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Interactive comment on "Front-orography interactions during landfall of the New Year's Day Storm 1992" *by* Clemens Spensberger and Sebastian Schemm

Anonymous Referee #2

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General comments:

The interactions of the fronts of the famous "New year's day storm" from 1992 with the Norwegian orography is investigated in this paper through analysis of the NORA10 reanalysis data and three simulations with the WRF model (a control and two simulations with modified orography). The study is presented well with detailed analysis and should be of interest to readers of this journal. It would be strengthened by the results being placed more firmly in the context of those from other studies. I recommend that the authors consider my, mainly minor, comments below.

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Discussion paper

Major specific comments:

Summary and conclusions: This section is rather brief and just summarises the results from the paper rather than placing these results in the context of other studies. Please link the results to those from the other studies discussed in the introduction.

Minor specific comments:

Section 2 You say how many vertical model levels there are in the NORA10 hindcast and WRF simulations but please add information about the model top and the midtropospheric vertical model level spacing (i.e. before interpolating to pressure levels).

L69: I got confused by these two timescales. Initially I thought that UTC$_{Sat}$ was the actual time whereas UTC$_{No}$ was an adjusted time to take account of the 1.5 hr time displacement in the hindcast such that e.g. 0000 UTC$_{No}$ would actually be 0130 UTC in the run. From the caption of Fig 5 I worked out that both times are the "actual" times, but that UTC$_{No}$ indicates the time in the lagging hindcast run. It might be easier to remove this notation but instead just note the times corresponding to the same stage of the evolution in the hindcast run where required. Relating to this point, how does the timing of the evolution in the WRF control simulation match to the satellite inferred development, is it better than that in the NORA10 hindcast? If so, do you have any idea why? The warm air seclusion is not as warm in the WRF control run as in the NORA10 hindcast, is this important?

L127: Presumably the main reason that the absolute wind is weaker along the developing bent-back front than along the cold front is because it is in the opposite direction to the motion of the cyclone i.e. although the earth-relative winds are weak, the cyclone-relative winds would be stronger.

Fig 5: What is the meaning of the blue spots in panels (a) and (c)?

L187: Do you mean to refer to Fig. e,f rather than d,e? The low-level jet associated with the bent-back front is a long way from the coast in panel d.

L196: It would be helpful to mark the regions of descent (Fig 4f) and patchy up and down drafts (fig 4e) in the corresponding figs. Note that difference in the vertical motion dynamics referred to in the text is only really clear in panels e,f and not also at the later time shown in panels g,h.

L207: Move shorthand terminology for the runs to section 2.1 as the terminology is first used there (L89: "in the Ocean simulation").

L211: Which bit of the warm sector are you referring to when you mention the "on going occlusion process"? Is it the weak filament of warm air over Scandinavia in Fig 7a which isn't there in Fig 2h, so indicating a slower occlusion process in the Ocean simulation?

L215: You say that the detected bent-back front extends further around the warm air seclusion in the Ocean simulation. Which run are you comparing with here though, the control run or that with Double orography? The extent of the bent-back front on the northern side of the seclusion is greatest in the control run (Fig 2h).

Fig 7 caption I think you mean "as Fig 2h" as both panels show results from the WRF runs (whereas Fig 2g is for the NORA10 hindcast).

L244: Can you provide some extra information to help me locate where you mean by "the cold sector"?

L258: Given that air is pretty much incompressible is it really surprising that the ascent and mass transport that occurs as the flow impinges on the orography is pretty much instantaneously seen at all levels (including the weak ascent at 500 hPa)?

Fig 11: Please clarify in the text whether the maps in the right hand column are θ_e differences (as they appear to be from comparison with the left hand column plots) or wind speed (as in Fig 10 which Fig 11 is supposed to mirror in structure).

L291: Please add some detail about how the trajectories were calculated. From Fig 12d I think the trajectories all run to 18 UTC and are started at 0, 3 and 6 UTC. But each panel seems to have 4 sets of circle markings along the trajectories—what times are these at? The caption refers to 3 hour trajectory segments so does e.g., Fig 12a just show the trajectories from 0 to 9 UTC? The caption states that the trajectories are coloured by the pressure of the preceding timestep—does this mean that the colour of the first segment of the trajectories in panel a relates to the pressure of these trajectories at 0 UTC? Why are the pressures then all negative in the colour bar under panel c? Finally, why are the last set of circle markers along the trajectories red whereas the other ones seem to match the colour of the trajectory segments?

Technical errors:

L23: Change “have” to “have had”.

L27: Change “by to the” to “by the”.

L71: Add “of” before “10 km”.

L137: Change “long” to “along”.

L170: Change “front” to “fronts”.

L197: Change “well compared” to “compared well”.

L202: Change to either “a clear orographic influence” or “clear orographic influences”.

L224: Add “the” before “somewhat”.

L233: I think you mean “sector” rather than “section” here.

L300 and L301: Change “begin” to “beginning”.

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