



What's New in ADMS-Airport 3.0?

December 2010

ADMS-Airport 3.0 is the latest in CERC's state of the art models for modelling the dispersion of pollutants from an airport. ADMS-Airport 3.0 contains a variety of new features and scientific improvements, for instance:

- the latest UK emission factor datasets
- the ability to model 3,000 road sources
- many improvements to the meteorological processor, including the ability to specify vertical profiles of the meteorological data and to specify that only a subset of the meteorological data should be used
- the output grid can now contain multiple heights
- a new comprehensive output file containing data from every meteorological line with a utility for viewing the data contained in this file
- simplifications in the comparisons to air quality objectives including the ability to calculate maximum daily values

This document contains details on all of the new features, scientific improvements and model corrections implemented since the previous version of ADMS-Airport (version 2.3.2, June 2008). Also contained in this document are instructions for installing ADMS-Urban 3.0 and upgrading from previous versions.

On the CD

This version of ADMS-Airport 3.0 includes an updated user interface, model and User Guides. The ADMS-Airport User Guides and guides to using the GIS links can be found in the 'Documents' sub-directory of the ADMS-Airport 3.0 install directory.

Please note that in order to run ADMS-Airport 3.0 you will need an updated licence file, which is supplied separately.

Before installing ADMS-Airport 3.0

If you use ADMS-Airport inventory files to store emissions data (instead of using CERC's emissions inventory tool EMIT), you should **import all source data stored in your inventory files into one or more ADMS-Airport 2.3 model input (.upl) files prior to installing ADMS-Airport 3.0.** This will enable you to upgrade these data, as described

below.

Once you have done this, log onto your computer as Administrator, and uninstall ADMS-Airport 2.3 by selecting Add/Remove Programs from the Windows Control Panel.

Installing ADMS-Airport 3.0

If you have not already done so, log onto your computer as Administrator. Insert the ADMS-Airport 3.0 installation CD and the install program should automatically start. If it does not, browse to locate the CD in Explorer and double-click on the file '*setup.exe*'. Follow the instructions on the screen. Further details are given in Section 2.2 of the User Guide, a copy of which is included on the installation CD in *.pdf* format.

New versions the GIS links you require (ArcGIS, MapInfo) can be installed by following the instructions in the ADMS-Urban User Guide.

Upgrading your input files

Model input (*.upl*) files that were set up using ADMS-Airport 2.3 will not automatically run with ADMS-Airport 3.0. To run an ADMS-Airport 2.3 file with ADMS-Airport 3.0, the file must first be saved in ADMS-Airport 3.0 format, as follows:

1. In Explorer, make a backup copy of the file.
2. Load the file into the ADMS-Airport 3.0 interface. A warning message will be issued indicating that the file will be updated to ADMS-Airport 3.0 format. Select Yes to continue.
3. Save the file, with a new name.

Upgrading ADMS-Airport inventory files

ADMS-Airport inventory files used with ADMS-Airport 2.3 cannot be used with ADMS-Airport 3.0, and these files cannot be directly upgraded. It is recommended that EMIT users make a new version of their ADMS-Airport inventory file using EMIT version 3.0. Users without EMIT can update the source data held in an inventory file by performing the following steps.

1. Before uninstalling ADMS-Airport 2.3, import the source data from the ADMS-Airport inventory files into one or more ADMS-Airport 2.3 *.upl* files.
2. Load the ADMS-Airport 2.3 *.upl* files into ADMS-Airport 3.0 following the steps described in the previous section.
3. Export the source data to a new inventory file from ADMS-Airport 3.0.

Changing between road source emission factor datasets

Two new UK emission factor datasets are included in ADMS-Airport 3.0, derived from Defra's Emission Factor Toolkit version 4.2.2¹. When upgrading *.upl* files to ADMS-Airport 3.0, users should consider whether or not the new emission factor datasets should be used.

Table 1 summarises the UK emission factor datasets included within ADMS-Airport 3.0. The difference between the two new emission factor datasets comes from the number of vehicle categories. UK EFT v4.2 (2 VC) has two vehicle categories: light and heavy duty vehicles, which is the same categorisation as the old UK DMRB 2003 dataset; UK EFT v4.2 (6 VC) has six vehicle categories: car, taxi ('black cab'), LGV, motorcycle, HGV and bus.

If an ADMS-Airport version 2.3 *.upl* is being upgraded, it is likely that the emission factor dataset used by the model is UK DMRB 2003. In this case, it is usually recommended that the emission factor dataset is changed to UK EFT v4.2 (2 VC).

Dataset name	New or old?	Suggested usage of dataset	Number of vehicle categories	Number of Road types
UK DMRB 1999	Old	This dataset has been superseded by the other datasets and should not be used for new modelling studies.	2	1
UK DMRB 2003	Old	This dataset should only be used for old projects that require consistency between emission factors. Any new modelling studies should use one of the EFT v4.2 emission factor datasets.	2	3
UK EFT v4.2 (2 VC)	New	This dataset should be used for all new projects where the traffic data are simply categorised into light and heavy duty vehicles.	2	6
UK EFT v4.2 (6 VC)	New	This dataset should be used for all new projects where the traffic data have a relatively detailed categorisation, for example, counts for buses and HGVs separately.	6	6

Table 1 – Summary of UK emission factor datasets included within ADMS-Airport 3.0

The range of years covered by the new emission factor datasets (2006-2025) is smaller than that covered by the old datasets (1996-2025). If the modelling year is earlier than 2006 the **UK DMRB 2003** emission factor dataset is recommended.

Users can update their *.upl* files to use the new emission factors by following these steps:

1. Make a copy of the ADMS-Airport 3.0 *.upl* file that uses the UK DMRB 2003 emission factor dataset.
2. In the Source screen, in the Automatic calculation of road traffic emissions section, select

¹ http://laqm1.defra.gov.uk/documents/tools/EFT_Version_4_2_2.zip

Change... to change between emission factor datasets. The screen given in Figure 1 below is displayed. Select the new emission factor dataset (UK EFT v4.2 (2 VC)), and then click OK.

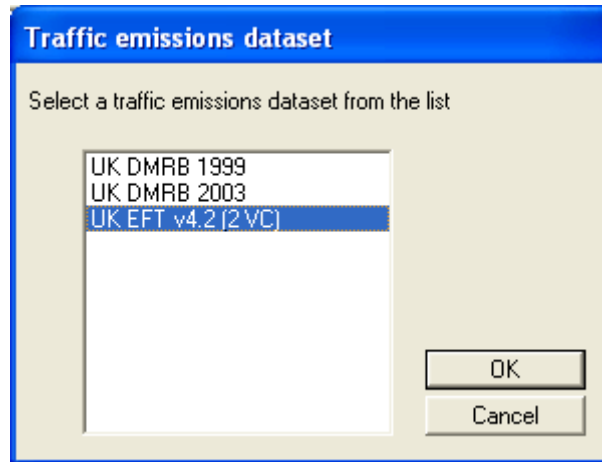


Figure 1 – Changing traffic emission factor dataset screen

3. Select Yes when the model warns that the update process may take some time.
4. The screen shown in Figure 2 is then displayed. Choose an alternative Road type by differentiating between roads within and outside London, and select OK. The dataset has now been updated successfully.

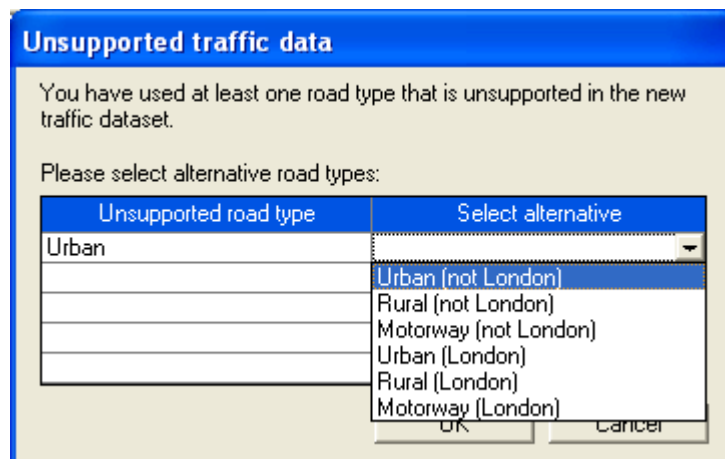


Figure 2 – Select a new Road type from options available with the new emission factor dataset

New Features

1. Two new UK emission factor datasets are included: UK EFT v4.2 (2 VC) and UK EFT v4.2 (6 VC). The factors are taken from Defra's Emission Factor Toolkit version 4.2.2¹. These datasets include fleet data appropriate for modelling urban and rural areas, in addition to motorways, with further categorisation in terms of 'outside London' and 'London'. The difference between the new datasets is the number of vehicle categories available:

- UK EFT v4.2 (2 VC) has two vehicle categories: light and heavy duty vehicles, which is the same categorisation as the old UK DMRB 2003 dataset;
- UK EFT v4.2 (6 VC) has six vehicle categories: car, taxi ('black cab'), LGV, motorcycle, HGV and bus.

The new six vehicle component emission factor dataset allows users to model such features as bus lanes with more accuracy; in addition, source apportionment studies by vehicle category can be performed.

In most cases, it is recommended that users upgrade their *.upls* to use one of these new emission factor datasets available. Details of how to do this are given in the previous section.

2. New tools are supplied for automating the creation of contour plots using Surfer and for creating a slideshow (animation) from ADMS-Airport model output. Further details of these tools can be found in the Surfer Automation and Slideshow Creator Tools User Guide, which can be found in the '*Documents*' subdirectory of your model installation directory.
3. A utility is now supplied for converting US format meteorological data into ADMS-Airport format meteorological (*.met*) files. See Section 6.3 of the ADMS-Urban User Guide for more details.
4. The ArcGIS and MapInfo links contain new options for importing ADMS-Airport results files and locating off-site maxima. Details of these are in the ArcGIS and MapInfo User Guides, which can be found in the '*Documents*' subdirectory of your model installation directory.
5. It is now possible to run more than one instance of the model simultaneously. In ADMS-Airport 2.3 this was not possible. This allows you to take advantage of computers with multiple processors to run multiple *.upls* simultaneously.
6. For long term runs, it is now possible to create a **Comprehensive output** file containing the concentration values at each output point, for each line (hour) of meteorological data. Due to the potentially large amount of data in this output file, the file is in netCDF format. For more details see Section 5.1.13 of the ADMS-Urban User Guide.

A new utility is provided for viewing and processing this **Comprehensive output** file. For details of this utility, please refer to the appropriate User Guide in the '*Documents*' subdirectory of your model installation directory.

7. The number of road sources that can be modelled has been increased to 3,000.
8. It is now possible to specify up to 500 diurnal and monthly profiles in the *.fac* file; previously this limit was 50.

9. It is now possible to model deposition without including the effects of depletion on the plume. This may be useful if following the guidelines for modelling Ammonia produced by the UK Environment Agency.
10. PM_{2.5} has been added to the pollutant palette and will be included in sulphate chemistry if SO₂ emissions are modelled and the chemistry option is used.
11. There are several new features of the buildings module (See Section 4.5 of the ADMS-Airport user guide for more details):
 - a. It is now possible to specify a different main building for each source.
 - b. Circular buildings can now be modelled.
12. In ADMS-Airport 2.3 a source height correction for point sources was introduced to model the effects of 'stack downwash'. The ability to switch off this 'stack downwash' correction has been introduced. Please refer to Section 4.8.2 of the ADMS-Urban User Guide for more details.
13. There have been various improvements relating to the meteorological input and processing:
 - a. If Met. data are hourly sequential is selected and the meteorological data are sequential but *not* hourly sequential (for example, a meteorological condition specified every three hours), then the model will interpolate the meteorological data providing the data meet certain conditions, see Section 3.3.6 of the ADMS-Urban User Guide.
 - b. Users can now choose to run a subset of the meteorological data in their *.met* file or that has been entered in the interface, by specifying a start and end date in the Meteorology screen.
 - c. Users can enter vertical profiles of wind speed, turbulence, temperature and specific humidity through the use of a new *.prf* file. Please refer to Section 4.7 of the ADMS-Urban User Guide for details.
 - d. Advanced meteorological options are now available to describe both the Met. measurement site and the Dispersion site. The parameters that can be entered for both sites are surface albedo, Priestly-Taylor parameter and minimum Monin-Obukhov length.
 - e. Surface roughness, surface albedo and Priestly-Taylor parameter values at both the Met. measurement site and the Dispersion site can now be entered in the *.met* file. In the *.met* file 'Z0 (M)', 'ALBEDO (M)' and 'ALPHA (M)' can be specified to represent the conditions at the Met. measurement site, and similarly 'Z0 (D)', 'ALBEDO (D)' and 'ALPHA (D)' at the Dispersion site.
 - f. The option to specify exact wind sector sizes has been introduced. In addition, the user can now specify that the wind direction supplied in the *.met* file is *not* in sectors.
 - g. For runs with long term output, a new *.lt.met* file is created. This file is a copy of the input *.met* data file, modified to give the *actual* modelled wind direction for each line of meteorological data – the modelled wind direction will differ from that in the *.met* file for some lines, when the wind direction has been specified in sectors.
 - h. It is now possible to model up to 5 years of meteorological data in one run; previously the limit was 10,000 lines of meteorological data (corresponding to just over one year).

14. It is now possible to select None on the Background screen of the ADMS-Airport interface if no background concentrations are to be included in the run. Note that if chemistry is to be modelled then background concentrations *must* be entered.
15. It is now possible to model gridded concentration output at multiple heights in the same run. When this option is used, a *.levels.glt* or *.levels.gst* file will be produced with separate columns for each grid height specified. For full details of this option, please refer to Section 5.1 of the ADMS-Urban User Guide.
16. The number of grid points available in each dimension has been increased to 101; previously the limit was 100 for regular grids or 32 for variable grids.
17. It is now possible to include intelligent grid points around road and line sources when a variable grid is being modelled, previously this was only possible if a regular grid was being modelled.
18. There have been some improvements to the way intelligent grid points are used with roads. These features are controlled using the *.igp* file, which is detailed in Section 3.5.2 of the ADMS-Urban User Guide.
 - a. The maximum number of intelligent grid points that can be applied to road sources has increased from 5,000 to 10,000.
 - b. It is now possible to specify the road sources to which intelligent grid points should be applied.
19. It is now possible to automatically include a higher resolution (nested) grid surrounding any point, area or volume sources. For more details of this option, please refer to Section 3.5.2 of the ADMS-Urban User Guide.
20. The path of the *.asp* file can now be specified on the Grids screen of the ADMS-Airport interface (previously it was picked up automatically if it had the same name as the *.upl* file and was located in the same directory). If you are upgrading a *.upl* file from a previous version of ADMS-Airport, if an appropriate *.asp* file is present, this will automatically be specified in the interface.
21. It is now possible to specify up to 30 outputs in the Output screen of the ADMS-Airport interface. The maximum number of outputs that can be selected and modelled in any run remains at 12.
22. A new option for calculating maximum daily values of an averaging time has been included. The maximum daily value is the maximum over the averaging periods ending on that day. For long term output, the maximum daily value is used in the calculation of exceedences and percentiles.
23. Users are now able to get *.gst*, *.dep* and *.bld* output for all hours specified in the *.met* file, rather than just the first 24. This is accomplished by using */LongOp* as a command line flag when running the model. For full details of how this option can be used, please refer to Section 5.1.14 of the ADMS-Urban User Guide. *Care should be taken when using this option, as very large output files may be produced.*
24. A new feature that facilitates the specification of Air quality objectives in the Pollutant output table of the Output screen has been added, this is described in Section 3.6.4 of the ADMS-Urban User Guide.

Major Changes

25. In addition to the new buildings features described above, there have been various improvements to the way buildings are modelled that brings ADMS-Airport 3.0 in line with the latest modelling techniques applied in the buildings module in ADMS 4. These improvements may have a significant effect on results when the buildings module is used.
26. Previously, if a large number of point sources were included in a model run then, in order to save run time, they would be modelled as follows: the 150 with the highest emissions would be modelled explicitly, the next 150 would be modelled using an effective source height for each and the remainder of the sources would be aggregated onto a grid source. Now, all sources are modelled explicitly. This may result in a slight increase in run time.
27. Previously, for volume and grid sources, the dry deposition plume depletion factor was calculated incorrectly. This issue has now been corrected.
28. If a wind sector size of greater than 15° is specified for long term runs, five wind directions are now modelled for line, area, volume, road and grid sources, in order to make a better approximation of the variation of wind direction within a particular sector. This was already the case for point sources.
29. There have been several changes to the way in which invalid lines of meteorological data are treated for averaging times greater than one hour:
 - a. Previously, for an averaging period to be considered valid (and thus output in short term or included in the long term statistics) it was required that the last hour of the averaging period was valid. Now, if at least one hour within an averaging period is valid, then output for that averaging period is given or the period is included in the long term calculations.
 - b. An issue with the way in which percentiles are calculated when there are invalid lines of meteorological data has been corrected. This is only likely to have any effect on results if there are a large number of missing hours of meteorological data.

Minor Changes

30. It is no longer possible to specify a factor in the interface that modifies the background PM₁₀ concentrations to account for inaccuracies in particulate monitoring devices. If required, a factor should be applied directly to the concentration data included in the background file, or to the hand-entered concentrations on the Background screen.
31. The NOX-NO2 Correlation chemistry option has been removed as it was not widely relevant.
32. Previously, when gridded output was selected, an outer 'ring' of output points was added around the edge of the output grid. This 'ring' has been removed, and the output grid created is now precisely as specified in the interface.
33. There has been a change to the way in which percentiles are calculated; this can have an effect on all percentile results below the 100th percentile.
34. If there is insufficient memory to generate a *.max* file for a particular run, the run will now continue without producing the *.max* file, rather than stopping as would have

previously happened.

35. There has been a change to the format of the coordinates in the *.max* file. This is to ensure the x and y locations are always reported to the nearest metre, even if six- or seven- figure coordinates are used.
36. It is now possible to run with a variable output grid at any height; previously, if a variable output grid was specified, the height was restricted to ground level.
37. If wet deposition is modelled, with a washout coefficient dependent on the precipitation rate, the run will now stop if precipitation data are not included in the meteorological data file. Previously a precipitation rate of zero would have been assumed.
38. If the first line of meteorological data is calm, i.e. has a wind speed at 10m of less than 0.75 m/s, then this hour will now be skipped, as there are no previous non-calm lines of data from which the wind direction can be taken. Previously the wind direction entered for that line of meteorological data would have been used.
39. An improvement has been made to the way in which line and road sources that are almost perpendicular to the wind direction are modelled. This eliminates occasional spurious results which may have occurred in these circumstances.
40. The names of the road traffic emission datasets, road types and vehicle categories used in the ADMS-Urban Emissions Inventory are not exactly the same as those displayed in the ADMS-Urban interface. Please refer to Tables 3.2, 3.3 and 3.4 in Section 3.2.1 of the User Guide for specific details.
41. If chemistry is being modelled, then *all* chemistry pollutants being modelled must either:
 - have an averaging time greater than or equal to one hour, or
 - have the same averaging time.

In previous versions of ADMS-Airport, if outputs were specified in the interface but not included in the run the model may not have correctly checked that these criteria were met; this has now been fixed.

42. Previously, an incorrect 'WARNING: (Internal) Top of source strip below bottom in DividePolygon()' message may have been issued by the model when modelling line, area, volume or road sources; this has now been corrected.
43. Previously, if the Chemical Reaction Scheme with Trajectory Model option was selected but no chemistry pollutants were selected for output, the model may have crashed. This has been corrected.
44. The emissions factors used in the calculation of traffic-induced turbulence for road sources, where the emissions factors are specified by the user, have been updated in line with the new emission factor datasets included in the model.
45. For runs where the surface roughness differs between the Dispersion site and Met. measurement site a change in the way wind directions are cycled if the wind directions are in sectors of less than 15° may have a small effect on results.