Review on:
Critical assessment of meteorological conditions and flow connectivity during HCCT-2010, by A. Tilgner et al.

The present paper gives an extensive description of the meteorological conditions prevailing during a field experiment performed at Mount Schmucke, Germany during September and October 2010. Also a larger scale analysis of the air mass origin prevailing at the observational sites by means of back-trajectories is given.

In addition the paper wants to document the flow connectivity between upwind, summit and downwind sites of the experimental place as the field experiments aim probably at further studies on atmospheric chemistry and physics in capped clouds. The study on flow connectivity uses non-dimensional numbers for atmospheric stability, gas and aerosol observations as well as tracer experiments.

Thus, a main focus of the paper is to provide information on the periods when so-called full cloud events with connected flow conditions occurred.

The volume of the paper, with about 50 pages and the on-line material of 100 pages, is very important and reflects a considerable work. However, real scientific findings or conclusions cannot be identified.
The paper doesn't explain its utility or importance for other following studies of HCCT-2010 or give references to papers already accepted or at least submitted which use or will use the presented results and analyses.
It is obvious that the paper wants to confirm the "Lagrangian type approach" of the hill cloud experiment. But is flow connectivity (as discussed in this paper) a sufficient criterion to justify that the same air parcel travels along the 3 observational sites? For such applications a quantitative analysis of flow connectivity is needed but not a qualitative evaluation as it is done in the paper.
The given tracer experiments of this study are an excellent quantitative measure. TE3 (Fig.10b) is evaluated as one of 14 Full Cloud Events with *connected flow* conditions (Tab. 5). But the absent tracer concentrations at the downhill site contradict the statement that air parcels travel from the summit to the downhill location. Thus Lagrangian conditions are not met although the selected criteria of airflow connectivity are fulfilled.

The title informs that the paper deals with the "critical" assessment of the atmospheric conditions, but nowhere in the paper a critical discussion or conclusion can be detected; it is just a lengthy listing of observational results and of meteorological conditions prevailing during the field campaign.

More detailed remarks:

The presentation of the flow analysis is inaccurate and not very profound. Richardson and Froude number are calculated from soundings 30 km southwest from the experiment location. The terrain is quite complex as illustrated by ***my attached Fig.1***. Why should wind speed, wind shear and stratification all be conserved during the flow from Meiningen (located in center of ***Fig.1***) to Goldlauter and Schmucke?
Fig. 2 of the paper shows a 'geographical map' with the different observational sites but gives no idea on the real topographical conditions for the airflow. NASA SRTM data with a 90

m resolution allow today for all (as free access) to reconstruct a 3D image of topography (see ***my Fig.2*** attached). This figure illustrates the complexity of the terrain up and downwind of Schmucke. Surprisingly, downwind of the summit two valleys begin uphill of the Gehlberg station what suggests that dominant parts of the downhill flow will escape along these two valleys.
As the FCE events are typically coupled with strong winds on the summit it is also most likely that a downdraft occurs behind the summit or mountain ridge causing the mixing with air from higher levels (from 300-400 m above the summit). Thus, it is not surprising that SF6 was not or only slightly detectable on the downslope station.
Very high resolved numerical modeling would be basically needed to understand the local transport phenomena and their consequences for the different measuring sites.

Another method for flow analysis in this paper is the comparison of the concentration of O_3 or $N_{aerosol}$ (49nm) between upwind, summit and downwind site. Non-connected air masses are identified when the concentrations between the three sites deviate and thus COD values are elevated. But no explanation is given on physical or chemical processes causing differences in O_3 or $N_{aerosol}$ concentration on scales of 3 km, which would clarify why the airflow does not cross the mountain ridge! Low CODs certainly support the idea of overflowing air but do not prove the connectivity of the observational sites.

In summary, the flow analysis is definitely not *comprehensive* as emphasized in the paper. It restricts to wind and temperature conditions in the mesoscale environment, and to O_3 and 50 nm particle concentrations on the very local scale. Discussion of flow characteristics prevailing over the experimental site, appropriate to the topographical conditions with varying mesoscale conditions are entirely missing.

I considered this paper as an extended documentation of observations but their interpretation is left in most parts up to the reader, or to other (further) studies focusing on the same experiment.

Actually this study has not the elements for a stand alone paper. Its individual results could be better incorporated into papers dealing with the same field experiment but with well identified objectives and results.

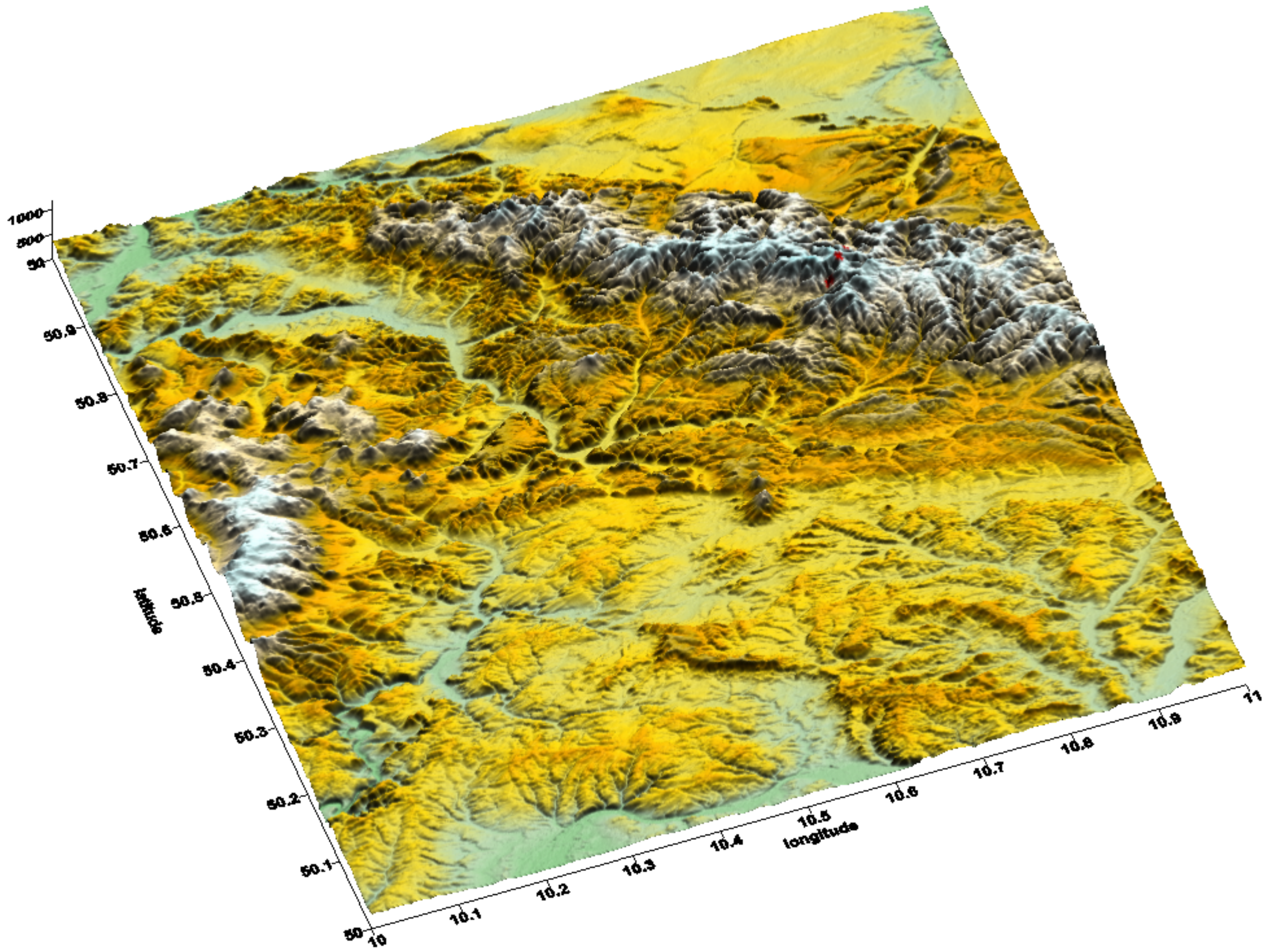
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Fig. 1

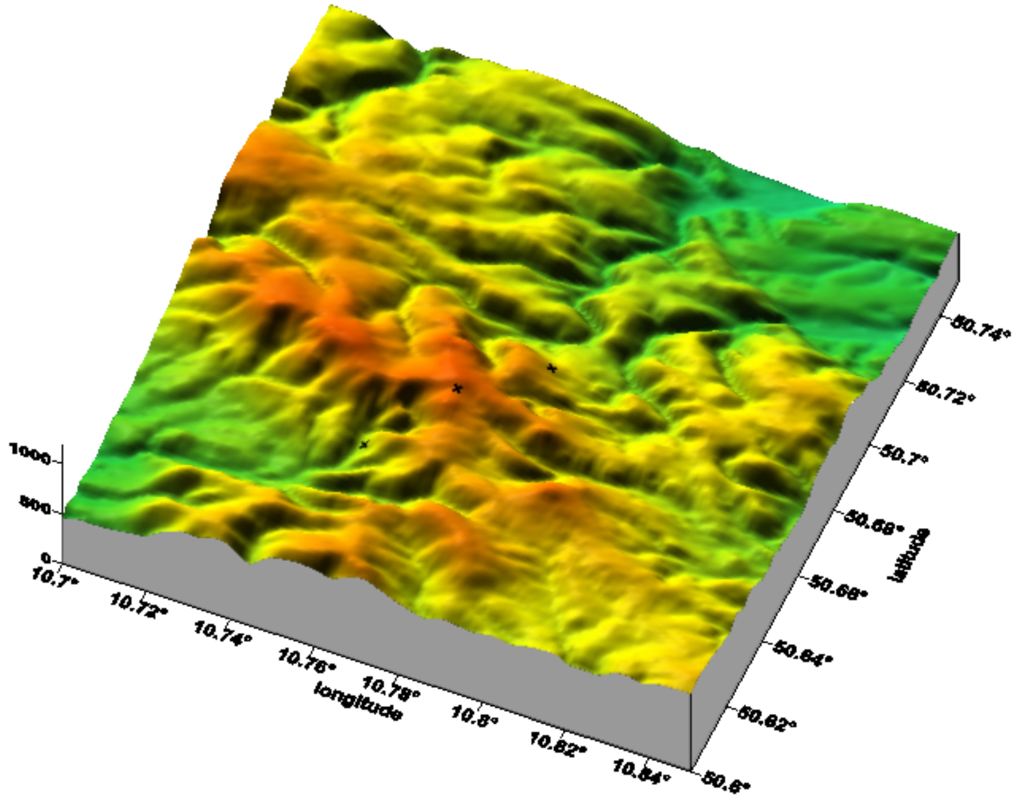
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Fig.2