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ResiBil

Hydrologic modeling for
Děčínský Sněžník and Hřensko/Kirnitzsch area

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VÚV TGM

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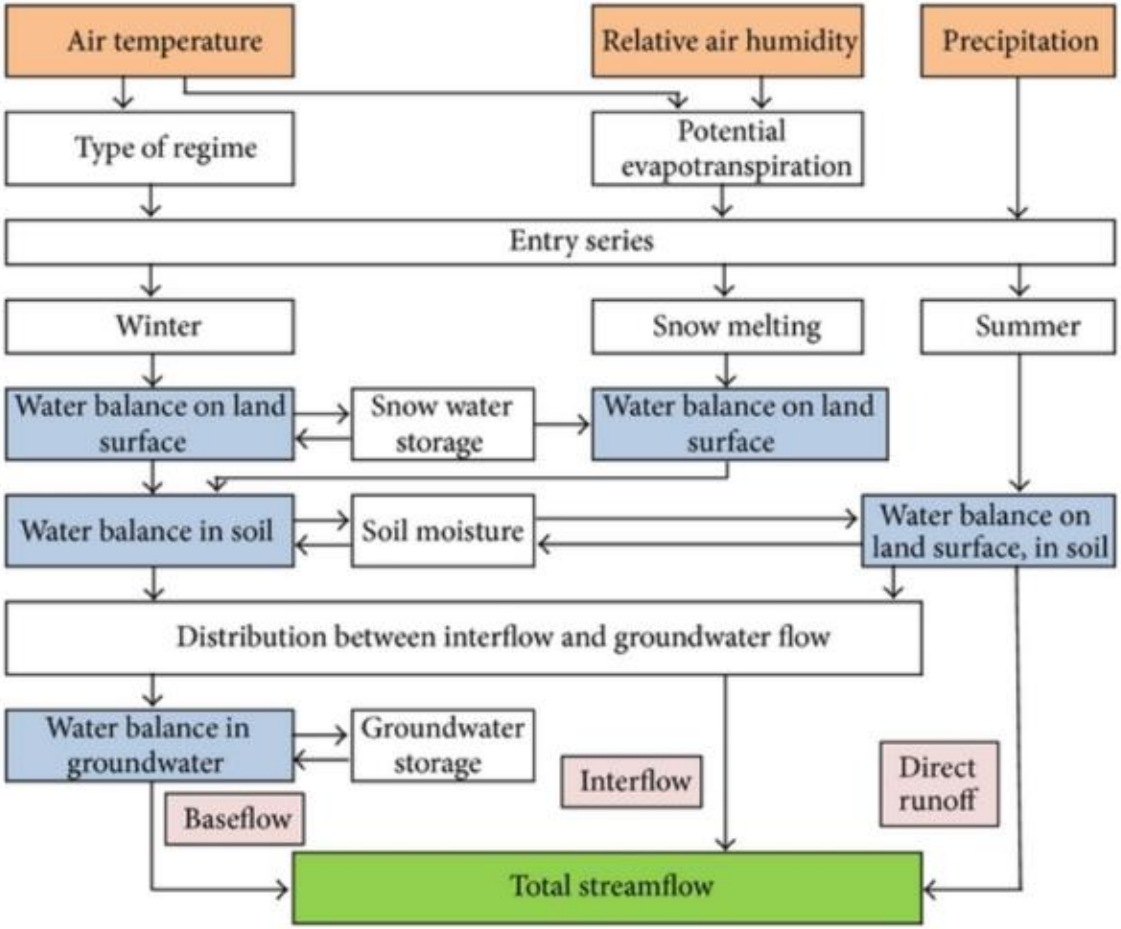
About BILAN

Infiltration of precipitation and recharge was assessed by hydrologic model BILAN.

- developed by T.G. Masaryk Water Research Institute
- described in Tallaksen and van Lannen (2004)
- further developed during the last decade and it has proven to be a reliable tool in local conditions (Vizina et al. 2015, Hanel et al. 2012, Horáček et al. 2008)

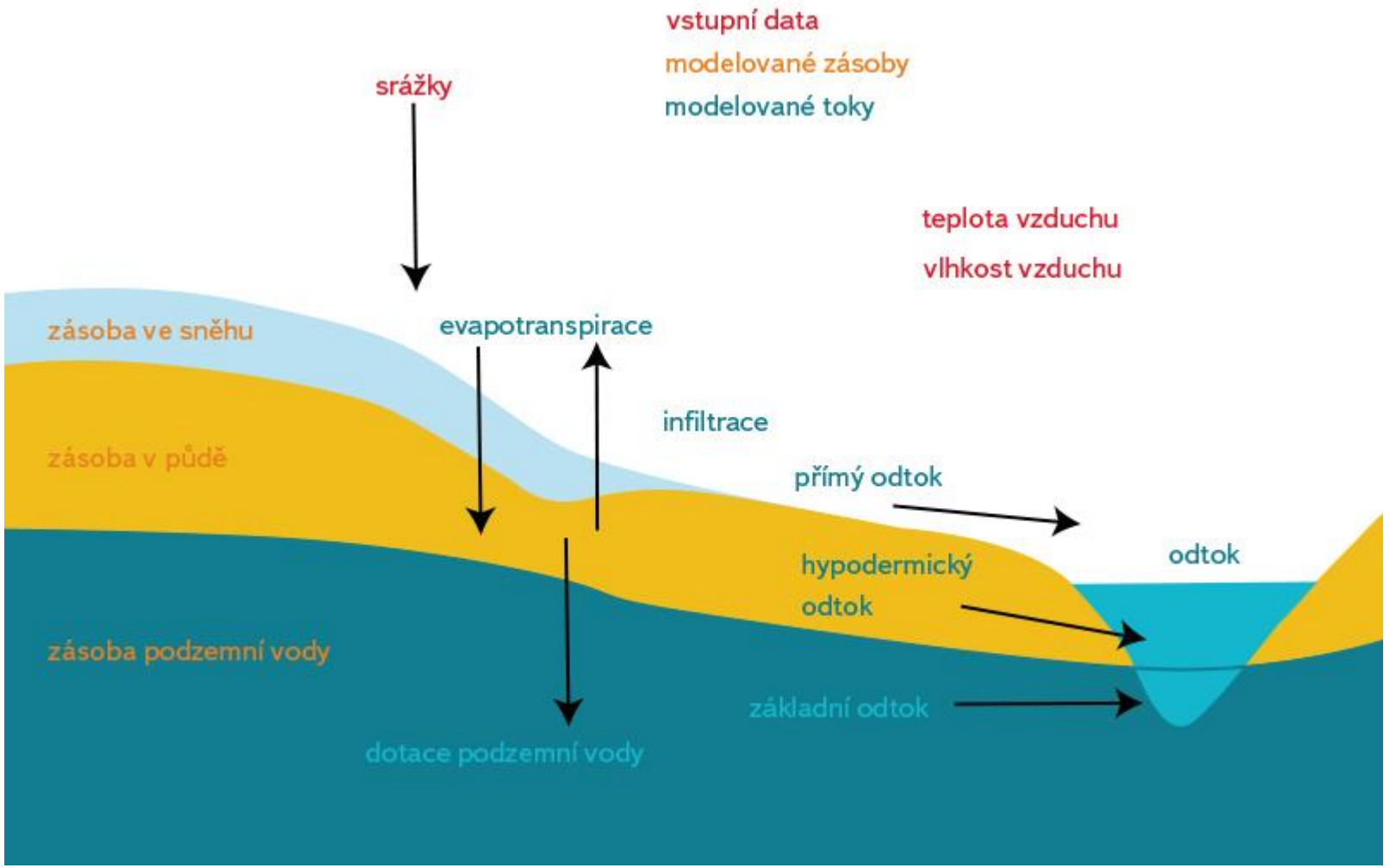
About BILAN



Structure of the model is constructed by a system of equations describing basic principles of water balance. It simulates the process on the surface, in the soil aeration zone including the effect of vegetation and in the saturated zone. Air temperature is used as an indicator of energy conditions, which significantly affect the water balance components.

About BILAN

The BILAN model simulates water fluxes and amounts of water stored in the snow pack, in the unsaturated zone and in the aquifer.



About BILAN

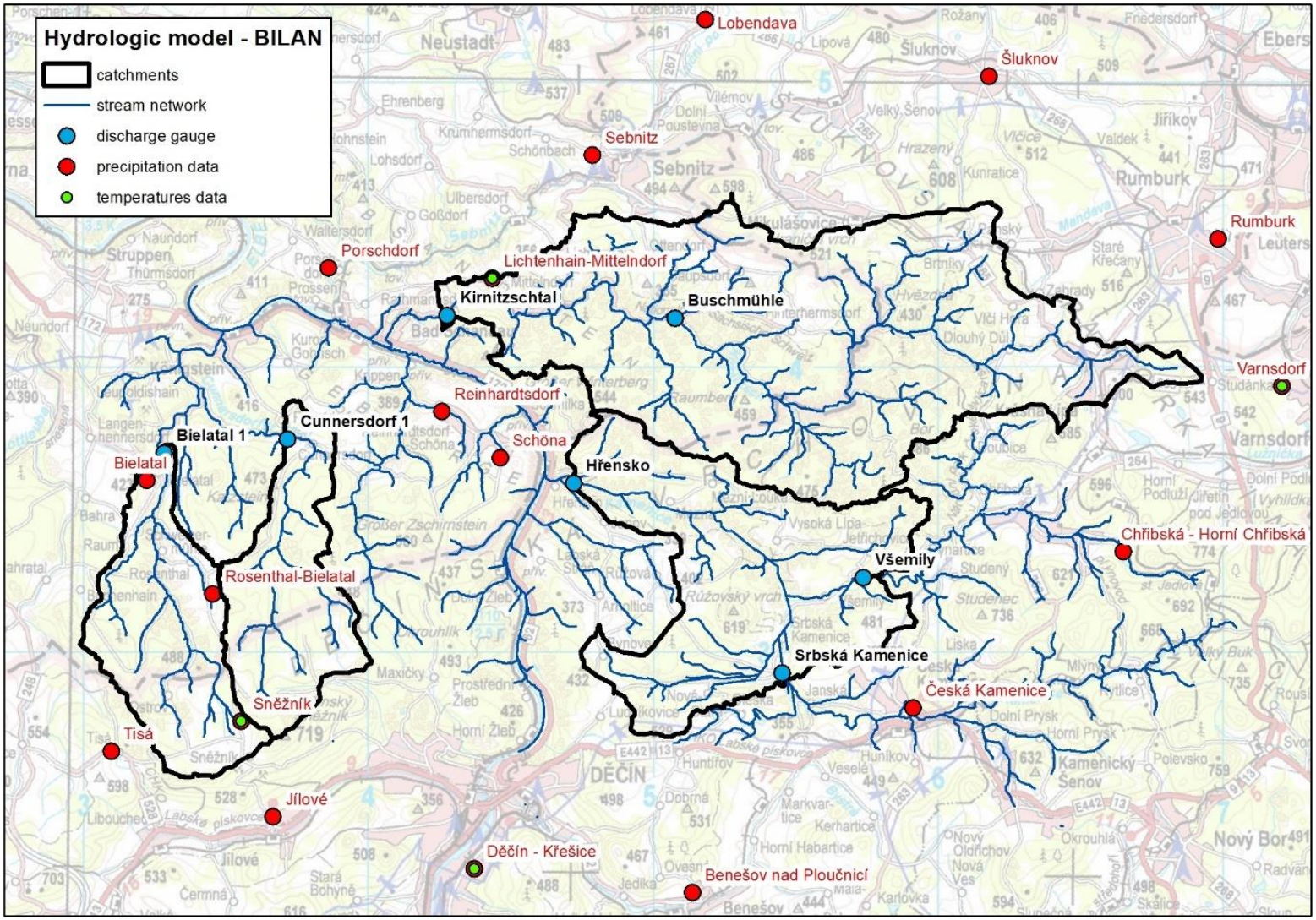
The simulated flow of water is dependent on six free parameters:

- capacity of soil moisture storage
- snow melting factor
- parameter controlling outflow from direct runoff storage
- parameter controlling distribution of percolation into direct runoff and groundwater recharge under summer conditions
- parameter controlling distribution of percolation into direct runoff and groundwater recharge under snow melting conditions
- parameter controlling outflow from groundwater storage

The parameters are calibrated using an optimization algorithm. The optimization process employs MAPE criterion to find the best fit between the observed and simulated runoff at the outlet from the catchment.

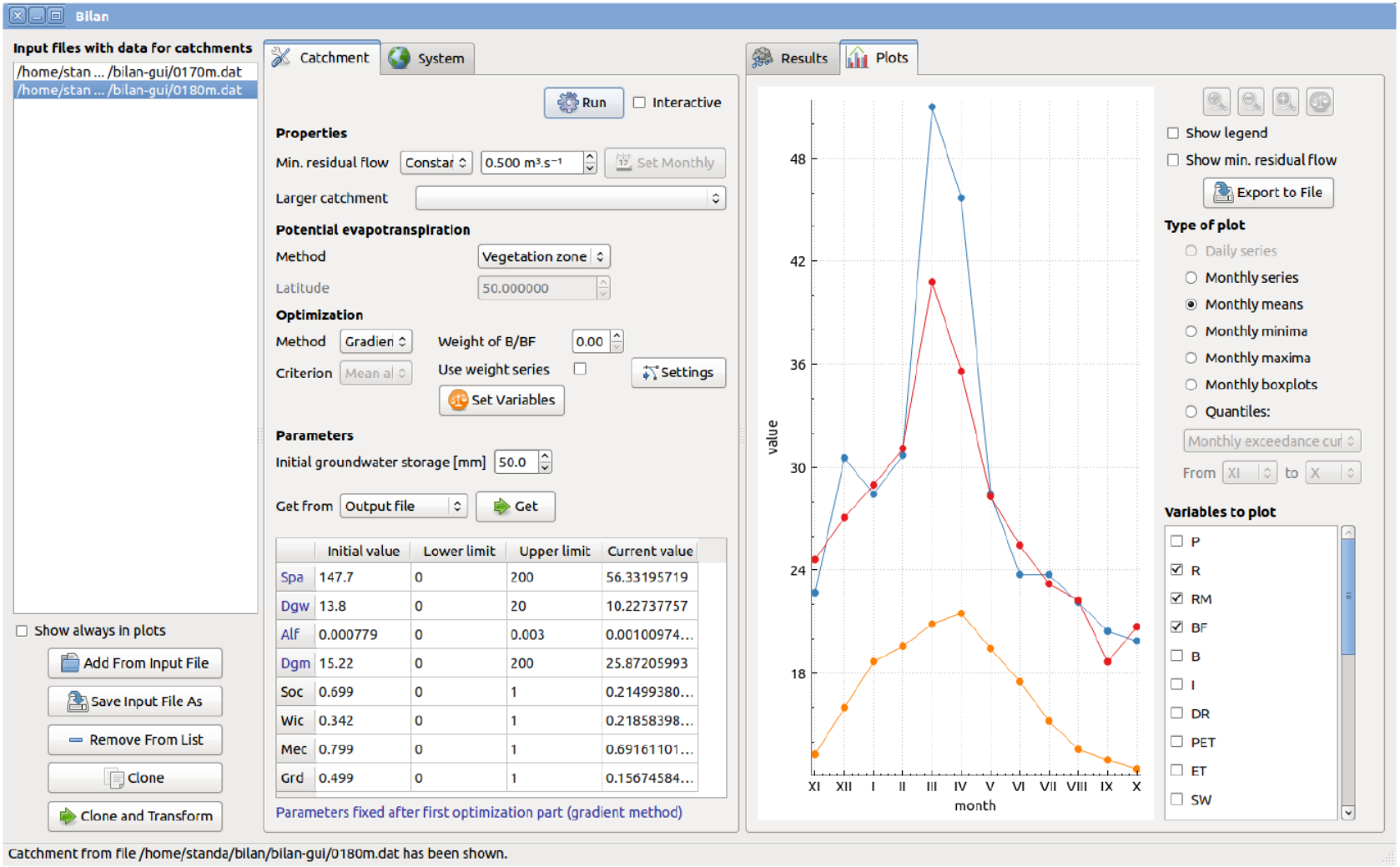
Input data

- delineation of model catchments
- measurement of catchment area
- interpolation od meteorological data
- transformation to mm/month



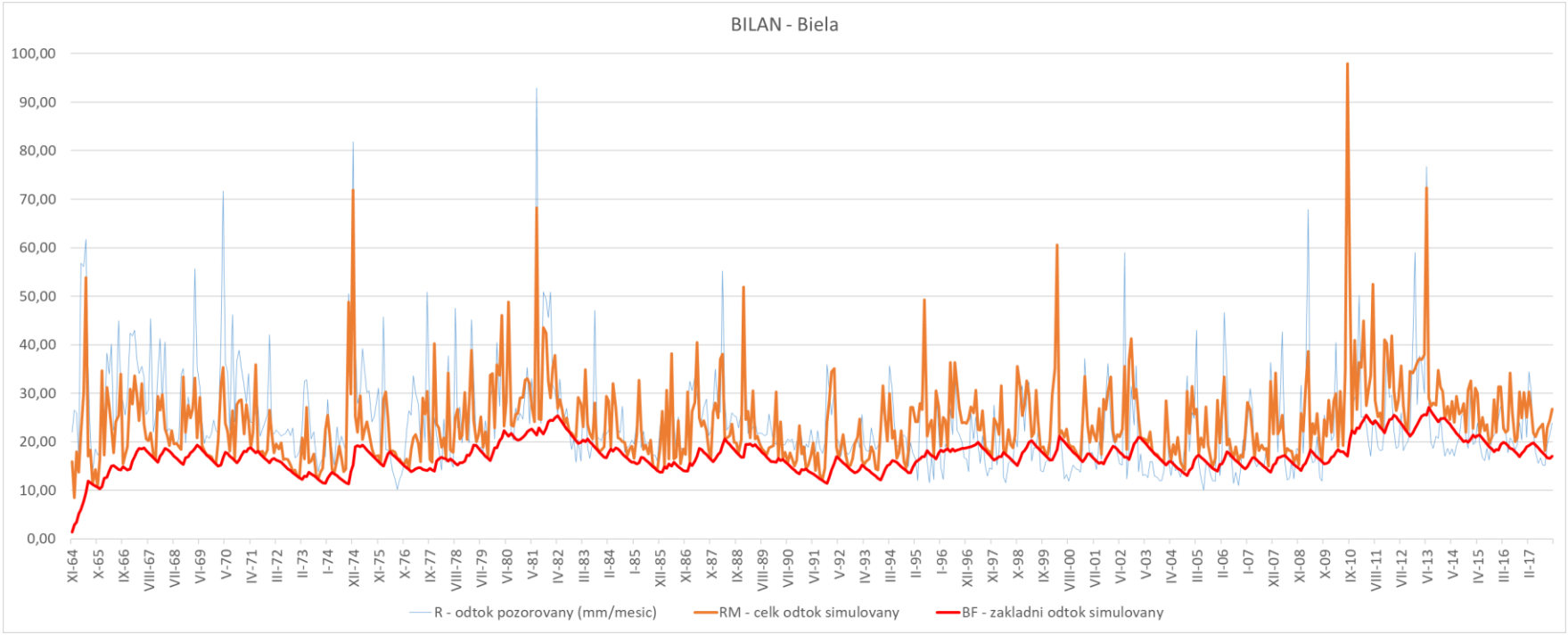
Processing and calibration

The parameters are calibrated using an optimization algorithm with MAPE (mean absolute percentage error) criterion to find the best fit between the observed and simulated runoff at the outlet from the catchment.



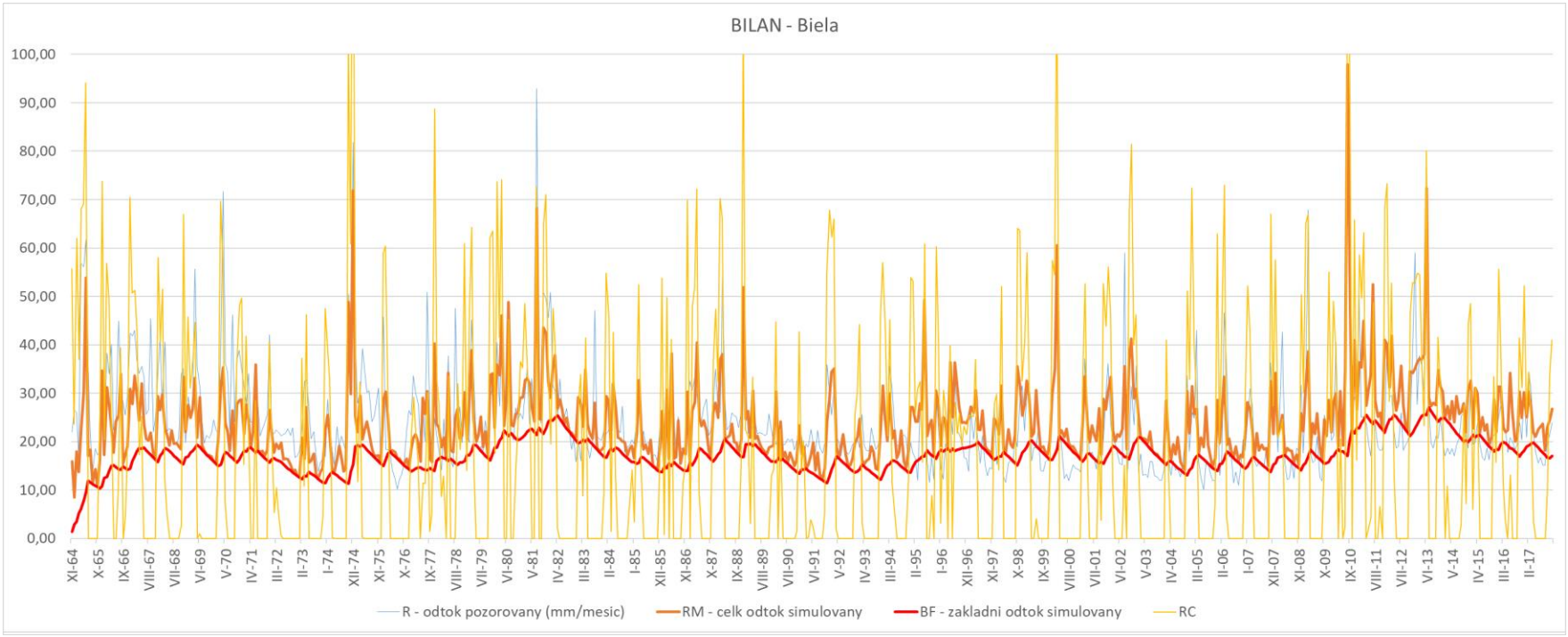
Output

The gained results are water balance components including potential and actual evapotranspiration, soil infiltration and recharge of the aquifer.

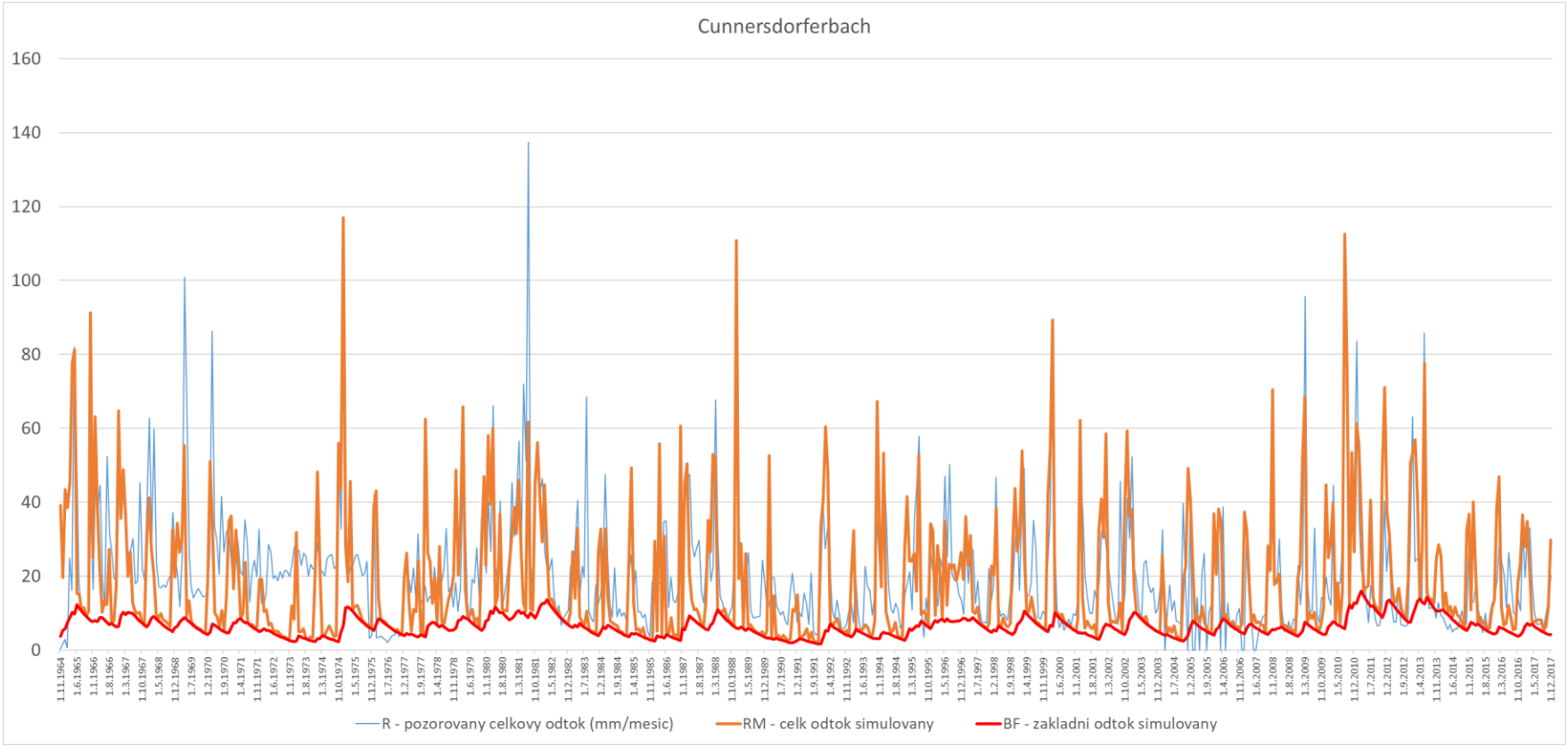


Output

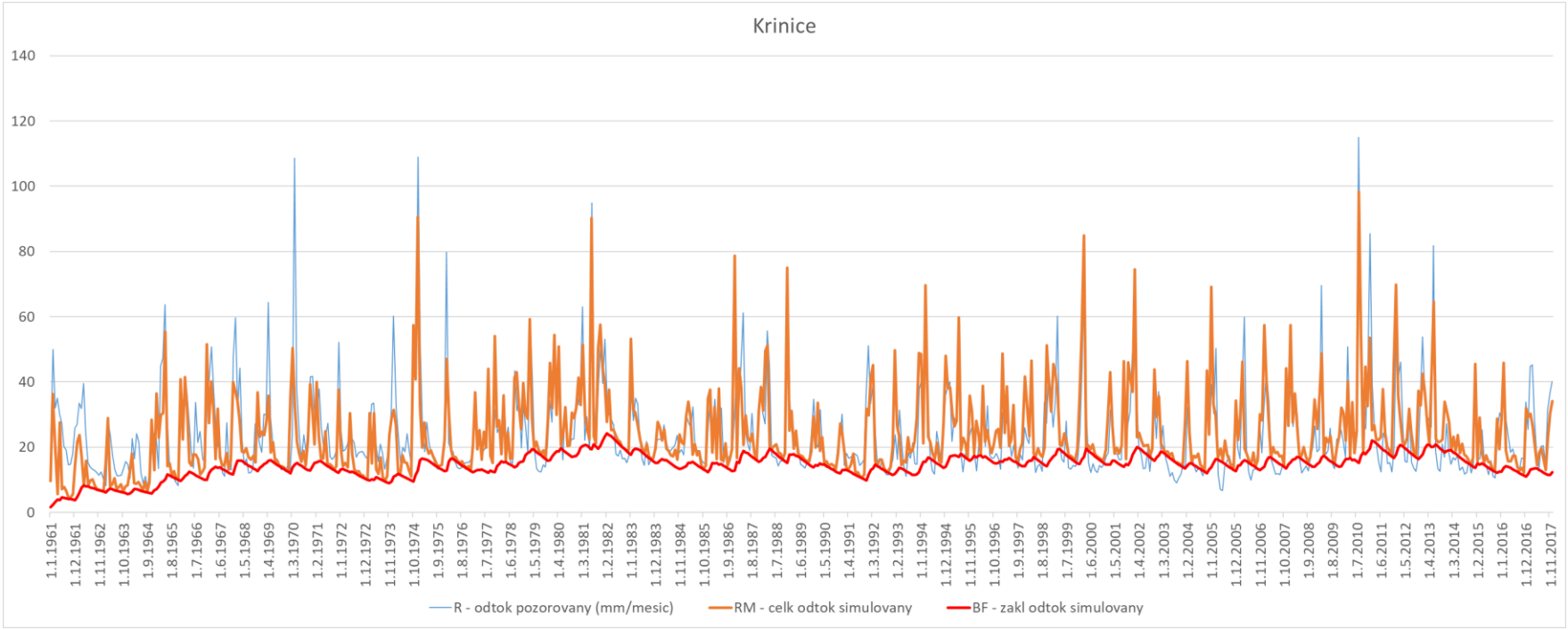
The gained results are water balance components including potential and actual evapotranspiration, soil infiltration and recharge of the aquifer.



Output


Cunnersdorferbach
160
140
120
100
80
60
40
20
0
R - pozorovany celkovy odtok (mm/mesic)
RM - celk odtok simulovany
BF - zakladni odtok simulovany

Output


Krinice
140
120
100
80
60
40
20
0
1.1.1961
1.12.1961
1.11.1962
1.10.1963
1.9.1964
1.8.1965
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1.12.2005
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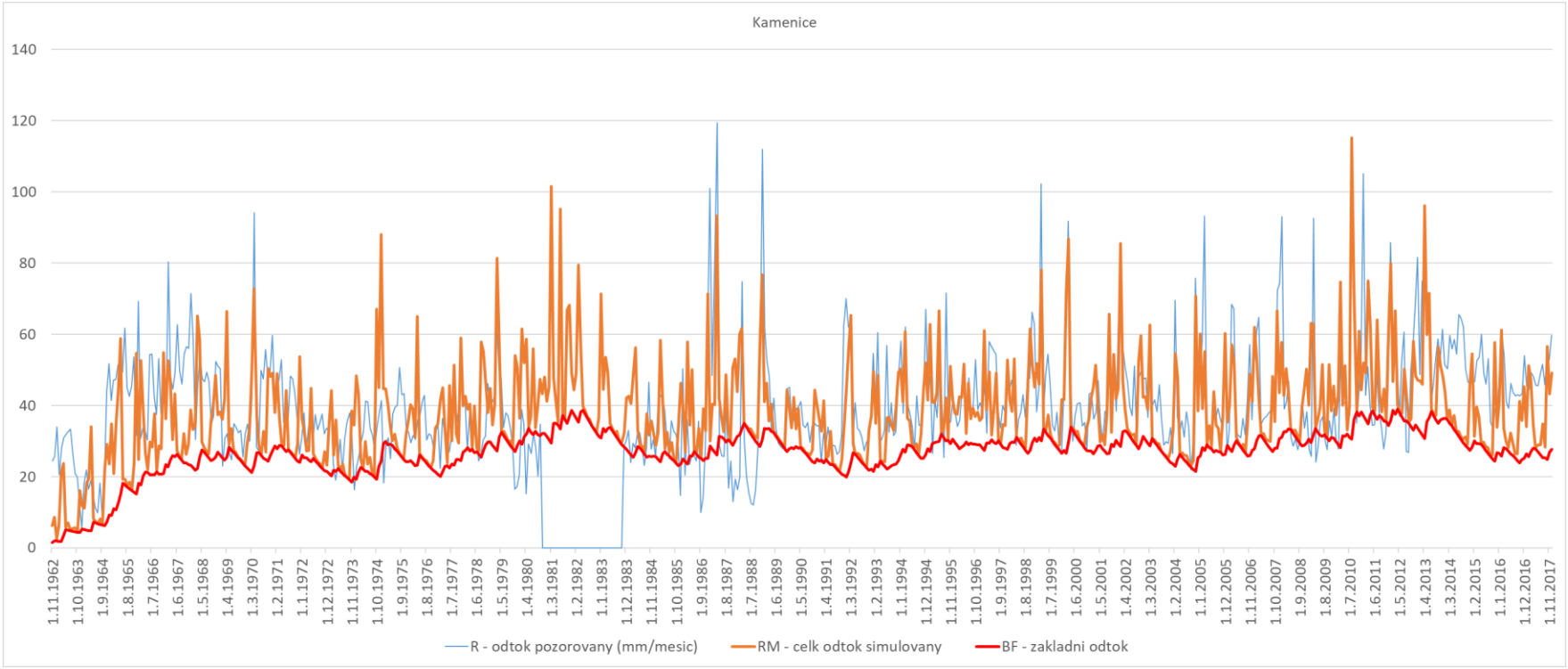
1.9.2008
1.8.2009
1.7.2010
1.6.2011
1.5.2012
1.4.2013
1.3.2014
1.2.2015
1.1.2016
1.12.2016
1.11.2017
R - odtok pozorovany (mm/mesic)
RM - celk odtok simulovany
BF - zakl odtok simulovany

Output


Kamenice
140
120
100
80
60
40
20
0
1.11.1962
1.10.1963
1.9.1964
1.8.1965
1.7.1966
1.6.1967
1.5.1968
1.4.1969
1.3.1970
1.2.1971
1.1.1972
1.12.1972
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1.6.2011
1.5.2012
1.4.2013
1.3.2014
1.2.2015
1.1.2016
1.12.2016
1.11.2017
R - odtok pozorovany (mm/mesic)
RM - celk odtok simulovany
BF - zakladni odtok

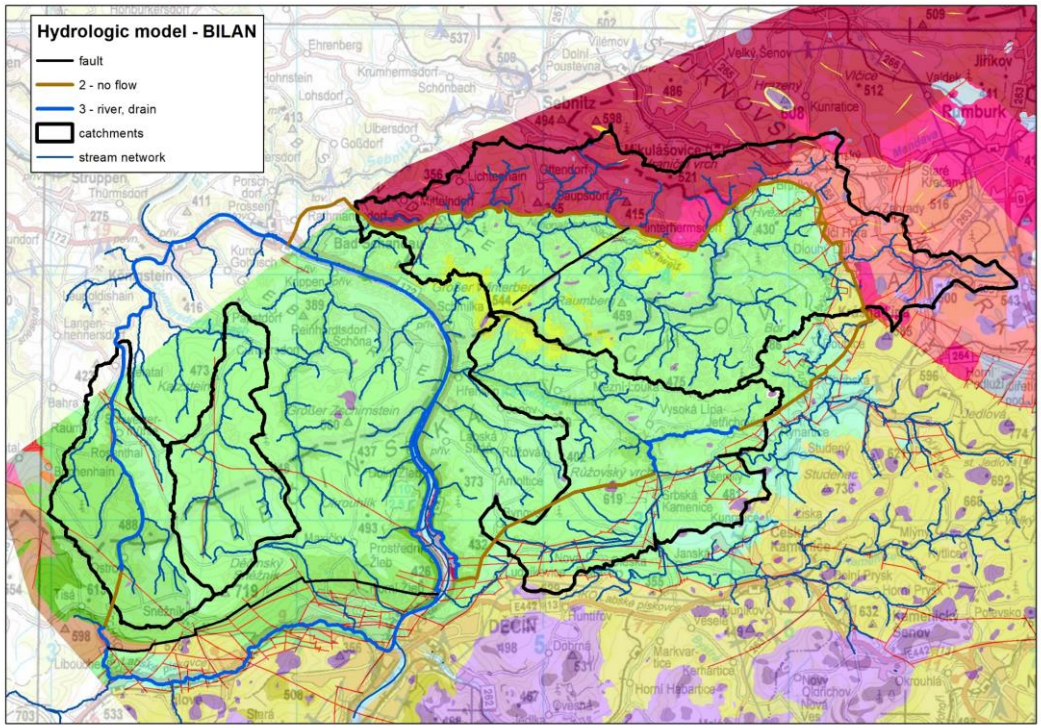
Results

Uncertainties:

- shorter calibration period for Cunnersdorferbach and Kamenice (input data quality?)
- in case of Kamenice, the baseflow for calibration was set by classic hydrograph separation (groundwater flows)
- In case of Křinice we are not able to quantify the effect of the part of the catchment North of the Lausitz thrust

Groundwater model input:

- outputs are valid for the model catchments
- time series relevant for the entire hydraulic model area are calculated as weighted average



Thank You