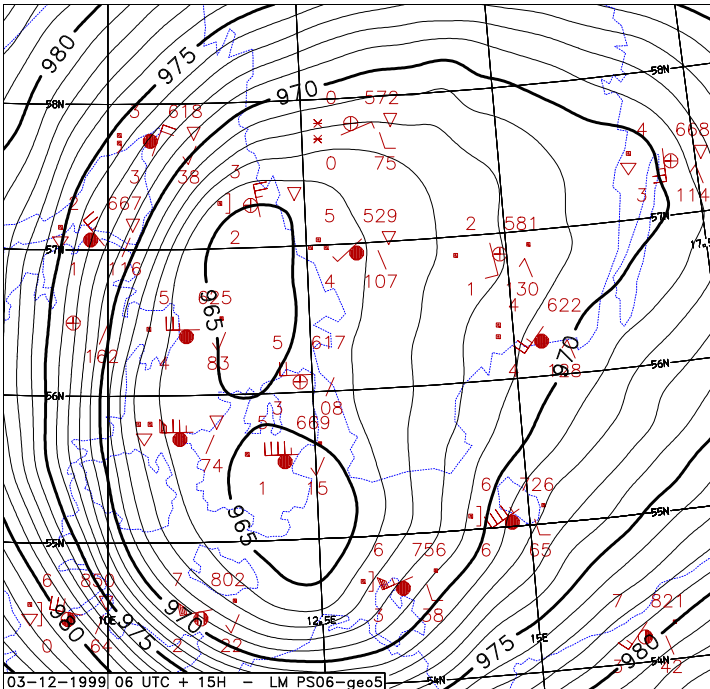
G_{p_s} : nudging coefficient for surface pressure

msl pressure of LM runs and surface observations

LM 15-h forecasts valid for 3 December 1999, 21 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

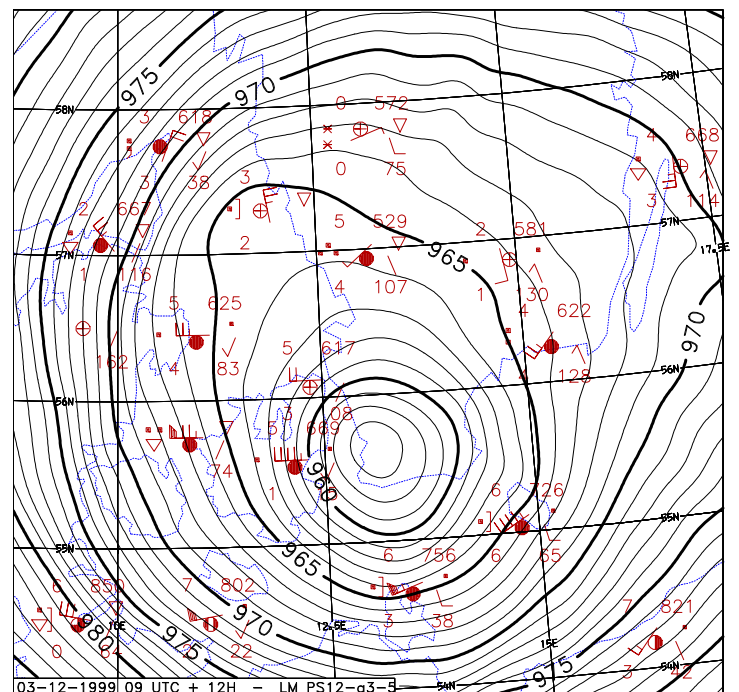
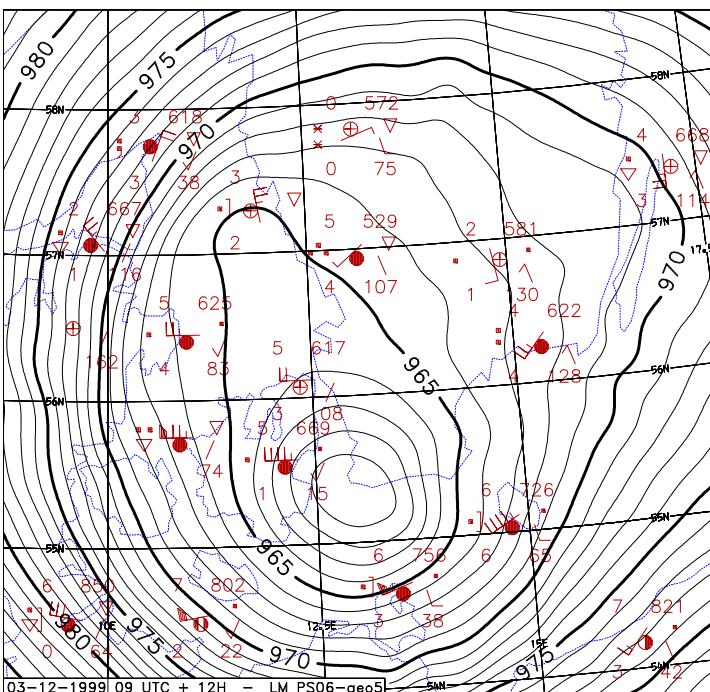
$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



LM 12-h forecasts valid for 3 December 1999, 21 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



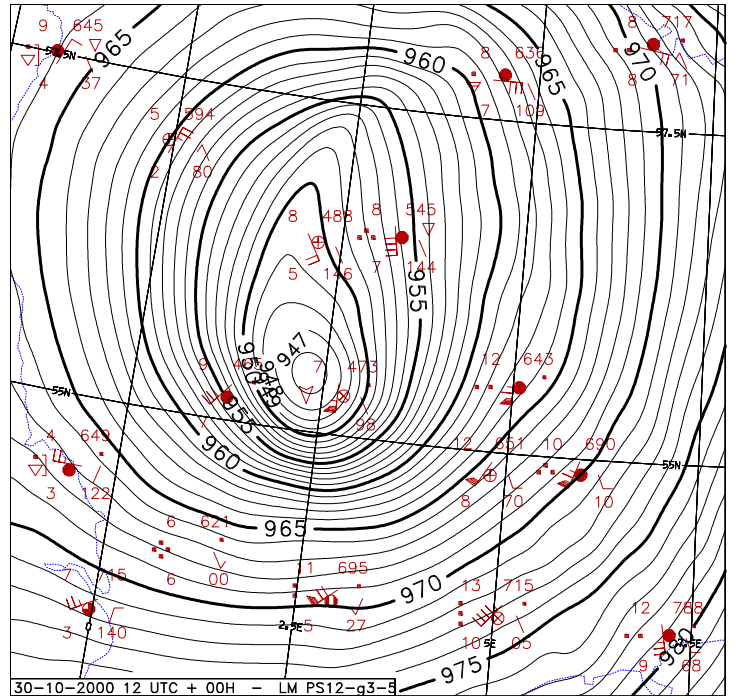
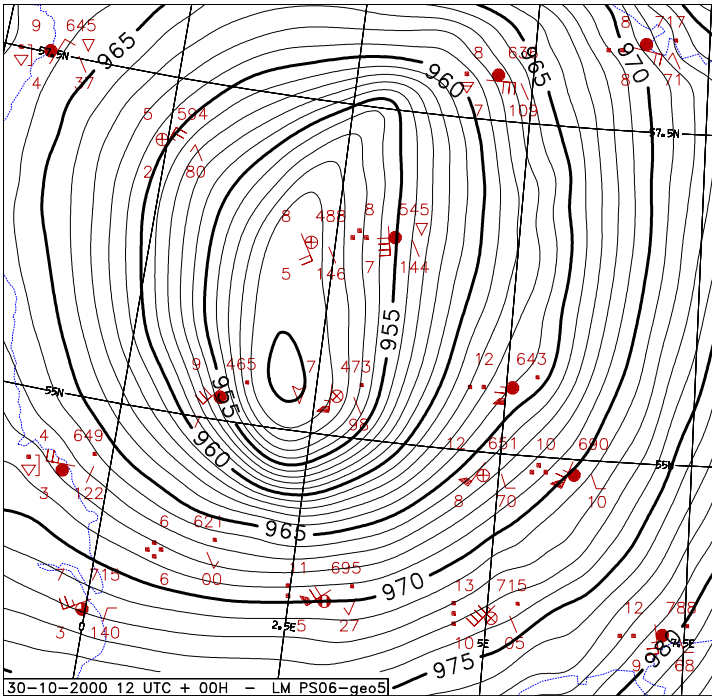
G_{p_s} : nudging coefficient for surface pressure

msl pressure of LM runs and surface observations

LM analyses valid for 30 October 2000, 12 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

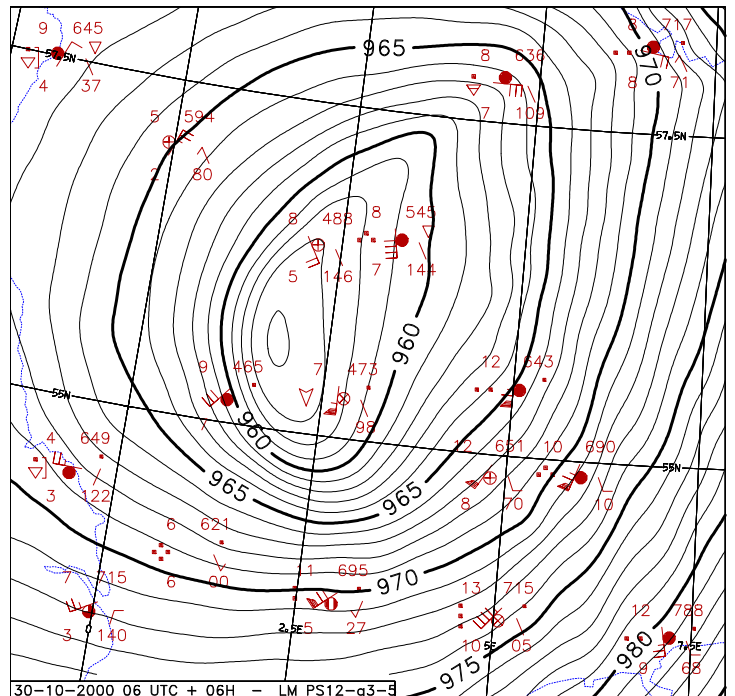
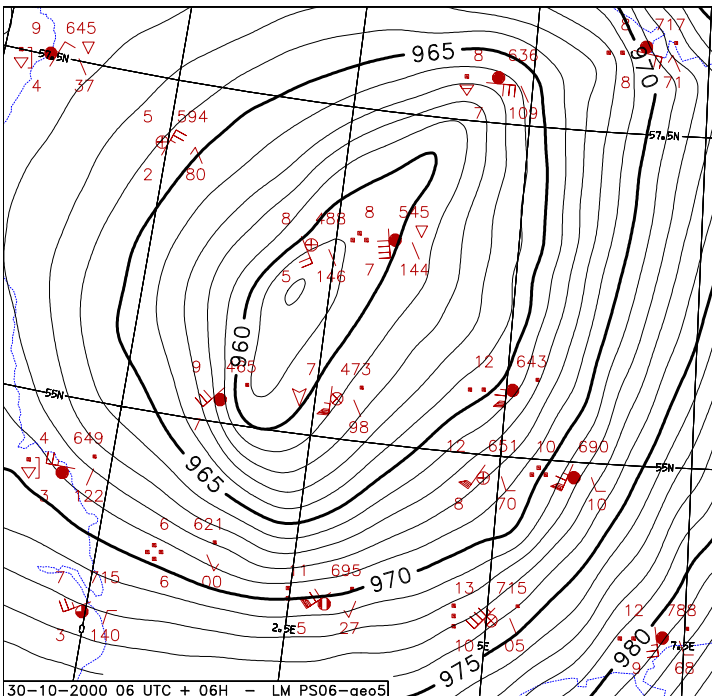
$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



LM 6-h forecasts valid for 30 October 2000, 12 UTC

$$G_{p_s} = 6 \cdot 10^{-4} s^{-1}$$

$$G_{p_s} = 12 \cdot 10^{-4} s^{-1}$$



G_{p_s} : nudging coefficient for surface pressure