What's New in ADMS 6?

March 2023

ADMS 6 is the latest general release of CERC's state of the art model for the dispersion of pollutants. ADMS 6 contains a number of new features and model options, most notably:

- Several enhancements to the modelling of buildings, including the ability to automatically determine a main building, easier plotting of the effective building and changes to the way the effect of buildings are modelled, particularly for upwind sources;
- An option to facilitate the calculation and visualisation of the contribution of individual sources to specific receptors;
- Enhancements to the modelling of time varying emissions factors, including the ability to specify profiles on a per source per pollutant basis in the .fac file along with improvements to the entering of time varying emissions factors on screen; and
- Many new usability features in the Mapper and ADMS 6 interface including increased output limits, a utility to easily create .asp files containing several different sets of gridded output points; functionality to export data in the Mapper to .spt files for import into ADMS 6 and the ability to calculate on-site or off-site maxima of model output.

This document contains details of the new features, scientific improvements and model corrections implemented since the last release of ADMS 5.2 (November 2016). Also contained in this document are instructions for installing ADMS 6 and upgrading from previous model versions.

In this release

This version of ADMS 6 includes an updated user interface, model, utilities and User Guides. The ADMS 6 User Guide and supplementary User Guides can be found in the '*Documents*' sub-directory of the ADMS 6 install directory.

Installation

Before installing ADMS 6

Log on to your computer as Administrator, and uninstall any previous version of ADMS by selecting **Programs and features** from the Windows Control Panel.

Installing ADMS 6

If you have not already done so, log on to your computer as Administrator.

ADMS 6 will have been supplied by download link. Extract the downloaded .zip file to a local directory. In Explorer, browse to this directory and double-click on the file 'setup.exe'.

Follow the instructions on the screen. Further details are given in Section 2.2 of the ADMS 6 User Guide which can be downloaded from the CERC website.[1]

You should also have been provided with a new licence file, which is required in order to run the model. To install the licence rename the file to *ADMS.lic* and then copy it to the directory in which the model is installed.

The first time that you launch the model after installation, it is important that you are connected to the internet so that your licence can be registered.

New versions of the GIS links you require (ArcGIS, MapInfo) can be installed by following the instructions in the ADMS 6 User Guide.

[1] https://www.cerc.co.uk/UserGuides

Upgrading your input files

Additional input (*.aai*) files

Any additional input (*.aai*) files must also be updated so that they are in file version 4 format. To do this:

1. If you wish, make a backup copy of the original *.aai* file in Explorer.
2. Open the **Additional Input file editor**, which can be accessed via the **Edit** button on the **Setup** screen of the ADMS 6 interface.
3. **Open** the *.aai* file via the **File** menu.
4. Click **Yes** to the automatic upgrade message that appears to allow the editor to upgrade the file.
5. **Save** the *.aai* file via the **File** menu.
6. Reference the new *.aai* file in the **Setup** screen of the ADMS 6 interface.

Users of the amine chemistry module have additional steps to follow to upgrade their .aai files. See the Amines Chemistry Supplement User Guide for full details.

New Features and Major Changes

Mapper

Full details on using the Mapper can be found in the Mapper User Guide.

1. Layers containing source information, e.g. a shape file of point source data, can be exported for *.spt* format so that they can be easily imported into ADMS 6. See Section 5.12.2 of the Mapper User Guide for more details.

2. A new 'Clip layer to polygons' tool allows individual features from one layer to be 'clipped' to the polygon(s) from a separate layer. The resulting set of clipped features are saved to a new shape file rather than replacing the original layer. See Section 5.13 of the Mapper User Guide for more details.

3. Statistics about a particular layer can be viewed using the new 'Layer statistics' tool. Namely, the minimum, maximum and X, Y location are reported for each numerical field in the layer. Up to five filters can also be applied to the layer to constrain the number of features/data points on which to calculate the statistics. See Section 5.14 of the Mapper User Guide for more details.

4. The geometry of all features in a particular polyline/polygon layer can be simplified simultaneously using a new 'Simplify layer' option. This can help to reduce vertex counts to within model limits.

5. Two new gridding methods have been added to the Interpolator to generate contour layers – triangulation and natural neighbour.

6. When a contour layer is created, a separate layer that displays the contour lines is also added.

7. The transparency of individual contour levels can now be altered. This can be useful for 'seeing through' certain regions of a contour plot.

8. Information tool:
    a. Holding down **AltGr** ensures that only features in the currently selected layer can be clicked.
    b. Raster layer (e.g. contour plot) values are now displayed in the status bar as you move your cursor across the layer, or displayed in the attributes table if you click on a particular point.

9. There have been various changes to improve usability:
    a. There have been several changes to the main and right-click menus.
    b. It is now possible to move the output grid and rotate a source or building.
    c. There are now three tabs in the layer panel; the Layers tab shows the layer order hierarchy while the Grouping tab shows which group each layer belongs to.

10. If the coastline module is being used, the line representing the coastline and the point on land are now displayed and editable in the Mapper.

11. When using the 'Extract data' option in the Mapper, the Output extent can be edited in the Mapper while the form is open. The Layers table now displays more information about the selected layer including its spacing. For more details on the 'Extract data' option see Section 5.6 of the Mapper User Guide.

12. When attempting to export a layer in a coordinate system which differs from the map coordinate system a choice of coordinate systems to export to will be given.

13. Mapper layer settings are now stored in *.ttkstyle* files rather than *.ini* files.

14. When adding a layer to the Mapper from a comma separated variable file, polylines and polygons can now be imported in addition to points and single-segment lines. See Section 5.5.3 of the Mapper User Guide for details on the format of the header to use for each of these options.

15. An option to 'Use Map coordinate system' has been added to the ADMS 6 interface. This option can be used when using a custom coordinate system for the input data.

16. Circular area and volume sources can now be defined using the ADMS Mapper. To define a circular area or volume source, select the appropriate layer in the **Legend** (e.g. the **Area sources** layer), click on the **Add Feature** button on the toolbar, then click on the drop down arrow next to the button and select **Circle**.

Interface

17. There have been various changes to the format of the *.spt* file (and related files) for data import/export (see Section 5 of the ADMS 6 User Guide for full details):

    a. The format of the data in the *.ptt* file, used for importing data to and exporting data from the pollutants palette, has changed slightly for particulate pollutants containing multiple particle species. Lines in the file corresponding to the second and subsequent particle species should have 'n/a' entered in all columns except for the pollutant name, deposition velocity, terminal velocity, particle diameter, particle density and mass fraction. Please see the ADMS 6 User Guide for full details of the format of the *.ptt* file

    b. Parameters which are not required can now be left blank (or 'n/a' or 'na')

    c. Old format files can still be imported, and data can still be exported in the old format using the 'Use legacy format' tick box

    d. Sources with more than the maximum number of allowed vertices can still be imported, but the *.apl* cannot be saved until the number of vertices have been reduced accordingly (see also #4).

18. Various limits have been increased:

a. The maximum length of all names (sources, buildings, groups, pollutants, receptors, profiles) has increased from 20 to 30 characters

b. The maximum number of pollutants in the palette has increased from 30 to 100

c. The maximum number of pollutants emitted per source has increased from 10 to 80

d. The maximum number of entries in the pollutant output table has increased from 30 to 80

e. The maximum number of outputs per run has increased from 10 to 25

19. The table columns in the Source screen and Output screen are now resizable. The order of the columns in the sources table has also changed.

20. ADMS-Urban and ADMS-Roads model files (*.upl* files) can now be opened directly in the ADMS 6 interface. Warnings will be issued about any model incompatibilities resulting in disabled options. The file can then be saved as a regular *.apl* file.

21. Right-click menus have been added to various screens in the ADMS 6 interface and utilities to allow for the following additional functionality:

    a. Set the start date and time to that of the met. file or to the end date and time, and vice versa, when using a subset of met. data.

    b. Choose the application with which to open an input file (Notepad, Wordpad, Excel, Other) on the View buttons

    c. Create a copy of a specified point

    d. Delete all but the selected entry in various tables (sources, buildings, specified points)

    e. Invert the selection of variable grid coordinates

    f. Refresh the list of files in the 2-D Output Plotter

22. Multiple copies of the interface can be used simultaneously. This is particularly useful for comparing two *.apl* files side by side.

23. It is now possible to open an .a*pl* file from Explorer by right-clicking on it and selecting **Open with ADMS 6** or **Open with ADMS-Screen**. Also, double-clicking on an .a*pl* file in Explorer will cause it to open in the most recently used model interface.

    If .apl files were previously associated with another program, such as a text editor, on your computer, then this new feature may not be available to you. In this case, please contact CERC for advice on how to change the association of .apl files.

    ---

24. Additional information about your model licence is available from the **Licence details** screen on the **Help** menu. The licence file path and licence number can be copied and

pasted into other documents using the **Copy** buttons. The licence can be located in Explorer using the **Find** button. The number of sources, groups and buildings that can be modelled with your licence can be seen by clicking **Details**.

25. It is now much easier to enter percentiles and exceedance thresholds in the Output screen. New values can be entered by typing the number and then pressing Enter. The full table of entries can be opened via the drop down arrow and closed via a right-click menu.

Buildings

26. There have been several enhancements to the way the effects of buildings are modelled, particularly in the case of sources which are upwind of the building. To allow consistency with previous modelling, when required, a new *.aai* option has been added which allows these new developments to be switched off, see Section 4.9.5 of the ADMS 6 User Guide for more details about this option.

    a. When a plume upwind of the building impacts onto the face of the building, the plume will now split into up-to three parts going round and over the building. These plumes will then be used for the calculation of entrainment into the cavity region and for the dispersion of the non-entrained material in the main wake. Previously a single plume was modelled for this case.

    b. The secondary plume emanating from the cavity region is now modelled as a line source element. Previously this was modelled as a virtual point source. The use of a line source better represents the distribution of concentration emanating from the well-mixed recirculation region, in particular immediately downwind of the recirculation region.

    c. Changes have been made to ensure consistency when the model selects an alternative main building. In all cases the closest eligible building will now be selected. Previously different behaviour would be seen depending on whether the nearest alternative building within the region of influence was too low compared with the source.

27. There is now an option to specify that the model should always automatically select a main building for a particular source. This option is specified by selecting "(Auto)" as the 'Main building' for this source in the Source screen. When using this option the closest building which is tall enough (met. line independent) and within the region of influence of the source (met. line dependent) will be selected.

28. It is now possible to model the effects of buildings and fluctuations within the same run.

29. When running in verification mode a *.bef* file will now be output showing the effective building for each source for neutral conditions for a range of wind directions. The wind directions used for this can be altered in the additional input file. When carrying out the full model run the *.bef* file will be created based on the modelled meteorological data as before.

30. The format of the *.bef* file has been altered to allow it to easily be plotted as a series of polygons within the Mapper, see also point 14. The effective building heights have

also been added to this file.

31. Output points within input buildings will now have their output concentration set to zero within the comprehensive output file for consistency with the output given in all other files.

Time varying emissions

32. The use of time varying emissions data from a *.var* file or *.fac* file is now specified on the 'Time varying emissions' screen. This can be accessed by turning on 'Time-varying source data' and clicking the **Data**... button in the Source screen.

33. There are various new features if entering on-screen time varying emission factors (see Section 4.1.3 of the ADMS 6 User Guide for full details):

    a. There is now a choice for which source types to apply the time varying emissions factors to. Any sources not selected will have a constant profile.

    b. The sum and average of each diurnal profile (Weekdays, Saturdays, Sundays) is displayed, as well as the overall sum and average

    c. There is a Normalise button that adjusts the factors so that the overall average equals one

    d. There is a graph that plots the time-series of each diurnal profile

    e. There is a Save button that generates a *.fac* file from the on-screen data, which can then be modified further in a text editor if desired

    f. The on-screen factors can also be imported from/exported to a simple *.csv* file

    g. It is possible to copy the factors from one profile to another by right-clicking on the header

    h. Values can also be pasted from Excel or a tab-separated text file into the table

34. Time-varying emission factor profiles in the *.fac* files can now be applied to a particular source-pollutant combination. See Section 4.1.2 of the ADMS 6 User Guide for more details.

35. The header required for water content to be specified in the *.var* file has been corrected to H2O (i.e. uses the letter O). The previous header of H20 (i.e. uses the number 0) will still be accepted for compatibility.

Complex terrain

36. A correction has been made to the location of the well mixed region in complex terrain, in cases where the recirculation is shallow compared to its width and the source is near the downwind edge of the recirculation region.

37. A higher grid resolution of 512 x 512 has been added for the internal flow field calculations when using complex terrain. Correspondingly, the terrain and surface roughness files can now contain up to 770,000 lines of data.

38. The user can now select the vector gridding method in the 2-D Output Plotter when using the Surfer gridding option.

39. When modelling with variable terrain height, the minimum turbulence value is now set based on the size of variation in terrain height. As this variation reduces, the minimum turbulence used will return to the value used for flat terrain.

40. Changes have been made to ensure consistency when modelling variable roughness with a nearly flat terrain file and without a terrain file at all.

    a. The blending function applied to the turbulence calculations is now only applied to the terrain component. Previously this blending function would also be applied to the roughness component if variable terrain was being modelled.

    b. The constraints on the variation of velocity in variable roughness are now always applied to the change in velocity due to the variable roughness, previously they would not be applied if variable terrain was also being modelled.

41. When modelling complex terrain, passive plumes will no longer penetrate the boundary layer due the vertical velocity in the flow field.

Meteorology

42. Year/Day/Hour and wind direction have been added to the boundary layer profile output (*.pro*) file. If only one height is defined in the *.pro* file, this means it can be plotted using the Wind Rose Viewer utility, allowing a dispersion site wind rose to be plotted.

43. There have been several changes to the format of the vertical profile files, *.prf*. For full details on this new format refer to Section 4.17 of the ADMS 6 User Guide.

    a. Year/Day/Hour can now be used in place of Met. Line number. This helps with matching to the meteorological data file, especially in the case where a meteorological subset is being used.

    b. A vertical profile of pressure can now be entered.

    c. It is no longer necessary to specify data for every variable in the *.prf* file. Now only columns for which a profile is to be supplied need to be entered. The height column and one of Year/Day/Hour or Met line number must always be specified.

Old format vertical profile files can still be used with the model, but cannot contain any of the new information.

---

44. The minimum valid value for surface sensible heat flux (FTHETA0) in the meteorological input data has been changed from -100 W/m^2 to -200 W/m^2.

45. The time used in the calculation of solar elevation, and hence the solar radiation, has

been altered to use the time in the middle of the hour rather than at the end. In certain circumstances, e.g. meteorological conditions entered represent individual conditions, it may be desirable to still calculate the solar elevation at the end of the hour, i.e. the time as entered for the meteorological data. The **Solar elevation** section in the *.aai* file provides the option to determine when the solar elevation is calculated, see Section 4.16 of the ADMS 6 User Guide.

Output

46. The option to specify output locations based on a polar coordinate system has been removed from the Grids screen of the interface. Output grids based on a polar coordinate system can be created for an *.asp* file using the Create ASP grid option, see point 47. The Grids screen now also allows for the specified points in the interface and from a file to be enabled independently of each other.

When upgrading an older .apl which used polar coordinates, all output locations will be converted to Cartesian coordinates and stored in a new .asp file. The Grids screen will be automatically set to use this new .asp file and all other options on the Grids screen will be turned off.

---

47. A new Create ASP grid utility has been added. This option allows *.asp* files to be created or appended to with grids of points representing rectangular grids aligned with the coordinate system, polar grids or rectangular grids aligned with a specific line. For each of these cases, regular or variable grids can be specified and output can be requested for a series of heights. See Section 7.7 of the ADMS 6 User Guide for more details on the Create ASP grid utility.

48. A new 'output per source' option has been added to write the output contribution from each source to each receptor in a new set of output files. The data in these files can also be visualised in the Mapper; these 'footprint' plots indicate to what degree each source contributes to the concentration at the selected receptor for a selected met. line (or long-term average) by colour-coding the sources themselves. Instructions for using this new option and details of the new output file formats can be found in Section 3.6.5 and Section 6.1.20 of the ADMS 6 User Guide, while details about the footprint plots can be found in Section 6.5.

49. A new 'validity threshold (%)' column has been added in the Output screen. This specifies the threshold percentage of met. lines that need to be valid within a given averaging period for that averaging period to be considered valid. See Section 3.6.1 of the ADMS 6 User Guide for more details.

50. Specified points in an *.asp* file can now be imported directly into the specified points table, and vice-versa.

51. The Comprehensive Output File Processor now includes an option to calculate statistics based on temporal subsets of the data. Subsets can be restricted to specified hours of the day, days of the week and/or months of the year. The minimum, maximum or average over these subsets can be calculated. For more details see Section 2.4.4 of the Comprehensive Output File Processor User Guide.

Modelling options

52. A new option to calculate odour hours has been added to the additional input file, Section 4.7.2 of the ADMS 6 User Guide. Two methods are available for determining if an hour is classified as an odour hour or not, with long term output then providing a count over these hours:

    a. A peak-to-mean method calculates the peak concentration based on an input peak-to-mean ratio and then compares this to a threshold

    b. A fluctuations method which makes use of the ADMS fluctuations module to determine if more than a specified percentage of the hour exceeds the threshold

53. When using a user input CFD flow field, the complex terrain option should now not be selected. Previously it was required that this option was selected but no information from the complex terrain screen was used with the modelling.

54. A new option has been added to the 'Switch off stack downwash' option in the additional input file to allow for stack downwash to be switched of for all point sources.

55. A new option has been added to the additional input file to allow the model to continue when a plume grounds, e.g. due to being dense. Without this option selected the model will stop with an error for long-term pollutants or skip that met line entirely for short-term pollutants, whereas switching this option on allows this check to be bypassed. Even with this option switched on, the interaction between the plume and the ground may not be modelled correctly, especially for very dense plumes, so it should be used with caution. See Section 4.23 of the ADMS 6 User Guide for more details.

Minor Changes

56. Line sources are now modelled as trapezia rather than rectangles. The shared edge of two adjoining trapezia is the bisector of the two centrelines of the line sources. If more than two line sources meet at a point the standard rectangular ends are used for each of these sources.

57. A small correction has been made to the vertical concentration profile used for volume sources in convective conditions.

58. A correction has been made when using volume sources with wet deposition, in which the depth was not correctly taken into account in the calculation.

59. If there are missing/invalid background values for the first modelled hour, the first valid values after this hour will be used providing they are within 24 hours.

60. The page numbering in the various User Guides has been altered so that the printed

page numbers match up with those displayed in electronic PDF viewing applications.

61. The version of AERMOD and AERMET supplied for use with the AERMOD link has been updated to 22112

62. An issue has been fixed which may have caused the model to crash when modelling chemistry and calm conditions with wind speeds where the dispersion was considered to be a mixture of the radial and Gaussian plumes.

63. A correction has been made to the calculation of the effective source height to ensure the ambient density at the source height is used rather than a default value. Note that this effective source height calculation is only used to determine if the plume is able to escape the cavity region with buildings or a reverse flow region with complex terrain.

64. When modelling using the Urban Canopy option the vertical turbulence profile below the displacement height will now include a convective component in convective conditions.

65. The shape factor applied when modelling dry deposition for particulates with strong gravitational settling has been altered to account for the whole plume settling. Previously the shape factor was the same as that used for gaseous pollutants and primarily represented removal at the surface.

66. An additional reaction has been added to the chemistry scheme. This models the reaction of NO with O_2 to form NO_2 and is only important if NO values are high for a long period.

67. The calculation of wind speed deficit due to wind turbines has been altered to better account for any local wind speed adjustments due to varying terrain or roughness. Previously the wind speed deficit could be too high in areas where the terrain or roughness were also causing the wind to slow down.

68. An issue has been fixed when modelling line, area or volume sources with calm conditions and wind in large sectors that would result in concentrations being too low in fully radial conditions.

69. The modelling of releases with high water content with the plume visibility module has been improved. Previously it was assumed that all water was initially exiting the stack as vapour, even when the water content was above the saturation level. This could lead to spikes in temperature immediately downstream of the source. The model now correctly calculates the amount of water exiting the stack as liquid water to prevent this issue.