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WEB-BASED TOOLS FOR AIR POLLUTION MODELLERS

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Abstract: The present paper delivers a guided tour to a range of web-based tools and techniques that can be of benefit to the air pollution modelling community.

Key words: *web, atmospheric dispersion modelling, tools for modellers.*

INTRODUCTION

Throughout the series of Harmonisation conferences it has been a key issue that in the modelling community we should build upon the experiences of each other. How can we establish mechanisms which work, when it comes to pooling experiences and obtain a better utilisation of our work?

Many steps forward have been taken thanks to the emergence of a wide range of web-based tools. Nowadays there are search engines, web portals, web-based models, Wikipedia, YouTube, mobile phone apps and numerous other techniques, which have potential to be of use in our daily work.

The present paper delivers a guided tour to a range of web-based tools and techniques that can be of benefit to the air pollution modelling community. In their use of the web air pollution modellers typically have a dual role as both information providers and information seekers. The paper takes the perspective of both information providers and information seekers.

The paper aims to outline some useful techniques for searching information on the web, as well as making you aware of a variety of tools which might help you in your work. It can be seen of a continuation of a paper presented at the 14th Harmonisation conference (Olesen, 2011).

SEEKING AND PROVIDING INFORMATION

Wikipedia

Non-specialists searching for information on the web will often start by performing a Google Search. Typically, one of the first results that pop up will be a link to Wikipedia.

This is a fact worth considering if you wish to provide information to the web, e.g., concerning a particular model. It implies that with a tiny effort you can make your information easily available to a very wide audience. You just have to sign up as a contributor for Wikipedia, have a look at the rules of conduct, and then add relevant information to Wikipedia. Be aware that in Wikipedia topics should be neutrally presented. Wikipedia is not a means of promotion, whereas it is fully acceptable to add one or more useful content-relevant external links to an article. Wikipedia has a list of atmospheric dispersion models (URL 1) and an entry on 'Atmospheric dispersion modeling', both of which may be good places to start, if you wish to explore Wikipedia's content related to the topics of the present conference.

Search strategy

If you are new to a topic, a way to get started could be an ordinary Google search and a look into Wikipedia. However, an ordinary Google search will inevitably contain a lot of 'noise'. Often, such a search will not be an efficient way of quickly obtaining information that closely matches your problem.

Here is where Google Scholar (URL 2) comes in. Many readers will know Google Scholar, but this service deserves some further explanation, for the benefit both of those who have tried it, and those who are yet unaware of its existence.

Google Scholar

In many cases Google Scholar should be your first stop in searching for information, because it delivers more serious results than ordinary Google searches. It indexes 'scholarly' papers, i.e. scientific journal papers, but also theses and reports on the entire web. Commercial bibliographic databases (like Web of Science and Scopus) also do the job of indexing journal papers, but despite the fact that Google Scholar is free, it can often provide a better coverage than the commercially available services.

Google Scholar has the advantage over other bibliographic databases that it indexes conference publications, theses etc., and thus often delivers more recent results, and results not found by the commercial bibliographic databases. Google Scholar provides immediate access to abstracts. Sometimes, Google Scholar finds a link to a free version of the full text. However, in general for journals with paid subscription a journal subscription is required for access to the full text.

The commercial bibliographic databases still have advantages over Google Scholar in respect to some features, such as their ability to download a large number of bibliographic references (whereas Google Scholar will give only 20 records at a time), and to refine results by searching within previously found records. Such shortcomings of Google Scholar are of concern in systematic scientific literature retrieval; this topic is discussed e.g. by Boeker et al. (2013).

Here are a few hints to perform efficient searches with Google Scholar.

- The search results give access to the links “Cited by” and “Related articles” which can be highly useful to guide your search.
- You may use the so-called "Advanced search" interface, e.g. to restrict your search by requiring that certain words appear in the title. Use the tiny down-arrow appearing next to the search field to access the "Advanced search" feature.
- However, a simple search can be enhanced by the use of operators, and can thus be made more advanced than a search with the "Advanced search" interface. Although it is not documented in the interface of Google Scholar, most of the operators available in an ordinary Google search also work within Google Scholar (help can be found by a Google search for "Help Google search operators"). Important examples are the "OR" operator, the "site:" operator, and the use of quotes to search for an exact phrase. For instance, the search string
  "air pollution" (guide OR guidance) site:uk
  will look for scholarly papers containing the phrase "air pollution" and either "guide" or "guidance", with results restricted to sites in the UK domain.

Altogether, Google Scholar is a recommendable tool for you as an information seeker. However, you should supplement it by an ordinary Google Search when appropriate, and possibly also by commercial bibliographic databases. Be aware that Google Scholar will not lead you to software tools or data sets, but only to papers and reports. Furthermore, Google Scholar will sometimes miss relevant content. This is a place where you as an information provider come into the picture. Check whether your publications are included in Google Scholar, for instance by doing a site-specific search (for 'xxx site:mysite.org'). If you suspect that your publications are not properly included in Google Scholar, take action. There are guidelines for webmasters who would like their papers indexed in Google Scholar search results. So if you are employed at an institution with professionals who take care of a publishing service, ask them to consult the Google Scholar guidelines. Otherwise, you yourself may find a solution in the guidelines.

TOOLS FOCUSSED ON AIR POLLUTION MODELLING

There are many tools for air pollution worth mentioning. We will point to just a few, although many others could rightfully be included as well.

Openair
The toolbox "openair" is a collection of open-source tools for the analysis of air pollution data. It is a knowledge exchange project led by the Environmental Research Group at King's College London, UK (URL 3). *openair* is written in the programming language "R". The package consists of many tools for importing and manipulating data, and undertaking a wide range of analyses to enhance understanding of air pollution data.

A central feature of *openair* is the use of conditioning plots and analyses. When working with data, my former colleague Ruwim Berkowicz stressed the importance of understanding, and he used to say: "Look at your data. They wish to tell you something!" He stressed the usefulness of exploratory data analysis and created wonderful customized tools in Microsoft Excel for such purposes (examples through URL 4), but *openair* is a good option for exploratory analyses for those less skilled in Excel.

DELTA Tool
The DELTA Tool is a software package for model evaluation. It allows the user to perform benchmarking and diagnostics of air quality and meteorological model performance. It has been developed by the Joint Research Centre Ispra. Within the framework of the FAIRMODE network work is ongoing on the use of DELTA Tool to benchmark models that are used within the context of the European Air Quality Directive. DELTA Tool, however, is not restricted to such applications. It is available free of charge, but you have to register at the Delta Tool web site (URL 5).

GENERAL TOOLS

Bookmark managers
Frequent users of the web will benefit from the use of a Bookmark manager to be able to return to interesting sites as needed. A very simple bookmark manager is the Favorites feature used by Internet Explorer, but this is not really efficient to work with. If you have many bookmarks you will probably spend time on organising them in a hierarchy, which is inefficient. Google Chrome has a decent bookmark manager, but there are more specialised programs like Linkman (URL 6), which supports several different browsers and gives you the option of very fast retrieval of a bookmark, if you are just able to recall a keyword you associated with it when you created the bookmark. Linkman's interface is not as simple as you might wish, but if you are a power user of bookmarks you will appreciate its capabilities. There is a pro version and a free version that can only be used in private, non-commercial environments.

AutoHotKey
AutoHotKey deserves brief mentioning, because it can be a timesaver for air pollution modellers.
It is a free, open-source macro-creation and automation software utility that allows users to automate repetitive tasks in Microsoft Windows. (URL 7).

Google Earth
Google Earth is an excellent tool to get an impression of on-site conditions if you are asked about dispersion conditions for a specific location. Invest half an hour of your time to become acquainted with the various tools for navigating: mouse, keyboard shortcuts (e.g. "r" to reset the view) and on-screen controls. Then you can use Google Earth to look around, move around, and tilt the view to inspect terrain features.

DATA RESOURCES

There are numerous freely accessible databases on the web that can be of use for air pollution modellers. E.g., there are emission databases, and also specialised emission databases such as a database providing gridded data with estimates of emissions from forest fires (URL 8). If you have a special need, try to conduct a search for relevant data.

APPS FOR MOBILE DEVICES

During recent years mobile phone apps with local air monitoring results and prognoses for air pollution have become abundant. A search for Android-based apps with the search term "Air Pollution" results in around 50 relevant apps, mainly with air quality information for citizens in a specific area. When

searching for useful apps there are helpful features like suggestions for related app, number of downloads, ratings and user comments.

NEWSLETTERS AND MAILING LISTS

Newsletters and mailing lists are plentiful. Probably some are worthwhile for you to subscribe to, but your specific needs must determine which. For those working with air pollution management in a European context a subscription to the EEA newsletter with notifications on new reports and products can be recommended (URL 9).

SOCIAL NETWORKS AND IDENTIFICATION SYSTEMS FOR RESEARCHERS

There are several social networks addressed towards the scientific community. Your time is a very scarce resource, and social networks have the potential to become very time-consuming. You should be conscious about this and take a decision about your priorities before becoming too absorbed in the temptations posed by the networks. Besides proper social networks, the following section also describes certain other systems which require that you register to use them.

LinkedIn

LinkedIn (URL 10) is an important professional network. If you have once created a LinkedIn profile, chances are high that in a Google search for your name, your LinkedIn profile will pop up as one of the top ranking results. Therefore, it is reasonable to invest a bit of time in your profile. If you are looking for a new job it is even more important to nurse your profile.

LinkedIn has several interest groups of relevance for atmospheric dispersion modellers, e.g. the group 'Air Quality Dispersion Modeling' (URL 11), currently with around 2500 members and a pretty lively activity with questions being asked and answers given. There are also several other groups in related fields. It can be tempting to spend time on such groups. However, the fact that professionals have to put sharp priorities on their time limits the number and quality of the replies to questions.

ResearchGate

ResearchGate (URL 12) is a social networking site for scientists and researchers to share papers, ask and answer questions, and find collaborators. Some researchers will consider ResearchGate a useful vehicle for collaboration. On the other hand, ResearchGate has a tendency to force you into more activity than you might feel appropriate, and it is receiving criticism for this. ResearchGate encourages you to upload full text versions of publications. You run a high risk of inadvertently inflicting copyright when doing so. Proper use of ResearchGate will require you to examine the details of copyright statements that apply to your publications. Personally, I find such use of time beyond my priorities. With its default settings ResearchGate is generating a large amount of mails, tending to spamming. To avoid receiving several emails a day, unwanted updates or followers, you should manage your Notifications and Privacy settings.

Figshare

Figshare (URL 13) is an online digital repository where researchers can preserve and share their research outputs, including figures, datasets, images, and videos. It is free to upload content and free to access it. Figshare allows a new way of publishing that goes beyond the traditional scholarly publishing. It offers to make uploaded material available in a citable, shareable and discoverable manner. Typically, Figshare will be used as a supplement to traditional publishing. Figshare was established in 2011.

ResearcherID and ORCID

ResearcherID (URL 14) is an identifying system for scientific authors. The system was introduced in 2008 by the company Thomson Reuters to address the problem of author misidentification. On ResearcherID, you are asked to link your ID with your publications. It can be used as a means to keep your publication list updated and online, but that will require regular maintenance by you.

The ResearcherID identifier is specific to Thomson Reuters. In 2012 another identifier was launched: ORCID (URL 15), meaning *Open Researcher and Contributor ID*, which is an open, non-profit,

community-driven effort to create and maintain a registry of unique researcher identifiers. There is now integration between ORCID and ResearcherID, so data exchange is possible.

VIDEO RESOURCES

Compared to the situation a decade ago it has now become much easier to find video material of relevance for air pollution modellers. Major sources of video material are YouTube and similar services. If you wish to search for video material, it is recommended to use video.google.com rather than a search within YouTube, because only the first search will include material in other video repositories.

Obvious possibilities for material of relevance are educational videos, providing examples of plume behaviour, stack downwash and other phenomena. Contributors should make sure to tag uploaded files with relevant labels (e.g., 'atmospheric', 'educational').

WEB SITES

A list of web sites of interest cannot fit into this brief paper. Here, we will just refer to a page on the Harmonisation website www.harmo.org, which is entitled 'Related activities and tools' (URL 16). On that page you can find the present paper and follow-up information related to it.

CONCLUSION

This paper points to tools that you can use in your daily work. Some of the tools also allow you to increase visibility of your work on the web with a small additional effort.

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Boeker, Martin, Werner Vach, and Edith Motschall, 2013: Google Scholar as replacement for systematic literature searches: good relative recall and precision are not enough. BMC medical research methodology 13.1: 131.

Olesen, H.R., 2011, Improving modelling culture: Obstacles and opportunities. In: Proceedings of the 14th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, Kos Island, Greece, 2-6 October 2011. p. 101-104. http://www.harmo.org/Conferences/Proceedings/_Kos/publishedSections/H14-259.pdf

All URL's below were visited July 10, 2014.

URL 1: http://en.wikipedia.org/wiki/List_of_atmospheric_dispersion_models Wikipedia. List with around hundred brief model descriptions.

URL 2: http://scholar.google.com Google Scholar search engine

URL 3: http://www.openair-project.org/ Open-source tools for analysis of air pollution data

URL 4: http://envs.au.dk/en/knowledge/air/models/background/ Aarhus University. Air pollution datasets prepared for exploratory analysis with customized Excel tools.

URL 5: http://aqm.jrc.ec.europa.eu/DELTA/ DELTA tool for air quality model benchmarking.

URL 6: http://www.outertech.com/en/bookmark-manager Linkman bookmark manager.

URL 7: http://ahkscript.org/ Open-source macro creation and automation utility.

URL 8: http://www.globalfiredata.org/ Databases with estimates of emissions from forest fires.

URL 9: http://www.eea.europa.eu/ Web site of the EEA from where you can subscribe to a newsletter with notifications on new reports and products (uppermost tool bar).

URL 10: http://www.linkedin.com/ LinkedIn. 'World's largest professional network'

URL 11: http://www.linkedin.com/groups/Air-Quality-Dispersion-Modeling-3722325 LinkedIn, group 'Air Quality Dispersion Modeling'

URL 12: http://www.researchgate.net/ ResearchGate. Social network for researchers.

URL 13: http://figshare.com/ Repository for research outputs.

URL 14: http://www.researcherid.com/ ResearcherID. System for identifying scientific authors.

URL 15: http://orcid.org/ ORCID. System for identifying scientific authors.

URL 16: http://www.harmo.org/harmoni/LinksTo.asp Harmonisation initiative. Related activities.