
INTRODUCTION

Col Judson E. Stailey, USAF
Assistant Federal Coordinator for
Air Force and Army Meteorological Affairs,
Office of the Federal Coordinator for
Meteorological Services and Supporting Research

Set the Stage

Recent events have focused attention on the potential for release of agents that could threaten the health or lives of large groups of citizens and, in turn, on how we in the meteorological community support the response to these types of incidents. As we begin to focus on this challenge, the first thing we notice is the large number of ATD models available, a result, apparently, of the bottom-up approach to ATD model development that has taken place in the US. When we look further into how these models support emergency response, we see that, because there are several response plans that designate different Lead Federal Agencies, a number of different models may be available for use depending on the situation. There is even some potential for more than one model to be applied in a given situation, leading to the possibility of conflicting information being passed to responders. None of this should be new information to those in the ADT community. What's new is the spotlight that has been focused on this situation and urgency for addressing it.

This workshop is the stepping off point for addressing this situation. Mr. Williamson has already discussed the workshop goal and objectives. This presentation will provide a little background information and define some terms to help us get started.

How Many Models?

In 1999 OFCM published an update to their ATD model directory, called Directory of Atmospheric Transport and Diffusion Consequence Assessment Models. This directory included information on 64 models, and some people often cite that number as the number of available federal models. That's really not the case, however. The directory includes models from outside the US, and includes only those models for which the developers or users responded to the request for information about their models. When FEMA conducted a review of models to determine what they should use, they looked at 144 models. Others have suggested that there are over 200 dispersion models. Numbers like this get people's attention. We saw that happen at the Federal Committee meeting Mr. Williamson mentioned a few minutes ago.

This situation begs the question "If we have an emergency involving the release of a dangerous substance, what model will we use?" It also suggests a follow-up question: "Why do we have all those other models?"

Now, I recognize that these questions reflect a serious over-simplification of the situation. However, at some level they also reflect valid concerns. A good way to answer those

concerns would be to obtain a clear, objective understanding of the characteristics of dispersion models. Such an understanding, perhaps documented in the form of a searchable database, would also support the selection of models that are appropriate for use in specific situations.

Types of Models

Before going into more detail on characterizing ATD models, we should think about what models we will be considering here. There are, of course, a lot of ways to categorize models, but for our purposes here we could think of models as being either research or operational. Not every model will necessarily fit neatly into one of these categories, and some may object to categorizing them in this fashion. However, as we are addressing operational scenarios in this context, this approach seems to be a practicable way of separating out a number of models that should not be considered because they are not useful in emergency response.

Categories and Criteria

In order to understand the characteristics of the models, we have proposed gathering information on them in a standard way. Model characteristics can be defined in terms of specific questions you might ask about models and the answers to those questions. The subject of a question is referred to as the "category" and the answers as "criteria." Unfortunately, there has been some difficulty articulating what is meant by "category." To help explain the term, consider an example. The category "range" would come from the question "At what distance from the source does this model provide information?" The question "How long does it take to run the model?" would define the category "runtime."

Application	Boundary Features (land-sea, urban, etc.)
Target User Community	Deposition
Range	Weather Input
Resolution	Source Implementation
Time Steps (steady state, time dependent)	Effects Implementation
Type of Diffusion Module (Gaussian, CFD, etc)	Platform
Type of Transport Module (prognostic, stochastic, etc)	Environment
Terrain Implementation	Runtime
	Status of Evaluation
	Accuracy
	On-going Development

Table 1. Strawman List of Categories

Table 1 shows a strawman list of categories. It is not intended to be definitive, or perhaps not even a starting point. It simply illustrates the concept. Something like it, only better, should come out of this workshop. This list certainly could use improvement. For example, when considering the category "application" one might come up with criteria like "chemical, biological, radiological" etc. That seems pretty straightforward, but when considering the concept of "application," a colleague proposed the criteria "planning, response, assessment, clean-up." This suggests that there are at least two dimensions to the term "application."

Perhaps a way to resolve this ambiguity would be to define a category called "threat" for the chemical, biological, and radiological criteria. In any case, this illustrates the challenges facing this workshop.

As mentioned earlier, the "criteria" associated with a category could be thought of as potential answers to the question that defines the category. Possible criteria for the category "application" have already been suggested. Consider the category "range," which was cited earlier. Criteria under range might be, say, source to 1 km, 1-10 km, 10-100 km, 100-1000 km, and greater than 1000 km. Of course, for a given model more than one range might apply. That approach works for the scientist in all of us, but users may want to specify it differently, perhaps using descriptive terms like city block, urban area, metropolitan area (or county?), state, region, continent, hemisphere. These are the types of issues to be considered as the list of criteria associated with each category is being developed.

Two additional points should be made. First, we should realize that the questions that define the categories also express what is important to us, and, as such, are related to requirements. So, while we're not actually considering requirements at this workshop, some of what we will be doing will be addressing requirements at least obliquely. We should not forget this. Going back to the 64 (or 144, or whatever) models we have, it's fair to ask which requirements those models were built to meet. Perhaps what we do here will move us toward being able to answer that question in an objective way.

Finally, one of the categories on our strawman list should be highlighted—status of evaluation. It comes from the question "What have you done to make sure that your model will give me what I need and that what it gives me is correct?" We have a responsibility to use tools that work properly, and to understand how well they work. It should be obvious, given recent events, that everything associated with a disaster is going to be put under a microscope by someone. We need to make sure that we've done our homework in this regard. Tomorrow we will be having a panel discussion on agency approaches to evaluating models, which will be a starting point for further work in addressing this issue.