Twenty-five years of Harmonisation conferences – looking back and ahead

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A focal point throughout the series of Harmonisation conferences:

- In the modelling community we should build upon the experiences of each other.
- An issue of permanent attention during the conferences:
  How can we establish mechanisms which work, when it comes to pooling experiences and obtain a better utilization of the work we do?
Constructing a pile of scientific knowledge
What to expect in my talk

- I’ll take you 25 years back in time...
- The fate of classic data sets
- A collection of successful activities – very briefly
- Some important lessons learnt – a glimpse into the work on model evaluation by the COST 732 action.
- Help requested: Concerns the Atmospheric Dispersion Wiki. How can we fulfil the intentions behind it?
Let’s go twenty-five years back in time

- An era before the World Wide Web
International workshop at Risø, Denmark, May 1992

The workshop was the start of the series of conferences on *Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes*.
This paper is meant as a short introduction to a potentially useful tool for the atmospheric dispersion modelling community: Electronic information exchange.

It is the intention to point to some possibilities which exist at present, or which could relatively easily be brought into existence. The idea is to stimulate discussions on which initiatives it will be appropriate to take.

1. INTRODUCTION

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First, an example serves to illustrate some possibilities. Then, a number of "media" for electronic information exchange are presented. Finally, some topics for discussion are suggested.

2. EXAMPLE OF ELECTRONIC INFORMATION EXCHANGE

- THE US "TECHNOLOGY TRANSFER NETWORK"

The Office of Air Quality Planning and Standards in the US EPA runs a public Bulletin Board Service (BBS), called the "Technology Transfer Network" (EPA, 1991). It started in 1989, and has since then matured. Users from anywhere can log on to the TTN using an ordinary telephone and a modem (telephone 919-541-5742; baud rate 2400/1200/300, 8 data bits, no parity, 1 stop bit). They then get access to 8 different bulletin boards, each containing a selection of files containing technical information.
Among the preparations for the workshop

Thank you for your letter of June 6, 1991 requesting information on our data archive, our electronic bulletin board system (BBS), and the UNAMAP evaluation.

1. Data Archive. This project (which was intended to be an ongoing effort) resulted in the construction of several ASCII data sets that are currently made available via our electronic BBS. Rather than list the data sets, I have enclosed a package of documentation that describes the data and the structure of the data sets. As you can see the initial project results are the only results to date. This is a continuing sad comment on the ability of our science to archive classic data sets for other users. Perhaps someday we can increase the data listings, or better yet, contribute our holdings to a group willing to archive data from many sources and make them easily available to researchers.

2. We have two BBS. I am familiar with one. One is operated by my branch, phone number (919)541-1325. The second, called SCRAM, is operated by our regulatory counterpart within EPA, phone number (919)541-5742. Our BBS contains research models (not accepted for general applications involving regulatory decisions), as well as our few archive data sets. When you call in for the SCRAM BBS you will find you are calling into a very large BBS with several special interest areas, where air quality dispersion modeling is the subgroup called SCRAM. The SCRAM BBS is much larger and more sophisticated than ours. It provides all of the air quality dispersion models currently used in regulatory modeling, as well as documentation, examples, and other useful tips to those interested.

3. As the SCRAM BBS has evolved, many of the models have been rewritten to allow them to be run on PC's. However, most of the concern has been on code corrections and associated documentation. We have not attempted to create user-friendly menu data entry front-ends for the models. This task is left to the private community. In summary, the model codes can be downloaded from the BBS systems, but if you are looking for user-friendly models, this is only a private vendor function, for now.

My Division Director, Frank Schaefer, has been discussing with me the possibility of my attending the planned NATO CCMS meeting in Greece, in order to participate in the round table discussion on 'urban meteorology'. Is there more than one round table discussion? Perhaps this is the same discussion you mentioned, in any case, I may see you there!

You gave me your e-mail address, which I assume is valid on INTERNET. I have access to ONNET, which may have some means to transfer messages to INTERNET, but I will need to discover how this is done before we can e-mail to each other.
Data Archive.

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SCRAM BBS (Bulletin Board Service)

Fig. 1

** SCRAM UTILITIES **
- <R>ead SCRAM Alerts
- <S> Register for SCRAM Mail
- <-> Return to Top Menu
- <G>oodbye

** FILE TRANSFERS **
- <A>ir Quality Models
- <Y> Utility Programs
- <W> Meteorological Data
- <D>ocumentation
- <U>pload/Download Area

** AGENCY COMMUNICATIONS **
- <K> Model Status
- <M>odel Change Bulletins
- <B>ulletins
- <N>ews
- <H> Model Clearinghouse

** PUBLIC COMMUNICATIONS **
- <P> Public Messages
- <E> Electronic Mail
- <C> Model Conferencing
Quite a contrast to today...
Today – plenty of powerful webservices
The fate of classic data sets
John Irwin established a web site around 2010: 

*Atmospheric Transport and Diffusion Data Archive.*

Some quotes from the web site:

“There are existing data from past tracer and meteorological field experiments that, as yet have not been fully converted to digital format.

This web site is my attempt to provide such data sets I have for use by others.

Many of these data sets, which were initially used to develop or test parameterizations for Atmospheric Transport and Diffusion models, can yield additional, valuable results...

I believe available data sets should posted on the web for access and use by the research community. It seems to me to be more cost-effective to archive and re-analyze these data sets than to repeat the underlying field studies at great expense.”
# Atmospheric Transport and Diffusion Data Archive

**Home**  |  **The transferred site**  |  **About John**

| **Tracer Data** | **Main page** |  
| The contents of the site www.jsirwin.com has been relocated to this url, www.harmo.org/jsirwin/  
| The author of the site, John Irwin, passed away in 2016. The data archives he compiled are retained here, largely as he created them.  
| Additional Information about the transferred site...  
|  
| **CAPTURE AND USE EXISTING DATA SETS** |  
| There are existing data from past tracer and meteorological field experiments that, as yet have not been fully converted to digital format.  
| This web site is my attempt to provide such data sets I have for use by others.  
| Many of these data sets, which were initially used to develop or test parameterizations for Atmospheric Transport and Diffusion (ATD) models, can yield additional, valuable results, for example, on concentration uncertainty and short-term fluctuations in concentration values.  
| I believe available data sets should posted on the web for access and use by the research community. It seems to me to be more cost-effective to archive and re-analyze these data sets than to repeat the underlying field studies at great expense.  
| If you publish analyses using data from this site, I would appreciate a citation to inform others about the content of this web site, for instance: "Data were downloaded from www.harmo.org/jsirwin".  
|  
| **Meteorological Data** |  
|  
| **Model Evaluation** |  
|  
| **Links** |  
|  
| The creator of jsirwin.com, John S. Irwin, passed away in 2016.  
| The site has since then been transferred to www.harmo.org/jsirwin  
| If you wish to publish analyses using data from this site you may do so – but see this citation information.
TRACER DATA SETS

I have listed all the data sets that I have and intend to eventually post availability to by way of the web site. Links will be shown for those data sets that I currently have available.

Dispersion from a near-surface release (rural):

1. **Round Hill** (1954/55 and 1957, SO2), (Cramer, Record and Vaughan, 1958) Ten minute samples of sulfur dioxide along three arcs (50, 100, and 200 m) downwind of a point source release. The release height for the 29 experiments in 1954/55 was 30 cm and for the 1957 was 50 cm. Receptor height was 2 m. Site roughness was greater than 10 cm. Samples were taken on three arcs (50, 100, and 200 m). A unique feature of the 1957 experiments was that sampling was conducted for the first 0.5 min and 3-min of the 10-minute sampling periods.

2. **Project Prairie Grass** (1956, SO2), (Barad, 1958; Haugen, 1959) Project Prairie Grass included 68 10-minute samples at 1.5 m along five arcs, 50 to 800 m from a point source release of sulfur dioxide 46 cm above ground. The 20-minute releases were conducted during July and August of 1956, with an equal number of cases occurring during daytime and nighttime. The sampling was for the 10-minute period in the middle of the 20-minute releases. Site roughness was 0.6 to 0.9 cm.

3. **Green Glow** (1959, uranium dye), (Fuquay, Simpson and Hinds, 1964), (Nickola, 1969) Thirty minute releases of zinc sulfide were sampled along 6 arcs (200, 800, 1600, 3200, and 25600 m) downwind of a point source release typically 2.5 meters above ground. Sampling was performed starting before and ending after the tracer cloud passed through the sampling area. Receptor height was 1.5 m. Site roughness was 3 cm.

- Round Hill
- Project Prairie Grass
- Green Glow
- Hanford-64
- Hanford-67
- Cabauw
- Kincaid
- Bull Run
- Minnesota 1973
A moral of the story

- The fact that this archiving and publication of data has occurred as a private initiative exposes some of the missing links in the construction of our "anthill".

- It is important to allocate sufficient resources to secure experimental data for the future.
John’s web site – model evaluation

- In addition to data the web site contains advice and warnings concerning model evaluation.
- The essence is that we should keep in mind that concentration measurements are results of stochastic processes, while models predict ensemble means.
A collection of successful activities...
Common tools – some examples

- The "Model Validation Kit" came in an early version for the Harmo workshop in Manno, 1993.
- It was consolidated over the following years, and used a lot in papers presented at the Harmo conferences. The BOOT software can be downloaded with it.
- The idea of the FAIRMODE network was launched at the 11th Harmonisation conference in 2007 (Moussiopoulos et al.). FAIRMODE has always interacted with the Harmonisation conferences. In the context of FAIRMODE several common tools have been launched. E.g.
  - The Delta Tool
  - The Composite mapping tool
  - plus several others...
- Harmo 18: We have heard about many additional tools of common interest.
Important lessons on model evaluation

- a glimpse into the work on model evaluation by the COST 732 action.
The MUST exercise of COST 732

- a demonstration of the power of exploratory analysis.
Examples from the MUST exercise

• Focus on results from CFD models
• The validation data were measured in the wind tunnel in Hamburg
• More than a dozen groups participated in a model validation exercise
• There was a common tool – a set of Excel workbooks, where the results could be placed in a common frame of reference.
On example of the analyses

• Are the models capable of predicting the u component of the wind?
• We consider the -45 degree flow case with measurements at 18 ‘towers’ (a vertical column of measurements).
Minus 45 degree flow
Minus 45 degree flow case – view from above

260 m
Minus 45 degree flow
- 45 degree flow

Diagram:

- Crossing
- Wide street
- Narrow street
Note:

- There are different challenges, depending on where the tower is located - and the height above ground.
Comparisons of model results vs. measurements – first for one model
-45 degree flow, u component all heights - Crossings

Fluent towers CR

\[ y = 1.1467x - 0.1155 \]
\[ R^2 = 0.9616 \]
-45 degree flow, u component, all heights - Wide Streets

\[
y = 1.1088x - 0.1001 \\
R^2 = 0.8048
\]
-45 degree flow, $u$ component, all heights - Narrow Streets

Fluent towers NS

$y = 1.5238x - 0.4573$

$R^2 = 0.9542$
• What is the state of the art for a number of models when predicting the u component for the -45 degree case in Narrow Streets?
u component, several models – Narrow streets (panel 1)
u component, several models – Narrow streets (panel 2)
u component, several models – Narrow streets (panel 3)

Model E: $y = 0.6273x + 0.3775$, $R^2 = 0.9211$

Model F: $y = 1.5304x - 0.4414$, $R^2 = 0.9135$

Model G: $y = 1.6434x - 0.5753$, $R^2 = 0.9403$
Common feature for models at -45 degree

- Narrow streets is too tough a challenge: $u$ is underpredicted at low heights in 'Narrow streets'
Are the models capable of predicting the \textit{w} component?

- Note: This is a difficult task. Vertical flow can go up and down, and the sign can vary even within a grid cell.
-45 degree flow, w component, all towers

\[ y = 0.2378x + 0.0082 \]

\[ R^2 = 0.6276 \]
-45 degree flow, w component, all towers
-45 degree flow, w component, all towers
The power of exploratory analysis used on a group of models

• Similarities and differences stand clearly out, potential problems are revealed.

• An unusual pattern is often the symptom of some underlying problem (messed-up data, misplaced buildings, shifted coordinate systems)

• It is amazing how easily errors can be overlooked!

• Or inversely: How many problems you detect if you look at data and perform exploratory data analysis.
Main message

• Exploratory data analysis is indispensable when you wish to assure quality!
• Look at data, explore them graphically!
The Atmospheric Dispersion Wiki

- A request for help. How can we fulfil the intentions behind the Wiki?
- The intention: An attempt to minimize the problem that researchers sometimes repeat others’ mistakes, and that sometimes misconceptions can propagate.
The Atmospheric Dispersion Wiki
Wiki on Atmospheric Dispersion Modelling

› A Wiki provides something that we normally miss in the community of atmospheric dispersion professionals:
› An easy possibility to provide feedback and pool our experiences. This could be experiences with procedures, data sets and models related to our work.
Wiki on Atmospheric Dispersion Modelling

› The original ideas behind the Wiki:
› The Wiki seemed to be well suited to pool experiences on experimental data sets, because anybody can contribute with experiences.
› Warnings against pitfalls and common mistakes were of high interest.
› HOWEVER: The wiki was no success – there were too few contributions to it.
Forum for individual data sets

See also:

- Experimental data sets. Top-level page in hierarchy on data sets.
- Data set repositories: Lists compilations of data sets.
- List of individual data sets: Lists links to information on individual data sets.

The present page is the entry to open forums on the present Wiki where users of a data set can report their experiences.

At present, there are a few such forums. These can serve as examples.

You can create a new forum for any data set. Start by adding an entry in the alphabetic list below. The sample entry AAA may serve as a model for you to do so. After having added the entry to the list, create a page with information.

Note: In order to edit the present page you must be a registered user - see Please identify yourself! Please follow the Rules of conduct when you add contents.

Alphabetic list of forums

- **AAA** A sample entry leading to a (non-existing) page on the present Wiki.
- **Prairie Grass** Page on this Wiki, discussing experiences with the classic Prairie Grass experiment from 1956.
- **Thompson Wind Tunnel data** Page reporting experiences with R.S. Thompson's data set from the US EPA wind tunnel (paper in Atmospheric Environment by Thompson, 1993). The data set systematically describes dispersion for a variety of building shapes, stack heights and stack locations. These data were originally used to estimate so-called Building Amplification Factor.
- **The MUST data set**. Concerns an array of containers at a military proving ground. The data set is used by the COST action called COST 732. There is more info in COST 732 forum
Wiki on Atmospheric Dispersion Modelling
Future of the Wiki

› It is no problem to let the Wiki continue its quiet life on the web for a number of years, but is there a better alternative?

› Can a different mechanism be found to serve the ideas behind the wiki? What can be done to minimize the problem that researchers sometimes repeat others’ mistakes?

› To find the wiki: Search for ”Wiki Atmospheric Dispersion” or go to http://AtmosphericDispersion.wikia.com
Future opportunities for the Harmo work

› I am leaving the scene, but
› FAIRMODE is providing tools.
› Many tools have been mentioned here at Harmo 18.
› We now have a multitude of tools on the web – something which was unheard of 25 years ago. Try to exploit their possibilities!
“Take home” messages (1 of 2)

› John Irwin’s data sets and other datasets are available through the Harmo web site www.harmo.org.

› It is important to allocate sufficient resources to secure experimental data for the future.

› Keep in mind that concentration measurements are results of stochastic processes, while models predict ensemble means.

› Provide and use tools that define a common framework for comparing models – such work is ongoing in FAIRMODE.
“Take home” messages (2 of 2)

› For in-depth quality assurance of models: **Exploratory analysis is indispensable.** Many lessons to be learned from the COST 732 action.

› Open-ended question: Can we establish **mechanisms to prevent researchers from falling into pitfalls**?