Computational Parameters

Control Parameters		
Name	Value	
Time Step [s]	3600	☑
Number of Time Steps [-]	8760	☑
Maxit [-]	1.5E3	
Convergence Crit. [-]	5E-4	

Time Step [s]   Duration of one time step in seconds.
Number of Time Steps [-]   Number of time steps to calculate.
Maxit [-]   Maximal number of iteration steps allowed.
Convergence Crit. [-]   Iteration stops when the maximal difference between two
                                     successive results of the iteration drops below this value.

Maxit and the Convergence Criterion are used to stop the iteration process. If Maxit is exceeded or the Convergence Criterion is fulfilled current time step stops and the next one will be calculated.

Solver Settings						
Name	GDS [-]	URF [-]	SOR [-]	NSW [-]	CAL	ADI
x-Velocity	0	0.75	0.2	1	☐	☐
y-Velocity	0	0.75	0.2	1	☐	☐
Press. Corr.	0	0.25	0.15	4	☐	☐
Temperature	0	0.8	0.2	4	☑	☐
Rel. Humidity	0	0.7	0.2	4	☑	☐

WUFI2D includes two equation solvers for calculating the equations. The standard one is ADI (Alternate Direction Iteration). If the box in the ADI column is not checked, the SIP-solver (Strongly Implicit Procedure) is used.

x,y-Velocity is the airflow field in x and y direction (only needed for CFD version of WUFI2D).
Pressure Correction is a value for the pressure in the equation of continuity (only needed for CFD version of WUFI2D).
Temperature is the temperature field in the building component.
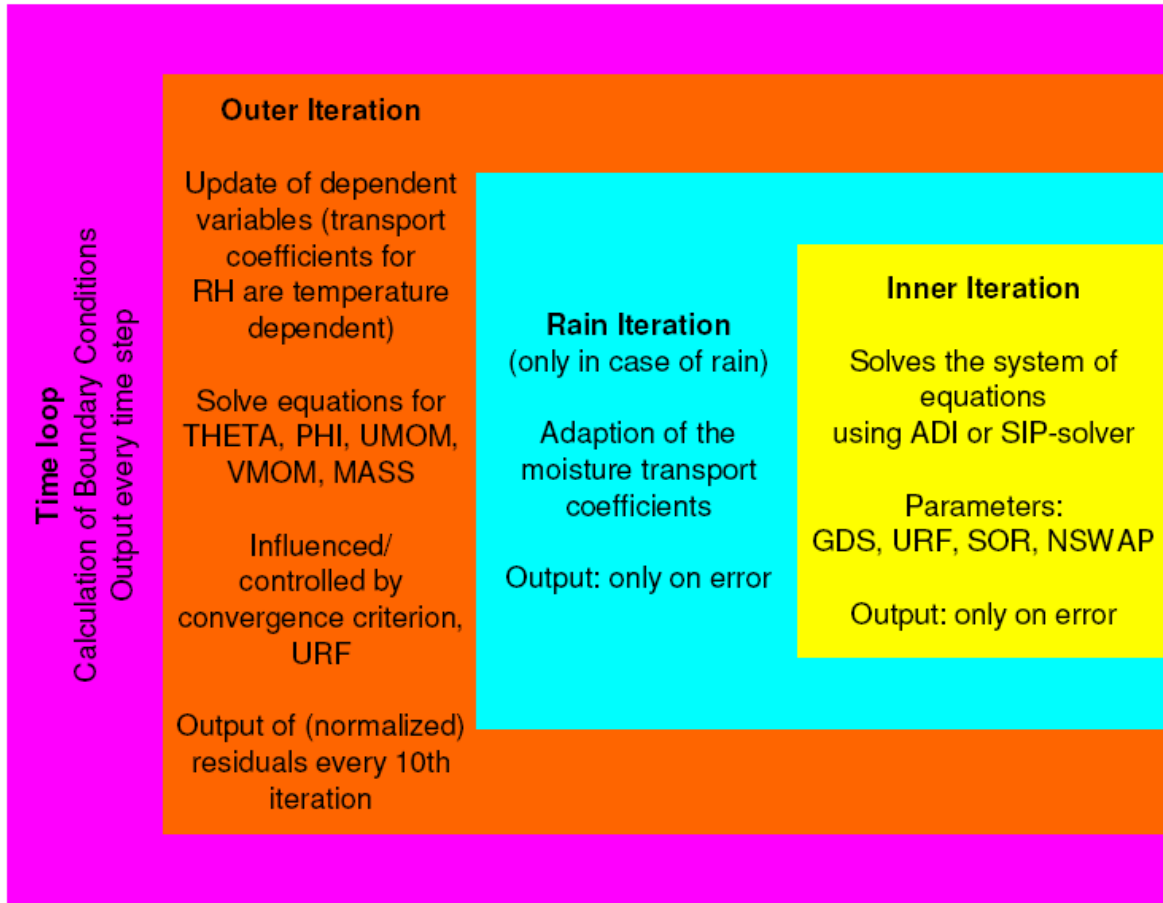**Rel. Humidity** is the moisture field.

GDS is the "Flux Blending Factor" (only needed for CFD version of WUFI2D)
URF is the underrelaxation factor. in order to improve the stability of the iteration at each iteration step WUFI2D modifies the result of the current step by taking the weighted average of the current result and the previous result. The URF is the weight of the current result.
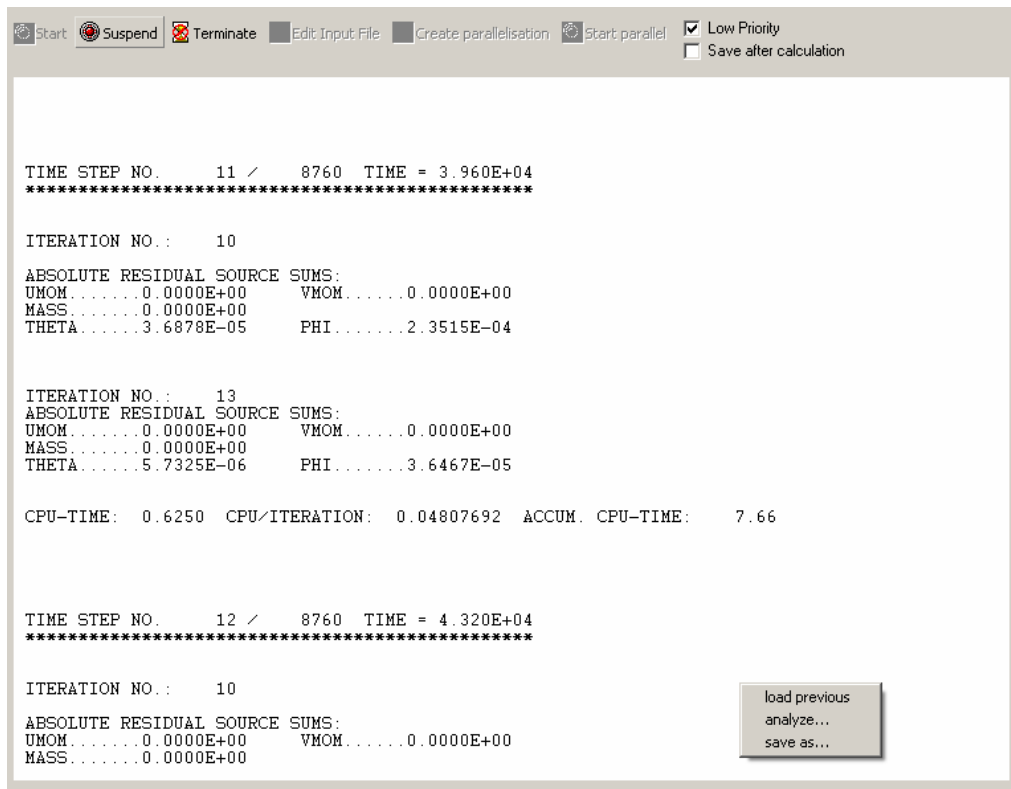**SOR** is for the SIP-solver to enhance the solution of one equation system. Here the inverse value is used.

NSW: n-swap is the number of times one system of equations is solved with different combinations of input parameters. Only used for the SIP-solver.

Process of Iteration

Time loop
Calculation of Boundary Conditions
Output every time step

Outer Iteration

Update of dependent variables (transport coefficients for RH are temperature dependent)

Solve equations for THETA, PHI, UMOM, VMOM, MASS

Influenced/controlled by convergence criterion, URF

Output of (normalized) residuals every 10th iteration

Rain Iteration
(only in case of rain)

Adaption of the moisture transport coefficients

Output: only on error

Inner Iteration

Solves the system of equations using ADI or SIP-solver

Parameters:
GDS, URF, SOR, NSWAP

Output: only on error

The Calculation Window


```
TIME STEP NO.    11 /   8760  TIME = 3.960E+04
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ITERATION NO.:   10

ABSOLUTE RESIDUAL SOURCE SUMS:
UMOM.......0.0000E+00    VMOM......0.0000E+00
MASS.......0.0000E+00
THETA......3.6878E-05    PHI.......2.3515E-04


ITERATION NO.:   13
ABSOLUTE RESIDUAL SOURCE SUMS:
UMOM.......0.0000E+00    VMOM......0.0000E+00
MASS.......0.0000E+00
THETA......5.7325E-06    PHI.......3.6467E-05

CPU-TIME:  0.6250  CPU/ITERATION:  0.04807692  ACCUM. CPU-TIME:    7.66



TIME STEP NO.    12 /   8760  TIME = 4.320E+04
*************************************************

ITERATION NO.:   10

ABSOLUTE RESIDUAL SOURCE SUMS:
UMOM.......0.0000E+00    VMOM......0.0000E+00
MASS.......0.0000E+00
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```
load previous
analyze...
save as...
```

This windows shows some statistics for every tenth iteration step.
UMOM, VMOM are the air velocities for CFD calculations.
MASS is the solution of the equation of continuity for CFD calculations.
THETA is the temperature residual that is the maximum difference between the temperature fields resulting from the current and the previous iteration.
PHI is the moisture residual that is the maximum difference between the relative humidity fields resulting from the current and the previous iteration.

The residuals have been multiplied by a scaling factor to make them comparable in size.

Iteration is stopped when THETA and PHI become smaller than the convergence criterion or the iteration number exceeds Maxit [-].

A right click on the calculation window pops up some functions:
load previous   to load the iter.txt of a previous performed calculation
analyse…   analyses the iteration output (see below)
save as…   saves the actual iteration output

The analyse function:
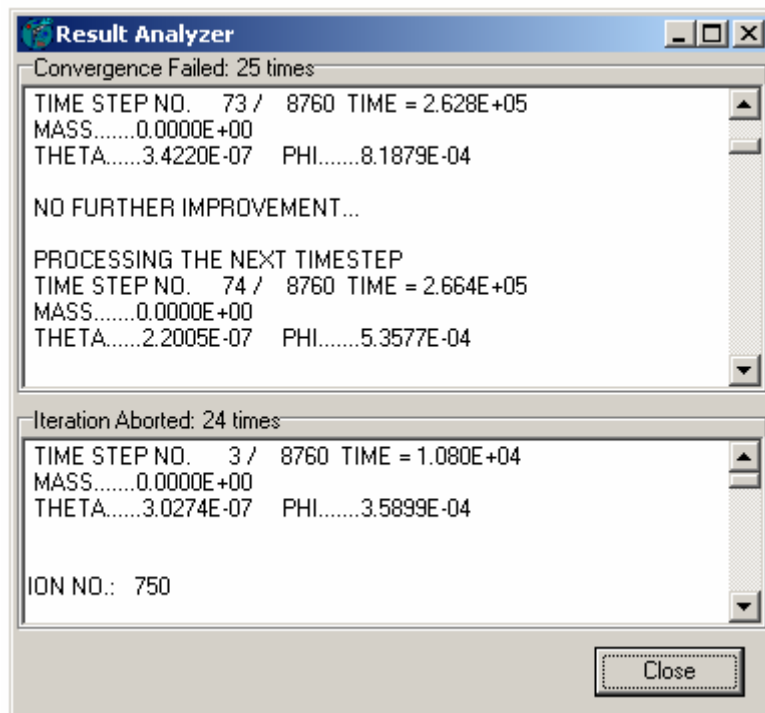
This window opens after a right click on the calculation output and choosing "analyse…". The top field shows every single convergence failure in the calculation. THETA and PHI are the temperature and moisture residuals of the respective iteration step.

The bottom field shows the number of times the iteration was aborted. This is caused by a too low Maxit [-].