

# Using ENVI-met BioMet

---

*... A quick guide*



## Basic Remarks

### System Requirements and Installation

BioMet is post-processor tool for calculating Human Thermal Comfort Indices from ENVI-met model output files. The system requirements of the tool itself are comparably low, but it needs to have a working ENVI-met V4 environment around it.

As long as ENVI-met V4 is not released to the public, BioMet is – together with LEONARDO 2014- bundled as an AddOn Package which creates a small ENVI-met V4 environment on your computer without all the other ENVI-met tools belonging to version 4.

With the release of ENVI-met V4, BioMet will be included in the regular setup package.

### Using BioMet: Requirements

As mentioned before, BioMet is a tool that calculates different human thermal comfort indices out of ENVI-met model files. To accomplish this task, it obviously needs some ENVI-met model outputs, more exactly: some ENVI-met atmospheric output files (\_AT\_).

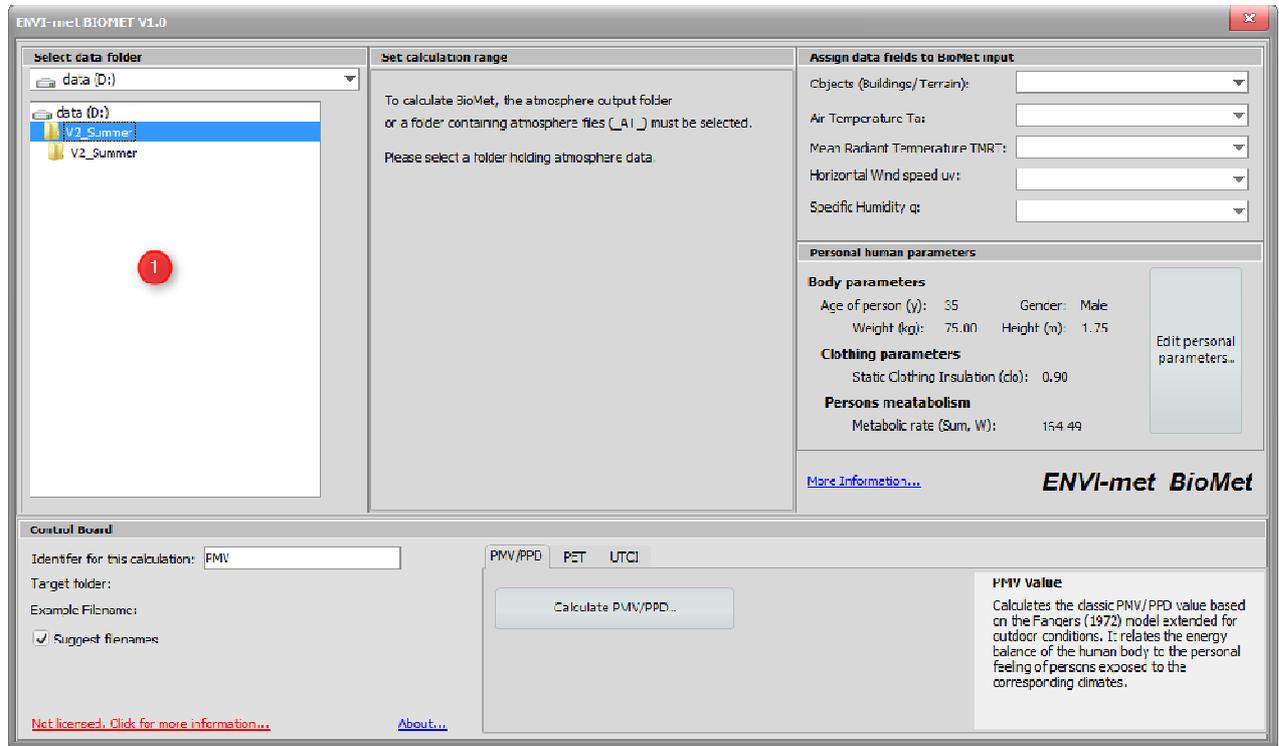
BioMet basically summarizes the impact of the 4 main atmospheric variables: Air Temperature, Radiative Temperature, Wind Speed and Humidity on the human thermal sensation. The quality or the reliability of the BioMet results depends completely on the quality and reliability of the data files provided. In other words: If your simulation has created bad or unrealistic results, BioMet will also give you bad and unrealistic outputs. There is nothing BioMet can do about it- it is a problem of the simulation that has generated the files.

### About this document

This is a first quick-and-dirty guide how to use ENVI-met BioMet. It lacks a lot of detail information and it will be extended as the new ENVI-met V4 site grows.

## Running BioMet – A step-by-step guide

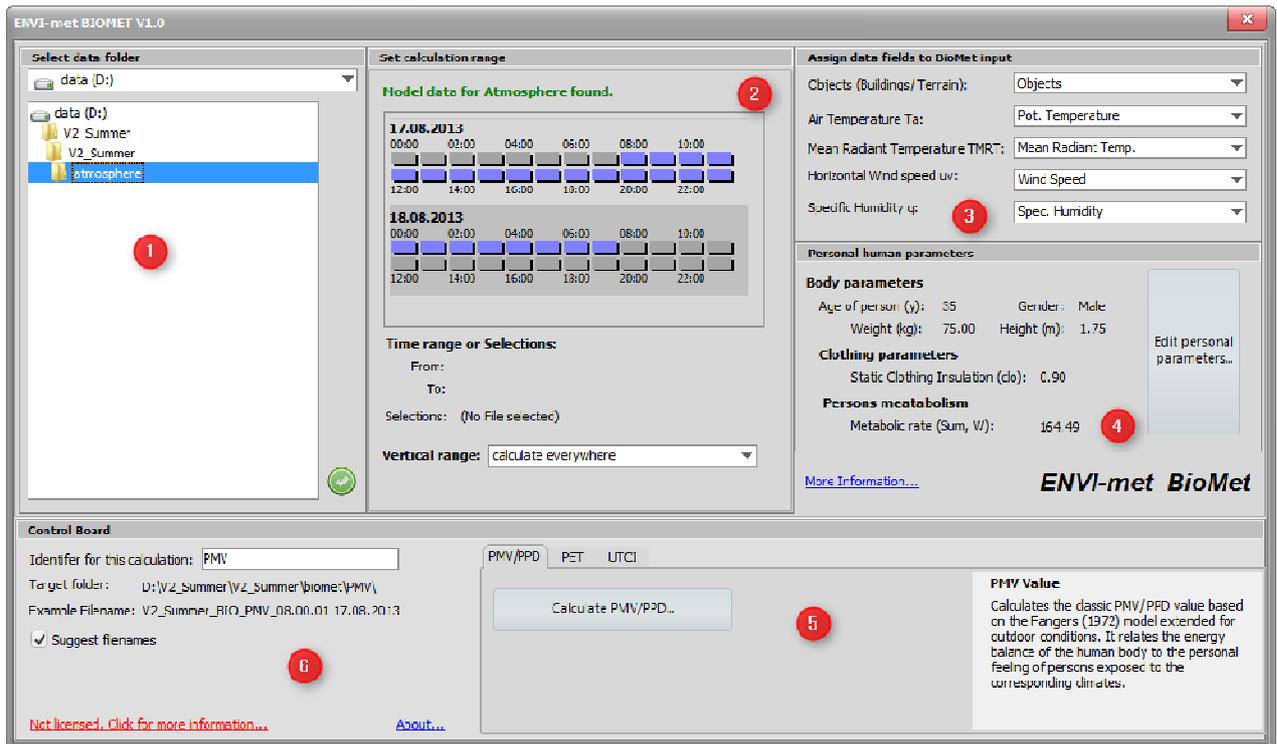
Launch BioMet via the WINDOWS start menu.



The main application window appears pointing to some default folder in the *Select data folder* (1) area. Before anything useful can happen, you need to tell BioMet where the ENVI-met model results you want to process are located. At the moment, BioMet does not support projects and workspaces to keep it compatible with ENVI-met Version 3.1

### Select the atmospheric data folder

Once you have navigated to a folder on your disc that at least contains one ENVI-met atmosphere file (*\_AT\_*) the program becomes active and shows the following screen:



So, let us navigate through the different areas and options we can now access.

### Step (1): Folder Selection

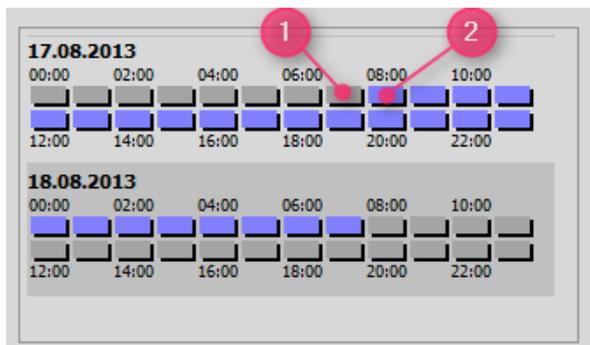
We're done here basically. You can navigate to any other folder at any time. If the other folder doesn't contain valid ENVI-met \_AT\_files, the other areas will be turned off again.

### Step (2) Set the calculation range

This section is used to define the hours of the day for which your indicator is going to be calculated as well as the special range of calculation. Let's see the details...

#### The DataFileMap (DFM): Selecting the time range

The DataFileMap (DFM) is a new control in ENVI-met V4 that will cross your way e.g. in LEONARDO2014. It simplifies the selection progress of single ENVI-met data files or data file series.



The concept of the DFM is pretty simple: It analyses the selected ENVI-met output folder and tries to reconstruct the time period of the simulation in it. In the

example above, there are two days simulated, the 17.08.2013 and the 18.08.2013. For the 17.08.2013 we have data from 08:00 to 23:00 and for the 18.08.2013 we have data from 00:00 to 06:00.

Time points with data are plotted in color (2), time points without data are plotted in gray (1). The DFM always displays full days regardless at what time the simulation actually started or ended. It can also handle smaller or larger output intervals as well as hand-selected or deleted data.

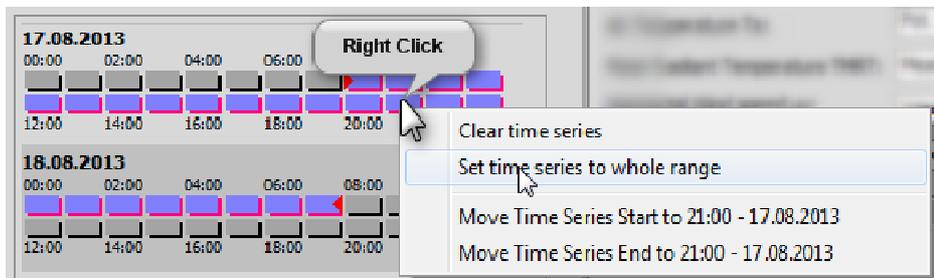
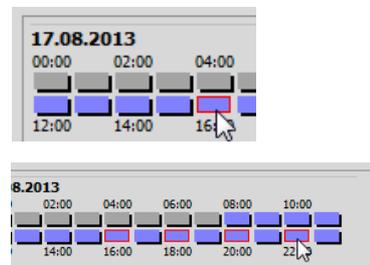
If more than one simulation output is found in the same folder (which is something that should be avoided), the DFM takes the simulation files belonging to the first file found in the selected folder

### Selecting files

The purpose of the DFM is to select one or more time points for which the biometeorological indices will be calculated.

There are several ways to do this:

- Select one file: Click with the left mouse onto a valid (existing) time frame
- Select several individual files: Hold the shift key and select several files
- Select a continuous range of files: Click the right mouse button and select one of the presented options:



- *Set time series to whole range* selects any available file within the bounds of the first and the last valid file found.

- *Clear time series* clears any selection done before

- *Move time series start/end to...* moves the start or the end of the selected time series to the time frame the mouse was hovering above when right-clicking

### Selecting the vertical calculation range

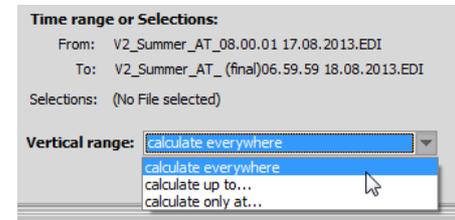
Calculating biometeorological indices can be time consuming, especially if you want to have them for each hour of the day or even in a finer resolution. By

default, ENVI-met will calculate the indices for each grid point corresponding to the atmospheric file `_AT_` found.

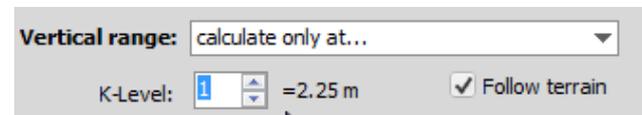
However, as biomet indices make basically sense in locations where humans are walking or sitting, there is not much sense to calculate PMV e.g. in 60m above ground in the free atmosphere .

You can therefore restrict the vertical range of calculation with 3 options:

- *Calculate everywhere*: No restriction
- *Calculate up to..*: Calculates from the ground surface up to the given height
- *Calculate only at..*: Calculates only at the selected height level



Once you have selected one of the latter restrictive options, additional options appear to select a vertical level.



The level numbering is equivalent to LEONARDO 2014 with  $z=0$  being the first vertical layer in the atmospheric model. The meter value displayed always refers to the center height of the selected layer.

The *Follow Terrain* Option is only valid if a digital terrain model is used in the simulations, which is experimental in ENVI-met V4 at the moment, so you won't see this option.

Please Note: Grid point outside the selected range will be marked as "No Data" in the output files. The output files themselves will have the same x-y-z dimensions as the original `_AT_` ENVI-met datafiles, regardless of which calculation range has been chosen.

### Step (3): Assigning the correct data fields

For the calculation of biomet indices, the program needs to know 5 information layers for each grid cell:

- The typology (free cell, building, terrain,...)
- The Air Temperature  $T_a$
- The Mean Radiant Temperature TMRT
- The horizontal wind speed  $u_v$
- The specific humidity  $q$

| Assign data fields to BioMet input |                    |
|------------------------------------|--------------------|
| Objects (Buildings/Terrain):       | Objects            |
| Air Temperature Ta:                | Pot. Temperature   |
| Mean Radiant Temperature TMRT:     | Mean Radiant Temp. |
| Horizontal Wind speed uv:          | Wind Speed         |
| Specific Humidity q:               | Spec. Humidity     |

All these data are store in the ENVI-met atmospheric file `_AT_`, in the section of the screen shown above, you link the internal data of BioMet with the output file structure.

Once you have successfully located a folder with valid simulation output files (see Step 1), BioMet should automatically fill all the relations given above. In theory, BioMet knows the output format of any ENVI-met `_AT_` file produced since Version 2. However, it might always be tha case that thing go wrong or that you want to use your own `.EDI/.EDT` or `.EDX/.EDT` files for running BioMet. In these cases, you need to link the variables manually.

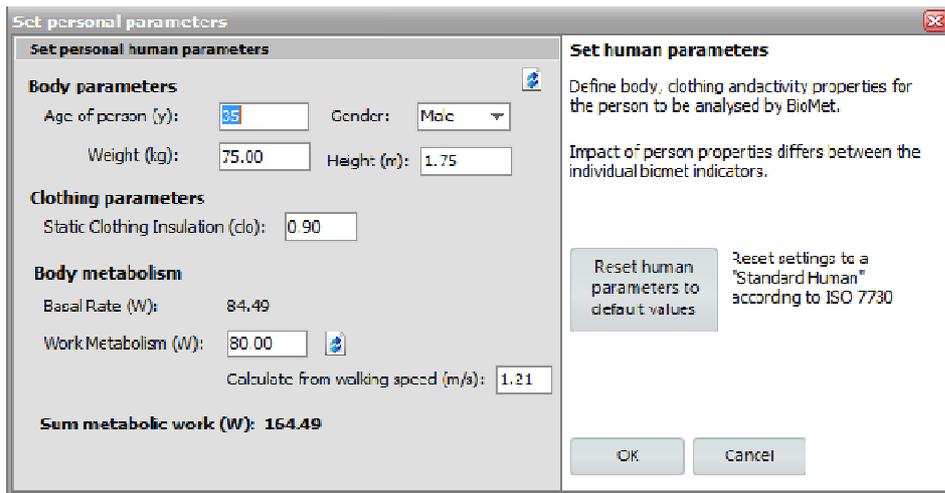
#### Step (4): Defining human parameters

In this quick guide we cannot go into detail about the different settings of the human body and its clothing and the influence on the different biomet indicators. This will follow later on as the software and the webpage developes , but the settings in BioMet are the same as in any other biometeorological context, so help can be found in many articles or books.

| Personal human parameters                                  |                  |
|--|------------------|
| <b>Body parameters</b>                                     |                  |
| Age of person (y): 35                                      | Gender: Male     |
| Weight (kg): 75.00   | Height (m): 1.75 |
| <b>Clothing parameters</b>                                 |                  |
| Static Clothing Insulation (clo): 0.90                     |                  |
| <b>Persons meatabolism</b>                                 |                  |
| Metabolic rate (Sum, W): 164.49                            |                  |
| <input type="button" value="Edit personal parameters..."/> |                  |

By default, the standard ISO 7730 person with a spring/autumn clothing is selected for calculation.

By pressing *Edit personal parameters...* you can modify the settings for the human body and its clothing and activity.



Please note, that the individual settings will not affect all biomet indices:

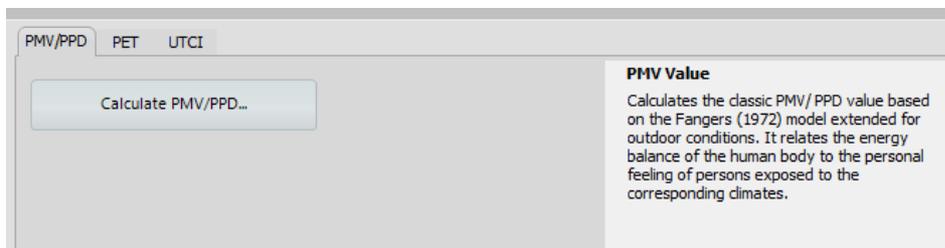
- UTCI is not influenced by any of these settings at all because in its implementation here it is based on a regression function assuming rational settings for different environments
- PMV/PPD is always related to a 35 year old male, but is reacting on clothing parameters and body metabolism
- PET is the most advanced of the yet implemented indicators and reacts on all of the settings adjustable here

### Step (5): Select biomet indicator

As the program is today, there are 3 biomet indicators implemented:

- PMV/PPD
- PET
- UTCI

In upcoming versions, there will be probably more of them.



In this section, there is nothing more to do than to select an indicator and press the *Calculate...* button.

**Please Note:** The free version only supports PMV/PPD. To calculate PET or UTCI you need to buy a “Registered” version of BioMet.

With your contribution, you allow us to proceed with our project, which –besides of scientific input which is free most of the times- requires a lot of side funding

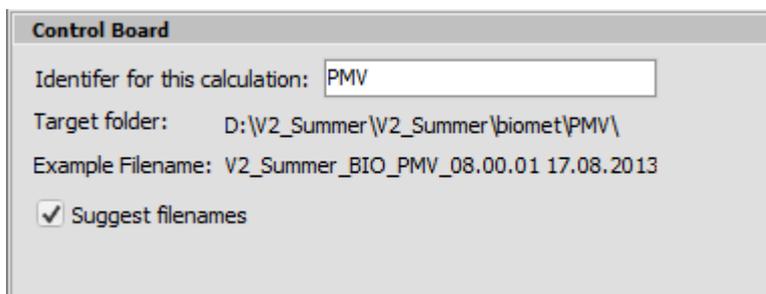
from servers over web designers up to licenses for the software we use. Thank you for your contribution....

For more information on how to register see the next section.

### Step (6): File name conventions

As the result of the calculation process, BioMet will produce new data files (\_BIO\_) by itself. These files are meant to integrate themselves into the other ENVI-met files and must be viewed by LEONARDO.

BioMet suggests a system of file names and folders that match with the ENVI-met file system.



Basically, a new folder "biomet" is always created in the same main folder where the atmospheric files have been located (you cannot change this). In addition, BioMet suggests to create a new subfolder labeled with the name of the selected biomet indicator.

In addition, the files created by BioMet are tagged with "\_BIO\_" as identification plus the identifier of the calculation.

If you do not like this logic, you can turn it off with disabling *Suggest filename*.

**Please Note:** BioMet writes only .EDX/.EDT files. These can only be read by LEONARDO 2014.

