

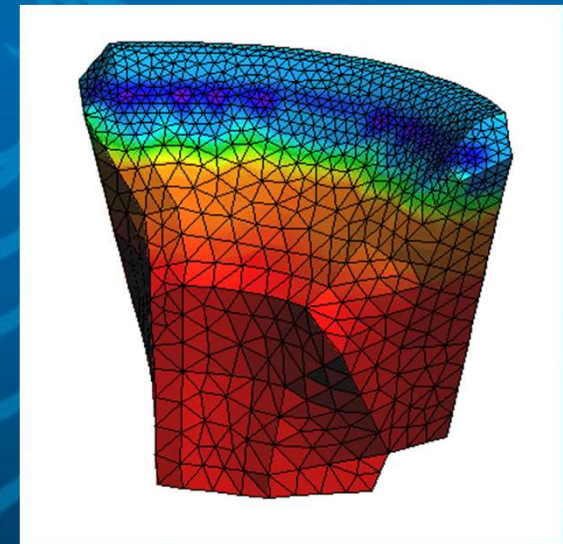
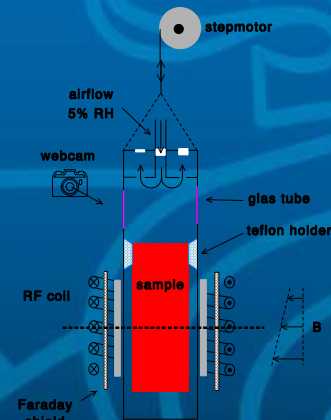
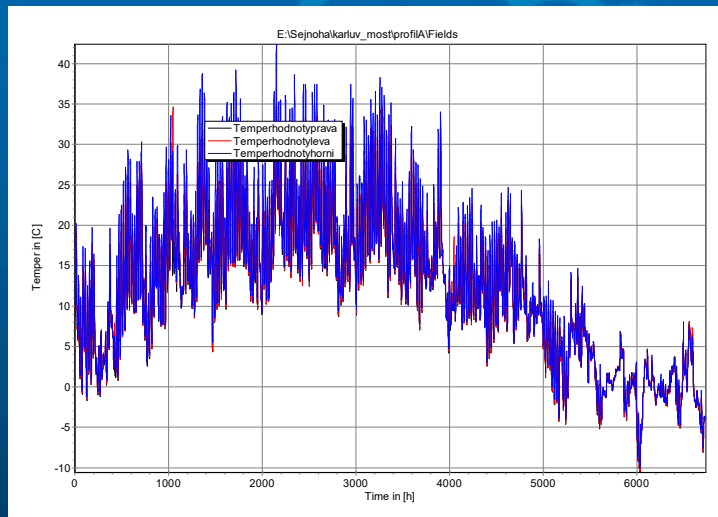


ČVUT
ČESKÉ VYSOKÉ
UČENÍ TECHNICKÉ
V PRAZE

KATEDRA MATERIÁLOVÉHO INŽENÝRSTVÍ A CHEMIE

Software

2P + 2C



Dostupné programy

- Rozdělení podle zaměření
 - Obecné
 - Specifické
 - Normové

Obecné

- ❑ ANSYS - <https://www.ansys.com/>

- ❑ MATLAB - <https://www.mathworks.com/products/matlab.html>

- ❑ COMSOL MULTIPHYSICS - <https://www.comsol.com/>

- ❑ GID - <https://www.gidsimulation.com/>

Specifické

- WUFI - <http://wufi.cz/>
- Delphin - <https://bauklimatik-dresden.de/delphin/index.php?aLa=en>
- TRANSMAT – ČVUT v Praze
- DesignBuilder, EnergyPlus



Specifické - normové

□ TEPLO, AREA,





Specifické - WUFI

$$\frac{\partial H}{\partial \vartheta} \frac{\partial \vartheta}{\partial t} = \frac{\partial}{\partial x} \left(\lambda \frac{\partial \vartheta}{\partial x} \right) + h_v \frac{\partial}{\partial x} \left(\frac{\delta}{\mu} \frac{\partial p}{\partial x} \right)$$

Heat transport

$$\rho_w \frac{\partial u}{\partial \varphi} \cdot \frac{\partial \varphi}{\partial t} = \frac{\partial}{\partial x} \left(\rho_w D_w \frac{\partial u}{\partial \varphi} \frac{\partial \varphi}{\partial x} \right) + \frac{\partial}{\partial x} \left(\frac{\delta}{\mu} \frac{\partial p}{\partial x} \right)$$

Moisture transport

D_w [m ² /s]	Liquid transport coefficient
H [J/m ³]	Enthalpy of moist building material
h_v [J/kg]	Evaporation enthalpy of water
p [Pa]	Water vapor partial pressure
u [m ³ /m ³]	Water content
δ [kg/msPa]	Water vapor diffusion coefficient in air
ϑ [°C]	Temperature
λ [W/mK]	Heat conductivity of moist material
μ [-]	Vapor diffusion resistance factor of dry material
ρ_w [kg/m ³]	Density of water
φ [-]	Relative humidity

Specifické - WUFI

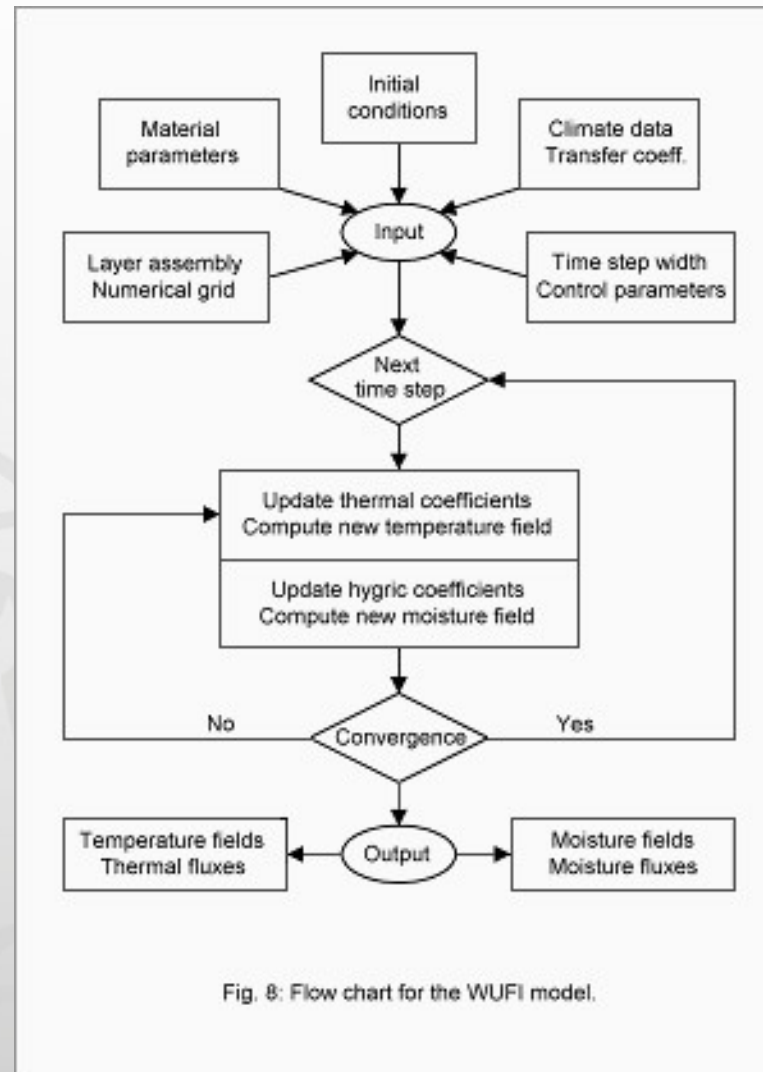


Fig. 8: Flow chart for the WUFI model.



Specifické – WUFI - 2D

WUFI2D 4.1 NonCommercial

File Input Output Database Options Help

Project: untitled

Project Name

Project Number

Client

Contact Person

Street

Town / ZIP

Phone Fax

e-mail

Responsible

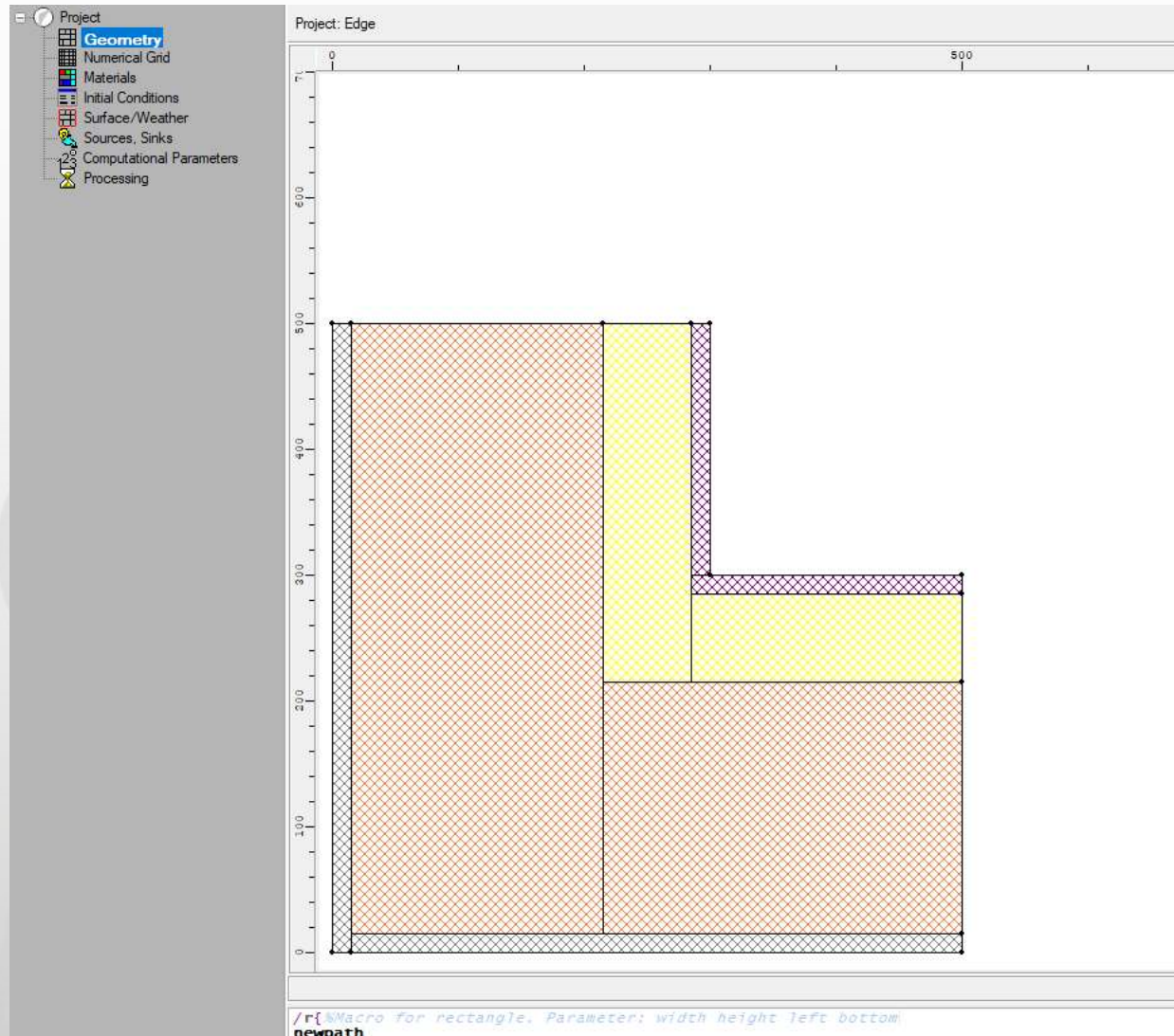
Remarks

Date

The screenshot shows the WUFI2D 4.1 NonCommercial software interface. The window title is "WUFI2D 4.1 NonCommercial". The menu bar includes "File", "Input", "Output", "Database", "Options", and "Help". The toolbar contains various icons for file operations and simulation. On the left, a tree view under "Project" lists: Geometry, Numerical Grid, Materials, Initial Conditions, Surface/Weather, Sources, Sinks, Computational Parameters, and Processing. The main area displays a form for project configuration. The form fields are: Project Name, Project Number, Client, Contact Person, Street, Town / ZIP, Phone, Fax, e-mail, Responsible, Remarks, and Date (set to 14.11.2023). A large, faint watermark of a stylized figure is visible on the right side of the slide.



Specifické - WUFI - 2D





Vliv prostředí na stavební materiály

6. přednáška

Specifické - WUFI - 2D

The screenshot displays the WUFI 2D software interface. On the left, a vertical toolbar contains icons for Project, Geometry, Numerical Grid, Materials, Initial Conditions, Surface/Weather, Sources, Sinks, Computational Parameters, and Processing. The main workspace shows a 2D cross-section of a wall with various material layers. A 'WUFI materials' dialog box is open, displaying a search results table for 'WUFI → Fraunhofer-IBP → Mortar and Plaster'. Below the table, there is a 'Material Information' section with 'Hygrothermal Functions' and 'Added to DB' and 'Last update' fields. At the bottom of the dialog, there are 'Import', 'Export', and 'Thickness [m]:' fields, along with 'Add', 'Cancel', and 'Help' buttons.

Material Name	Bulk density [kg/m ³]	Porosity [m ³ /m ³]	Heat Cap. [J/kgK]	Therm. Co... [W/mK]	Vap.Res. [-]
Bayosan LeichttonMörtel LTM 81®	988	0.58	850	0.165	24
Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	1900	0.24	850	0.8	19
Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	1900	0.24	850	0.8	19
Cement Plaster (stucco, A-value: 0.51 kg/m ² h ^{0.5})	2000	0.3	850	1.2	25
DIATHONITE EVOLUTION	367	0.54	1100	0.045	4
EdelPutz Leicht MF	1360	0.49	850	0.9	8.1
Exterior Plaster A - layer 1 of 4 (exterior)	1310	0.36	850	0.87	8
Exterior Plaster A - layer 2 of 4	1210	0.26	850	0.97	8

Name	X-Material	Edit	Y-Material	Edit
ziegel0	Aerated Clay Brick density: 650 kg/m ³	Edit...	Aerated Clay Brick density: 650 kg/m ³	Edit
ziegel1	Aerated Clay Brick density: 650 kg/m ³	Edit...	Aerated Clay Brick density: 650 kg/m ³	Edit
putz1	Lime Cement Plaster (stucco)	Edit...	Lime Cement Plaster (stucco)	Edit
putz0	Lime Cement Plaster (stucco)	Edit...	Lime Cement Plaster (stucco)	Edit
daemmung0	Mineral Wool (heat cond.: 0,04 W/mK)	Edit...	Mineral Wool (heat cond.: 0,04 W/mK)	Edit



Vliv prostředí na stavební materiály

6. přednáška

Specifické - WUFI - 2D

Layer/Material Data

Layer/Material Name:

Bulk density [kg/m³]:

Porosity [m³/m³]:

Spec. Heat Capacity [J/kgK]:

Thermal Conductivity [W/mK]:

Water Vapour Diffusion Resistance Factor [-]:

Typical Built-In Moisture [kg/m³]:

Thermal Conductivity, Design Value [W/mK]:

Color:

Hygrothermal Functions | Material Information

Moisture Storage Function

- Liquid Transport Coefficient, Suction
- Liquid Transport Coefficient, Redistribution
- Water Vapour Diffusion Resistance Factor, moisture-dependent
- Thermal Conductivity, moisture-dependent
- Thermal Conductivity, temperature-dependent
- Enthalpy, temperature-dependent

Approximate

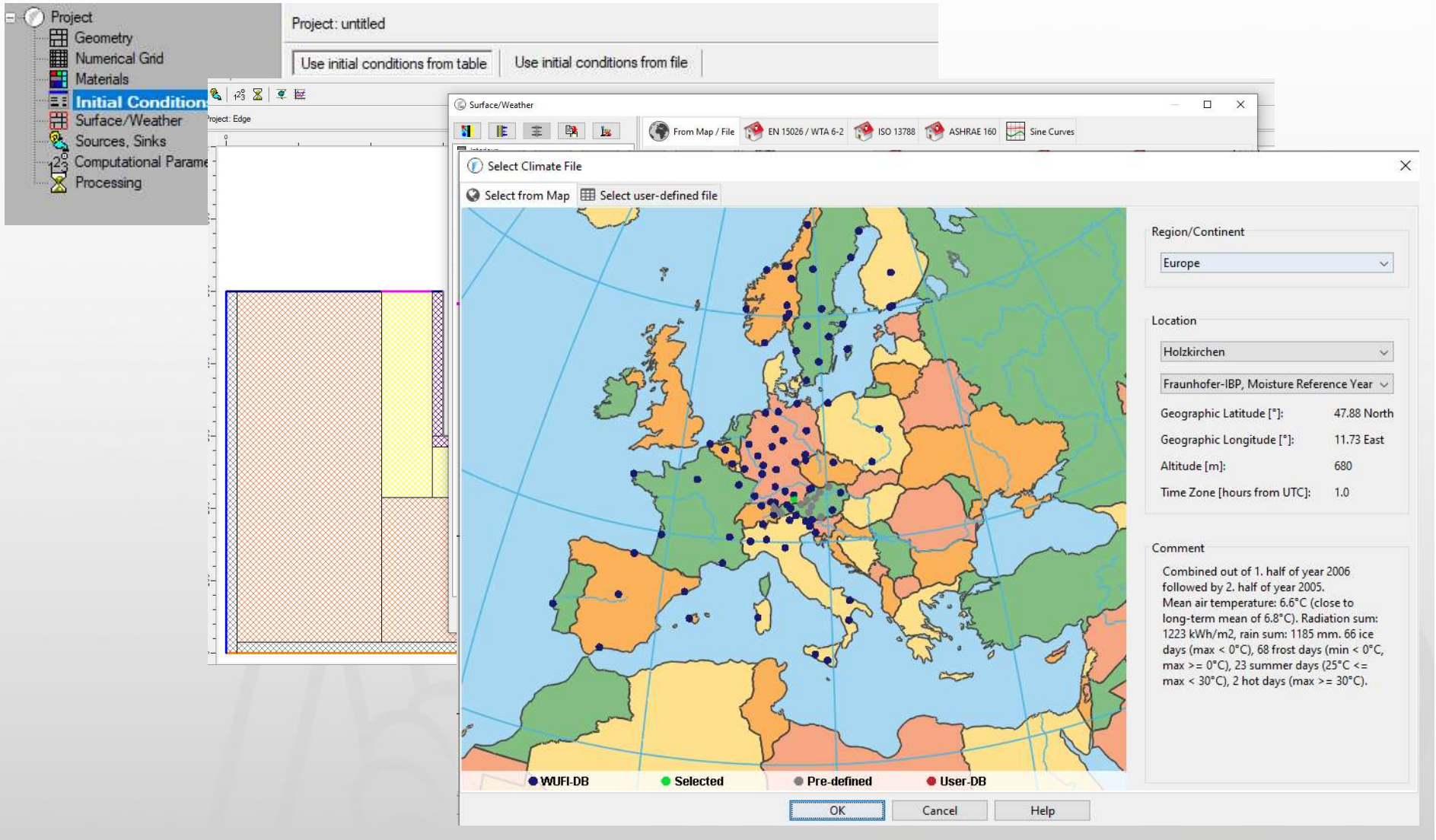
No.	RH [-]	Water Cont... [kg/m ³]
1	0	0
2	0.5	30
3	0.8	45
4	0.9	65
5	0.99	95
6	0.999	110
7	0.9995	140
8	0.9999	200
9	1	210

Water Content [kg/m³]

Relative Humidity [-]

Paste into Database | Import | Export | OK | Cancel | Help

Specifické - WUFI - 2D



The screenshot displays the WUFI 2D software interface. On the left, a project tree shows components like Geometry, Numerical Grid, Materials, Initial Conditions, Surface/Weather, Sources, Sinks, Computational Parameters, and Processing. The main window shows a 2D cross-section of a building wall with different material layers. Overlaid on this is the 'Surface/Weather' dialog box, which is currently set to 'Select Climate File'. This dialog features a map of Europe with various climate stations marked. The 'Region/Continent' is set to 'Europe', and the 'Location' is 'Holzkirchen'. The 'Fraunhofer-IBP, Moisture Reference Year' is selected. The dialog also displays the following climate data:

Geographic Latitude [°]:	47.88 North
Geographic Longitude [°]:	11.73 East
Altitude [m]:	680
Time Zone [hours from UTC]:	1.0

Below the map, there is a legend with four categories: WUFI-DB (blue dot), Selected (green dot), Pre-defined (grey dot), and User-DB (red dot). The 'OK', 'Cancel', and 'Help' buttons are visible at the bottom of the dialog.



Vliv prostředí na stavební materiály

6. přednáška

Specifické - WUFI - 2D

The screenshot displays the WUFI 2D software interface. The 'Computational Parameters' panel is active, showing various settings for the simulation. The 'Project' tree on the left includes: Project, Geometry, Numerical Grid, Materials, Initial Conditions, Surface/Weather, Sources, Sinks, Computational Parameters (selected), and Processing.

Project: untitled

Simple | Enhanced

Period of Calculation

Start Date/Time: 01.10.2023 | 0:00

Number of Time Steps: 8760

Mode of Calculation

Heat Transport Calculation

Moisture Transport Calculation

Hygrothermal Special Options

Excluding Latent Heat of Evaporation

Excluding Latent Heat of Fusion

Excluding Capillary Conduction

Numerical Parameters

Accuracy: Medium

Convergence: Soft dependencies

Adaptive Time Step Control

Enabled

Steps: 3 | Max. Stages: 5

Result File contains

W.C.	R.H.	Temp.	Va.P.	Flu.C.	Flu.D.	Flu.H.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Specifické - WUFI - 2D

The screenshot displays the WUFI 2D software interface during a simulation. On the left, a sidebar contains icons for 'Sources, Sinks', 'Computational Parameters', and 'Processing'. The main window shows a text-based output of simulation results, including iteration counts and absolute residual source sums for theta and phi. A progress bar at the bottom indicates that 23% of the simulation is complete, with approximately 10.6 seconds remaining.

```
Save after calculation

absolute residual source sums:
theta..... 0.8141E-03   phi..... 0.3972E-02

iteration no.: 20

absolute residual source sums:
theta..... 0.7880E-04   phi..... 0.2329E-03

*** rain refinement ***
iteration no.: 28   rainiteration no.: 2   rain residual..... 0.5884E-06

iteration no.: 10
absolute residual source sums:
theta..... 0.8748E-03   phi..... 0.3993E-02

iteration no.: 20

absolute residual source sums:
theta..... 0.8580E-04   phi..... 0.1931E-03

*** rain refinement ***
iteration no.: 28   rainiteration no.: 3   rain residual..... 0.4936E-06

iteration no.: 10
absolute residual source sums:
theta..... 0.9315E-03   phi..... 0.3901E-02

iteration no.: 20

absolute residual source sums:
theta..... 0.9656E-04   phi..... 0.2112E-03

*** rain refinement ***
iteration no.: 28   rainiteration no.: 4   rain residual..... 0.4102E-06

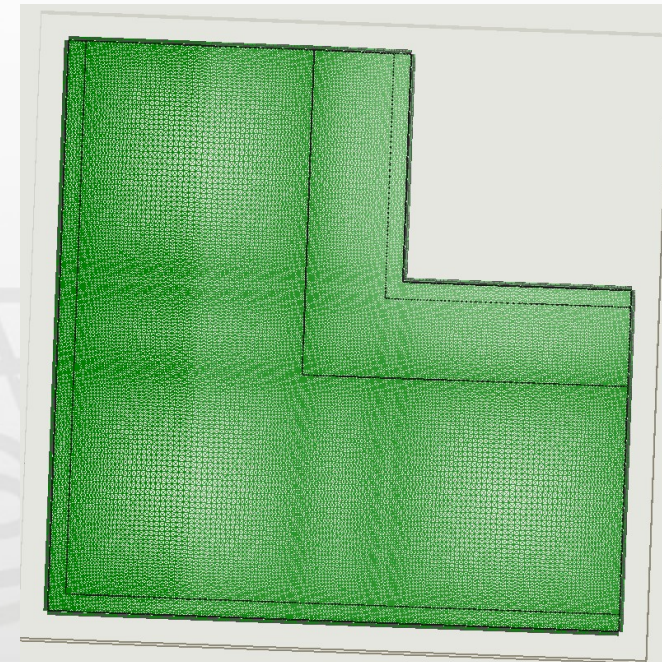
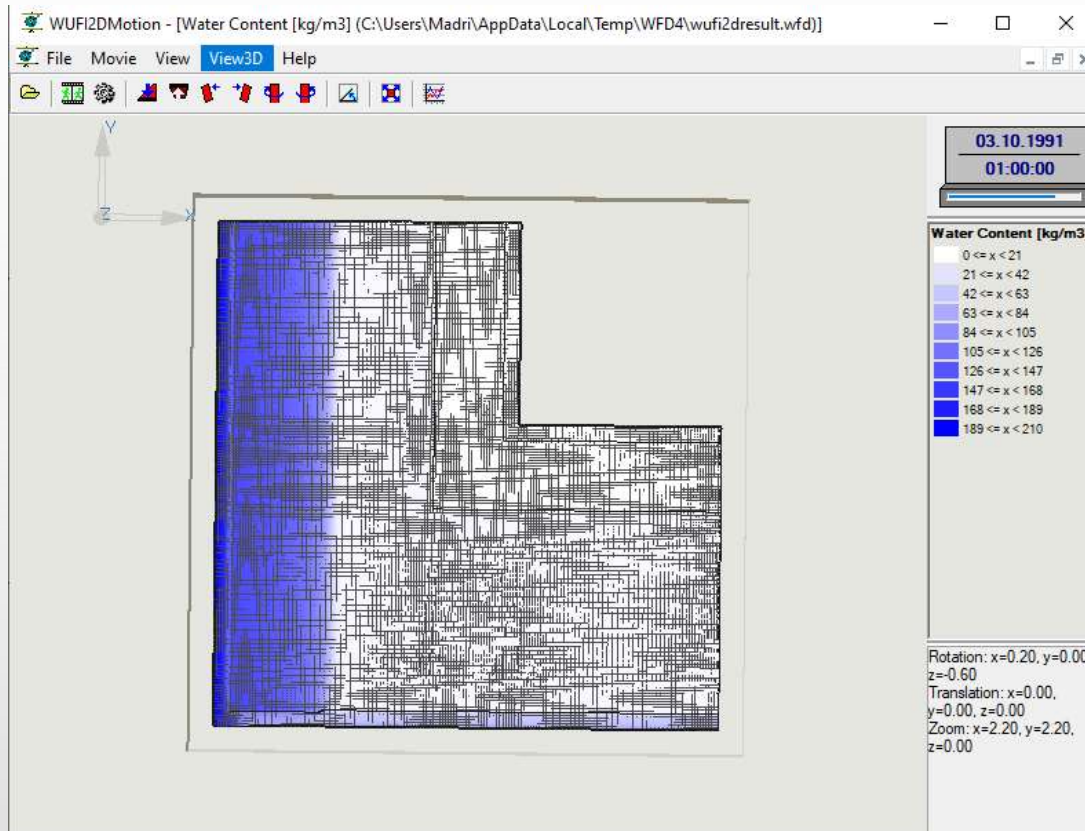
iteration no.: 10
absolute residual source sums:
theta..... 0.9611E-03   phi..... 0.3905E-02

iteration no.: 20
absolute residual source sums:
theta..... 0.1000E-03   phi..... 0.2010E-02

time left (approx.): 10.6 seconds

23%
```

Specifické - WUFI - 2D



Specifické - WUFI - 1D

Project: Demo Projekt

Assembly/Monitor Positions | Orientation/Inclination/Height | Surface Transfer Coeff. | Initial Conditions

Assembly

Layer Name: Kalksandstein aussen (Dichte: 1900 kg/m³) | Thickn. [m]: 0,105

Exterior (Left Side): 0,105 | Interior (Right Side): 0,015

0,105 | 0,06 | 0,175 | 0,015

Material Data | Sources, Sinks

New Layer | Duplicate | Delete

Assign from: Material Database | Example Cases

Grid: Automatic Grid: Coarse Medium Fine

Project: Demo Projekt

Assembly/Monitor Positions | Orientation/Inclination/Height | Surface Transfer Coeff. | Initial Conditions

Orientation

West

Inclination

Inclination [°]: 90

Building Height/Driving Rain Coefficients

Rain load calculation according to ASHRAE Standard 160P

R1 [-]: 0

R2 [s/m]: 0,07

Note:
Rain Load =
Rain*(R1 + R2 * Wind Velocity)

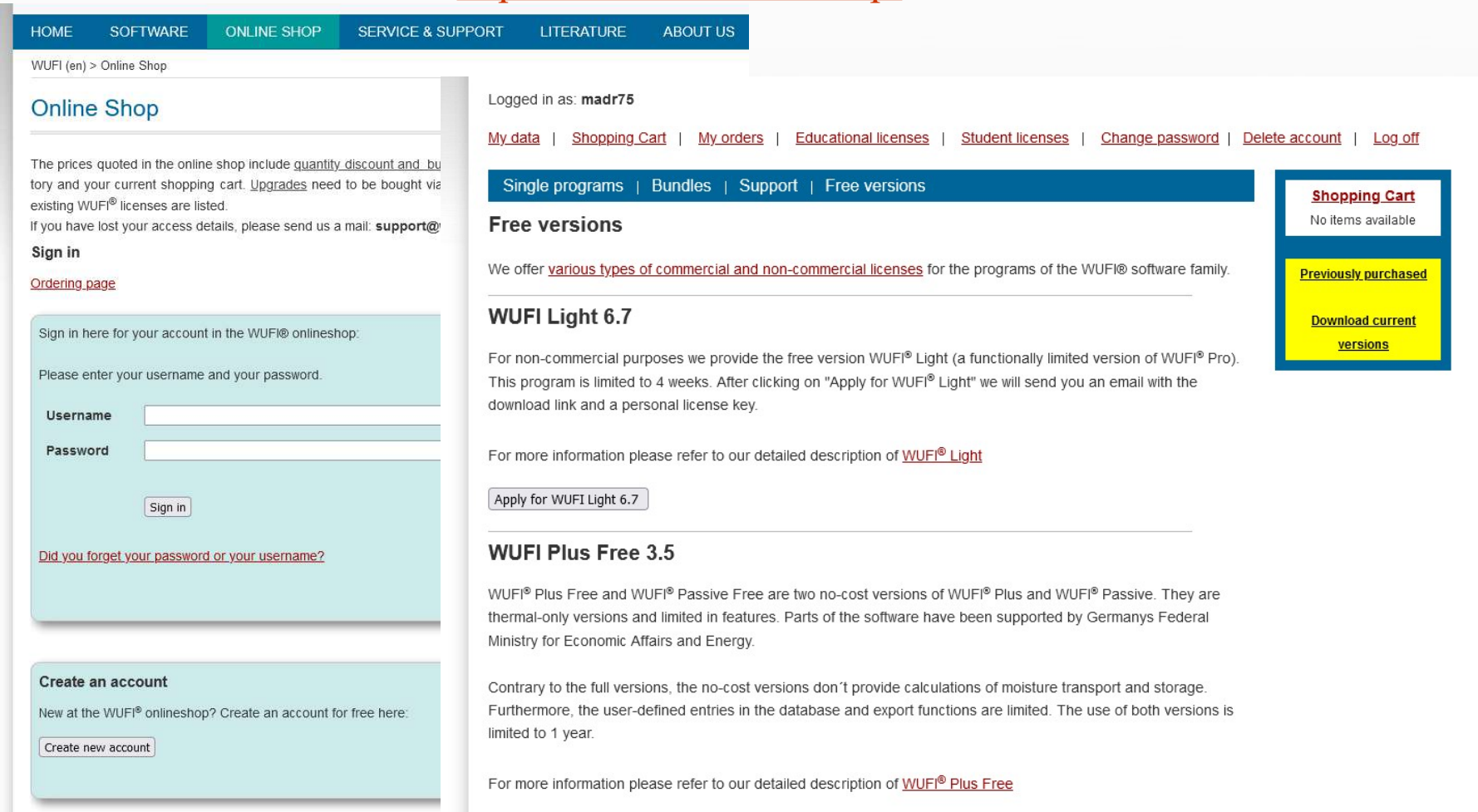
Short Building, height up to 10 m

Project: Case: 1 (Act. Case)

- Component: 10 cm Mineralwolle
- Assembly/Monitor Positions
- Orientation
- Surface Transfer Coeff.
- Initial Conditions
- Control
- Calculation Period/Profiles
- Numerics
- Climate
- Outdoor (Left Side)
- Indoor (Right Side)

Specifické - WUFI - 2D

<https://wufi.de/en/webshop/>



HOME SOFTWARE ONLINE SHOP SERVICE & SUPPORT LITERATURE ABOUT US

WUFI (en) > Online Shop

Online Shop

The prices quoted in the online shop include [quantity discount and buy](#) tory and your current shopping cart. [Upgrades](#) need to be bought via existing WUFI® licenses are listed.

If you have lost your access details, please send us a mail: support@wufi.de

Sign in

[Ordering page](#)

Sign in here for your account in the WUFI® onlineshop:

Please enter your username and your password.

Username

Password

[Did you forget your password or your username?](#)

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New at the WUFI® onlineshop? Create an account for free here:

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Free versions

We offer [various types of commercial and non-commercial licenses](#) for the programs of the WUFI® software family.

WUFI Light 6.7

For non-commercial purposes we provide the free version WUFI® Light (a functionally limited version of WUFI® Pro). This program is limited to 4 weeks. After clicking on "Apply for WUFI® Light" we will send you an email with the download link and a personal license key.

For more information please refer to our detailed description of [WUFI® Light](#)

WUFI Plus Free 3.5

WUFI® Plus Free and WUFI® Passive Free are two no-cost versions of WUFI® Plus and WUFI® Passive. They are thermal-only versions and limited in features. Parts of the software have been supported by Germanys Federal Ministry for Economic Affairs and Energy.

Contrary to the full versions, the no-cost versions don't provide calculations of moisture transport and storage. Furthermore, the user-defined entries in the database and export functions are limited. The use of both versions is limited to 1 year.

For more information please refer to our detailed description of [WUFI® Plus Free](#)

Shopping Cart
No items available

Previously purchased

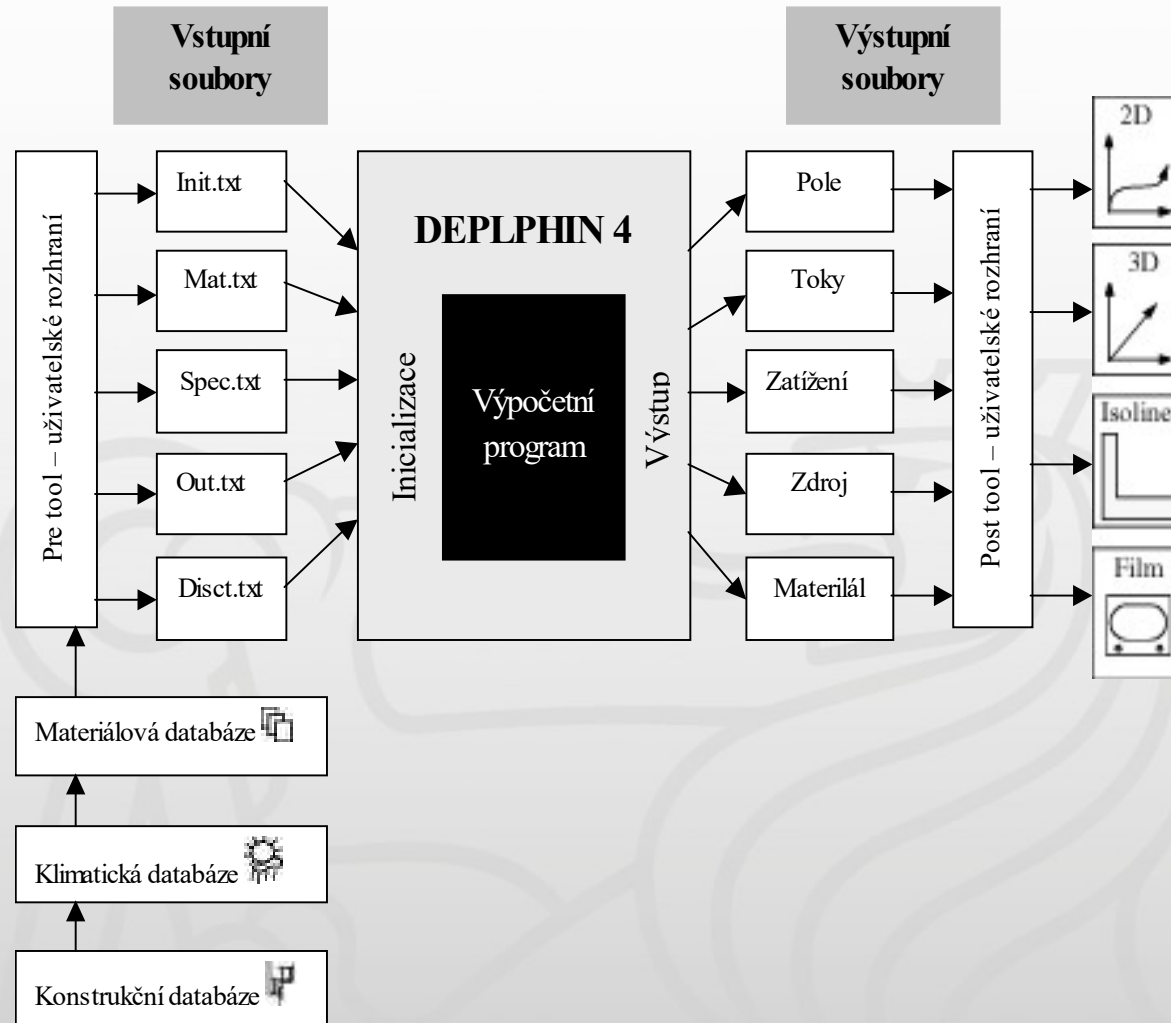
[Download current versions](#)

Specifické - Delphin

- Institut stavební klimatologie, TU Dráždany
- John Grunewald, Rudolf Plagge, Staf Roels
- Transport tepla, vzduchu, solí a vlhkosti
- 1D, 2D a 3D problémy
- Metoda konečných objemů



Specifické - Delphin





Specifické - Delphin

$$s_{11} \frac{\partial w_1}{\partial t} + s_{12} \frac{\partial p_g}{\partial t} + s_{13} \frac{\partial c_s}{\partial t} + s_{14} \frac{\partial T}{\partial t} = - \operatorname{div} [(\rho_w \vec{v}^{ml} - \vec{j}_{\text{dif}}^{\text{ms}} - \vec{j}_{\text{disp}}^{\text{ms}}) w_1 + (\rho_v \vec{v}^{\text{mg}} + \vec{j}_{\text{dif}}^{\text{mv}}) w_g]$$

$$s_{21} \frac{\partial w_1}{\partial t} + s_{22} \frac{\partial p_g}{\partial t} + s_{23} \frac{\partial c_s}{\partial t} + s_{24} \frac{\partial T}{\partial t} = - \operatorname{div} [(\rho_a \vec{v}^{\text{mg}} - \vec{j}_{\text{dif}}^{\text{mv}}) w_g]$$

$$s_{31} \frac{\partial w_1}{\partial t} + s_{32} \frac{\partial p_g}{\partial t} + s_{33} \frac{\partial c_s}{\partial t} + s_{34} \frac{\partial T}{\partial t} = - \operatorname{div} [(\rho_s \vec{v}^{ml} + \vec{j}_{\text{dif}}^{\text{ms}} + \vec{j}_{\text{disp}}^{\text{ms}}) w_1]$$

$$s_{41} \frac{\partial w_1}{\partial t} + s_{42} \frac{\partial p_g}{\partial t} + s_{43} \frac{\partial c_s}{\partial t} + s_{44} \frac{\partial T}{\partial t} = - \operatorname{div} [\rho_1 u_1 \vec{v}^{ml} w_1 + (\rho_v u_v + \rho_a u_a) \vec{v}^{\text{mg}} w_g] - \operatorname{div} \vec{j}_{\text{dif}}^{\text{Q}} - \\ - \operatorname{div} [(h_s - h_w) (\vec{j}_{\text{dif}}^{\text{ms}} + \vec{j}_{\text{disp}}^{\text{ms}}) w_1] - \operatorname{div} [(h_v - h_a) \vec{j}_{\text{dif}}^{\text{mv}} w_g],$$

$$s_{44} = \rho_m \frac{\partial u_m}{\partial T} + \rho_p w_p \frac{\partial u_p}{\partial T} + \rho_1 w_1 \frac{\partial u_1}{\partial T} + u_1 w_1 \frac{\partial \rho_1}{\partial T} +$$

$$u_v w_g \frac{M_v}{RT} \left(\varphi \frac{dp_{\text{sat}}}{dT} - \frac{p_v}{T} + p_{\text{sat}} \frac{\partial \varphi}{\partial T} \right) - u_a w_g \frac{M_a}{RT} \left(\varphi \frac{dp_{\text{sat}}}{dT} + \frac{p_a}{T} + p_{\text{sat}} \frac{\partial \varphi}{\partial T} \right) +$$



Specifické - Delphin

The screenshot displays the Delphin4 software interface. The main window shows a 2D construction model with three distinct material regions: a red region (brick Jóns), a green region (HeavyConcrete), and a yellow region (Pine transversal). A 'Conditions' dialog box is open, showing a table of data records for boundary conditions.

No.	BoundCond	Record
1	HeatCond	IntConstant
2	VapDiff	IntConstant
3	HeatCond	ExtConstant
4	VapDiff	ExtConstant
5	HeatCond	Germany-Middle
6	SHwRad	Germany-Middle
	LoWRad	Germany-Middle

Below the table, there is a section for 'Assignments of properties (results in change of construction data)' with columns for No., Location, Range, BoundCondition, and Record.

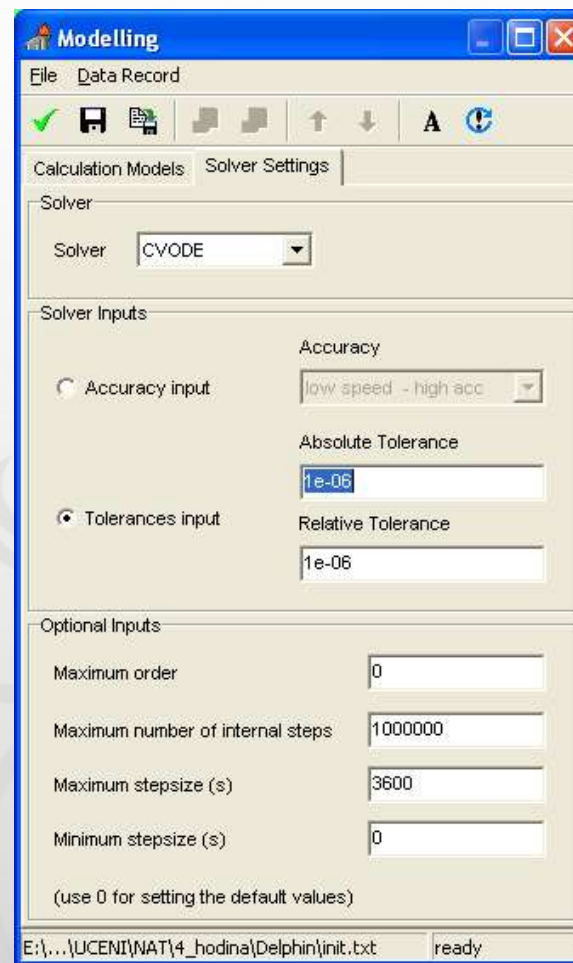
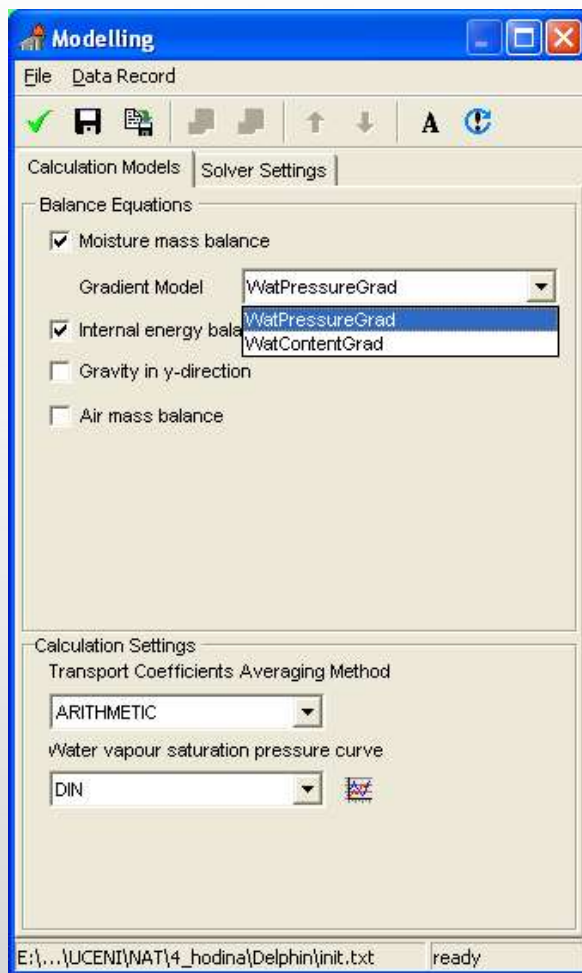
The status bar at the bottom indicates: (X-Y)-Geometry= PLANE-PLANE | NumElements= 9 | E:\... \UCENI\NAT\4_hodina\Delphin\spec.txt | ready | changed | created= Mon Mar 26 18:16:43 2007 | lasted



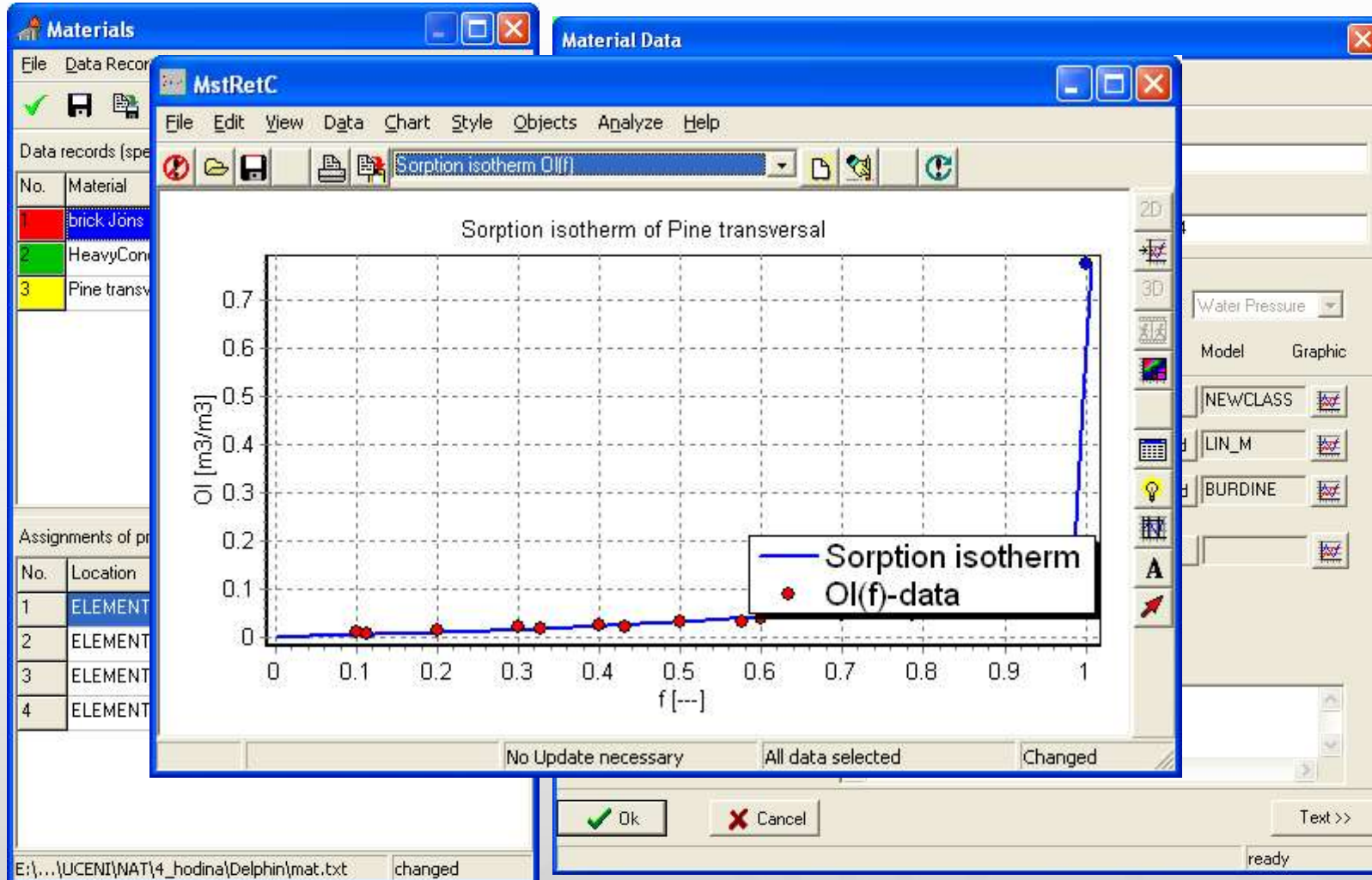
Vliv prostředí na stavební materiály

6. přednáška

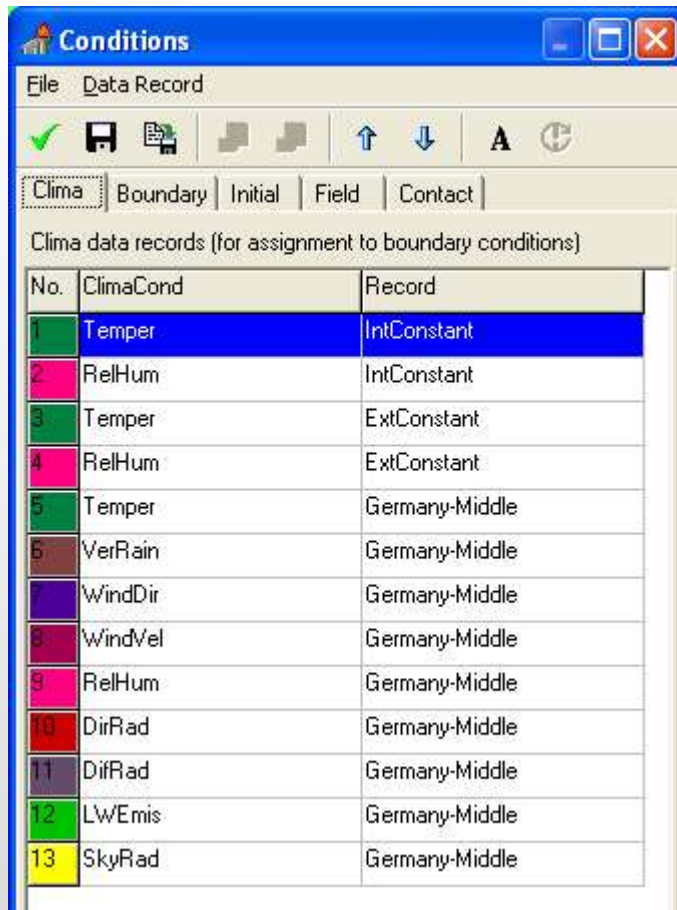
Specifické - Delphin



Specifické - Delphin



Specifické - Delphin



Conditions

File Data Record

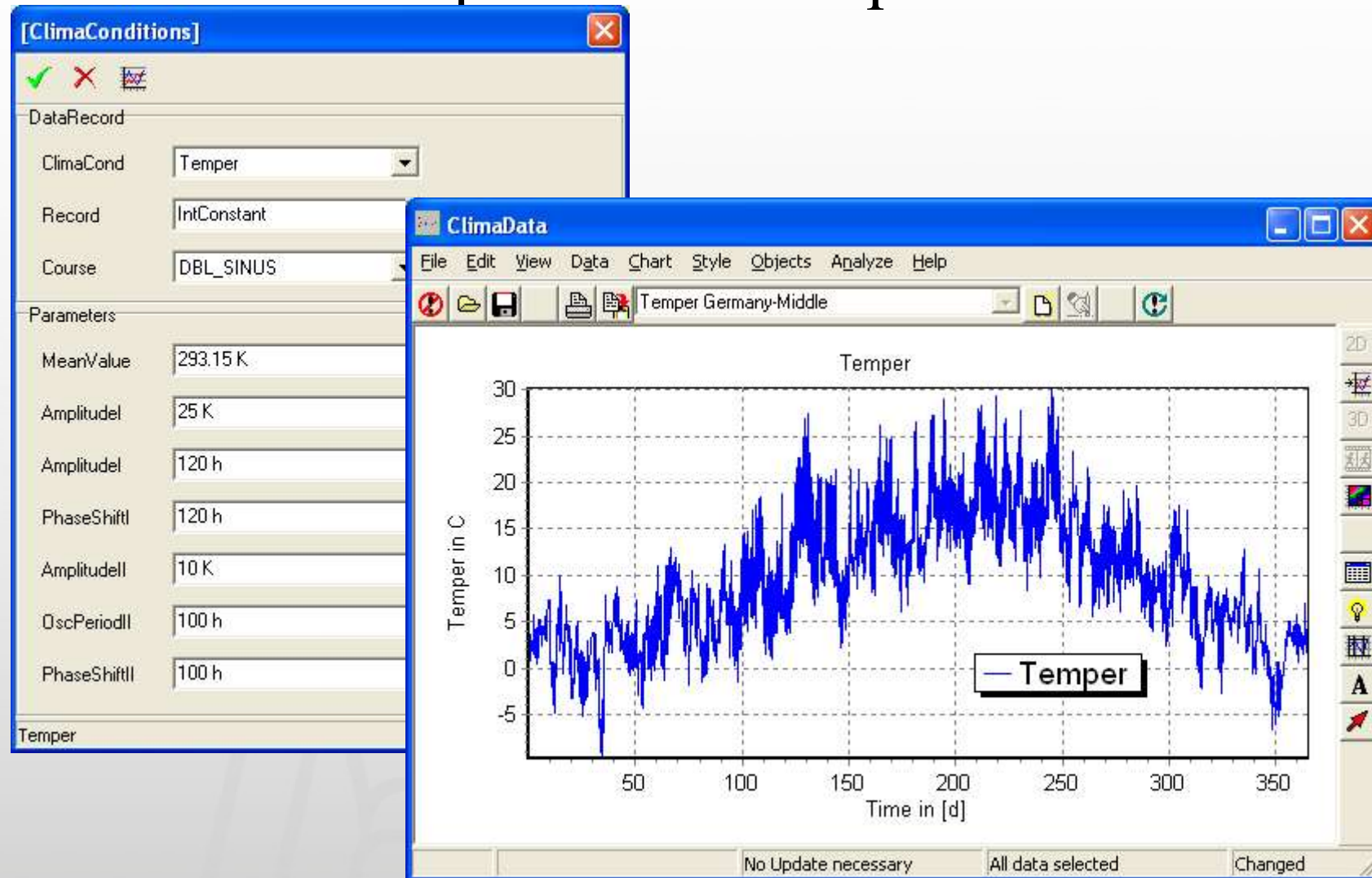
Clima Boundary Initial Field Contact

Clima data records (for assignment to boundary conditions)

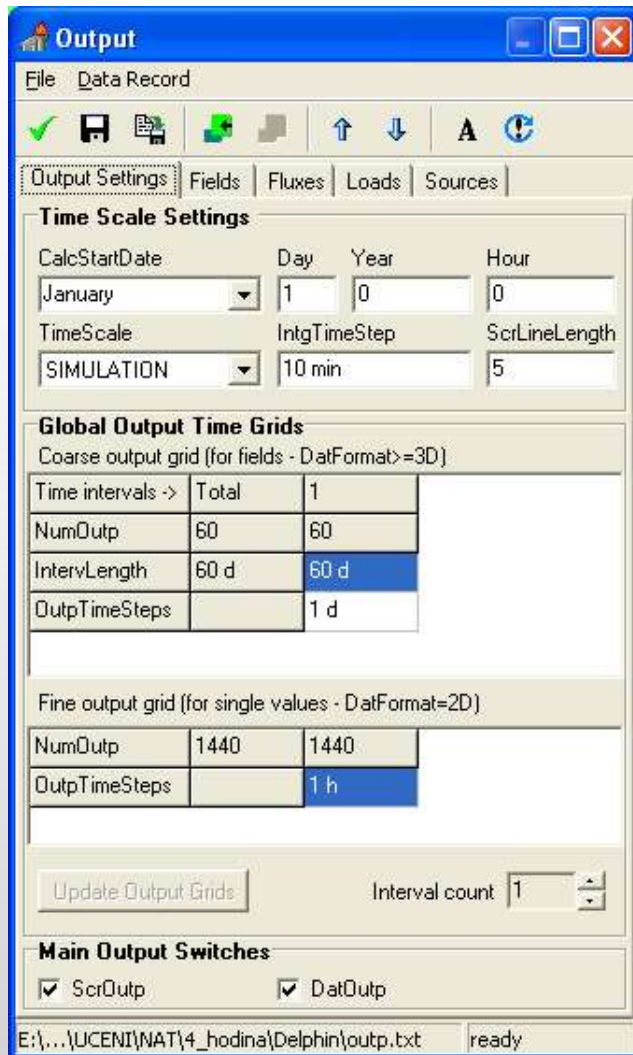
No.	ClimaCond	Record
1	Temper	IntConstant
2	RelHum	IntConstant
3	Temper	ExtConstant
4	RelHum	ExtConstant
5	Temper	Germany-Middle
6	VerRain	Germany-Middle
7	WindDir	Germany-Middle
8	WindVel	Germany-Middle
9	RelHum	Germany-Middle
10	DirRad	Germany-Middle
11	DifRad	Germany-Middle
12	LWEmis	Germany-Middle
13	SkyRad	Germany-Middle

- Okrajové podmínky
- Počáteční podmínky
- Kontaktní podmínky

Specifické - Delphin



Specifické - Delphin



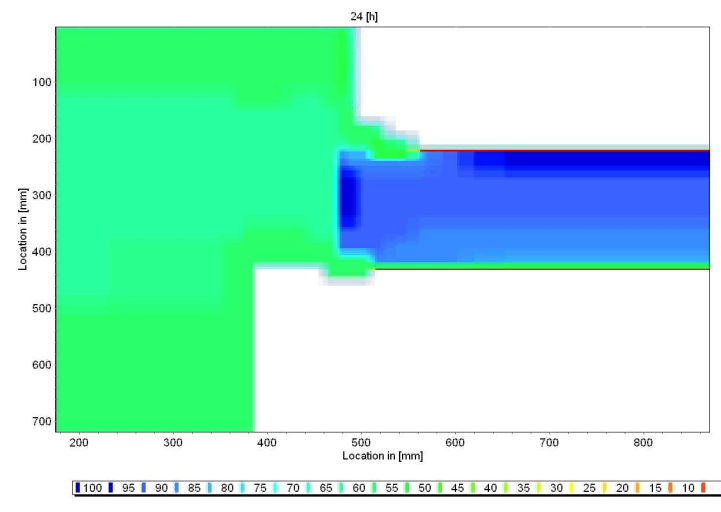
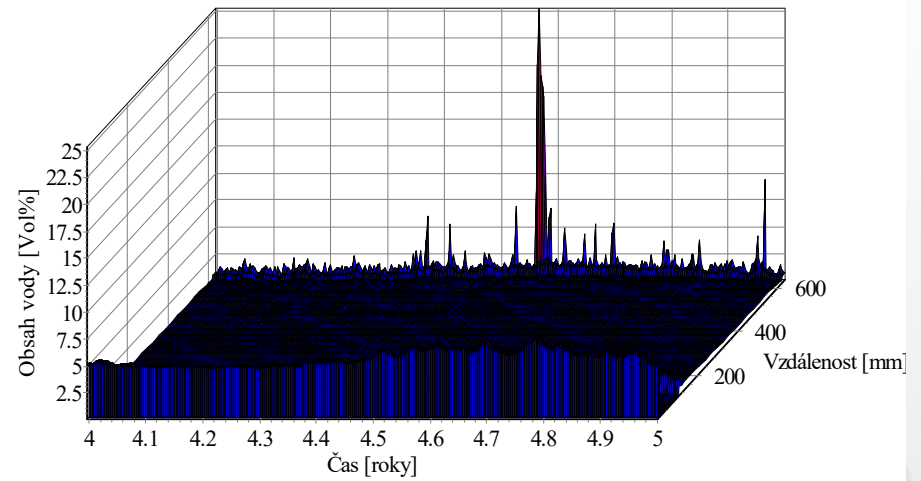
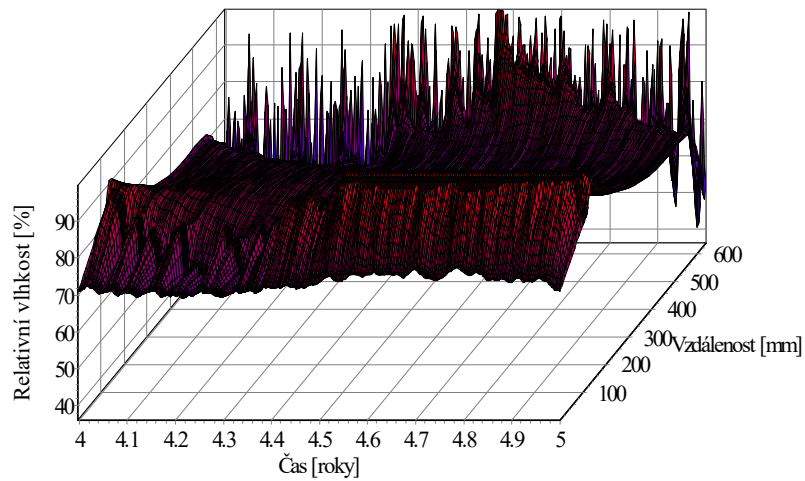
- Nastavení časové diskretizace
- Výstup – toky, pole, zdroje, zatížení



Vliv prostředí na stavební materiály

6. přednáška

Specifické - Delphin



Specifické – SIFEL

SIFEL - Simple Finite Elements

1. GEFEL – hlavní nástroje metody konečných prvků
2. MEFEL – modely pro mechaniku
3. TRFEL – modely pro transporty
4. METR – společný modely transportu a mechaniky
5. PARGEF – paralelní verze předcházejících modulů
6. PARMEF
7. PARTRF
8. PARMETR

Specifické – SIFEL

TRFEL - Matematický model

- Kunzel
- Grunewald
- deVries
- Bear a Bachmat

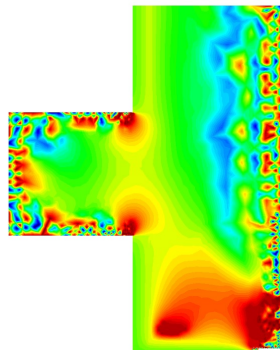
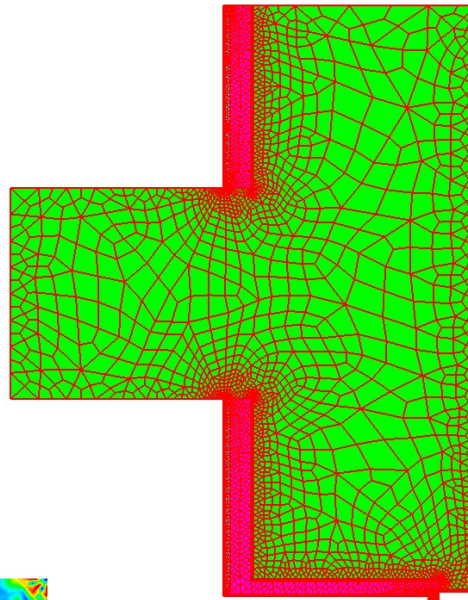
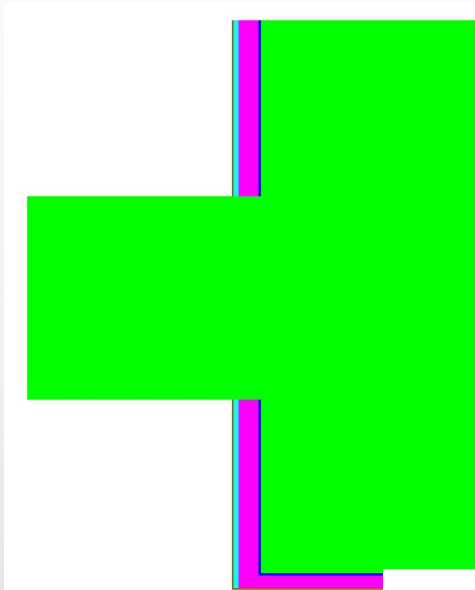
Specifické – SIFEL

Diskretizace problému

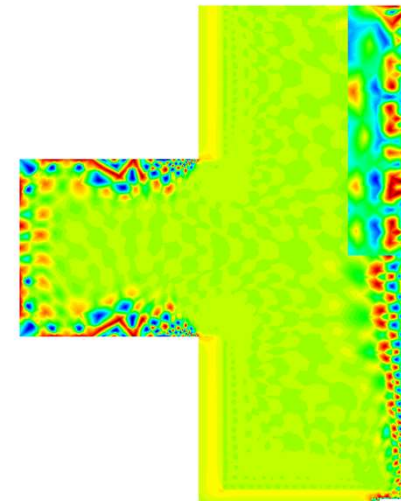
1. Vhodná volba geometrických tvarů
(obdélník, trojúhelník, n-úhelník,)
2. Vhodná velikost prvků – počet prvků
(dva a více prvků na materiál)
3. Vhodná volba „míry“ zhuštění
(okrajové podmínky, kontaktní podmínky)

Specifické – SIFEL

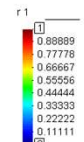
Diskretizace problému



y
x



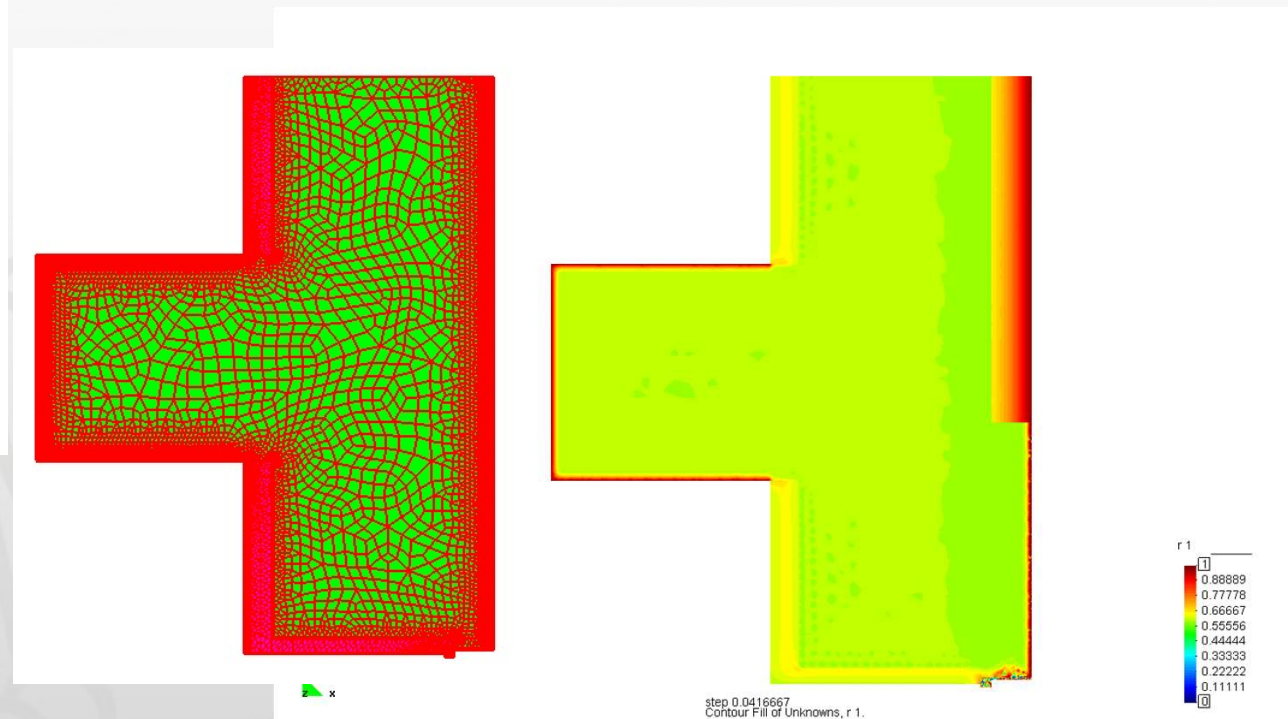
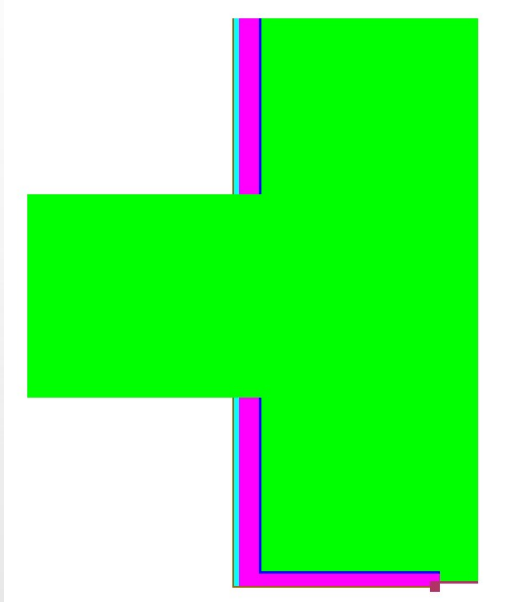
step 0.0416667
Contour Fill of Unknowns, r 1.





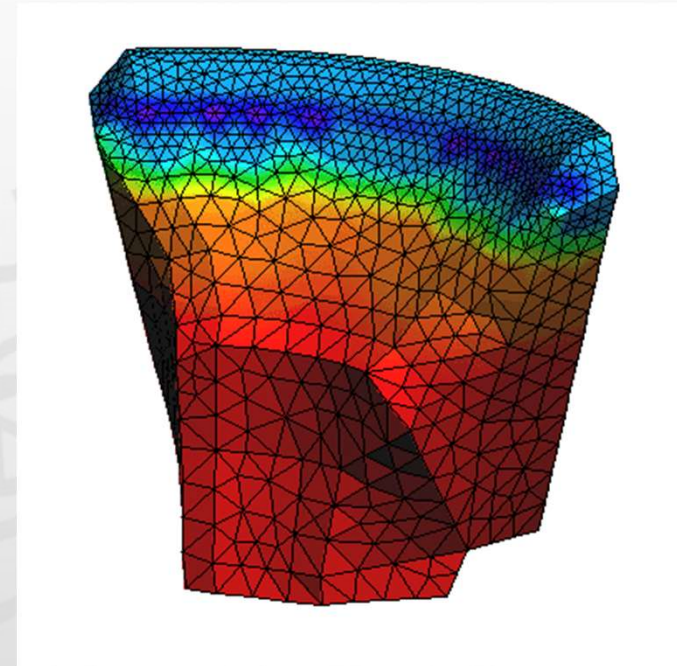
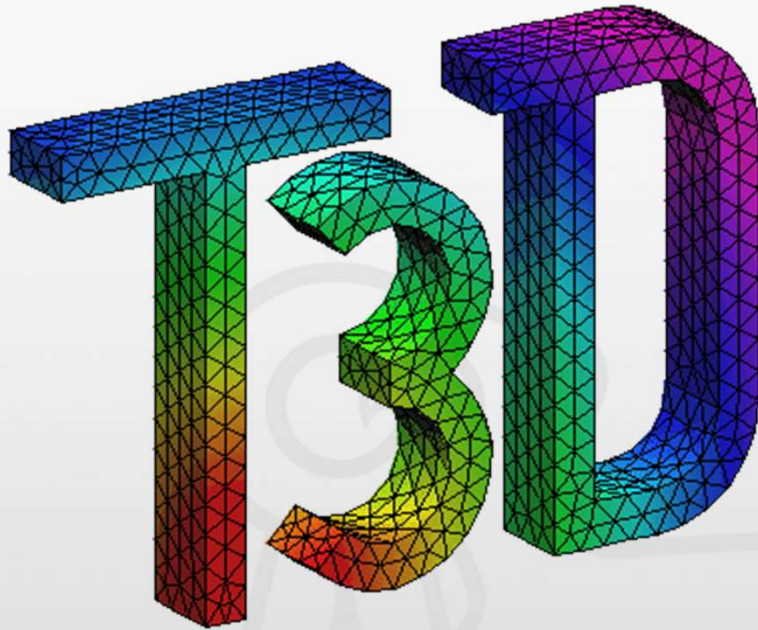
Specifické – SIFEL

Diskretizace problému



Specifické – SIFEL

SIFEL - Simple Finite Elements

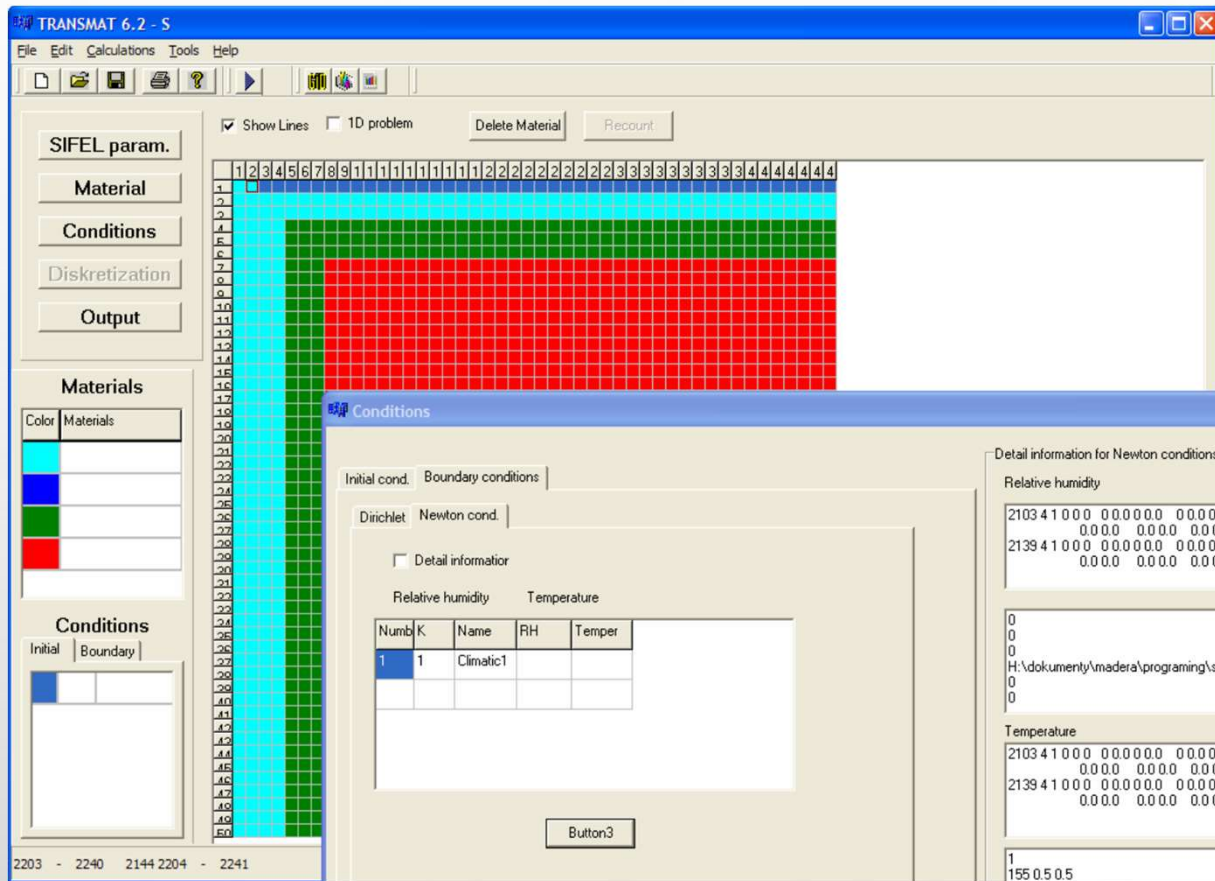


Vstupní soubor T3D

Vstupní soubor SIFEL

Specifické – TRANSMAT - HEMOT

Pracovní nástroj pro tvorbu vstupního souboru pro programový balík SIFEL



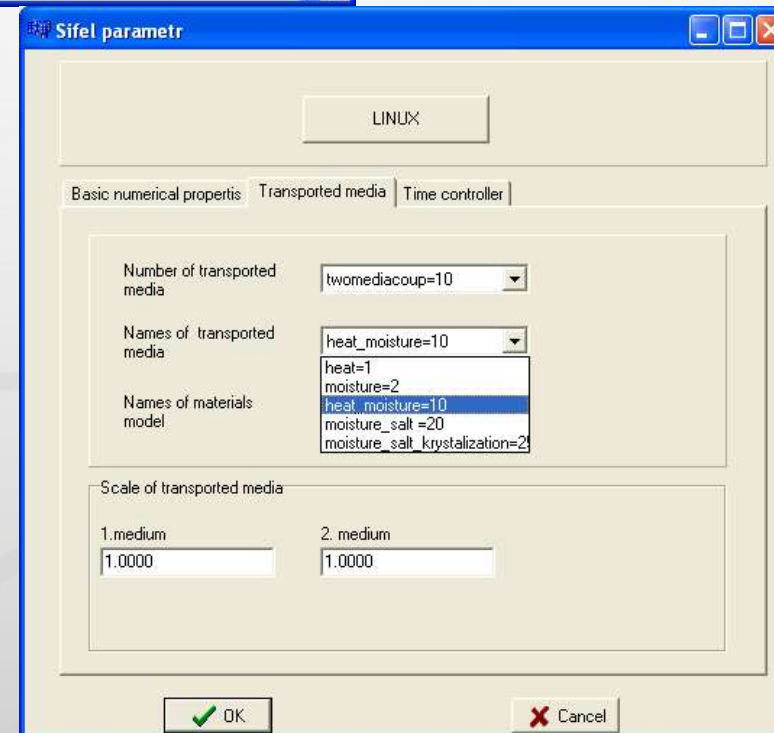
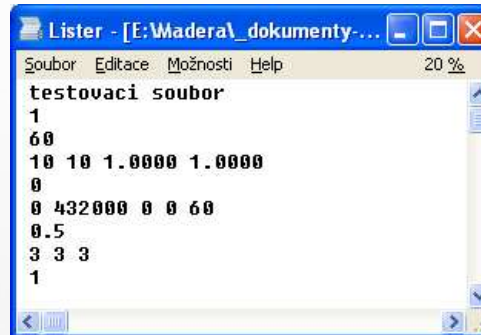
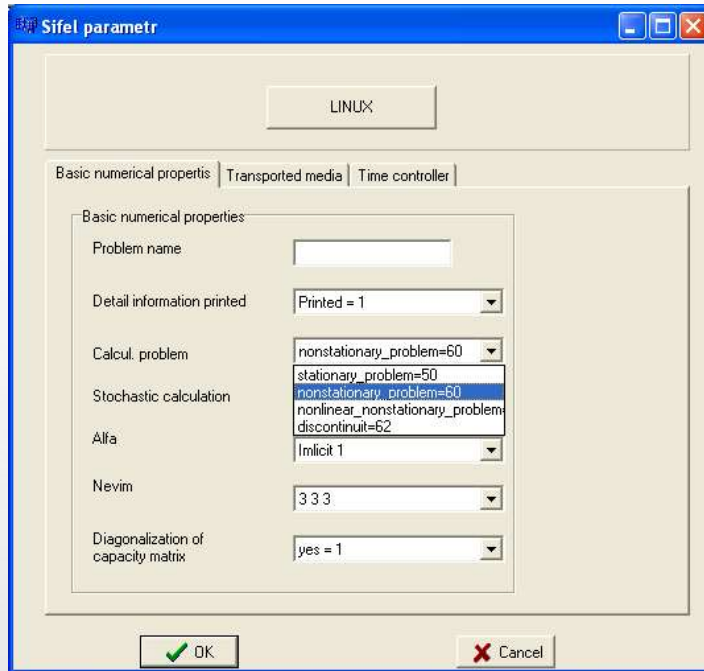


Specifické – TRANSMAT - HEMOT

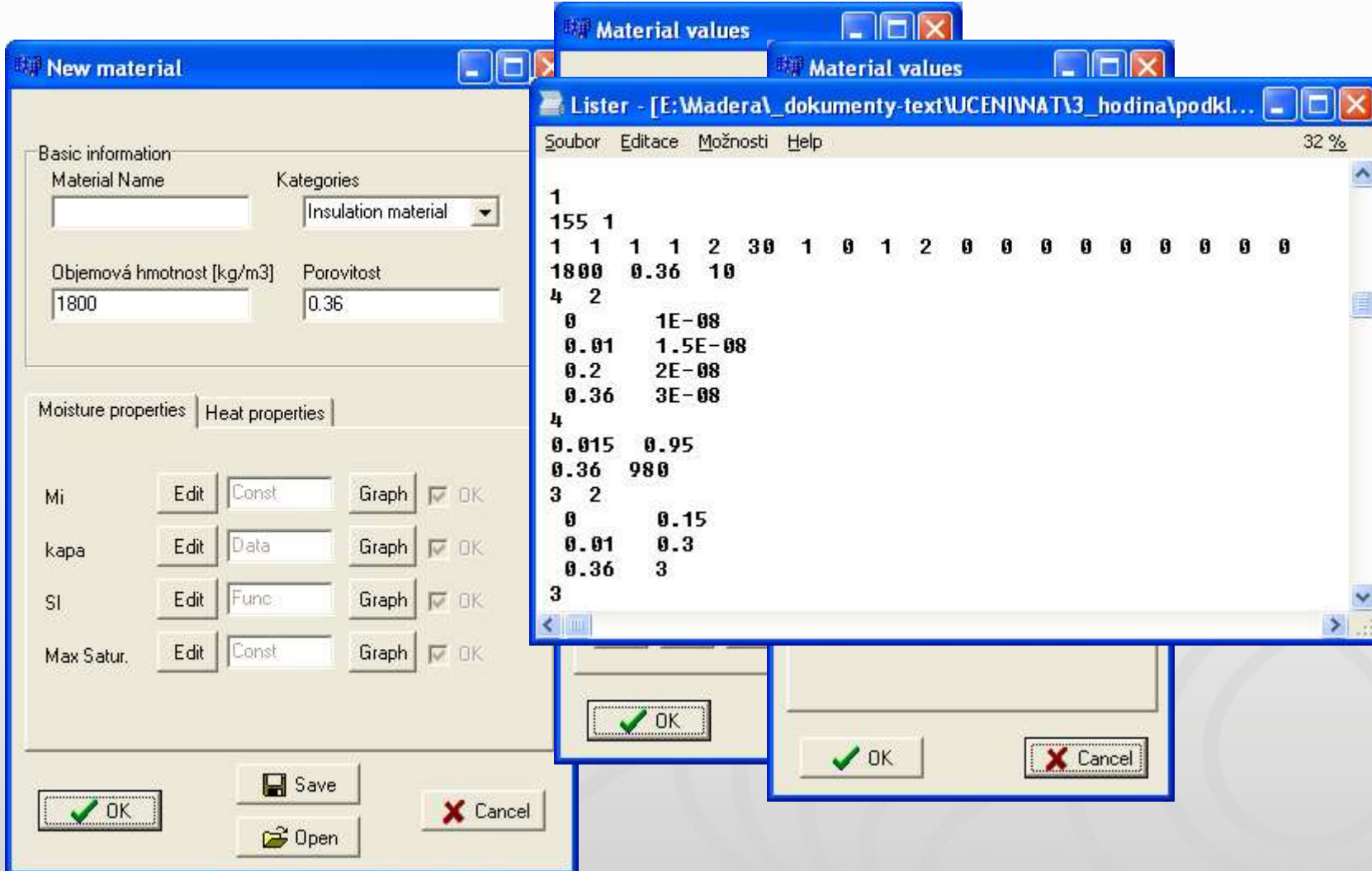
Postup zadávání

1. Základní parametry výpočtu
2. Materiálové charakteristiky
3. Diskretizace problému
4. Počáteční a okrajové podmínky
5. Výstupy
6. Vyhodnocení výsledků

Specifické – TRANSMAT - HEMOT



Specifické – TRANSMAT - HEMOT



The screenshot displays the TRANSMAT - HEMOT software interface. The 'New material' dialog is open, showing the following fields:

- Basic information:**
 - Material Name: [Empty]
 - Categories: Insulation material
 - Objemová hmotnost [kg/m³]: 1800
 - Porovitost: 0.36
- Moisture properties:**
 - Mi: Edit Const Graph OK
 - kapa: Edit Data Graph OK
 - SI: Edit Func Graph OK
 - Max Satur.: Edit Const Graph OK

At the bottom of the 'New material' dialog are buttons for OK, Save, Open, and Cancel.

The 'Material values' dialog is also open, showing a table of material properties:

Material	Value 1	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7	Value 8	Value 9	Value 10	Value 11	Value 12	Value 13	Value 14	Value 15	Value 16	Value 17	Value 18	
1	155	1																	
1	1	1	1	2	30	1	0	1	2	0	0	0	0	0	0	0	0	0	0
1800	0.36	10																	
4	2																		
0	1E-08																		
0.01	1.5E-08																		
0.2	2E-08																		
0.36	3E-08																		
4																			
0.015	0.95																		
0.36	980																		
3	2																		
0	0.15																		
0.01	0.3																		
0.36	3																		
3																			

The 'Lister' window also shows a menu bar (Soubor, Editace, Možnosti, Help) and a zoom level of 32%.



Specifické – TRANSMAT - HEMOT

The image shows two overlapping windows from the TRANSMAT software. The background window is titled 'frmEditBoundaryConditions' and has two tabs: 'Constant' and 'Climatic'. The 'Climatic' tab is active, showing settings for 'Climatic2'. The 'Wall direction' and 'Wall inclinational' fields both contain the value '1.5707963267949', with mathematical constraints $0 \leq \alpha \leq 2\pi$ and $0 \leq \alpha \leq \pi$ respectively. Below these are sections for 'Moisture mass' and 'Energy' with radio button options for 'ZERO', 'EXCHANGE', 'IMPFLUX', 'EXCHANGE-TAB', and 'EXCHANGED'. The 'Necessary files' section lists various input files like 'temper.cli', 'winddir.cli', 'difrad.cli', etc. The foreground window is titled 'Lister - [E:\Madera_dokumenty-text\UCENI\NAT\3_...' and displays a list of numerical values and file paths.

Index	Value 1	Value 2	Value 3
1			
155	1.5707963267949	1.5707963267949	
30	1		
0	0.015	0.95	
0	0.36		
12	25		
0			
0			
0			
0			
61	1.87E-7	0	
	E:\Madera_dokumenty-text\UCENI\NAT\3_hodina\podkl...		
	E:\Madera_dokumenty-text\UCENI\NAT\3_hodina\podkl...		
	E:\Madera_dokumenty-text\UCENI\NAT\3_hodina\podkl...		
	E:\Madera_dokumenty-text\UCENI\NAT\3_hodina\podkl...		



ČVUT
ČESKÉ VYSOKÉ
UČENÍ TECHNICKÉ
V PRAZE

Vliv prostředí na stavební materiály 6. přednáška

Specifické – TRANSMAT - HEMOT

Finální vstupní soubor pro TRFEL

Výstupy – GID – sít' a výsledky

Výstupy – DAT – výsledky



Specifické – Prize list

WUFI® PRO 6.7



WUFI® 2D 4.5



WUFI® 2D is a specialized stand-alone software tool for investigating the two-dimensional hygrothermal behavior of building components. It is directed towards advanced WUFI® Pro users and is mainly applied for scientific investigations like simulations of hygrothermal heat and moisture

Available in

Description

Fee (+ VAT)

WUFI® PR

Time limit

Commercial License

This license for commercial use of the software (expertises, industry projects, etc.) is personalised for one user. We use a yearly fee and a start fee for the first year. If DELPHIN is used by several persons, or installed and used on several computers concurrently, the appropriate number of licenses need to be purchased. Please ask for a quantity discount.

600,- € per year, 800,- € start fee

WUFI® PR

Time limit

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600,- € per year

25th anni

WUFI Pro

License for education

This license is exclusively for educational purposes and the use of DELPHIN on several machines in a computer pool. This license is always time-restricted.

(*)

Support p

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