

Guide to Excel sheets for MUST experiment

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Introduction

The COST action 732 on *Quality Assurance and Improvement of Micro-Scale Meteorological Models* has fostered a comprehensive modelling exercise. More than a dozen different research groups have modelled the MUST (Mock Urban Setting Test) experiment, as simulated in a wind tunnel. The experimental data allow the study of flow as well as of dispersion.

Tools in the form of Excel workbooks have been developed to perform exploratory analyses of model performance and present results graphically, while also allowing for computation of metrics.

The present document is a guide to the use of these tools.

Another document - at present available only within the COST community, and in a preliminary version ('Working document on the MUST wind tunnel exercise' from December 2007) - presents results and gives further explanations.

The present document is a guide to the use of Excel tools

The essentials concerning the use of the *Full workbooks* are briefly explained in the workbooks themselves. There is an explanation in each workbook on the sheet 'Explanation'. The present document is of use if you feel a need for a more comprehensive explanation, or if you wish to obtain an overview of available material.

The following chapters present figures taken from the Excel sheets, showing the layout of measurements and some very few examples of the graphs that can be produced. At the end of the document there is an FAQ.

Overview of workbooks

The main group of Excel files is a set of files that allows *easy graphical inspection of the details of every case for all of the models* (here called: **the Full workbooks**). These files are very large. The largest (with results of dispersion modelling) has a size of more than 100 MB. The workbooks allow computation of metrics.

Based on these 'full workbooks', another group of Excel workbooks have been derived, containing essential information extracted from the full workbooks. These are called the '**Saved-metrics' workbooks**. They are smaller in size than the 'Full workbooks'.

The Full workbooks are:

- A workbook for the 0 degree case, where flow results from a large number of models are collected (an example of the name of this workbook is **UVWtke_0degree_11june.xls** – the date when the workbook was last modified is included in the name).
- A workbook for the -45 degree case, where flow results from several models are collected (an example of the name of this workbook is **UVWtke_45degree_11june.xls**).
- Two workbooks for the -45 degree case, where concentration results from several models are collected. The amount of data is huge, so one workbook is devoted to results from CFD models, while another is devoted to results from non-CFD models. (examples of the names are **Dispersion_45degree_11June.xls** and **Dispersion_nonCFD_7Mar08.xls**).

For each of the above workbooks, there is one or two workbooks with Saved Metrics, such as SavedMetrics_ **Dispersion_45degree_26May.xls**. As of May 26, 2008, there are four Saved-Metrics workbooks. Table 1 on page 14 gives an overview.

A set of additional workbooks exist: workbooks for submission of data to the person who collects results. It is convenient to submit data with these special workbooks, because they are more manageable in size than the Full workbooks.

Model results for inclusion in the workbooks should be submitted to Ruwim Berkowicz (ruwim@brnet.dk). The sheets were developed by Ruwim Berkowicz, and the present documentation is maintained by Helge R. Olesen (hro@dmu.dk).

Where to download the workbooks

A 'limited edition' of the Full workbooks is available on the public web site <http://www.dmu.dk/International/Air/Models/Background/MUST>

'Full workbooks': allow easy graphical inspection of details

'Saved-metrics' workbooks contain metrics and graphical summaries.

Names of Full workbooks

Names of Saved-Metrics workbooks

Workbooks for submitting results

A 'limited edition' with public access

Material available to COST
732 participants

This 'limited edition' includes only results from a small number of models. The web site gives access to other relevant information, such as workbooks for submitting results and the present document.

A 'full edition' of the Excel workbooks is available for COST 732 participants. COST participants can find the relevant web address if they visit the internal COST 732 web site: <http://www.mi.uni-hamburg.de/Internal-Documents.467.0.html>. Alternatively, they can find the address and some explanation at the COST 732 Google Groups site (<http://groups.google.com/group/cost732/web/excel-workbooks-with-results?hl=en>).

Getting started with the workbooks

The graphs in the workbooks only work as intended if you allow macros to be executed. The procedure for this is explained in the sheet *Explanation of each workbook*.

In the same sheet you will also find an explanation on how to get started with using the workbooks.

The 'Full workbooks' are very large: 10-120 MB for each workbook.

Adding your own data

If you wish to add your own model results to a workbook you should follow the instructions in the sheet *Models_Cases*. However, if you wish to submit model results, so they can be included in the common files, you should not use the full workbook for this purpose. Instead, download the file *MUST_NewData.zip* from one of the web sites (the public, URL 1, or the internal, URL 2), unzip it, and use the relevant workbook to add your data. The sheet *Models_Cases* briefly explains how to add your own data. You must adhere to the instructions given there (follow the sheet naming conventions, don't change the column headings in the sheets where you place your data, etc.).

Basic information on coordinate system etc

Concerning coordinate systems, note that the release point for the -45 degree case is sometimes referred to as Point 29. In the *model coordinate system* (axes aligned with buildings) this has coordinates - 77.46 m, 67.46 m.

In the *wind tunnel coordinate system* (x axis parallel to the incoming wind flow) it has coordinates -102.48 m, -7.06 m. The coordinate system used for the two 45 degree worksheets is the wind tunnel coordinate system.

The following chapters present figures taken from the Excel sheets, showing the layout of measurements etc. At the end there is an FAQ.

0 degree sheet, flow

The 0 degree sheet is called *UVWtke_0degree_11june.xls* (or a different date).

Vertical profiles, 0 degree

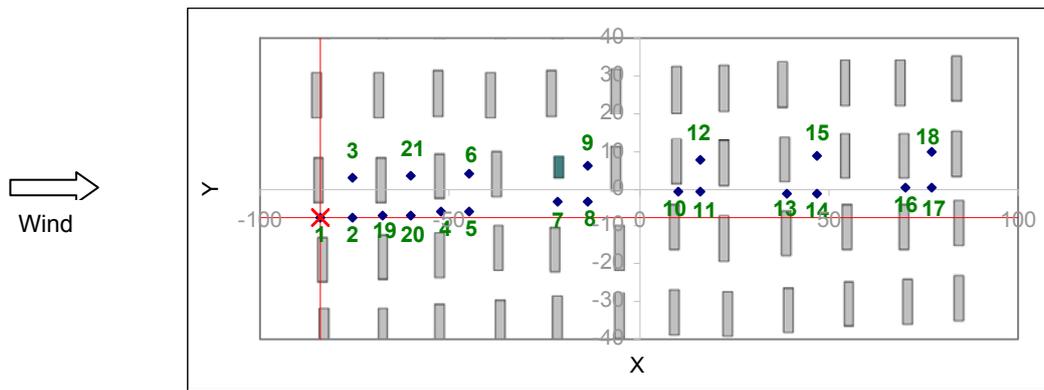


Figure 1 Layout of measurements for the 0 degree case. The vertical profiles of wind components etc. are measured at the locations shown. The numbering of measuring positions is based on the sequence of numbers in the original data set. In the illustration above, the red lines cross at position 1 (also referred to as T-01).

Modellers were requested to submit model results for vertical profiles at the 21 cases illustrated in Figure 1 and Figure 2.

zCases	x in m	y in m
T-01	-83.925	-7.575
T-02	-75.825	-7.575
T-03	-75.825	2.85
T-19	-67.425	-7.125
T-20	-60.075	-7.125
T-21	-60.075	3.375
T-04	-52.425	-6.3
T-05	-44.925	-6.3
T-06	-44.925	4.05
T-07	-21.3	-3.375
T-08	-13.275	-3.375
T-09	-13.275	6.075
T-10	10.2	-0.75
T-11	16.425	-0.75
T-12	16.425	7.575
T-13	38.775	-1.125
T-14	46.725	-1.125
T-15	46.725	8.7
T-16	70.2	0.075
T-17	77.175	0.075
T-18	77.175	9.675

Figure 2 Coordinates of the 21 cases for the vertical profiles (0 degree case).

A sample sheet with modelled data is shown below.

	A	B	C	D	E	F	G	H
1	Case	Xcell	Ycell	Zcell	u/Uref	w/Uref	ww/Uref	tke/Uref2
2	T-01	-84.3	-7.5	0.25	0.54305	0.00553	0.008226	0.023221
3	T-01	-84.3	-7.5	0.75	0.671657	0.004475	0.022266	0.012862
4	T-01	-84.3	-7.5	1.25	0.741635	0.006905	0.031442	0.01298
5	T-01	-84.3	-7.5	1.75	0.78991	0.008555	0.036773	0.013888
6	T-01	-84.3	-7.5	2.25	0.827739	0.009175	0.039964	0.014582
7	T-01	-84.3	-7.5	2.75	0.859057	0.009076	0.042011	0.015024
8	T-01	-84.3	-7.5	3.25	0.885647	0.008569	0.043439	0.015285
9	T-01	-84.3	-7.5	3.75	0.908579	0.007892	0.044508	0.015429
10	T-01	-84.3	-7.5	4.25	0.928622	0.007196	0.045329	0.015501
11	T-01	-84.3	-7.5	4.75	0.946372	0.006561	0.045942	0.015529
12	T-01	-84.3	-7.5	5.3	0.963867	0.005962	0.046384	0.015528
13	T-01	-84.3	-7.5	5.96	0.982182	0.00539	0.046625	0.015503
14	T-01	-84.3	-7.5	6.75	1.001228	0.004878	0.046541	0.015462
15	T-01	-84.3	-7.5	7.7	1.021152	0.004438	0.045999	0.015413
16	T-01	-84.3	-7.5	8.84	1.041957	0.004064	0.04489	0.015362
17	T-01	-84.3	-7.5	10.005	1.063744	0.003720	0.043457	0.015310

Figure 3 Sample sheet with vertical profile data (MISKAM_Ketzel_z). Note that the vertical resolution is higher than the 30 measurement points available for this tower, so a complete modelled profile can be compared to measurements.

Horizontal cross-section, 0 degree

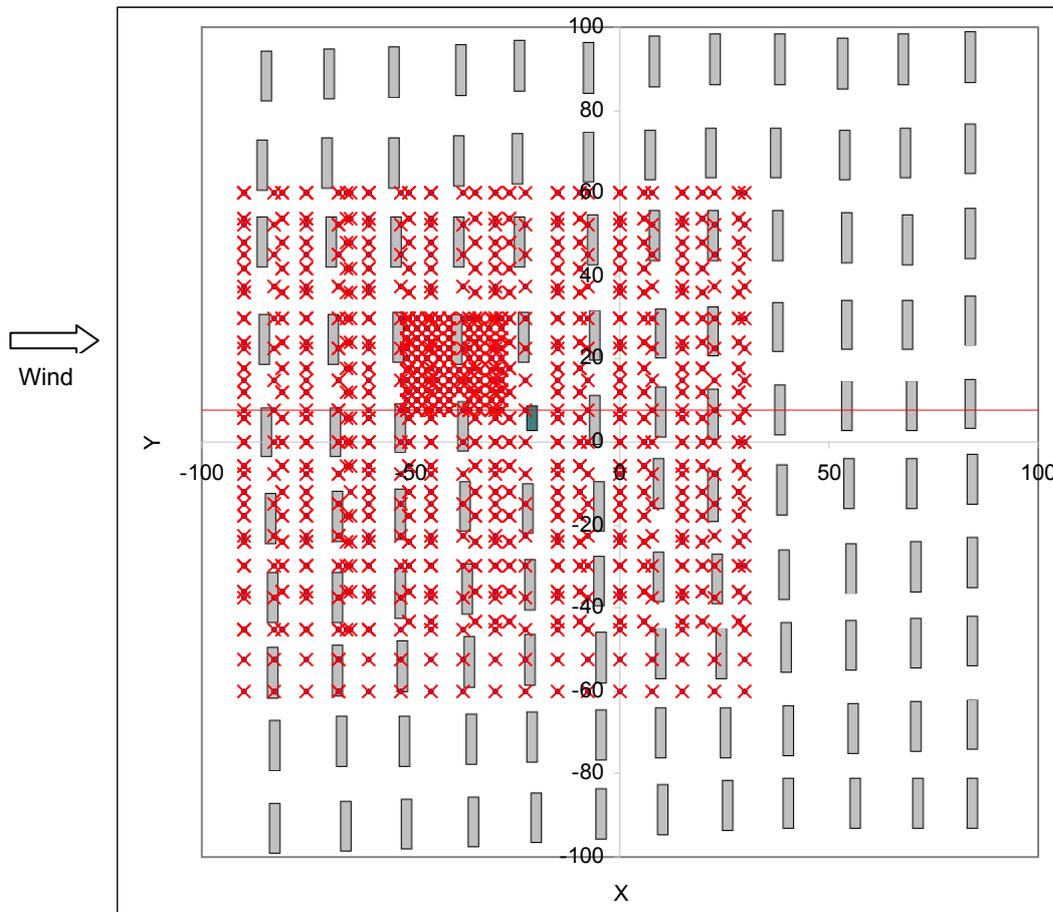


Figure 4 Layout of measurements for the 0 degree case in a horizontal plane. The red line on the figure indicates case B-1, B-2, and B-3.

Modellers were asked to provide results along two lines parallel to the x axis, each in three heights (cases A-1, A-2, A-3, B-1, B-2 and B-3). Some modellers have added additional cases. Thus, if you browse through the cases, there are many cases for which most models do not show results.

	C	D	E
xCases	y in m	z in m	
A-1		0	1.275
A-2		0	2.55
A-3		0	5.1
B-1		6	1.275
B-2		6	2.55
B-3		7.5	5.1

Figure 5 The 6 cases for which data were requested. 0 degree case, horizontal plane.

-45 degree sheet, flow

The -45 degree sheet for flow parameters is called UVWtke_45degree_11june.xls (or a different date).

The first version of the sheet includes only MISKAM results.

Vertical profiles, -45 degrees flow

The coordinate system and the vertical profile cases for the 45 degree sheet for flow parameters is illustrated in Figure 6 and Figure 7.

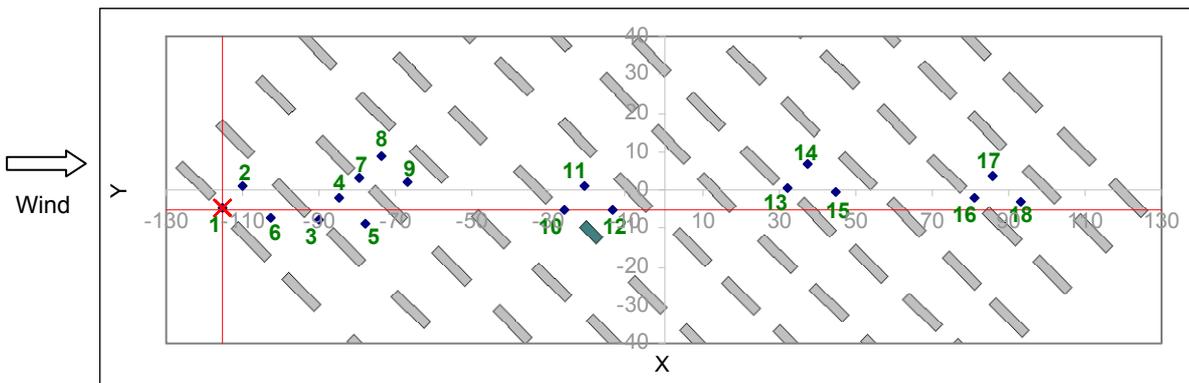


Figure 6 Layout of measurements for the -45 degree case. The vertical profiles of wind components etc. are measured at the locations shown. The numbers indicate measurement positions T-01 to T-18. They have no relation to positions with the same name in the 0 degree sheet. The numbering sequence corresponds to the order of the data in the original data set. As an example, T-01 has coordinates (-115.35m, -4.875m). The coordinates refer to the wind tunnel coordinate system.

zCases	x in m	y in m
T-01	-115.35	-4.875
T-02	-109.95	0.825
T-06	-102.525	-7.125
T-03	-90.3	-7.725
T-04	-84.825	-2.25
T-07	-79.425	3.15
T-05	-77.925	-8.775
T-08	-73.95	8.625
T-09	-66.975	1.875
T-10	-25.875	-5.25
T-11	-20.775	0.975
T-12	-13.65	-5.1
T-13	32.25	0.375
T-14	37.5	6.525
T-15	44.775	-0.3
T-16	80.925	-1.95
T-17	86.1	3.675
T-18	93.375	-3.375

Figure 7 Coordinates of the 18 cases for the vertical profiles (-45 degree case). Wind tunnel coordinates.

	A	B	C	D	E	F	G	H
1	Case	Xcell	Ycell	Zcell	u/Uref	w/Uref	w/Uref	tke/Uref
2	T-01	-115.258	-5.3033	0.25	0.335622	0.021828	0.006739	0.008906
3	T-01	-115.258	-5.3033	0.75	0.421192	0.004225	0.019372	0.014196
4	T-01	-115.258	-5.3033	1.25	0.476822	0.000995	0.030245	0.018008
5	T-01	-115.258	-5.3033	1.75	0.528944	0.002535	0.039497	0.020284
6	T-01	-115.258	-5.3033	2.25	0.58612	0.005737	0.047646	0.021108
7	T-01	-115.258	-5.3033	2.75	0.654937	0.009042	0.055725	0.020214
8	T-01	-115.258	-5.3033	3.25	0.723842	0.016042	0.062947	0.018964
9	T-01	-115.258	-5.3033	3.75	0.781166	0.023858	0.067145	0.018014
10	T-01	-115.258	-5.3033	4.25	0.826708	0.029397	0.068112	0.017404
11	T-01	-115.258	-5.3033	4.75	0.863165	0.032158	0.066897	0.017007
12	T-01	-115.258	-5.3033	5.3	0.895879	0.032881	0.064206	0.016695
13	T-01	-115.258	-5.3033	5.96	0.926783	0.031852	0.060321	0.016411
14	T-01	-115.258	-5.3033	6.75	0.956028	0.029521	0.05563	0.016149
15	T-01	-115.258	-5.3033	7.7	0.984158	0.026387	0.050505	0.015909
16	T-01	-115.258	-5.3033	8.84	1.011462	0.022911	0.045309	0.015698

Figure 8 Sample sheet with model results for vertical profile data (MISKAM_Ketzel_z).

Horizontal cross-section, -45 degrees flow

Modellers can provide model results corresponding to 'xCases'. Each 'xCase' refers to a line parallel to the x axis. The various flow parameters (u, v, w and a measure for TKE), as modelled and as measured, are compared along these lines.

There are 51 xCases: 3 levels at 17 y values. They are denoted A_1, A_2, A_3, B_1, ... , Q_3.

C	D	E
xCases	y in m	z in m
A_1	-60.00	1.275
A_2	-60.00	2.55
A_3	-60.00	5.1
B_1	-52.50	1.275
B_2	-52.50	2.55
B_3	-52.50	5.1
C_1	-45.00	1.275
C_2	-45.00	2.55
C_3	-45.00	5.1
D_1	-37.50	1.275
D_2	-37.50	2.55
D_3	-37.50	5.1
E_1	-30.00	1.275

Figure 9 Data from the sheet **Models_Cases**, listing cases and positions (wind tunnel coordinates).

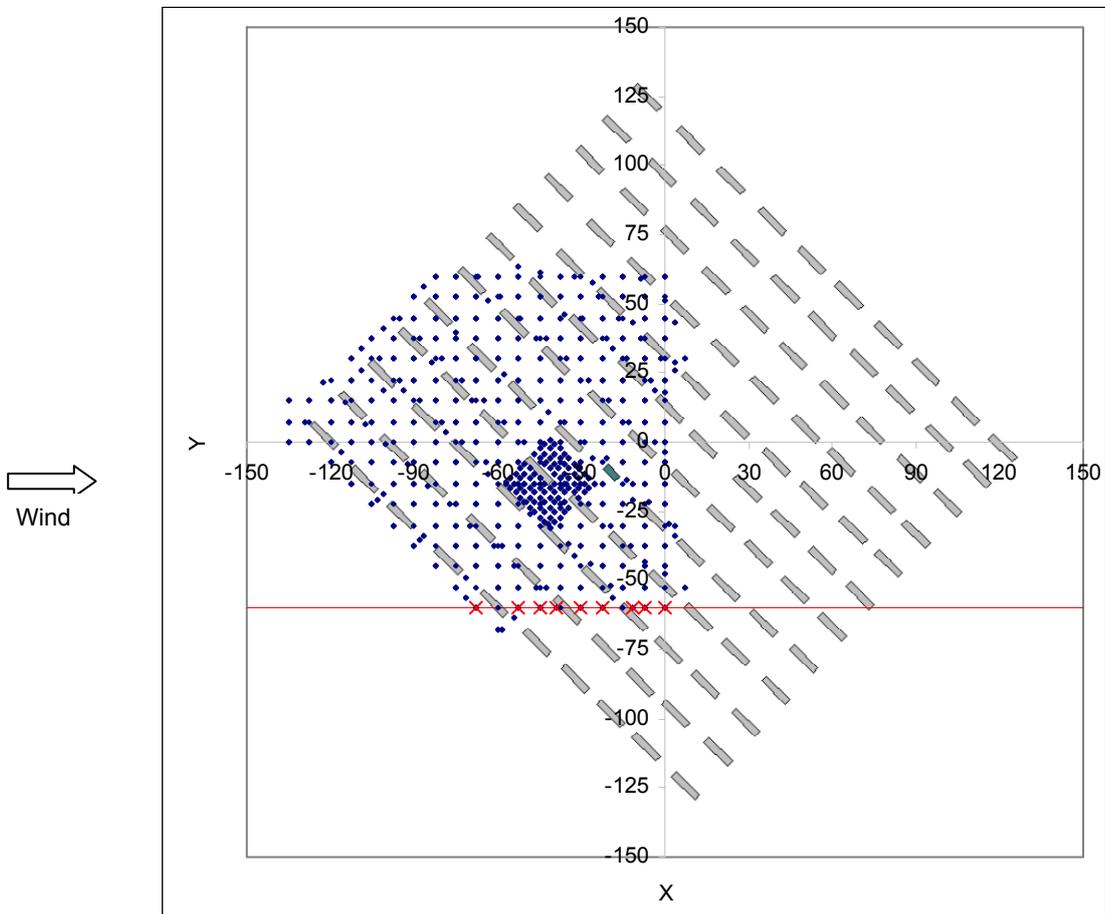


Figure 10 Layout of measurements for the -45 degree case in a horizontal plane. The red line indicates case A.

A	B	C	D	E	F	G	H
Case	Xcell	Ycell	Zcell	u/Uref	w/Uref	w/Uref	tke/Uref
A_1	-137.71	-59.93	1.25	0.696297	-0.00194	0.000259	0.015692
A_1	-134.88	-59.93	1.25	0.695987	-0.00247	0.0003	0.015686
A_1	-132.05	-59.93	1.25	0.695625	-0.00307	0.000343	0.015679
A_1	-129.22	-59.93	1.25	0.69521	-0.00373	0.00039	0.015671
A_1	-126.40	-59.93	1.25	0.694739	-0.00445	0.00044	0.015663
A_1	-123.57	-59.93	1.25	0.694207	-0.00524	0.000496	0.015653
A_1	-120.74	-59.93	1.25	0.693608	-0.0061	0.000557	0.015642
A_1	-117.91	-59.93	1.25	0.692935	-0.00703	0.000626	0.01563
A_1	-115.08	-59.93	1.25	0.692173	-0.00802	0.000704	0.015617
A_1	-112.25	-59.93	1.25	0.691309	-0.00909	0.000792	0.015602
A_1	-109.42	-59.93	1.25	0.690319	-0.01024	0.000893	0.015585
A_1	-106.60	-59.93	1.25	0.689175	-0.01148	0.001012	0.015566
A_1	-103.77	-59.93	1.25	0.68784	-0.01282	0.001152	0.015544
A_1	-100.94	-59.93	1.25	0.686266	-0.0143	0.001323	0.015521
A_1	-98.15	-59.96	1.25	0.684466	-0.01593	0.001511	0.015495
A_1	-95.35	-60.00	1.25	0.682311	-0.01778	0.001774	0.015465
A_1	-92.52	-60.00	1.25	0.679708	-0.02	0.002108	0.015429
A_1	-89.70	-60.00	1.25	0.676672	-0.02261	0.002547	0.015386
A_1	-86.90	-60.03	1.25	0.673325	-0.0255	0.003082	0.015335
A_1	-84.53	-60.70	1.25	0.669598	-0.02858	0.003737	0.015274

Figure 11 Sample sheet with model results for the 'xCases' with lines parallel to the x axis (MISKAM_Ketzel_x).

-45 degree concentration sheet

The -45 degree sheet for concentration data is called Dispersion_45degree_xxx.xls (xxx refers to the date).

Note that the release height of the source is 0 meters, while concentrations are measured at a height of 1.275 m.

In the -45 degree concentration sheet, the concept of 'cases' is not used. Instead, the key parameter is distance from the source to a line parallel to the Y axis. Modellers can supply data with a density of their own choice, preferably with an interval of 0.5 m and up to a distance of at least 185m. However, Excel has a limitation on the size of worksheets, implying that the number of data records in this sheet should be below 64000. Very likely, this means that you cannot include data from all model grid cells in the Excel sheet.

Figure 12 shows the layout of the measurement positions, side-by-side with a crosswind profile of concentrations.

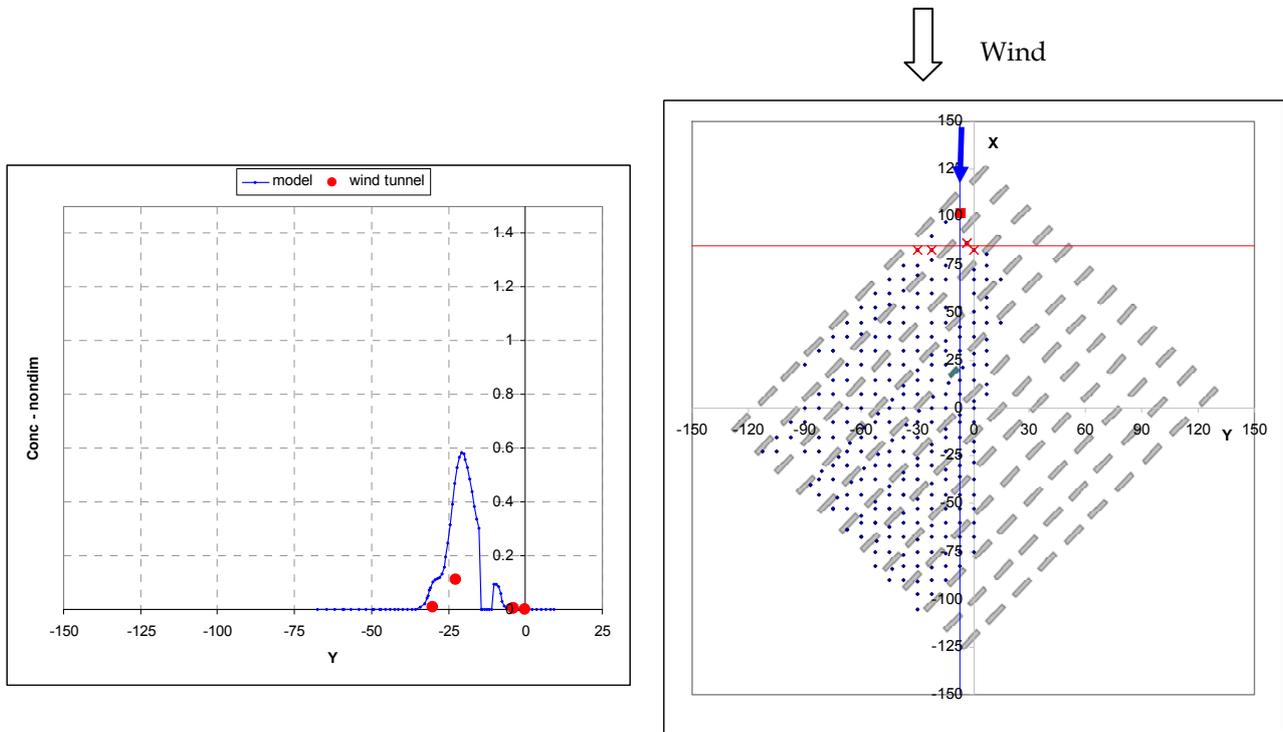


Figure 12 On the left a cross-wind concentration profile is displayed (at a height of 1.275 m, 17 m downstream of the source). The measurement results are shown as red points and model results as a full drawn line. In the illustration, the model overpredicts.

On the right, the layout of measurement positions is shown, and a red line indicates where the profile is taken. Note that this 'map' is rotated so that the X axis is vertical. The source is in the upper part of the figure, and the wind blows from the top.

This layout makes it easy to interpret the corresponding concentration profile on the left. When the Excel sheet is open, one can move from one cross-section to the next by pressing the up- or down-arrow.

Note: Measurements are included on the left-hand plot as soon as they are closer than 3 m from the red line displayed on the map. Thus, the graph is not an accurate representation of the concentration profile at the red line. The default value of 3 m for allowed deviation can be changed in the spreadsheet.

(Further note: For technical reasons, the sign of the X-axis is reversed on the 'map' on the right)

	A	B	C	D	E	F	G	H	I
1	Distanci	DistanceEx	Xcell	Ycell	Zcell	Conc		Source X	-102.354
2658	17	17.25340192	-85.1003	-67.4226	1.25	1.3E-18			
2659	17	17.25340192	-85.1003	-64.5942	1.25	1.04E-17			
2660	17	17.21804579	-85.1357	-61.8011	1.25	8.62E-17			
2661	17	17.46553554	-84.8882	-59.4323	1.25	7.46E-16			
2662	17	17.11198176	-85.2417	-59.0788	1.25	7.63E-16			
2663	17	17.32411079	-85.0296	-56.7453	1.25	7.21E-15			
2664	17	17.14733483	-85.2064	-54.0937	1.25	7.39E-14			
2665	17	17.28875466	-85.0649	-51.8309	1.25	7.85E-13			
2666	17	17.39482592	-84.9589	-49.6035	1.25	8.51E-12			
2667	17	17.04127215	-85.3124	-49.25	1.25	9.15E-12			
2668	17	17.39482288	-84.9589	-47.4822	1.25	9.03E-11			
2669	17	17.04126911	-85.3124	-47.1287	1.25	9.9E-11			
2670	17	17.25340404	-85.1003	-45.5023	1.25	9.3E-10			
2671	17	17.32411155	-85.0296	-44.0174	1.25	8.08E-09			
2672	17	17.32411155	-85.0296	-42.6032	1.25	7.05E-08			
2673	17	17.32411155	-85.0296	-41.189	1.25	6.24E-07			
2674	17	17.32411155	-85.0296	-39.7748	1.25	5.57E-06			

Figure 13 Sample sheet with model results for concentration data to be displayed as shown in Figure 12, where model results are compared to measurements along a line parallel to the y axis (sheet MISKAM_Ketzel_y).

Vertical concentration profiles, -45 degrees

The workbook for the -45 degree case provides an option that allows *vertical profiles of model results* to be displayed. However, there are *measurements at one height only*, and therefore a proper comparison between model results and measurements is not possible.

If you wish to use this option, consider the sheets with a name ending in *_z*. The result is displayed in graphs like the one in Figure 14, shown side by side with graphs as those in Figure 12.

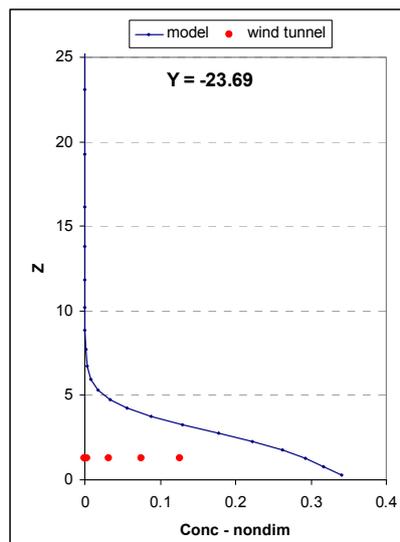


Figure 14 Modelled vertical profile, 27 m from the source and with a y value of -23.69 m. Measured values are shown for four positions, all located approximately 27 m from the source, but at various off-centerline distances.

Scatter plots and computation of metrics

The 'Full workbooks' allow you to create a summary of information

All the 'Full workbooks' allow you to create a summary of information for all cases in the form of scatter plots and computation of metrics. We will here explain how this feature is used in case of the -45 degree flow workbook. The principles are the same for the other two workbooks.

It may take one or more minutes to generate a set of metrics for one model, because the necessary data extraction and computation is CPU-intensive.

You may not need to create the summary yourself

Note, however, that you may not need to create this summary, because it may already exist. Files with 'saved metrics' have been prepared, where metrics from many models are stored. Concerning files with 'Saved metrics', see the chapter "Excel files with Saved Metrics".

Note also that you can compute metrics for a subset of data (explained in the next chapter on Saved Metrics).

The procedure

The procedure for generating metrics is as follows: Open one of the 'Full workbooks', e.g. UVWtke_45degree_date.xls.

If you wish to summarise information for all towers for a certain model, use the sheet PlotsZ and select the model, e.g. MISKAM_Ketzel_z. Then click the button 'Metrics and scatter plots' and wait. When Excel has finished its calculations you will see the sheet MatchVertical, which includes scatter plots, metrics and a 'map' of towers. Figure 15 shows the result.

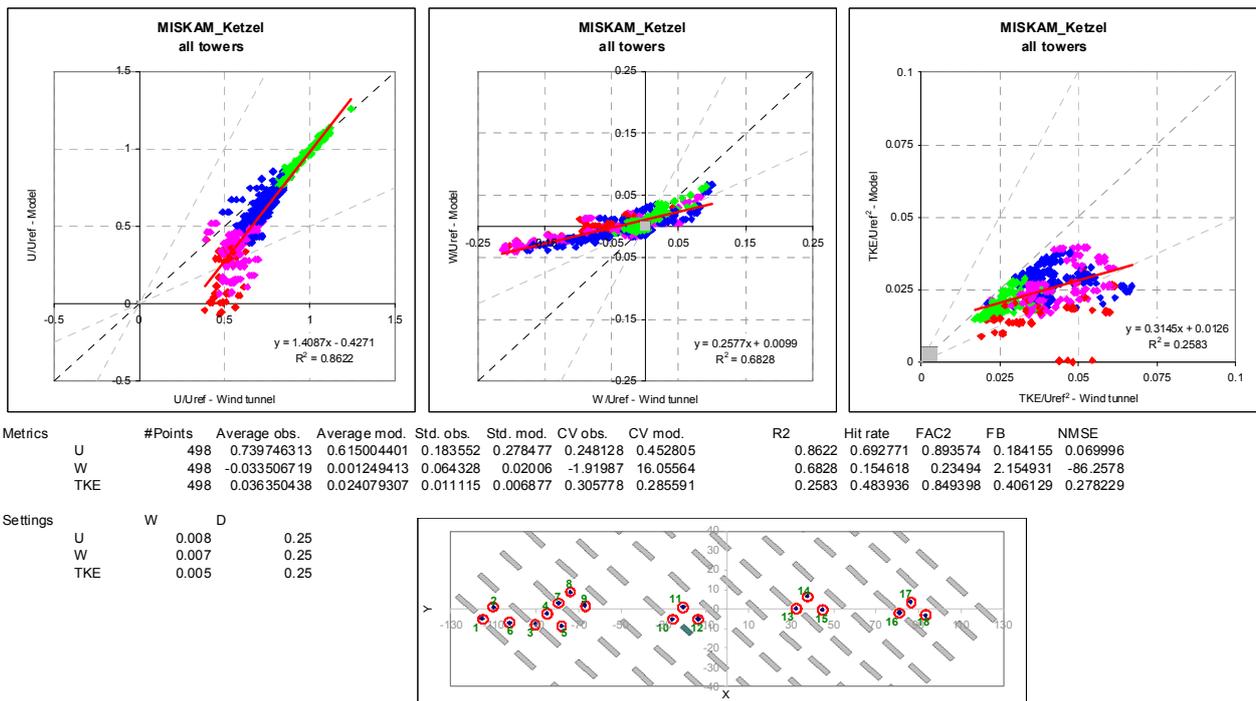


Figure 15 Scatter plots and metrics for velocities. Sample taken from the file UVWtke_45degree_26May08.xls

Some comments are pertinent:

Matching: When an observation is paired with a model result, the matching procedure selects the model result that is closest to the observation (no interpolation). It may confuse you that in sheets such as PlotsZ you can specify an 'Allowed difference in co-ordinates between Wind tunnel and Model'.

This allowed difference is *not used in the computation of metrics*, but only to manage the display of points in PlotsZ.

Pitfall: FB and NMSE do not always make sense

Warning: For some parameters the metrics do not make sense! When interpreting the metrics, be aware that the numbers are blindly calculated, irrespective of the parameter considered. For parameters that can take *both positive and negative values* (e.g. u, v, w), the metrics FB and NMSE do not make sense!

Warning: Should a bias of zero be expected for a perfect model? An important point should be kept in mind before considering the values of any metrics: When comparing observations with model results one will often be tempted to assume that for a good model the bias should be as close to zero as possible. *However, this should not always be taken for granted.* In the present context be particularly aware of the fact that 'TKE' derived from wind tunnel measurements is not the true TKE, but an artefact, because only two of the three turbulent wind components were measured. Thus for TKE, measurements and model results are *not* really comparable, and a bias of zero may not be the ideal¹.

Note: The threshold may have a substantial effect on metrics

Threshold values: In the definition of the metrics FAC2 and Hit Rate certain threshold values are used, They are referred to as W (allowed absolute deviation, used for FAC2 and Hit Rate), and D (allowed fractional deviation D for Hit rate). The values used are indicated on the sheets MatchVertical and MatchHorizontal. You can change the threshold values by using the button 'Metrics settings', which is visible in the toolbar for these two sheets.

Other workbooks: The example described above concerns scatter plots and metrics for flow observations performed on towers (vertical profiles) in the -45 degree case. Similar plots and metrics can be generated for other data.

Saving a copy of a sheet with metrics

Each time you want a summary of results for a different model, you must click the button 'Metrics and scatter plots' in sheet PlotsZ. This takes a while. However, you can *save results for later analysis* in the following manner:

Download the SavedMetrics.zip file from the public web site (URL 1). Unpack the relevant file - in this case SavedMetrics_UWtke_45degree.xls. This file is a template for saving the MatchVertical sheet from files of type UVWtke_45degree_date.xls. From the MatchVertical sheet you can save a copy of the sheet in the template file using ordinary Excel tools (right-click on the sheet tab, choose 'Move or copy...').

The next chapter explains more about existing Saved-Metrics files.

Excel files with Saved Metrics

The preceding chapter "Scatter plots and computation of metrics" describes how to generate a sheet with scatter plots and metrics for one model.

Such sheets have been generated for a large number of models and have been collected in Saved-Metrics files. The table below gives an overview of the relationship between 'Full workbooks' and 'Saved-Metrics' workbooks.

¹ The observed TKE is computed as 'TKE' = $0.5 (U_{rms}^2 + 2 * (W_{rms}^2))$
This would be the true TKE if $V_{rms} = W_{rms}$.

Table 1 Relationship between 'Full workbooks' and 'Saved Metrics' workbooks.

Full workbook	Sheet in Full workbook used to activate metrics	Sheet with metrics in Full workbook	Workbook in SavedMetrics package
UVWtke_0degree_xxx.xls	PlotsZ	MatchVertical	SavedMetrics_UWtke_0degree.xls
UVWtke_45degree_xxx.xls	PlotsZ	MatchVertical	SavedMetrics_UWtke_45degree.xls
UVWtke_45degree_xxx.xls	PlotsX	MatchHorizontal	SavedMetrics_UWtke_45degree.xls
Dispersion_45degree_xxx.xls	Plots	MatchConc	SavedMetrics_Dispersion_45degree.xls
Dispersion_nonCFD_xxx.xls	Plots	MatchConc	Has not been produced. For nonCFD models point-by-point comparisons hardly make sense, and other comparisons should be considered.

When interpreting the metrics such as those there are a few pitfalls to be aware of. You will find these described in the preceding chapter on 'Scatter plots and computation of metrics'.

Metrics for subsets of data: When a sheet with scatter plots and statistics for a model is available to you, you can quickly see the results for various subsets of the data, by using the *Autofilter* feature of Excel. An example: If you wish to see results for a certain tower, click on the downward arrow next to 'Tower' in line 1 of the spreadsheet. There you can select a certain tower and view statistics (see *Figure 16*).

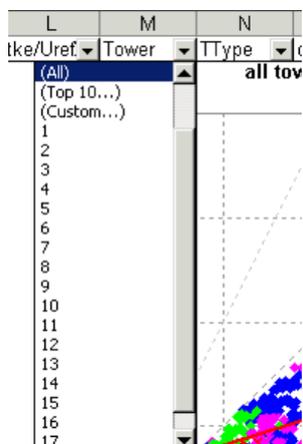


Figure 16 Illustration of the Autofilter feature that can be used to view metrics and scatter plots for a subset of data - for example, for a certain tower.

For flow data, in a file such as SavedMetrics_UWtke_45degree.xls, measurement positions have been classified in the groups 'Narrow streets', 'Wide streets' and 'Crossings' (abbreviated NS, WS and CR). If you apply a filter on the parameter TType, you can choose between these groups. The *Autofilter* feature allows you to define a wide range of criteria.

The Autofilter applies to only to the model you are looking at, unless you use the Synchronisation macro described below.

The 'Saved-Metrics' files include two useful macros that you should be aware of if you work with these files. They are activated by a certain key combination:

Synchronisation macro

Ctrl+y

Synchronise filters or disable synchronisation

Example: When inspecting results for one of the models, you decide to impose a filter, e.g. on the distance. Do it (by selecting the arrow at top of one of the columns and specifying a criterion). Next, if you press Ctrl+y you will be offered to enable 'synchronisation mode', meaning that the current filter is imposed on results for ALL models.

Synchronisation mode remains switched on until it is de-activated.

NB! You must not have two 'SavedMetrics' files open at the same time - synchronisation will only apply to the first file you opened.

Macro for collecting metrics

Ctrl+q

This macro picks metrics and creates a new sheet, with one line for each model.

You can run this macro several times, each time with a different filter imposed, in order to see the effect of classifying results.

FAQ

Why can one see data lines for only one case in sheets such as MISKAM_Ketzel_z?

In Excel, the *Autofilter* feature is automatically turned on by a macro when you inspect plots. Autofilter is imposed on the sheets with model results, and it filters data so only one case is shown. If a sheet such as MISKAM_Ketzel_z is active, you can manually switch off Autofilter by using the menu *Data > Filter > Autofilter*. Autofilter is automatically turned on again when you go to a sheet such as PlotsZ and change the model or case.

Are there pitfalls in the use of metrics?

Certainly yes. Metrics do not assure quality and they are no substitute for looking at data. Metrics carry some information, but they do not tell the whole story.

Note the comments in the chapter on 'Scatter plots and computation of metrics'. In particular, note that for parameters that can take *both positive and negative values* (e.g. u , v , w), the metrics FB and NMSE do not make sense!

I have problems when I try to copy graphs from a worksheet to PowerPoint

A useful trick in Excel: 'Copy picture'

There is a very useful trick that only few people know of.

Select the graph in question.

Press Shift and hold it while moving the mouse to Edit on the menu line.

You may now release Shift.

Now note that the Edit drop-down menu offers a choice called 'Copy picture...' that you can use to copy the graph without problems.

Error: 'out-of-range'

One user has experienced that this error occurred when he tried to create metrics within one of the Full workbooks. The likely cause is too little memory in the PC.

References

URL 1: A 'limited edition' of the workbooks is available on the public web site

<http://www.dmu.dk/International/Air/Models/Background/MUST>

This 'limited edition' includes only results from a small number of models. The web site gives access to other relevant information, such as the present document.

URL 2: A 'full edition' of the Excel workbooks is available for COST 732 participants. COST participants can find the relevant web address if they visit the internal COST 732 web site: <http://www.mi.uni-hamburg.de/Internal-Documents.467.0.html>

URL 3: COST 732 participants have access to a Google Groups site at <http://groups.google.com/group/cost732> Pages at that site also describe how to get access to the Excel workbooks.