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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Critical assessment of meteorological conditions and airflow connectivity during HCCT-2010" *by* A. Tilgner et al.

Anonymous Referee #1

Received and published: 28 February 2014

Tilgner et al. evaluate the meteorological conditions and flow connectivity with respect to a Lagrangian-type experimental approach during the Hill Cap Cloud Thuringia 2010 experiment (HCCT-2010). They calculate coefficients of divergence and cross correlation coefficients of ozone and aerosol time series at different sites, the Froude and Richardson numbers from rawinsonde data, and they characterize the overall meteorological conditions using in-situ data, ceilometer data, satellite images, backward trajectories and weather charts. In addition, they present results of four SF6 tracer experiments to validate their procedure of identifying appropriate conditions for a Lagrangian-type approach. Overall, this manuscript will be helpful for researchers investigating the HCCT-2010 data set in further studies. However, I strongly encourage the authors to take into account the following specific comments, and to carefully edit the manuscript

for language in a revised version.

Specific comments

1) When calculating the COD to analyze the relative spatial variability and using a cross correlation analysis to evaluate the time lag between measurement stations, it seems inconsistent not to take into account the time lags for the COD calculation. Even more, this seems mandatory if the desired experimental approach is of a Lagrangian-type, i.e. following an air mass from one site to the next. Also, Equation 1 must be corrected ("+" instead of "-" in the denominator).

2) The cross-correlation analysis was only performed for ozone – why not for the well-defined aerosol size bins N_49nm and N_217nm?

3) Ozone measurements by UV absorption, e.g. using a TE49C analyzer, were shown to be influenced by potentially large water vapor interferences (cf. Wilson, K.L. and Birks, J.W. (2006) Mechanism and elimination of a water vapor interference in the measurement of ozone by UV absorbance. Environmental Science & Technology, 40, 6361-6367). Did you dry the sample air before measuring ozone at the three stations?

4) The ozone time series at the Goldlauter station (red line in Fig. 4) obviously exhibits a strong diurnal cycle during extended periods (e.g. 18 – 25 September). This may indicate a local impact on ozone measurements, e.g. NOx from nearby traffic, which makes a direct comparison of the ozone measurements at the Goldlauter station and the other stations difficult. Thus, the corresponding COD values are not necessarily indicative of local flow connectivity. Please discuss in a revised manuscript!

5) When calculating the Froude number, how representative is an effective mountain height of 484 m, which is apparently the change in altitude between the Meiningen station and the Mt. Schmücke station?

6) Figure 4 clearly shows that wind speed and direction at the Goldlauter station deviate from the summit and Gehlberg stations. I found a brief hint in section 3.4 that the

Goldlauter station is located in a rather narrow valley. This should already be mentioned and discussed in the corresponding text of Figure 4.

7) Figure 5 (right) is discussed as an example of a cloud period but I cannot identify a cloud event on 14/15 October in Figure 4. Please clarify!

8) Please indicate the source of the land use data shown in Figure 7!

9) It is difficult to find the location of the measuring site in Figures 8 and 9. Please clearly indicate the measuring location and add more information about the show satellite images (e.g. IR or VIS?) to the figure captions.

Technical comments

Please carefully edit the text for language. I found many parts of the manuscript cumbersome to read. The following list of technical corrections is not complete:

p.1862/19: “Comprehensive analyses” instead of “A comprehensive analyses”

p.1863/1: “approximately” instead of “approx.”

p.1867/4-7: I don’t understand this sentence, please rephrase!

p.1867/7: Remove “aimed” twice!

p.1868/5: “slope of the Thuringian Forest”

p.1868/15-16: Rephrase the last sentence of this section!

p.1869/7: Correct Eq. 1!

p.1869/25: What do you mean by “floating 3h time span”?

p.1870/18-19: What do you mean by “trace gas concentration profile analyses”?

p.1871/18: What do you mean by “concentration profiles”?

p.1871/19: “was” instead of “were”

p.1872/24: Delete “Performed”!

p.1873/1: What do you mean by “gravity waves initiate to amplify”?

p.1873/16: Explain all variables used in Eq. 4!

p.1874/17: “in Heinold et al. (2005)” instead of “in (Heinold et al., 2005)

p.1874/19: Delete “ca.”!

p.1875/7: “presence of orographic” instead of “presence orographic”

p.1875/8: Delete “occurred”!

p.1875/14-15: Revise sentence!

p.1876/10-14: Verb is missing in sentence!

p.1876/16: “with both a” instead of “with a both”

p.1877/7-8: For clarity, I suggest “...by frontal passages and variable weather conditions.”

p.1877/24-28: Please rephrase!

p.1878/16: “caused” instead of “cause”

p.1878/24: “Wind direction changed” instead of “Wind direction has changed”

p.1879/13: Remove “good”!

p.1879/15 and afterwards: Replace “congruencies” by “agreement”!

p.1880/4: Rephrase “period is with about 0.11 smaller than”!

p.1880/22: Remove “hence”!

p.1880/24: Replace “than” by “as”!

p.1882/1: Replace “differ” by “distinguish”!

p.1882/4-5: Rephrase sentence!

p.1883, section 3.2.3: Carefully revise language of section 3.2.3!

p.1885/20: Rephrase “between the upwind and the two seems...”!

p.1886/3: Remove “on”!

p.1886/27: Remove “to”!

p.1887/4-5: Rephrase sentence!

p.1888/13: “Arctic circle” instead of “Arctic cycle”

p.1888/13 and afterwards: “unstable” instead of “labile”

p.1890/13: What do you mean by “overall adequate conditions”?

p.1891/13 and afterwards: “lay” instead of “lied”

p.1892/10: Remove “by both”!

p.1893/1: Remove “by both”!

p.1893/26: Remove “cannot”!

p.1893/28: “was” instead of “were”

p.1894/24: I cannot find a site 31 in Figure 10; please correct!

p.1895/1: “that this was” instead of “that is was”

p.1895/8: Remove “official”!

p.1896/14 and afterwards: “pros and cons” is colloquial language.

p.1896/18: Revise sentence!

p.1896/22-23: I don’t understand the part starting from “...it is noted that the disadvantages...”.

p.1896/24: Remove “aimed”!

p.1897/15: “in an objective” instead of “in a objective”

p.1897/17: “was” instead of “were”

p.1897/23-24: Remove sentence “An overall evaluation...”!

p.1897/27: “approximately” instead of “approx.”

p.1897/28: “about two thirds by clouds associated to” instead of “about two third by clouds occurring associated to”

p.1898/6: Remove “required”!

p.1898/7: Remove “relatively”!

p.1902/Table 1: Add “(TE)” at end of table caption!

p.1904/Table 3: Please clarify in table caption if RR is total precipitation amount or mean precipitation during indicated period!

p.1905/Table 4: “unstable” instead of “labile”

p.1910/Figure 3: For clarity, label top and bottom panels as Fig. 3a and 3b!

p.1912/Figure 4: For clarity, label left and right panels as Fig. 5a and 5b!

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 1861, 2014.