NANOPARTICLE EXPOSURE MODELS:

ENVIRONMENTAL MODEL

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User manual

November 2018

EXPOSURE MODELS

OCCUPATIONAL EXPOSURE MODELS

Predicting the concentration of nanoparticles in a work environment while a task is carried out

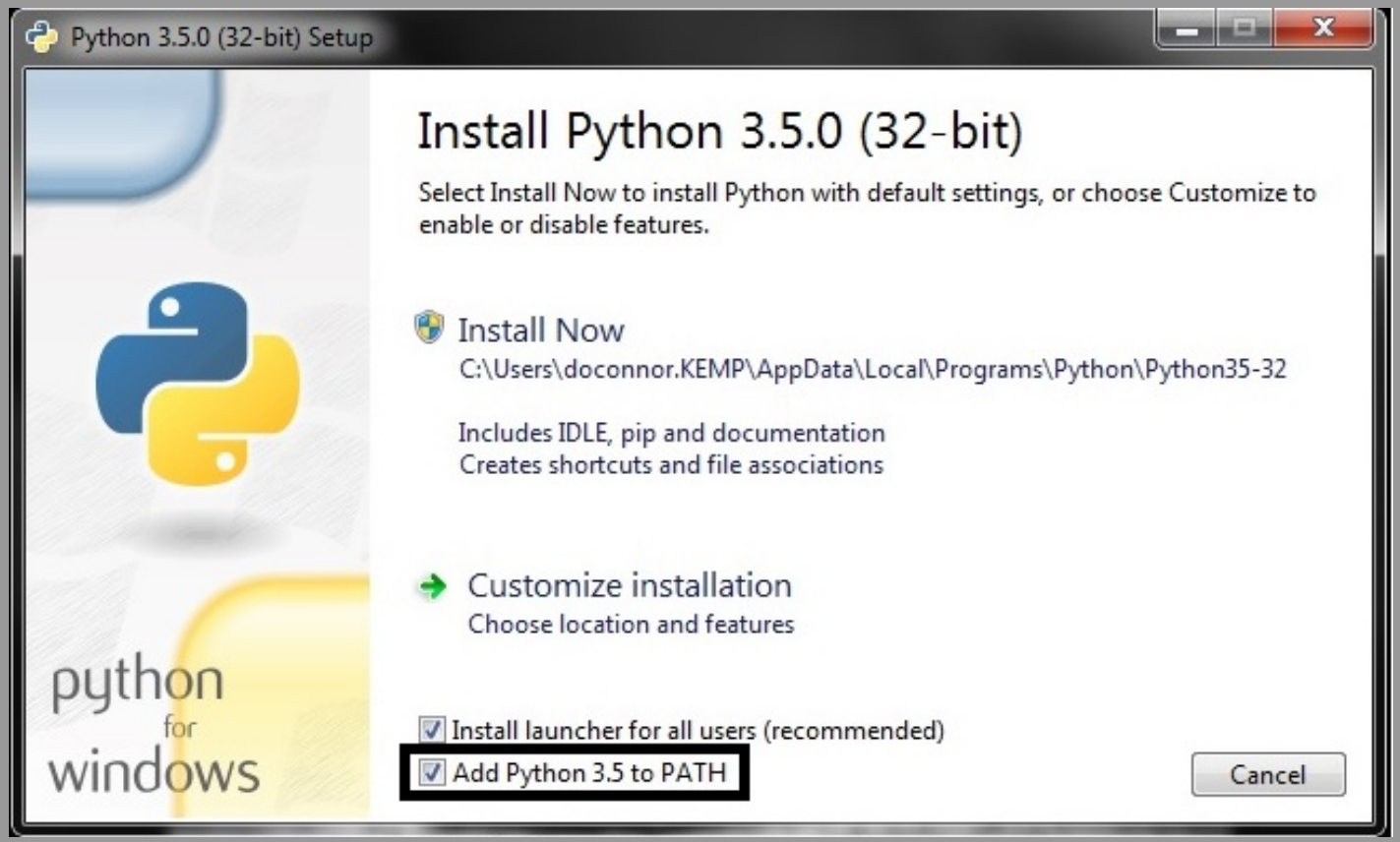
ENVIRONMENTAL EXPOSURE MODELS

Prediction of the amount of nanoparticles that are released into the environment: water, air, soil

HTTPS://WWW.PYTHON.ORG/DOWNLOADS/

Please download last Python version and install it

Make sure to select “Add Python X.X to path”



HTTP://SUDOENANODESK.EUROPEANPROJECTS.NET/PLATFORM/EXPOSURE_MODELS

INSTALL THE MODEL

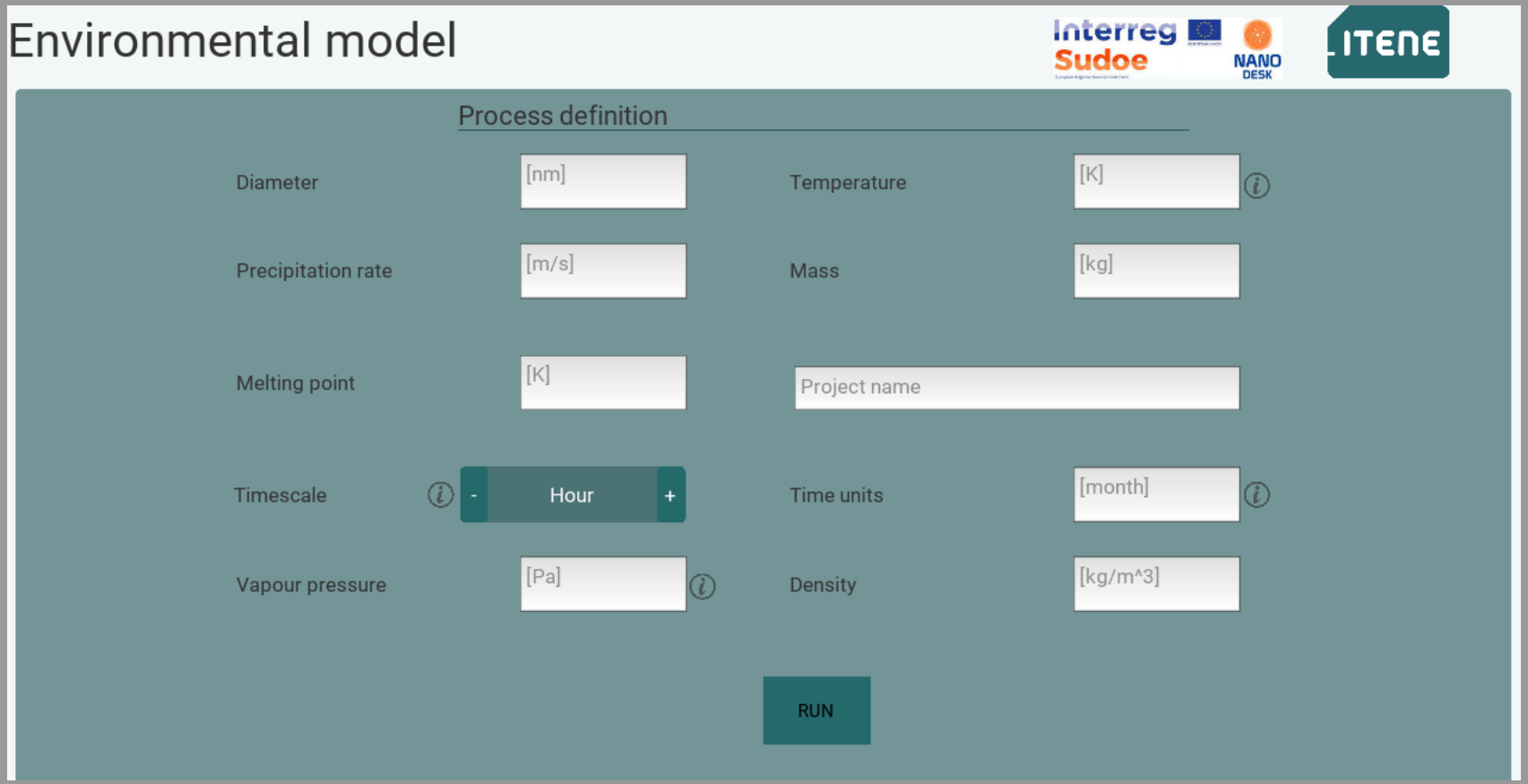
1. Once downloaded, uncompress the file .zip: a folder will be created named:

   environmental_model

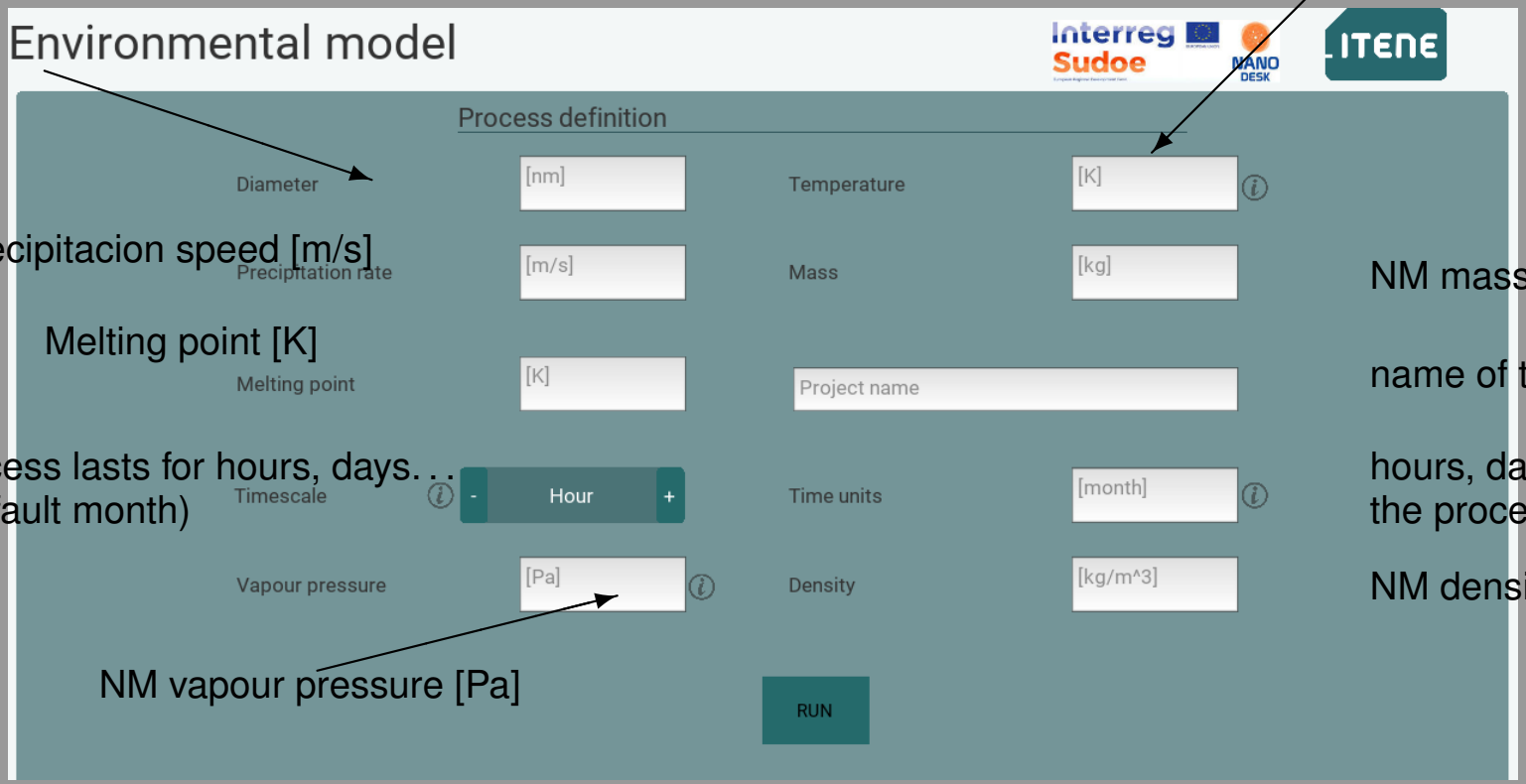
2. Double click in the file `setup.bat`:
   All dependencies will install and the Graphical User Interface (GUI) will open

   It can take 2/3 minutes to finish!
   Only the first time the model is run

GRAPHICAL USER INTERFACE (GUI)



PROCESS DEFINITION



NM diameter [nm]

temperature in K

NM precipitacion speed [m/s]

NM mass in g

Melting point [K]

name of the project (pc

the process lasts for hours, days... (default month)

hours, days... that the process lasts

NM vapour pressure [Pa]

NM density [kg m^{-3}]

EXECUTE THE MODEL

RUN

Click RUN to execute the model

- It will operate with the input data
- A .pdf file with input and output date will be generated
- Everything will be saved in the same folder where the code has been run

REPORT IN .PDF

Environmental model results

project

Input

Diameter: 20.0 nm
Time interval: 6 Weeks
Mass: 50 kg
Temperature: 300 K
Density: 4.23 kg cm^{-3}
Melting point: 274 K
Precipitation rate: 2.22e-08 m s
Vapour pressure: 232 Pa

Output

Mass of material used in the synthesis process

$\mathbf{M_{raw}}$ = 56.243 kg

Predictive environmental concentrations

$\mathbf{PEC_{air}}$ = 6.940e-15 kg/m^3

$\mathbf{PEC_{water}}$ = 9.986e-11 kg/m^3 ; $\mathbf{PEC_{water'}}$ = 1.057e-12 kg/m^3

$\mathbf{PEC_{soil}}$ = 4.758e-10 kg/m^3 ; $\mathbf{PEC_{soil'}}$ = 6.798e-11 kg/m^3

Mass in the different environments

$\mathbf{M_{air}(0)}$ = 10.343 kg/m^3 ; $\mathbf{M_{air}(\ 6\ Week\ )}$ = 0.016 kg/m^3

$\mathbf{M_{soil}(0)}$ = 2.381 kg/m^3 ; $\mathbf{M_{soil}(\ 6\ Week\ )}$ = 12.024 kg/m^3

$\mathbf{M_{water}(0)}$ = 7.011 kg/m^3 ; $\mathbf{M_{water}(\ 6\ Week\ )}$ = 7.668 kg/m^3

$\mathbf{M_{sed}(0)}$ = 0.000 kg/m^3 ; $\mathbf{M_{sed}(\ 6\ Week\ )}$ = 0.002 kg/m^3

$\mathbf{M_{tot}(0)}$ = 19.735 kg/m^3 ; $\mathbf{M_{tot}(\ 6\ Week\ )}$ = 19.710 kg/m^3

$\mathbf{M_{loss}}$ = 0.126 %

REPORT IN .PDF

Deposition constant

K_{soil} = 1.694e-06

$K_{soil,hum}$ = 2.153e-11 kg/m^3 ; $K_{soil,dry}$ = 1.694e-06 kg/m^3

K_{water} = 8.874e-08

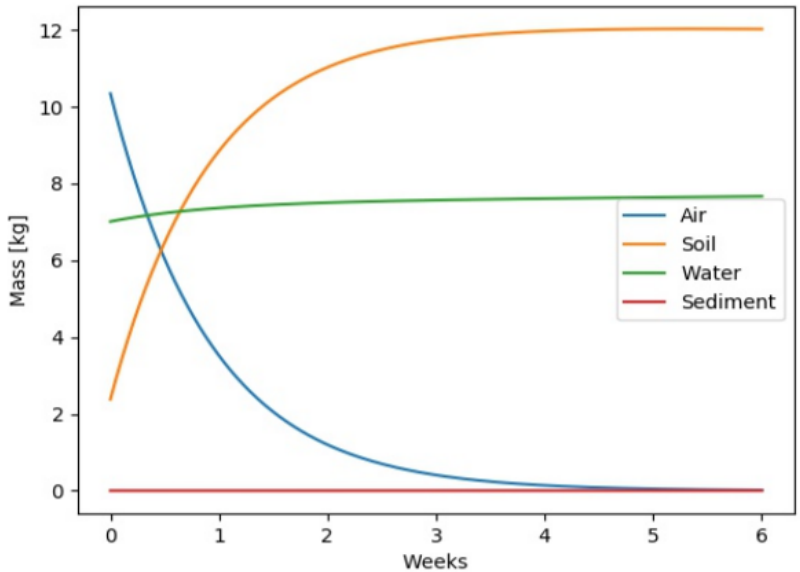
$K_{water,hum}$ = 6.660e-13 kg/m^3 ; $K_{water,dry}$ = 8.874e-08 kg/m^3

Emission during the life cycle

$E_{m,air}$ = 10.343 kg

$K_{m,soil}$ = 2.381 kg

$K_{m,water}$ = 7.011 kg



Evolution of the NM (mass) during the selected time