

Interactive comment on “Sensitivity of free tropospheric carbon monoxide to atmospheric weather states and their persistency: an observational assessment over the Nordic countries” by M. A. Thomas and A. Devasthale

Anonymous Referee #1

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In their manuscript they relate a climatology of 11 years CO concentration from satellite observations to weather patterns classified by utilization of ERA-Interim horizontal winds. The conclusion is that some weather patterns can be strongly correlated with certain spatial CO distribution. Anomalies are used to show this relation. I miss in the study information on mean concentration and information how they would vary over the course of the 11 years and during the season to get information on how significant the anomalies are. After adding more on seasonality and variation over the years, as well as a better method description I would recommend this paper for publication in ACP.

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Main comments:

You consider CO and wind speed in one layer only, it would be interesting to know how this is related e.g. to CO surface concentrations or the total CO column. Maybe some surface measurements or discussion on the influence can be added to this analysis.

What about trends, did CO change on a global mean over the 11 years period? It would be interesting to have some mean CO plots to get a better impression on how important the anomalies are. But not only seeing changes of the 11 years but also during the seasons would be interesting.

NAO shows the highest correlation with pollutants in winter/spring. How stable are your results during summer? It would be good to have some description of the temporal evolution of the NAO over this 11 years.

If I would need to sort Fig 2c NAO-EP into Fig1, I would think it would correspond to Fig 1c, even though the CO anomalies in Fig 5 (SE, P3) and Fig 7 (P3, EP) look very different, why is this the case?

What is the conclusion from the temperature and water vapor anomalous, they are highly correlated, is it necessary to show both? (Fig 3)

Fig 5 shows anomalies depending on persistence periods, the lowest row looks very patchy, how many CO images where used for those?

Often satellite retrievals cannot be performed because of the presence of clouds (you say you omitted when cloud cover was about 30%), are there regions for the respective weather pattern where clouds are abundant? What impact would that have?

Fig 8: it would be better to show a box plot, including mean and percentile instead of an average percentage.

I would find it useful if the satellite retrievals as well as the grouping algorithm of the windfields would be described in more detail. E.g. could all fields be classified? How

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frequent were satellite observations for certain regions/times?

Minor/technical comments:

The figure caption need some better description: Fig 1, units of contours, how to interpret the length of the arrows. It says 10, maybe explain for the reader that there is an arrow which represents the wind speed of 10 xx.

Fig 4: describe in the caption what a,b,c shows

p 9256 line 2 and line 17 - the coordinates of the study area do not match

p 9253 line 4 and p 9252 line 14 - I noticed that some abbreviations are inconsistent e.g. N. America and North America

p 9254 line 12 - a reference to IASI could be given

p 9257 line 21 - MSLP was already used at 9256 line 21, define there

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 9249, 2014.