

Report on the CASANZ ModSIG Workshop - Hobart - 3 May 2005

A one day workshop on current air dispersion modelling issues within Australia and New Zealand was held on the 3rd May 2005, prior to the CASANZ Hobart Conference. With the overlap in topics and interest between the modelling and odour special interest groups (SIGs), the workshop was split into a ModSIG session and a joint 3 hour session with the OdourSIG. A summary of the joint session is to be presented in an upcoming edition of Clean Air.

The ModSIG session included presentations by two invited speakers on new developments in modelling (Bob Yamartino, USA and Martin Cope, CSIRO, Australia). The remainder of the ModSIG session consisted of short presentations from the modelling community on perceived issues, followed by discussions. Following the presentations, the various speakers were requested to summarise their major points and recommend a way forward. As there was no time to finalise or reach a position at the workshop, these were then circulated to presenters to clarify/add to the recommendations, if necessary. These finalised recommendations were circulated to the workshop attendees who were asked to note their level of agreement (or disagreement) on each of the recommendations. The following table contains the main points, recommendations and a summary of the responses.

CASANZ Hobart 2005 - Modelling Workshop Recommendations

#	Main Point(s)	Recommendations	Strongly Agree	Agree	Neutral/Undecided	Disagree	Strongly Disagree	Index of Agreement	Ranking Index
1	In comparison studies with observations, ISC3 generally over-predicts (sometimes significantly as in complex terrain), whilst AERMOD generally slightly under-predicts the observations.	a) We need to better define (more validation studies) the differences between AERMOD vs AUSPLUME, particularly for emissions from surfaces such as ponds.	8	10	3	0	0	1.2	11
		b) Ausplume should be modified to follow exactly the AERMOD modelling approach.	1	3	9	3	4	-0.3	4
		c) With changes in models over time (especially the step change from ISC3 to AERMOD), there is a need for model guidance, explicit statements on how this may effect regulatory modelling in Australia and NZ.	11	7	2	1	0	1.3	9
2	Meteorological processing under stable conditions shows inconsistencies between CALMET, AERMET and TAPM. The reliance on cloud data at sites remote from BoM observing sites is a problem. This is alleviated using the new AERMET delta T solar radiation scheme.	An Australian (NZ) meteorological pre-processor should be developed, particularly for local modelling of surface sources in stable conditions (e.g. odour). For example this pre-processor could be based on AERMET, modified to use Aus/NZ data (BoM radiosonde and cloud data etc), with guidance on use of bulk Richardson method, Bowen ratios on a monthly/seasonal basis for Australian land/climate types, etc.	6	9	3	3	0	0.9	35
3	The PG dispersion curves used in CALPUFF (based on US EPA regulatory requirements) are inconsistent with the AUSPLUME approach. The facility to make adjustments to the PG horizontal dispersion curve for differing averaging times will be removed from future CALPUFF versions.	a) CALPUFF should retain the averaging time adjustment to the horizontal dispersion to allow consistency with the AUSPLUME approach.	2	6	7	4	2	0.1	0
		b) The micrometeorological dispersion option in CALPUFF should be used in preference to PG dispersion curves because of its better theoretical basis.	8	6	5	2	0	1.0	3
		c) More studies and documentation are needed on the differences that will result for modelling low level sources such as surfaces releases using the micrometeorological versus PG curves (see item 1).	10	10	1	0	0	1.4	11
4	Photochemical models still require further verification on photochemistry within an urban plume.	The use of limited field studies to measure photochemical oxidants such as hydrogen peroxide, and all of the components of NO _y , should be considered. This type of data can be used to verify whether models are correctly predicting the state of the photochemistry (i.e. NO _x -limited or NO _x -rich) within an urban plume.	3	10	8	0	0	0.8	13

5	Models are predictive tools – each with its own characteristics performance. If the performance is not articulated by modellers/models, projects may be discredited in court.	<p>a) An independent peer review of the performance of models used in Australia and New Zealand should be conducted urgently.</p> <p>b) CASANZ should produced a guidance statement on modelling that includes guidance with respect to the suitability of model applications in terms of location (coastal, inland, complex terrain), stack height etc.</p> <p>c) A CASANZ statement on model uncertainty that can be referred to in court cases should be developed.</p>	12	7	1	1	0	1.4	19
			8	8	3	2	0	1.0	23
			8	8	1	2	2	0.9	14
6	Model Verification is important - we (CSIRO) have done some but more is needed. Model inter-comparison shows variable model performance and is a good way to find problems with models.	More model verification work (including model inter-comparison) is required.	10	11	0	0	0	1.5	28
7	Peer review is essential to ensure that model comparisons are on the same basis and “fair”. More sharing of model data is needed to ensure better model evaluations/validations	<p>a) Developers should talk to one another more to improve models.</p> <p>b) More rigorous peer review is needed of model validation studies.</p>	10	8	2	0	0	1.4	9
			13	5	1	1	0	1.5	13
8	<p>Assimilation of prognostic wind data and observations into a diagnostic model such as CALMET can produce unrealistic winds such as</p> <ul style="list-style-type: none"> • "bullseyes" of wind speed due to non-conformance of the prognostic and observational wind speeds at discrete locations; and • unrealistic convergence of wind directions in CALMET final guess wind fields due to non-conformance of prognostic wind fields and observational directions at discrete locations. 	<p>To ensure consistent wind fields from the assimilation of prognostic and observational data, the following are recommended:</p> <p>a) Observational data should only be assimilated into prognostic wind fields if certain criteria are met eg;</p> <ul style="list-style-type: none"> - the observational winds are not affected by local obstructions, which affect observed wind directions and speeds. - the prognostic winds are already in reasonable agreement to the observed winds. <p>b) Guidelines for data assimilations within CALMET should be developed.</p>	4	10	4	2	1	0.7	7
			5	13	3	0	0	1.1	3
9	Extremely low values of O ₃ may not be correctly represented by TAPM. Onset and cessation times of sea breeze (at Adelaide) are not well predicted by TAPM.	We should use seasons (say winter versus summer) as indicator of low O ₃ values instead of hourly time data (i.e. fine resolution temporal scale). More research needed for sea breeze simulation over a fine temporal resolution.	1	4	15	1	0	0.2	0
			1	7	12	0	0	0.5	0
10	Limited documented evaluation of Ausplume. Ausplume has been shown not to consistently over-predict maximum concentrations but even under predict. Regulators like conservativeness.	<p>a) Maximum concentrations are appropriate to use in impact assessments for regulatory purposes.</p> <p>b) Need to incorporate the PDF algorithm in AUSPLUME for stack sources less than 100m.</p> <p>c) Need rigorous and independent documented evaluation of Australian regulatory dispersion models.</p>	4	6	3	6	3	0.1	4
			9	7	4	1	1	1.0	21
			9	9	1	0	0	1.4	19
11	Is the PM ₁₀ (24 hours) criteria of 50 µg/m ³	a) Need a more flexible approach to assess PM ₁₀ impacts.	8	6	6	1	0	1.0	11

	suitable criteria for boundary assessments	b) The focus should be on the best available technology. c) There is a requirement for different PM ₁₀ standards dependent on the nature of the particles.	2	12	3	2	1	0.6	1
			3	11	4	3	0	0.7	6
12	Siting of 10m wind sensors using the 10 x height rule for nearby obstructions as recommended in the Australian Standard (AS 2923) does not guarantee representative winds for use in modelling.	The AS should be revised to note the 10 times height rule can lead to a winds that are 20 to 30% lower than those without the obstructions. For negligible influence a 30 times rule is necessary (in line with the BoM anemometer siting guidelines) for the purpose of extrapolating surface winds to upper levels in plume modelling, though it is noted in most applications this may not prove to be practical.	6	10	4	2	0	0.9	2
13	Is the Civil Aviation Safety Authority (CASA) <i>Guidelines for Conducting Plume Rise Assessments</i> a case of overkill? Particular points being the: a) the recommended TAPM method using 5 years of meteorological data; and b) is the plume-rise risk real anyway?	a) CASA should be requested to provide data to substantiate the risk to aircraft for updraft velocities greater than 4.3 m/s. b) If the risk in a) is substantiated, consideration should be given to introducing the option of a simpler method as a replacement to the 5-year TAPM method in appropriate cases. c) If the risk in a) is substantiated, and if a simpler method b) can be developed, the simpler method should be recommended to CASA as a option/replacement to be considered for the Guideline in appropriate cases.	5	10	5	0	1	0.9	4
			7	12	2	0	0	1.2	0
			7	11	3	0	0	1.2	0
14	Is there a need for upper air data sets for CALMET from MM5?	Is there a need for upper air data sets for CALMET from MM5?	3	9	5	1	3	0.4	4
15	Requirements from Model Developers	Model developers should: a) Ensure that model documentation is up to date and available to all users; b) Provide publicly a list of known bugs and issues with the current version of the program; c) Have an accessible contact to discuss (eg via e-mail) model issues; and d) Make available model code for review and checking in some form.	14	7	0	0	0	1.7	11
			12	8	0	1	0	1.5	4
			10	10	0	1	0	1.4	3
			12	4	3	1	1	1.2	13

Notes:

1) The 'Index of Agreement' was determined from the mean of the responses assigning points of 2, 1, 0, -1 and -2 to the categories of strongly agree, agree, neutral/undecided, disagree and strongly disagree.

2) The 'Ranking Index' is the sum of the responses where each respondent ranked their top 5 issues/recommendations from 5 (most important) to 1 (least important).

3) The survey results are based on 22 responses from a workshop attendance of 52.

The post workshop survey indicates the following issues on which there was strong agreement (an index of agreement of 1.5 or more):

- That model documentation needs to be up to date and available,
- The need to provide publicly a list of known bugs with the current version of the model,
- More model verification work including model inter-comparison is needed; and
- More rigorous peer review of validation studies is needed.

Areas where there was the largest divergence in the responses (a high number both for and against the proposition) were:

- Whether maximum (eg 1 -hour) concentrations are appropriate to use in impact assessments for regulatory purposes (10 for and 9 against with 3 neutral/undecided); and
- Whether Calpuff should retain the averaging time adjustment to the horizontal dispersion to be consistent with the Ausplume approach (8 for and 6 against with 7 neutral/undecided).

In ranking the issues, the most important issues identified in decreasing order were:

- The need for an Australian (and NZ) meteorological pre-processor (35 points);
- The need for more model verification work (28 points). This issue was both highly ranked and also a point on which there was good agreement between all the respondents;
- That CASANZ should produce a guidance statement on modelling that includes guidance as to the suitability of model for various applications (23 points);
- That the PDF algorithm in Ausplume should be incorporated for stack sources less than 100 m (21 points);
- That an independent peer review of the models used in Australia and New Zealand should be conducted urgently, and that rigorous and independent documented evaluation of Australian regulatory dispersion models is needed (equal fifth on 19 points).

Of the above issues, action will be dependent on the response ModSIG may be able to garner from regulatory and other potential funding organisations. It is suggested that a small group be formed to examine the options for achieving this and that ModSIG members be kept informed on its progress at regular intervals.

The 2005 Hobart Modelling SIG workshop was proudly sponsored by the following companies.

