What's New in ADMS 6.0.2?

April 2024

ADMS 6.0.2 is an update to ADMS 6 that includes new model features, improvements and corrects a number of minor issues. The new features include:

- An option to output additional variables to the plume centreline (*.cen*) output file, including mean plume height variables, plume rise variables and flow field variables;
- An option to calculate accumulated horizontal concentration flux per 10° or 30° wind sector at each specified point.

This document contains details of the new model features, improvements and corrections. The list of corrections includes those implemented for the previous ADMS patch (version 6.0.1, October 2023). Also contained in this document are instructions for installing ADMS 6.0.2.

Installing ADMS 6.0.2

In addition to a *.pdf* copy of this document, this update includes the following files within the *ADMS 6.0.2.zip* file:

ADMSModel.exe
Support\AAI Editor\Languages\AAIEditor_40C.syn
Support\AAI Editor\Languages\AAIEditor_804.syn
Support\AAI Editor\Languages\AAIEditor_809.syn
Support\AAI Editor\Syntax With Amine\Languages\AAIEditor_40C_With_Amine.syn
Support\AAI Editor\Syntax With Amine\Languages\AAIEditor_804_With_Amine.syn
Support\AAI Editor\Syntax With Amine\Languages\AAIEditor_809_With_Amine.syn

In order to upgrade an installed version of ADMS 6 to ADMS 6.0.2, ensure you are logged in as Administrator and copy-paste the above files into the ADMS 6 installation directory (typically *C:\Program Files (x86)\CERC\ADMS 6*), replacing the existing files of the same name. It is advisable to keep copies of the original versions of these files, although the original *.exe* and *.syn* files can also be found in the previous ADMS 6.0.1 and ADMS 6 installation *.zip* files, respectively. You should then navigate to the *Support/AAI Editor* subdirectory of the ADMS 6 installation directory (or *Support\AAI Editor\Syntax With Amine* for users with an amine chemistry licence) and run the appropriate batch file for your preferred language, e.g. *ToEnglish.bat*.

New Features and Improvements

1. It is now possible to request additional variables in the plume centreline (*.cen*) output file via a new *.aai* file option, including mean plume height variables, plume rise variables and flow field variables. For more details regarding this new option, please refer to Appendix A of this document.

2. It is now possible to output accumulated horizontal concentration flux per 10° or 30° wind sector at each specified point via a new *.aai* file option. For more details regarding this new option, please refer to Appendix B of this document.

3. Efficiency improvements have been made to the 'Spatial and temporal variation of deposition parameters' option. When using a spatially-varying deposition parameter (*.din*) file that contains a large number of data points, this improvement can lead to significantly faster model run times, particularly for model runs that include multiple sources and/or span multiple met lines.

Minor Changes

Since ADMS 6.0.1

4. A memory leak issue has been fixed that could cause the model to reach its RAM limit (2GB) and stop before completing the run. This typically only affected runs with short-term output that used multiple years of met data.

5. An issue has been fixed that could cause the model to crash when using the gamma dose option with output points located very far from the source.

6. An issue has been fixed in which the crosswind position of the plume in the plume centreline (*.cen*) and line-plotting (*.!01* etc) output files was given relative to the effective building centre rather than relative to the source when modelling buildings.

7. A separate issue has also been fixed that corrects other variables in the plume centreline (*.cen*) and line-plotting (*.!01* etc) output files when modelling buildings with complex terrain.

8. An issue has been fixed that could cause the model to crash when modelling plume visibility for a source that has a very high mixing ratio.

9. An issue has been fixed that could affect plume rise calculations for jets pointing upstream

10. An issue has been fixed that could cause long *.sst* or *,slt* file headers to wrap onto multiple lines.

Included in ADMS 6.0.1

11. An issue has been fixed that could cause the model to crash when modelling buildings with releases where the molecular weight or specific heat capacity are not at the default values.

12. An issue has been fixed that could cause the model to crash on rare occasions when modelling buildings.

13. An issue has been fixed that could cause the model to crash when using the buildings and ‘temperature and humidity output’ model options together.

14. An issue has been fixed that could cause the model to crash if using a *.fac* file that includes more than one blank line between the different profile blocks.

15. An issue has been fixed that could cause the model to crash when using the coastline and ‘combine multiple flues’ model options together.

16. An issue has been fixed that could cause the model to crash when using the amines chemistry model option with a large number of output points.

APPENDIX A Extra .cen file output

The list of variables included in the plume centreline (*.cen*) output file can be extended using an *.aai* file option. Recall that the *.cen* file is only produced for short-term, single point source calculations with gridded output.

To enable this option, first create an *.aai* file or edit the existing *.aai* file (as described in Section 3.1.7 of the ADMS 6 User Guide) so that the **Extra .cen file output** section (keyword CENEXTRAOUTPUT) is enabled, as shown in **Figure 1**.

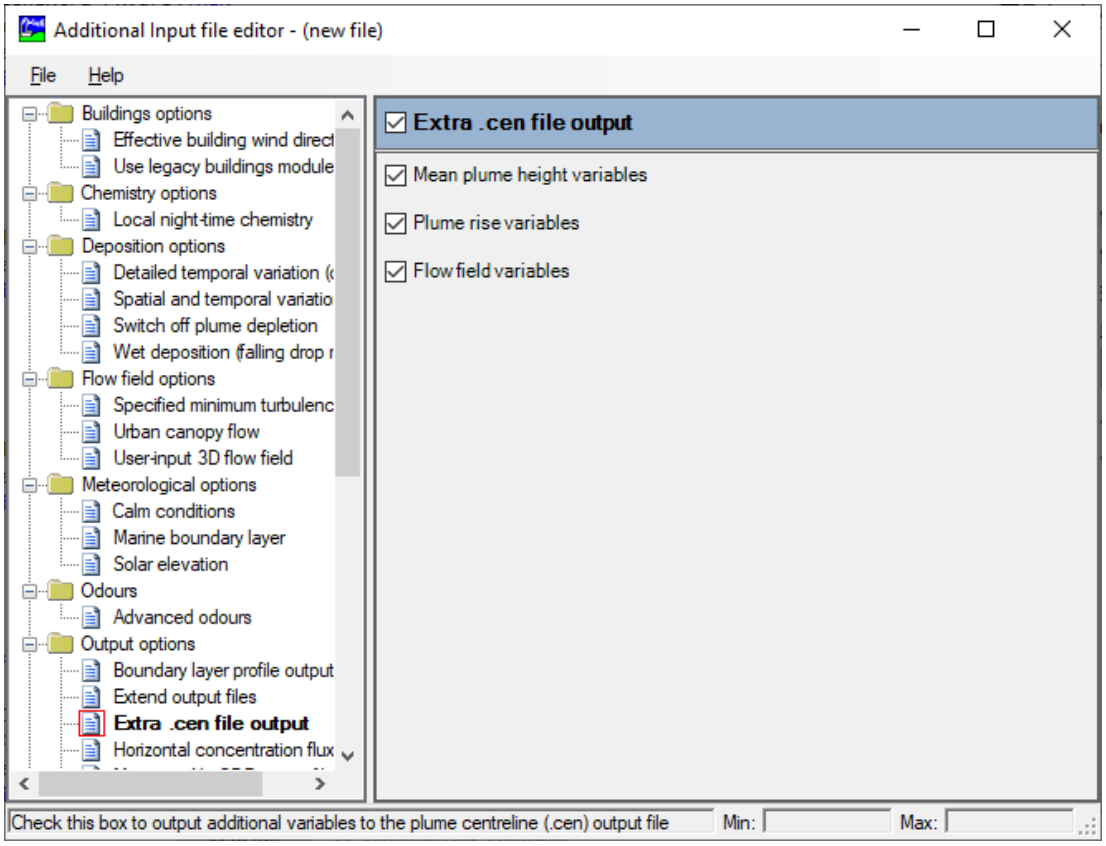

Figure 1 – **Extra .cen file output** section in the **Additional Input file editor**

Table 1 shows the additional variables that can be included in the *.cen* file depending on which of the checkboxes in **Figure 1** are ticked.

Table 1 – Extra variables in the *.cen* file

Variable	Set	Description
C(Zm)	Mean plume height variables	concentration at mean plume height (directly above/below plume centreline) (user-selected concentration units)
LiqW(Zm)		liquid water content at mean plume height (kg/kg)
TmpZm		temperature at mean plume height *(if temperature output is selected)* (°C)
RHZm		relative humidity at mean plume height *(if relative humidity output is selected)* (%)
SHZm		specific humidity at mean plume height *(if relative humidity output is selected)* (kg/kg)
RHO_a	Plume rise variables	ambient density used in plume rise calculations (kg/m^3)
RHO_p		plume density used in plume rise calculations (kg/m^3)
Ri		Richardson number used in plume rise calculations
U(Zm)	Flow field variables	Wind speed parallel to upstream flow at mean plume height (m/s)
SigU(Zm)		Along-wind turbulence component at mean plume height *(if modelling time-dependent puffs)* (m/s)
SigV(Zm)		Across-wind turbulence component at mean plume height (m/s)
SigW(Zm)		Vertical turbulence component at mean plume height (m/s)

APPENDIX B Horizontal concentration flux

Most air quality monitors measure pollutant concentrations that can be compared directly against standard ADMS concentration output. However, monitors such as the Directional Passive Air Sampler (DPAS)[1] work by pivoting in the wind to collect directional samples, measuring instead accumulated horizontal concentration *flux* from a number of different wind sectors.

In order to be able to compare against data from this type of monitor, it is possible to request accumulated horizontal concentration flux output in ADMS 6 via an *.aai* file option. To enable this option, first create an *.aai* file or edit the existing *.aai* file (as described in Section 3.1.7 of the ADMS 6 User Guide) so that the **Horizontal concentration flux** section (keyword HORIZONTALFLUX) is enabled, as shown in **Figure 2**. Choose the **Wind sector size** used by the directional monitor (available options are 30° or 10°) and the mid-point of one of the wind sectors (**Wind sector mid-point**) so that the model can calculate the boundaries between the different wind sectors.

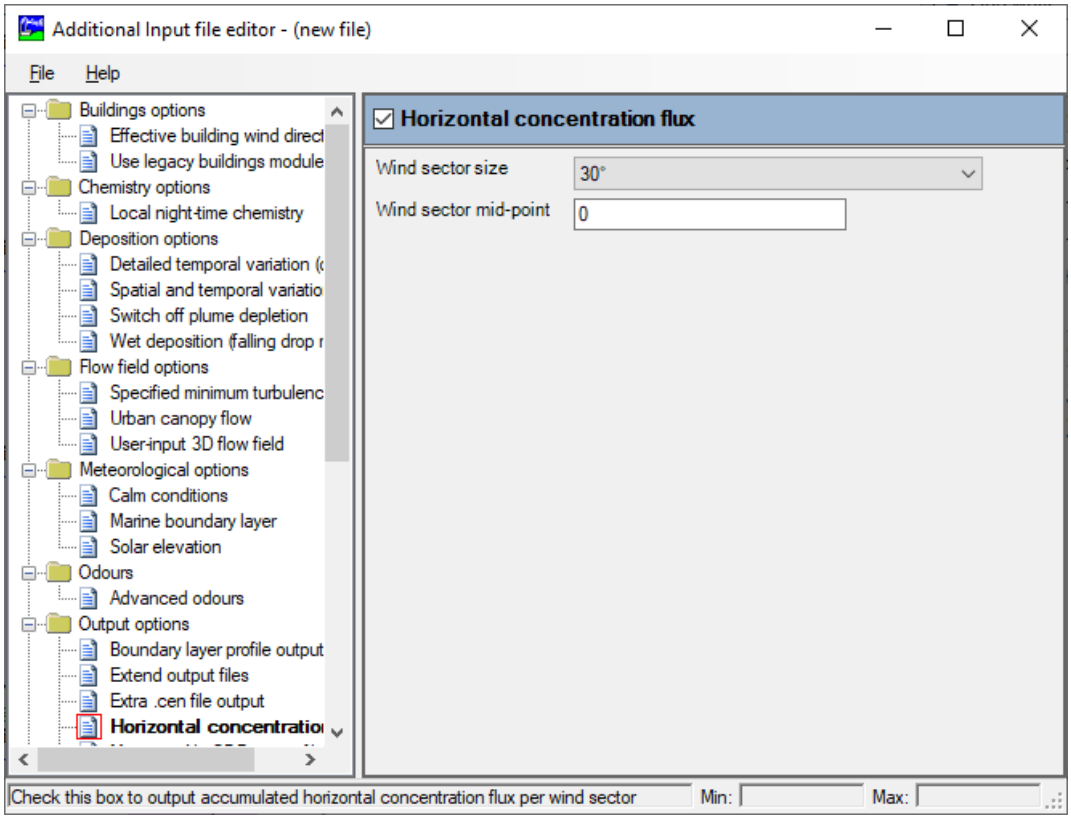

Figure 2 – **Horizontal concentration flux** section in the **Additional Input file editor**

[1] Solera Garcia, M.A., Timmis, R.J., Van Dijk, N., Whyatt, J.D., Leith, I.D., Leeson, S.R., Braban, C.F., Sheppard, L.J., Sutton, M.A. and Tang, Y.S., 2017: Directional passive ambient air monitoring of ammonia for fugitive source attribution; a field trial with wind tunnel characteristics. In *Atmospheric Environment*, **167**, pp. 576-585. https://doi.org/10.1016/j.atmosenv.2017.07.043.

When this option is selected, the model will create a new output file with extension *.flx* in the same directory (and with the same file stem) as the *.apl* file. This file will contain the accumulated horizontal concentration flux:

- at each specified point defined in the **Specified points** table and/or **Specified points file** from the **Grids** screen (i.e. no flux output is given at gridded output points);
- for each long-term (LT) pollutant with an averaging time of 1 hour or less that is selected for output in the **Output** screen;
- for the 'All sources' group only (which must therefore be ticked in the **Output** screen if **Groups** output is selected), or for the selected source if **Source** output is selected.

For a given receptor, the accumulated flux for a given met line and pollutant is calculated as $3600 \times C \times U$, where C is the hour-average concentration at that receptor (including any background concentration), U is the local horizontal wind speed (including any complex terrain effects but not including any buildings effects) and 3600 is the number of seconds in an hour. This value is assigned to the appropriate wind sector based on the local wind direction. An accumulated flux of zero is assigned to all other wind sectors for that met line. The output value in the *.flx* file is simply the sum of these hourly values over all valid hours. Note that met lines for which reverse flow was encountered at that receptor are discounted from the total for that receptor.

The *.flx* file includes the following variables:

- **Receptor name**: Name of specified point
- **X(m)**: X coordinate of specified point
- **Y(m)**: Y coordinate of specified point
- **Z(m)**: Z coordinate of specified point
- **Total valid hours**: Total number of valid hours used in the accumulated flux calculation for this receptor.
- **Num valid hrs (###.# deg)**: Number of valid hours when the wind at this receptor was blowing from a given sector, for each wind sector. The value in brackets gives the mid-point of the wind sector, e.g. 270.0°. The sum of these values over all wind sectors will equal the value in the 'Total valid hours' column.
- **Mean horizontal wind speed (m/s) (###.# deg)**: Mean horizontal wind speed (m/s) over hours when the wind at this receptor was blowing from a given sector, for each wind sector.
- **AccHFlux (###.# deg)**: Accumulated horizontal concentration flux over hours when the wind at this receptor was blowing from a given sector, for each wind sector. A set of columns are given per relevant pollutant. This has units of [conc]·m, where [conc] is the user-selected output units for that pollutant. Note that it is also possible to calculate an indicative average concentration over hours when the wind was blowing

from a given sector by dividing this value by: the corresponding ‘Mean horizontal wind speed’ value × the corresponding ‘Num valid hrs’ value × 3600.

Restrictions

The **Horizontal concentration flux** option cannot be used in conjunction with the following model options:

- **Radioactive decay**;
- **Gamma dose**;
- **Puff**.