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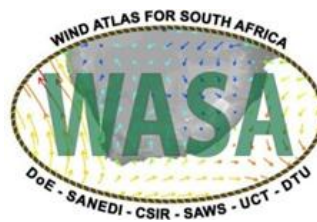
Wind Atlas for South Africa (WASA)

Western Cape and parts of Northern and Eastern Cape

South African Wind Atlas (WASA) Guide

Eugène Mabilie

Council for Scientific and Industrial Research (CSIR)



April 2014

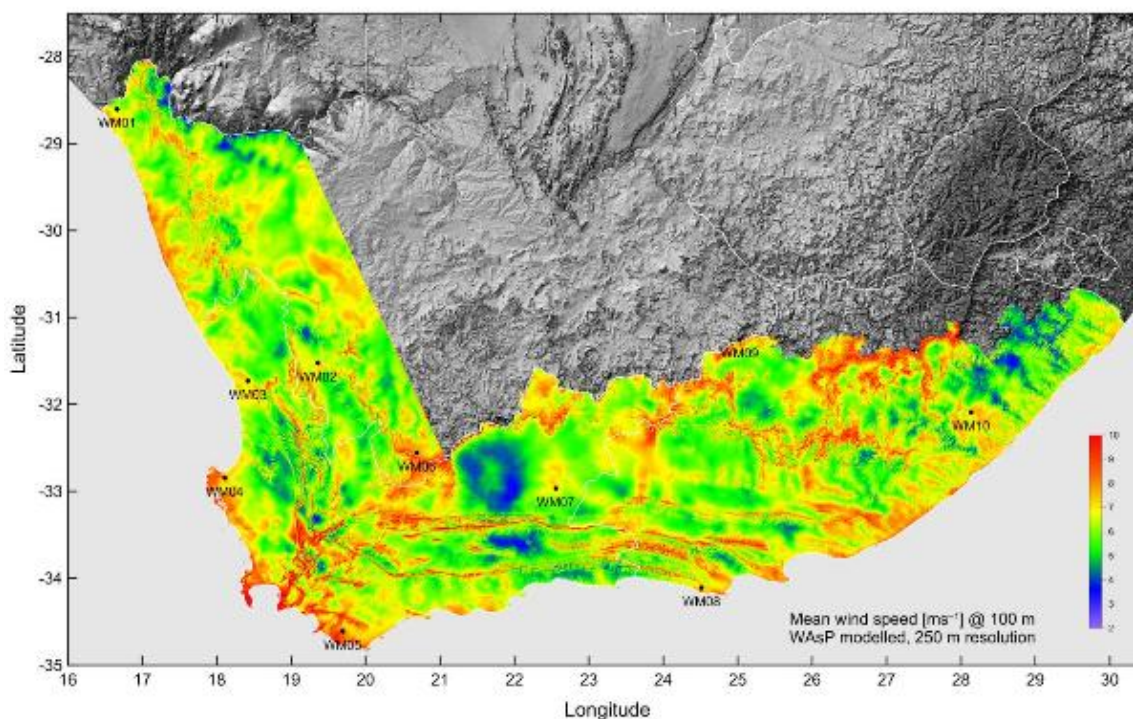
SOUTH AFRICAN WIND ATLAS (WASA) GUIDE

WASA (2009 to 2014) is an initiative of the South African Government, Department of Energy, and the project is co-funded by the UNDP-GEF through the South African Wind Energy Programme (SAWEP), and the Royal Danish Embassy. South African National Energy Research Institute (SANERI) is the Executing Partner, coordinating and contracting contributions from the implementing partners: CSIR, UCT, SAWS, and Risø, now DTU Wind Energy.

Introduction

The Numerical Wind Atlas (NWA) shows the generalised¹, climatological (30-year) annual mean wind speed [m/s] 100 m above ground level, for the Northern Cape, Western Cape and Eastern Cape.

Mean wind speed (WRF based)



The Numerical Wind Atlas Database contains the generalised¹ wind climate data sets (.lib files) for the entire modelling domain. Currently there are two data sets available on the WASA download site:

1. The original KAMM based data set (March 2012) which has a generalised wind climate for every 5 km x 5 km, corresponding to approximately 15000 data points (“virtual masts”)

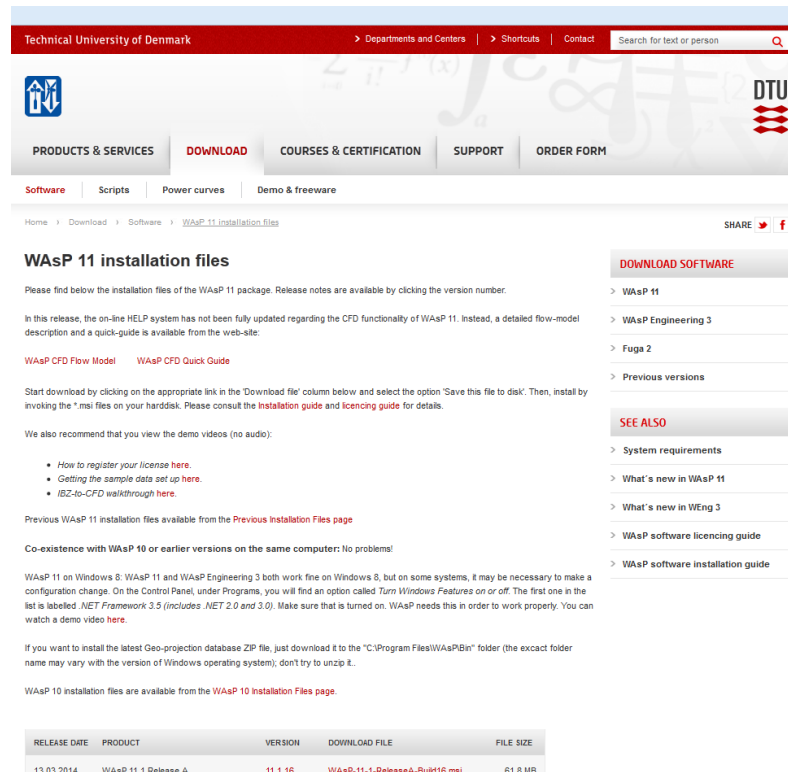
¹ flat, uniform terrain, no obstacles and with 3 cm roughness (e.g. farmland with open appearances) over the entire area

2. The NEW WRF based data set (March 2014) which has a generalised wind climate for every 3 km × 3 km, corresponding to approximately 40 000 data points (“virtual masts”)

The generalised wind climates can be viewed directly with WASP, however to employ the .lib files (calculations) for wind farm planning and wind resource assessment a licensed version is required.

How to access the Numerical Wind Atlas Database

1. Download WAsP 11.1 Release A from the WAsP website www.wasp.dk/Download/Software/WAsP11_Installation. Install the WAsP software on the hard disc drive (HDD). The unlicensed WAsP will allow you view the Generalised Wind Climate .lib files, **but will not allow any calculations to be done.**



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WAsP 11 installation files

Please find below the installation files of the WAsP 11 package. Release notes are available by clicking the version number.

In this release, the on-line HELP system has not been fully updated regarding the CFD functionality of WAsP 11. Instead, a detailed flow-model description and a quick-guide is available from the web-site:

[WAsP CFD Flow Model](#) | [WAsP CFD Quick Guide](#)

Start download by clicking on the appropriate link in the 'Download file' column below and select the option 'Save this file to disk'. Then, install by invoking the *.msi files on your harddisk. Please consult the [Installation guide](#) and [licencing guide](#) for details.

We also recommend that you view the demo videos (no audio):

- [How to register your license here.](#)
- [Getting the sample data set up here.](#)
- [IBZ-to-CFD walkthrough here.](#)

Previous WAsP 11 installation files available from the [Previous Installation Files page](#)

Co-existence with WAsP 10 or earlier versions on the same computer: No problems!

WAsP 11 on Windows 8. WAsP 11 and WAsP Engineering 3 both work fine on Windows 8, but on some systems, it may be necessary to make a configuration change. On the Control Panel, under Programs, you will find an option called *Turn Windows Features on or off*. The first one in the list is labeled *.NET Framework 3.5 (includes .NET 2.0 and 3.0)*. Make sure that is turned on. WAsP needs this in order to work properly. You can watch a demo video [here](#).

If you want to install the latest Geo-projection database ZIP file, just download it to the "C:\Program Files\WAsP\Bin" folder (the exact folder name may vary with the version of Windows operating system), don't try to unzip it.

WAsP 10 installation files are available from the [WAsP 10 Installation Files page](#).

RELEASE DATE	PRODUCT	VERSION	DOWNLOAD FILE	FILE SIZE
13.03.2014	WAsP 11.1 Release A	11.1.16	WAsP-11.1-ReleaseA-Build16.msi	61,8 MB

DOWNLOAD SOFTWARE

- > WAsP 11
- > WAsP Engineering 3
- > Fuga 2
- > Previous versions

SEE ALSO

- > System requirements
- > What's new in WAsP 11
- > What's new in WEng 3
- > WAsP software licencing guide
- > WAsP software installation guide

2. Register for data downloads on the WASA website www.wasa.csir.co.za

- i. Go to the downloads page



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WASA
WIND ATLAS FOR SOUTH AFRICA
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CSIR Built environment Online data Guest (not logged in) Log in

CSIR online

Welcome to our online database of meteorological data.

[To the list of projects...](#)

[To the map of projects...](#)

[To the download page...](#)

[Guide to accessing and viewing the Wind Atlas for South Africa](#)

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Comments and help requests to the [webmaster](#)

ii. Complete all the required fields



Message Board:

- Please note: All the date/times are in SAST (UTC +2)
- 2014/04/03: March 2014 data now available.
- 2014/03/14: February 2014 data now available.
- 2014/03/12: January 2014 data now available.
- 2014/01/17: November and December 2013 data now available
- 2013/11/07: October 2013 data now available.
- 2011/01/06: The directions of all the stations have been corrected. Please download the new versions.
- 2011/01/06: (Magnetic declination had been added instead of subtracted)

Welcome to the WASA download site

If you are **already registered**, and want to download data, OR if you want to **check whether you are registered**, please complete the log in form below, **Password'** button. It will be sent to you by e-mail.

E-mail:

Password:

If you have **not yet registered**, and want to download data, please complete the registration form below.

First name: *

Surname: *

Company name / Affiliation / Personal user: *

Affiliation type: *

If 'Other' above, please enter:

Intended usage: *

If 'Other' above, please enter:

Address: *

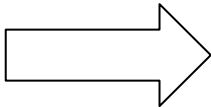
Country: *

Telephone: *

E-mail: *

Password: *

Confirm Password: *



iii. Click on the <Register> button

3. Log in to the data download website using your e-mail address and password provided.

Welcome to the WASA download site

If you are **already registered**, and want to download data, OR if you want to **check whether you are registered**, **Password'** button. It will be sent to you by e-mail.

E-mail:

Password:

- There are a number of download options on this page. To access the generalized wind climate .lib files click on 'WASA Wind Atlas downloads'

[Log out](#)

Welcome to the WASA download site, Eugene

You are logged in as **emabille@csir.co.za**

[WASA Extreme wind atlas downloads](#) **NEW**

[WASA Large Scale Wind Resource Map \(April 2014\)](#)

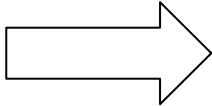
[WASA Large Scale Wind Resource Map \(May 2013\)](#)

[WASA Wind Atlas downloads](#)

WASA Met. data downloads

Please choose the sites from which you wish to download data.

- WM01 (28°36'06.7"S, 16°39'51.9"E - since 2010-06-23)
- WM02 (31°31'29.7"S, 19°21'38.7"E - since 2010-06-30)
- WM03 (31°43'49.4"S, 18°25'10.11"E - since 2010-06-24)
- WM04 (32°50'41.2"S, 18°06'34.5"E - since 2010-05-18)
- WM05 (34°36'41.6"S, 19°41'30.3"E - since 2010-05-20)
- WM06 (32°33'24.4"S, 20°41'28.7"E - since 2010-09-17)
- WM07 (32°58'00.2"S, 22°33'23.8"E - since 2010-05-28)
- WM08 (34°06'32"S, 24°30'49"E - since 2010-08-04)
- WM09 (31°15'05.76"S, 25°01'50.19"E - since 2010-09-01)
- WM10 (32°05'26.5"S, 28°08'09.0"E - since 2010-08-05)



- Scroll down to the Tadpole link on the Wind Atlas web page and click on the link. There are now two links, one for the original KAMM based data set and one for the NEW WRF based data set.

[Home / Download Data](#) [Log out](#)

The WASA download site

This is the download site for the First verified numerical atlas for South Africa

- [First Numerical Wind Atlas](#)
- [WASA Observational Wind Atlas](#)
- [Case studies](#)
- [Reports and Guidelines](#)
- [Map data and tools](#)
- [Software](#)

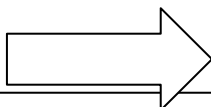
To provide feedback to the WASA team, you can optionally download and fill in the [questionnaire](#), and e-mail to the [Webmaster](#)

[First Numerical Wind Atlas](#)

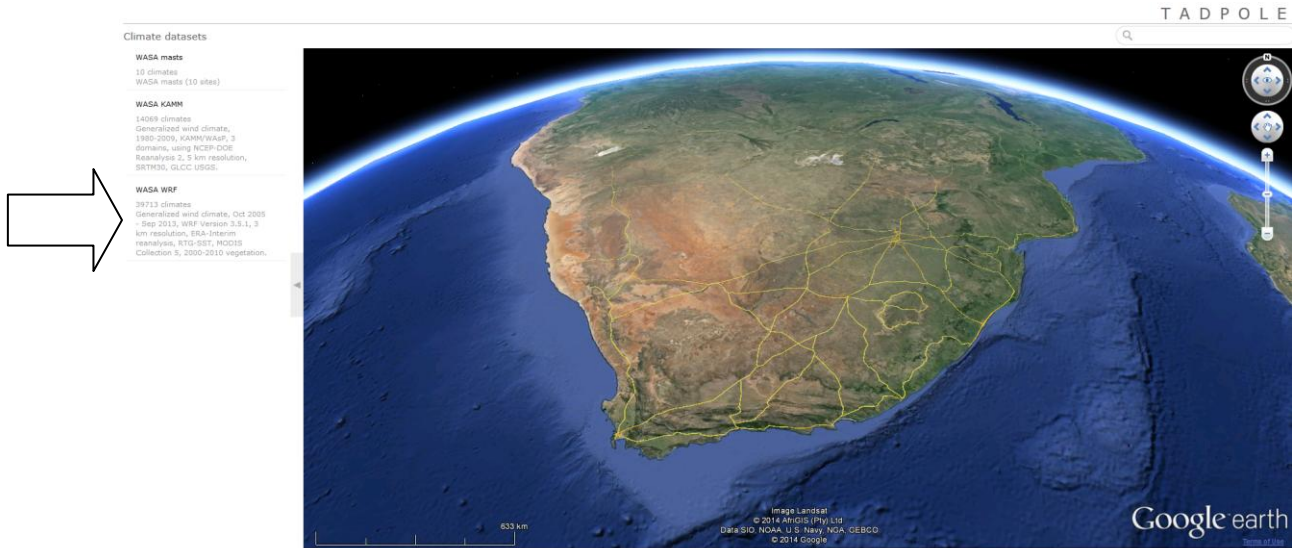
The WASA numerical wind atlas contains generalised wind atlas data sets for tens of thousands of model grid points in the WASA domain. The WASA domain and 10 met. stations are shown here:



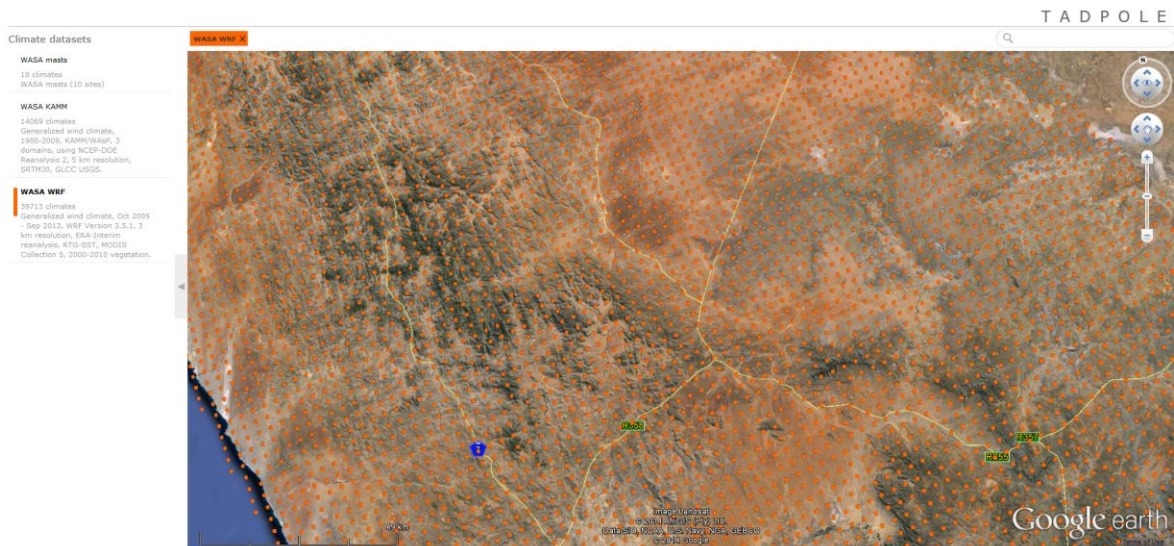
The mesoscale model used for the first verified atlas is the Karlsruhe Atmospheric Mesoscale Model (KAMM) and the spacing between the grid points is 5 km. The wind atlas data sets for each grid point are stored in a database: [old KAMM Tadpole web interface](#), [new WRF Tadpole web interface](#)



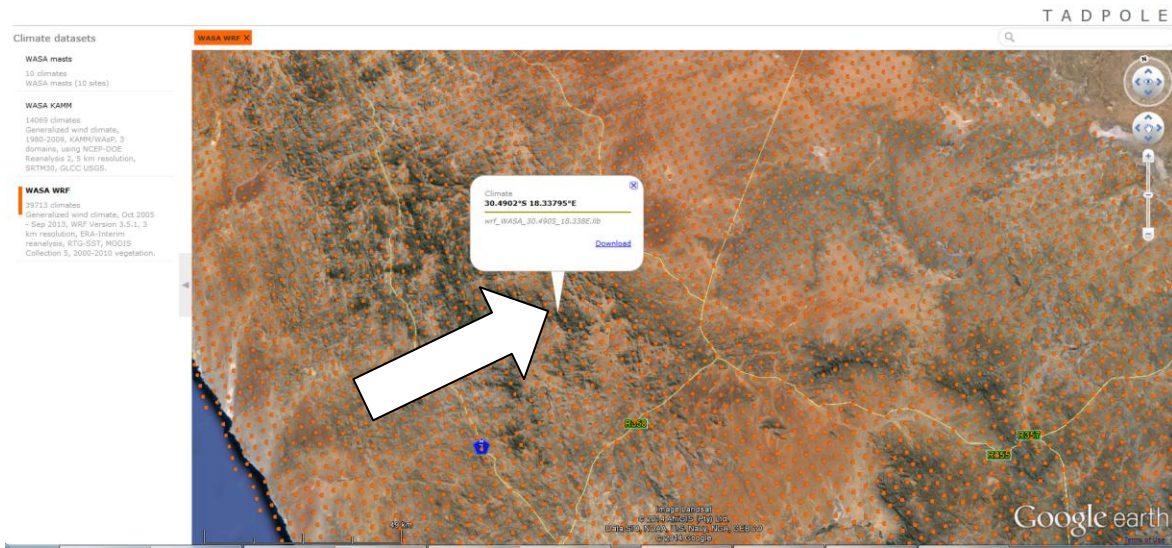
6. For the purposes of this guide we will only be demonstrating the WRF data set. The WRF page contains links to both the old KAMM data set as well as the new WRF data set. The Tadpole page with the Google Earth plug-in will open. Select WASA WRF.



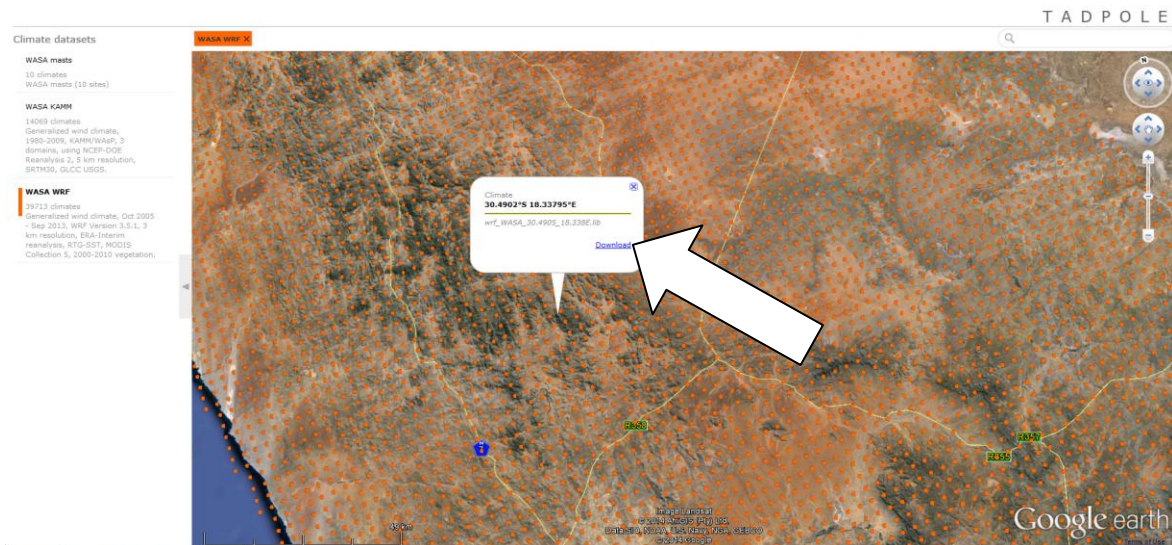
8. Locate your area of interest using the standard Google Earth controls.

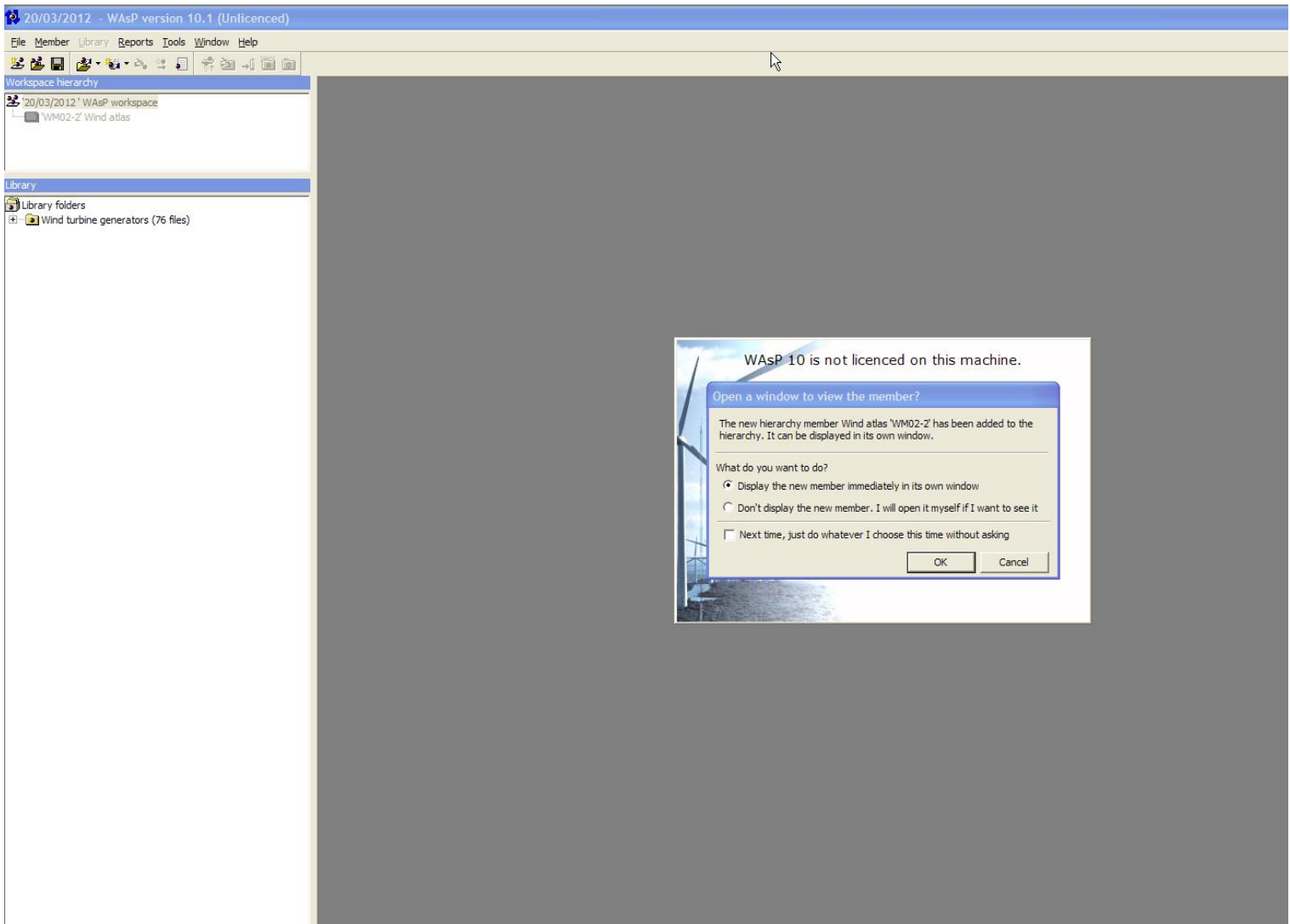


9. Click on the wind atlas grid point closest to your area/point of interest.



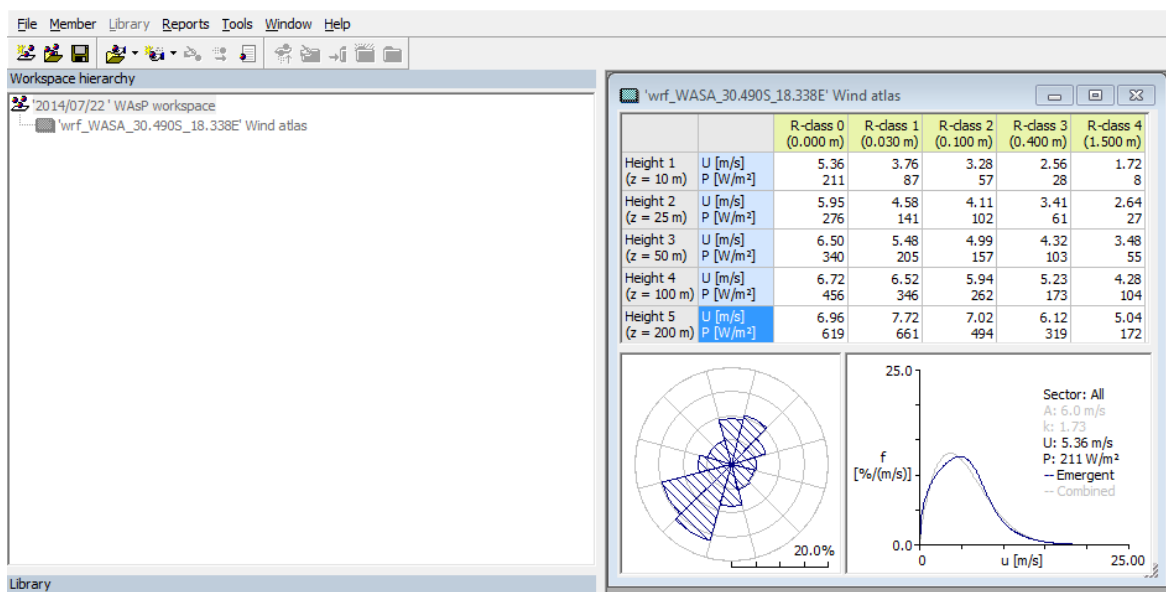
10. Download the .lib file and save on your hard drive.



11. View the .lib file by:**i. Double clicking on the saved .lib file or**

- ii. Run the WAsP 11.1 program. Open the .lib file by using the File|New Workspace
Right click on Project 1
Insert from File
Select Wind Atlas, locate the file you downloaded and Open.**

- iii **Generalised wind climate at the selected point. Left click on the wind rose sectors to display the sectorised wind speed distribution curve.**



12. The .lib file is the Generalised¹ or Geostrophic wind climate for the selected grid point. The .lib file contains the wind direction distribution as well as the sectorised and all wind speed distribution for the selected grid point. The table contains the mean wind speed and power density at five standard heights above ground level (10m, 25m, 50m, 100m, 200m) and five roughness classes. The roughness classes correspond to ground cover types:

R class 0 (0.000m) water areas, R class 1 (0.030m) farmland with open appearances, very few buildings, trees, airport area with some buildings and trees, R class 2 (0.100m) farmland with closed appearance, R class 3 (0.400m) low forest, suburbs, shelter belts, many trees and/or bushes and R class 4 (1.500m) tall forest

It also shows the Weibull graph and parameters A and k (lower right corner) which is a mathematical fit to the generalised wind data. The Weibull parameters A and k are used in combination with the wind turbine power curve, to calculate e.g. the estimated Annual Energy Production (AEP) etc. of a wind turbine(s) at the site.

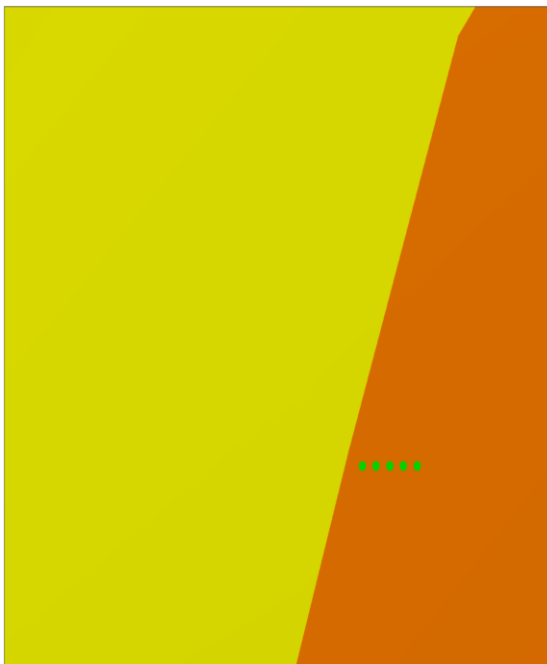
13. Any further analysis to estimate the actual wind climate, wind farm planning, layout and wind resource assessment at the area/point of interest (e.g. microscale modeling) will require a licensed version of WAsP, see 15. If you are unfamiliar with WAsP or microscale modelling you are urged to contact a reputable wind energy specialist or consultant to help in assessing your needs.

14. Note, that although the WASP software has been used in this guideline it should be possible to use any similar software (WindPro, GH WindFarmer etc.) to view the .lib file.

15. **Microscale Modeling**

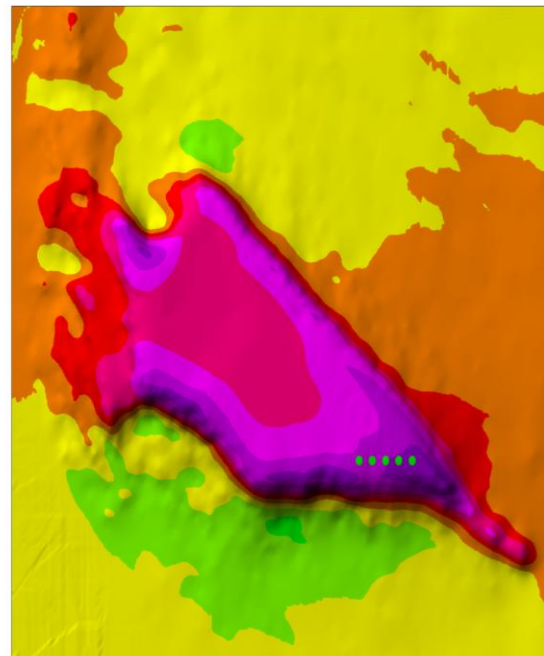
The Numerical Wind Atlas and database assume a flat, uniform terrain, with no obstacles and with 3 cm roughness (e.g. farmland with open appearances) everywhere. I.e. it ignores surface effects such as elevation (e.g. hill that can speed up the wind), roughness (e.g. forest that can slow down the wind), obstacles etc. It is then very likely that the Numerical Wind Atlas will over- or under-predict the mean local wind speed and power density.

Numerical Wind Atlas



Grid cell size 5120 m
Wind farm of five 2 MW turbines
Estimated AEP = 39 GWh

Microscale Modeling



Grid cell size 20 m
Wind farm of five 2 MW turbines
Estimated AEP = 55 GWh

Microscale modeling of the surface effects such as elevation, roughness, obstacles etc. that results in a more accurate prediction of the local wind climate and therefore wind farm planning, layout and wind resource assessment is called downscaling and requires a fully licensed version of WAsP or similar software and professional assistance to set up and run the software. See also: Planning and Development of Wind Farms (Risø-I-3272)(ed.2) for more information.

[http://stel-apps.csir.co.za/wasa-data/docs/Planning_and_Development_of_Wind_Farms_\(Report-I-45\).pdf](http://stel-apps.csir.co.za/wasa-data/docs/Planning_and_Development_of_Wind_Farms_(Report-I-45).pdf)

16 Please complete the questionnaire and provide feedback on your experience.

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PLEASE NOTE. While the application of the Numerical Wind Atlas NWA assists anyone, for free, to explore the generalized wind climate for every 3km x 3 km (about 40 000 data points on the NWA), it does not substitute the need for proper wind measurements which is a usual requirement for funding.

DISCLAIMER

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