

Einsatz von BASEMENT in geographischen Fragestellungen

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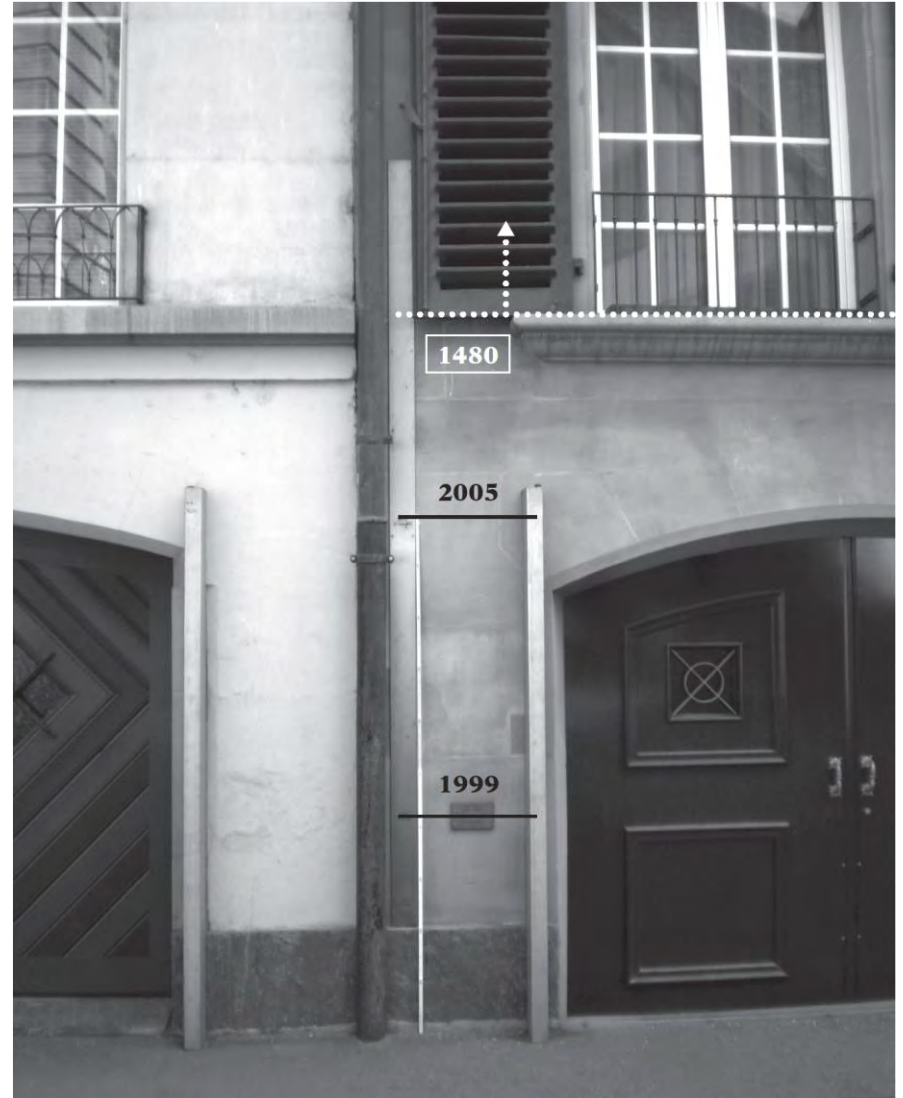
Oeschger Centre for Climate Research

Universität Bern

Hochwasser in Bern



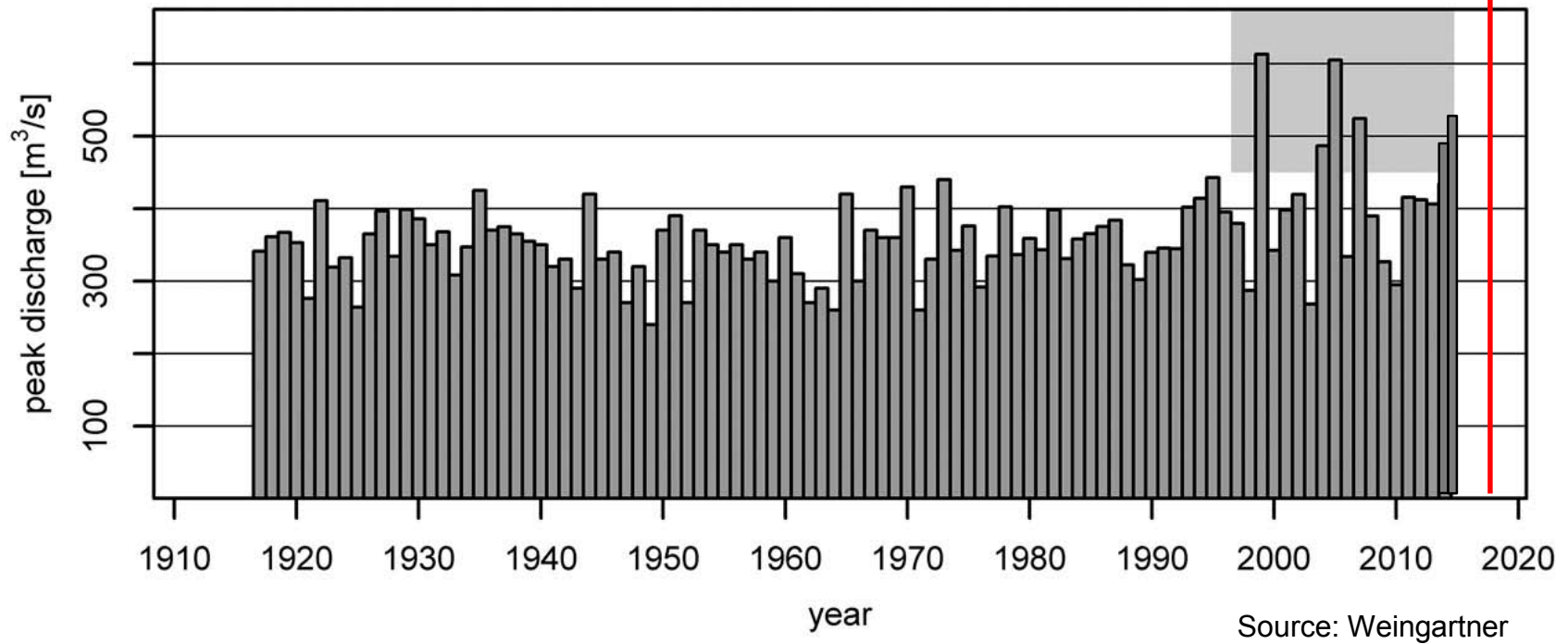
Bern, August 2005



Pfister and Wetter (2011)

Hochwasser in Bern

Was ist das physikalische Limit?



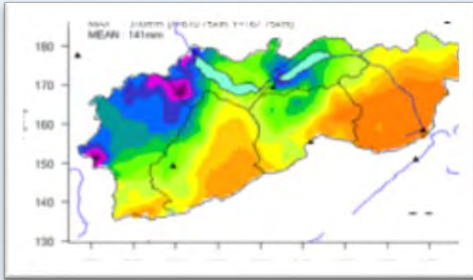
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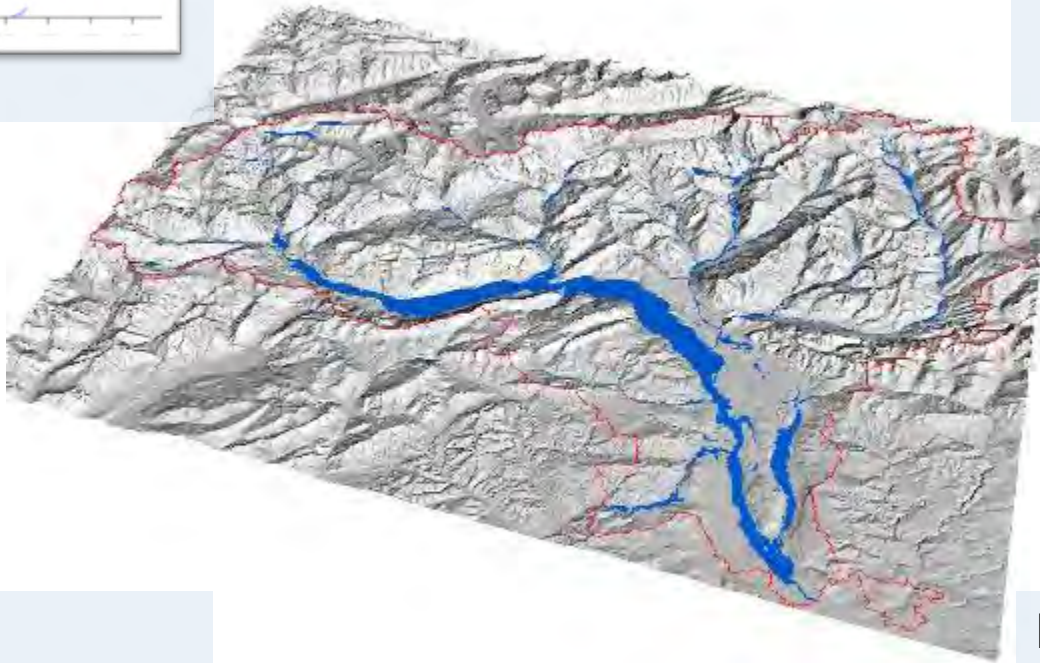
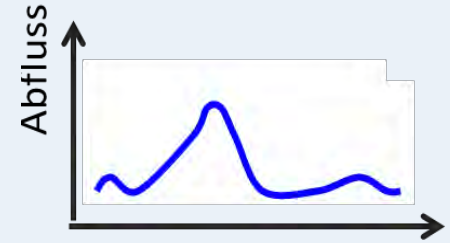
1.) M-AARE Modellkette

Atmosphäre-Abfluss-Risiko-Entscheidungen

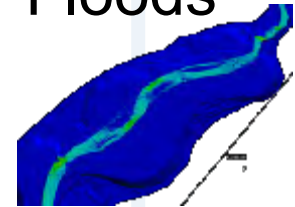
Precipitation:



Discharge:



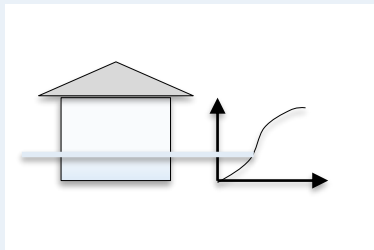
Floods



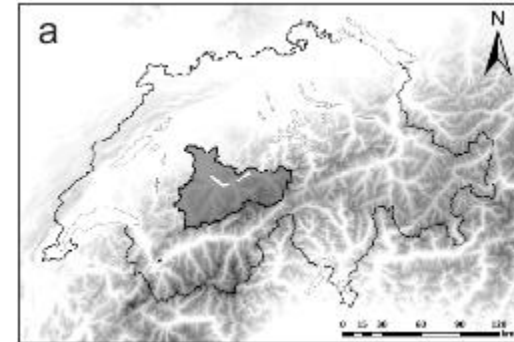
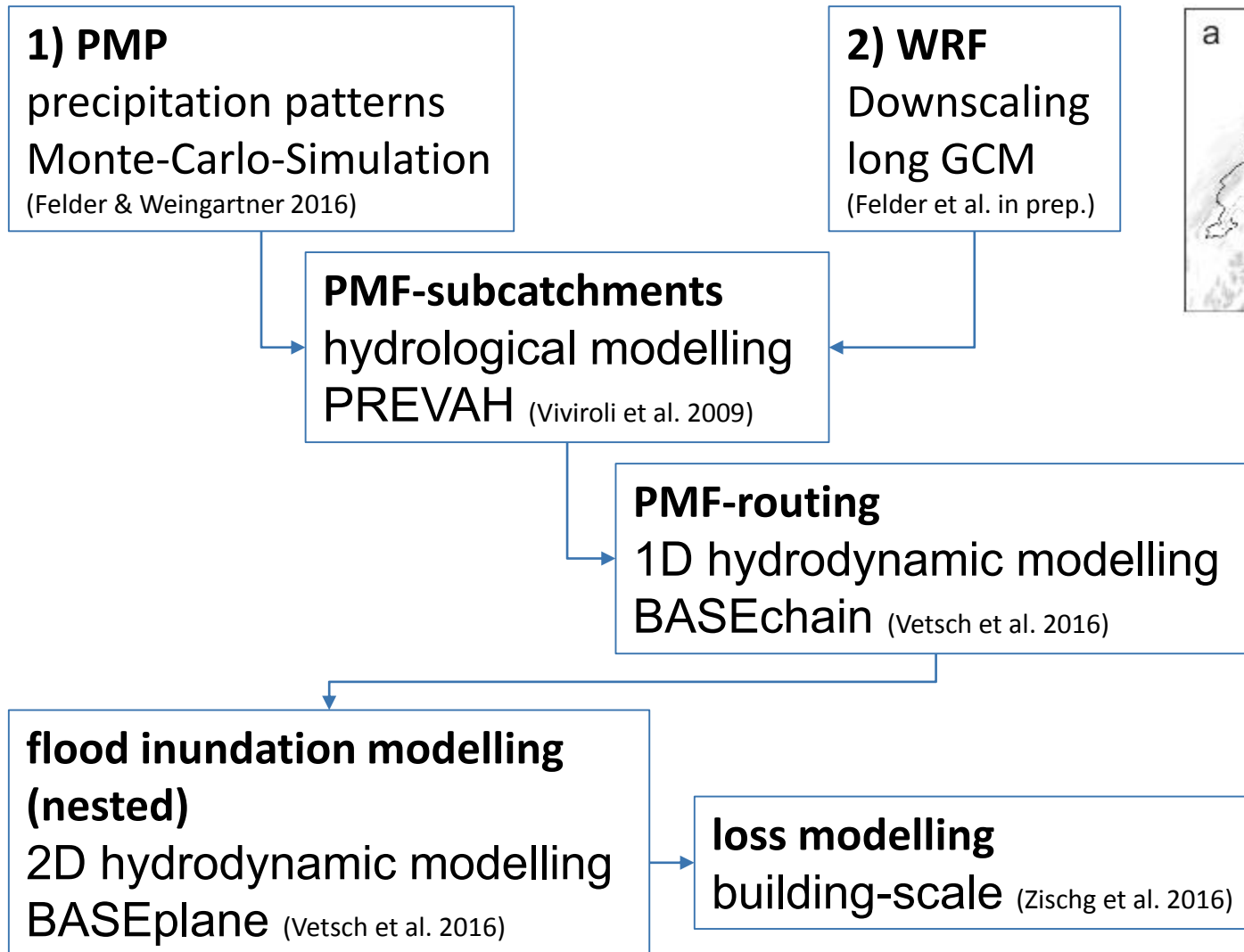
Flood risk:



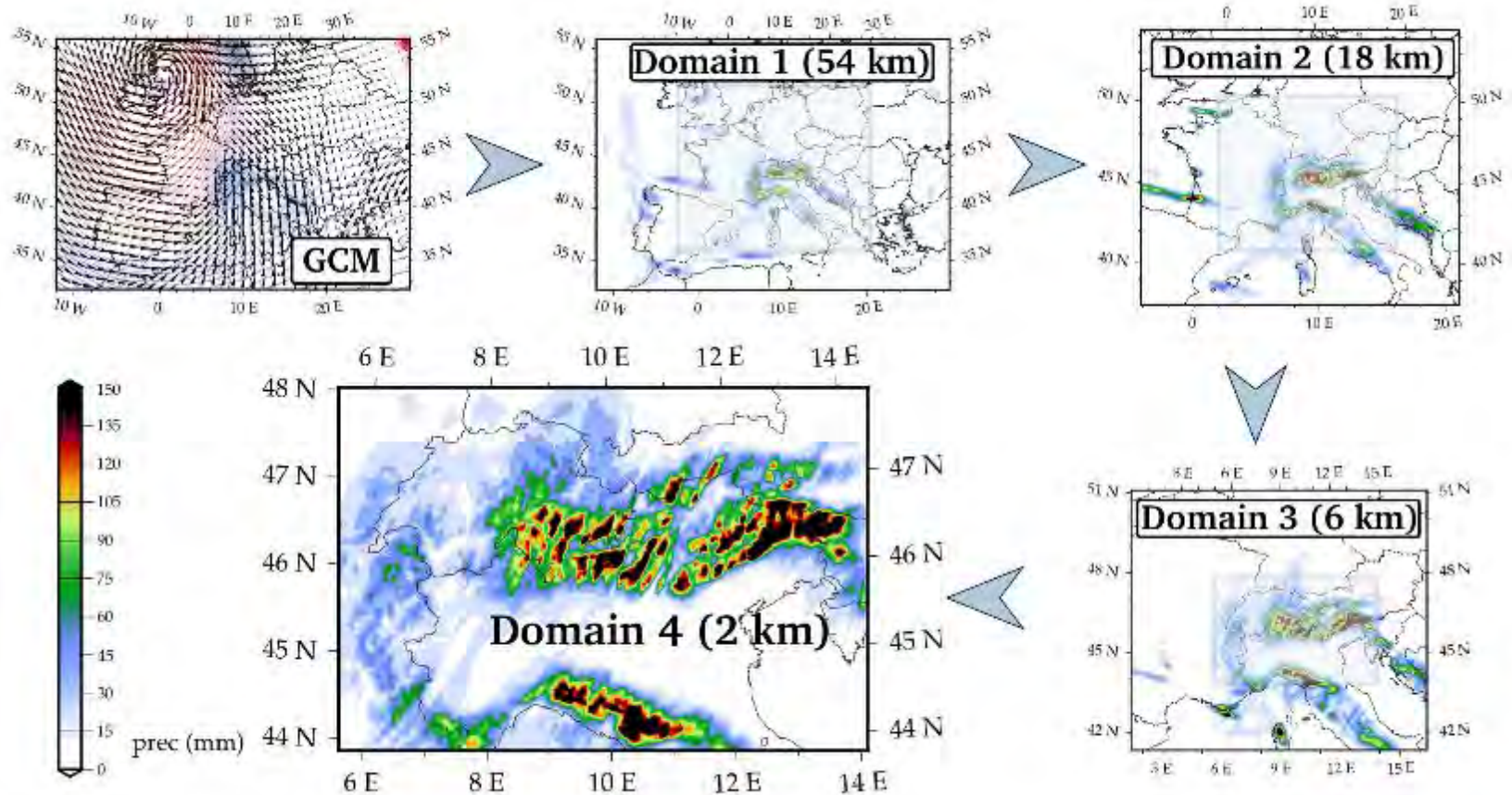
Flood losses:



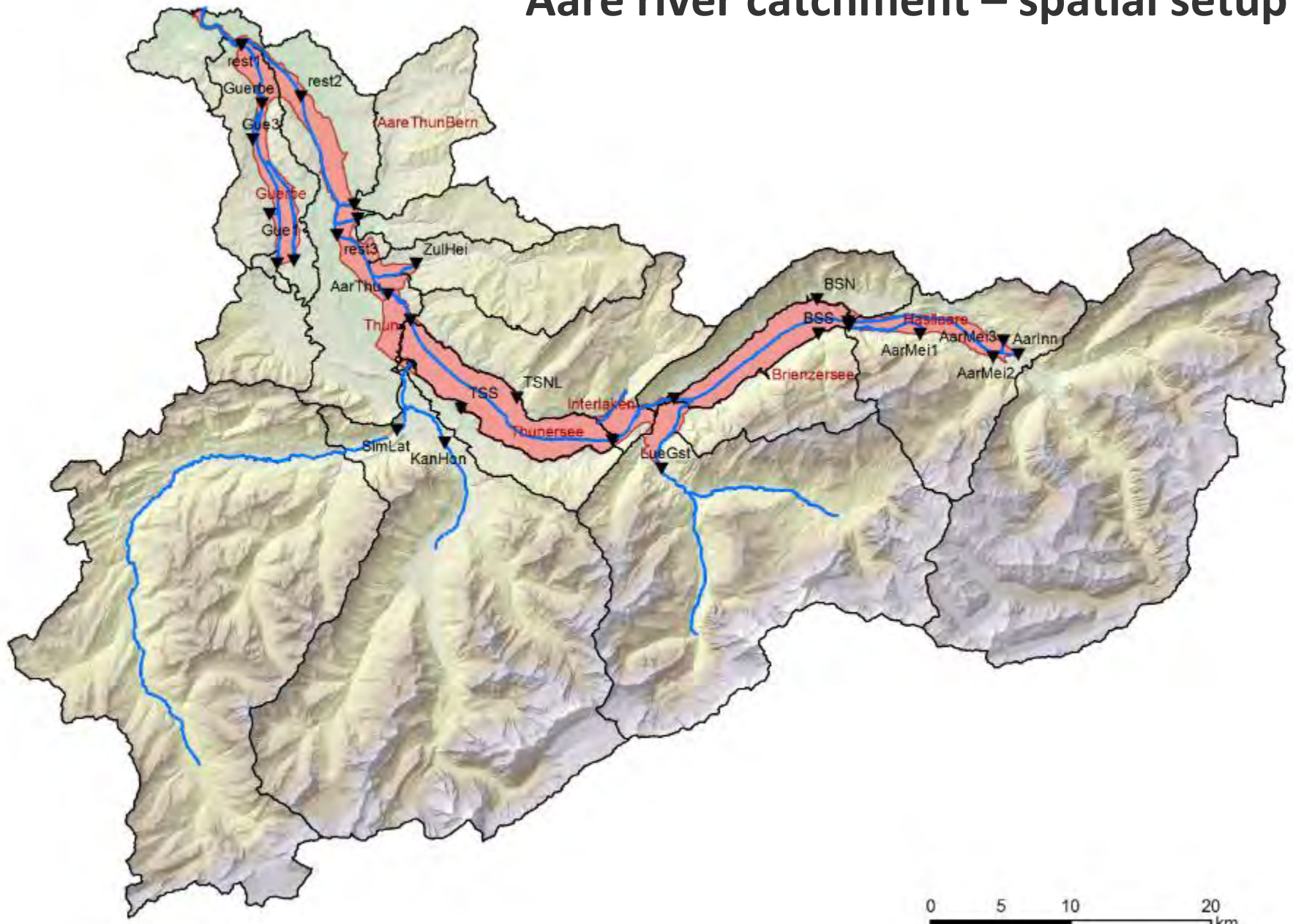
M-AARE model setup



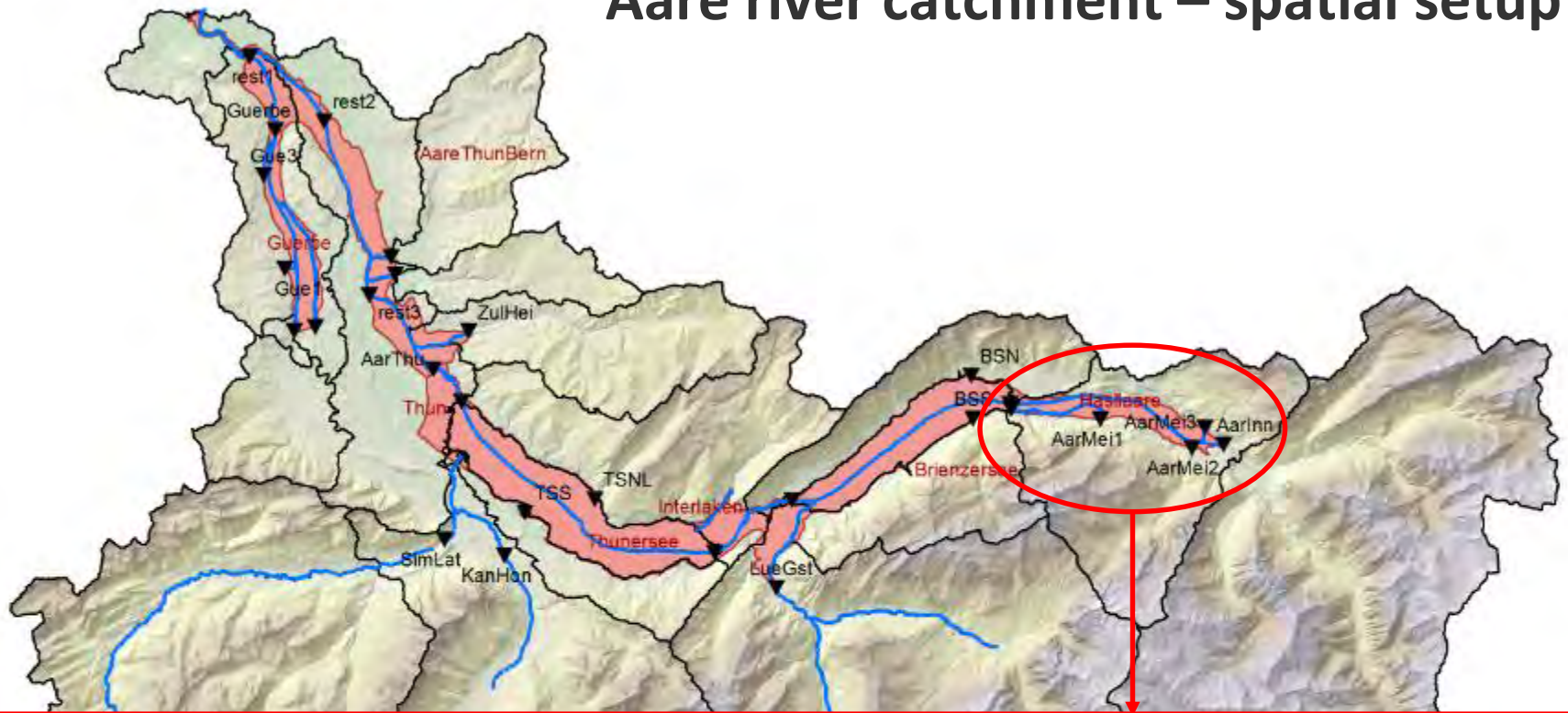
2) WRF downscaling scenarios



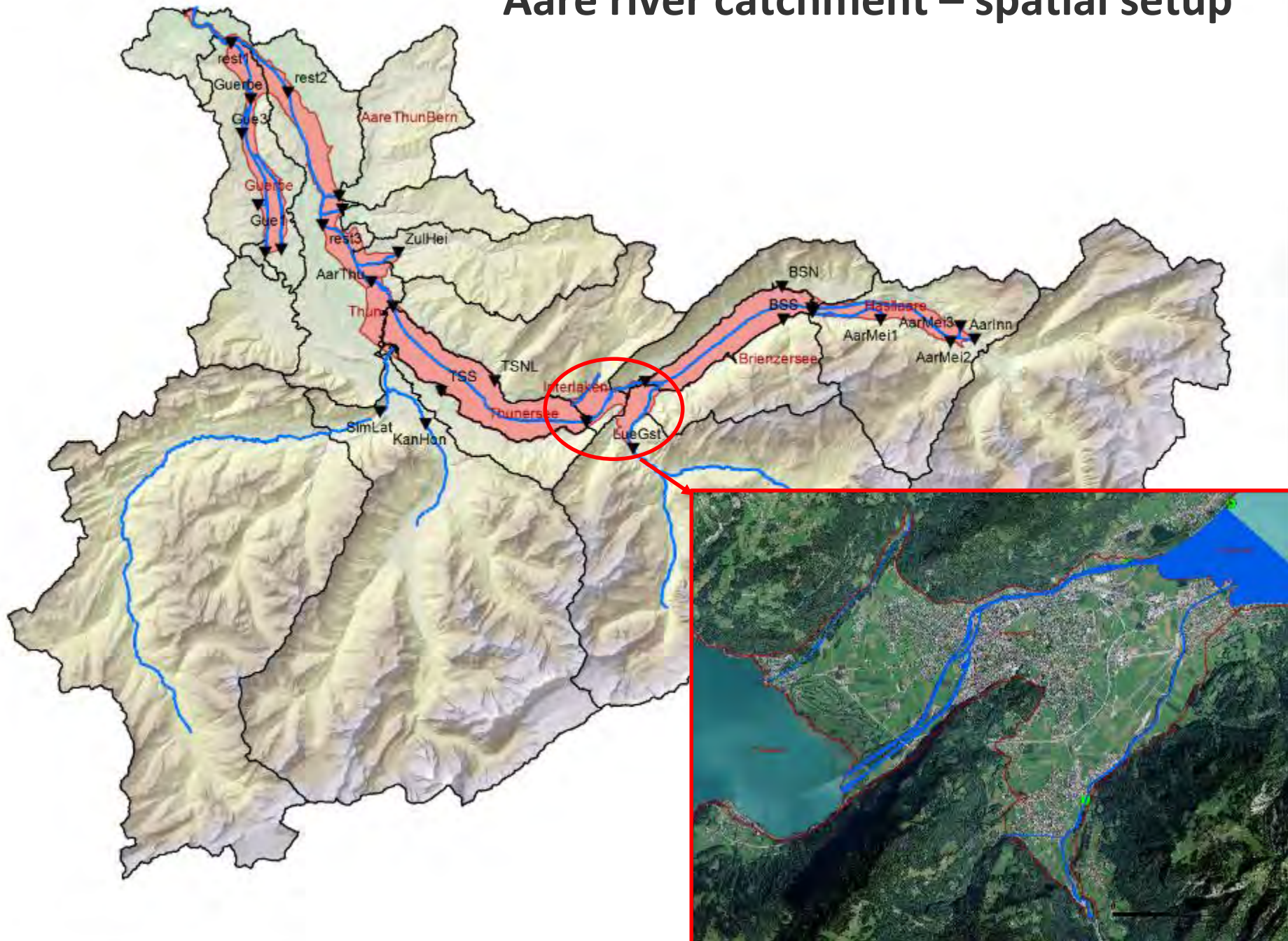
Aare river catchment – spatial setup



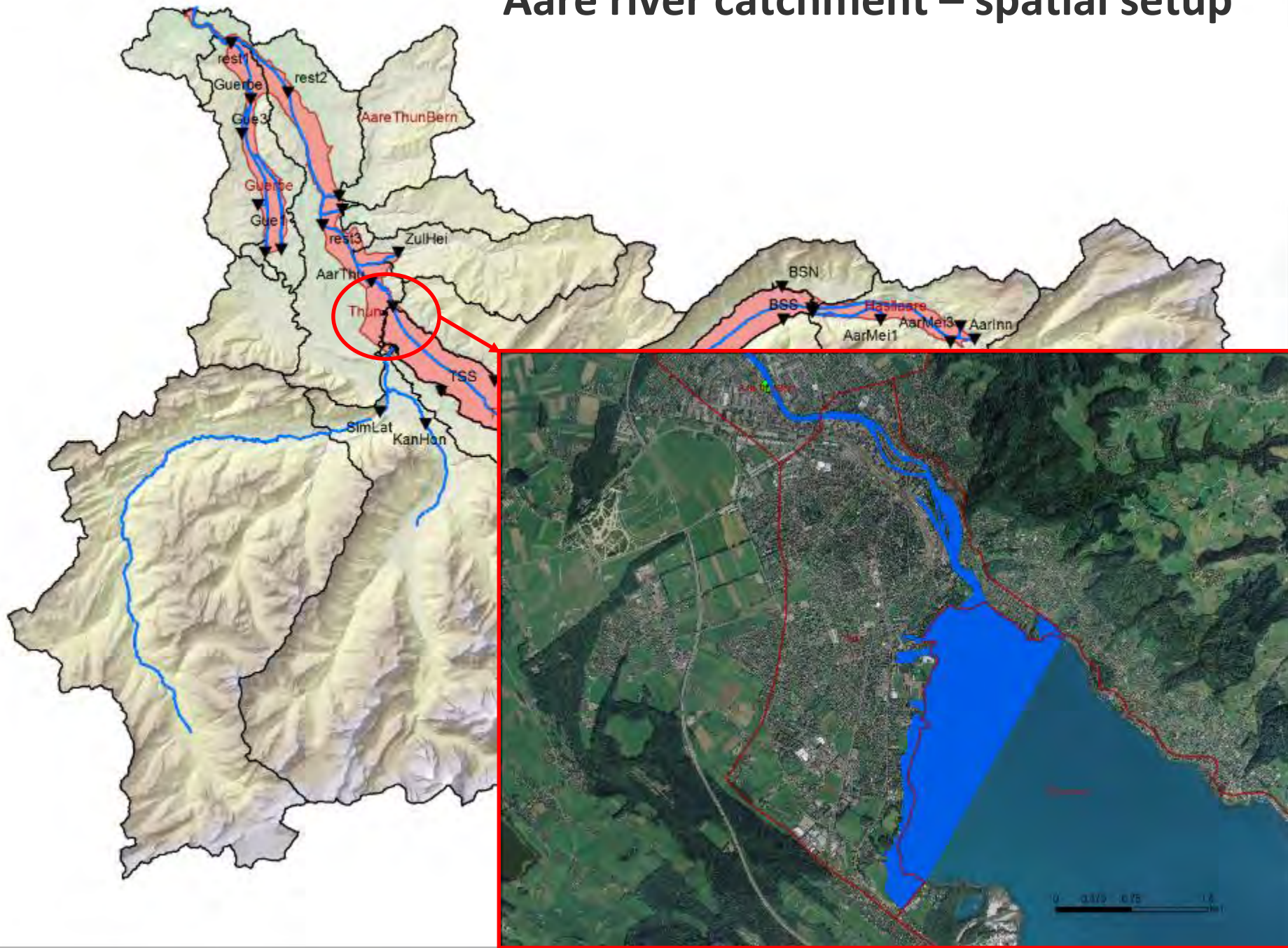
Aare river catchment – spatial setup



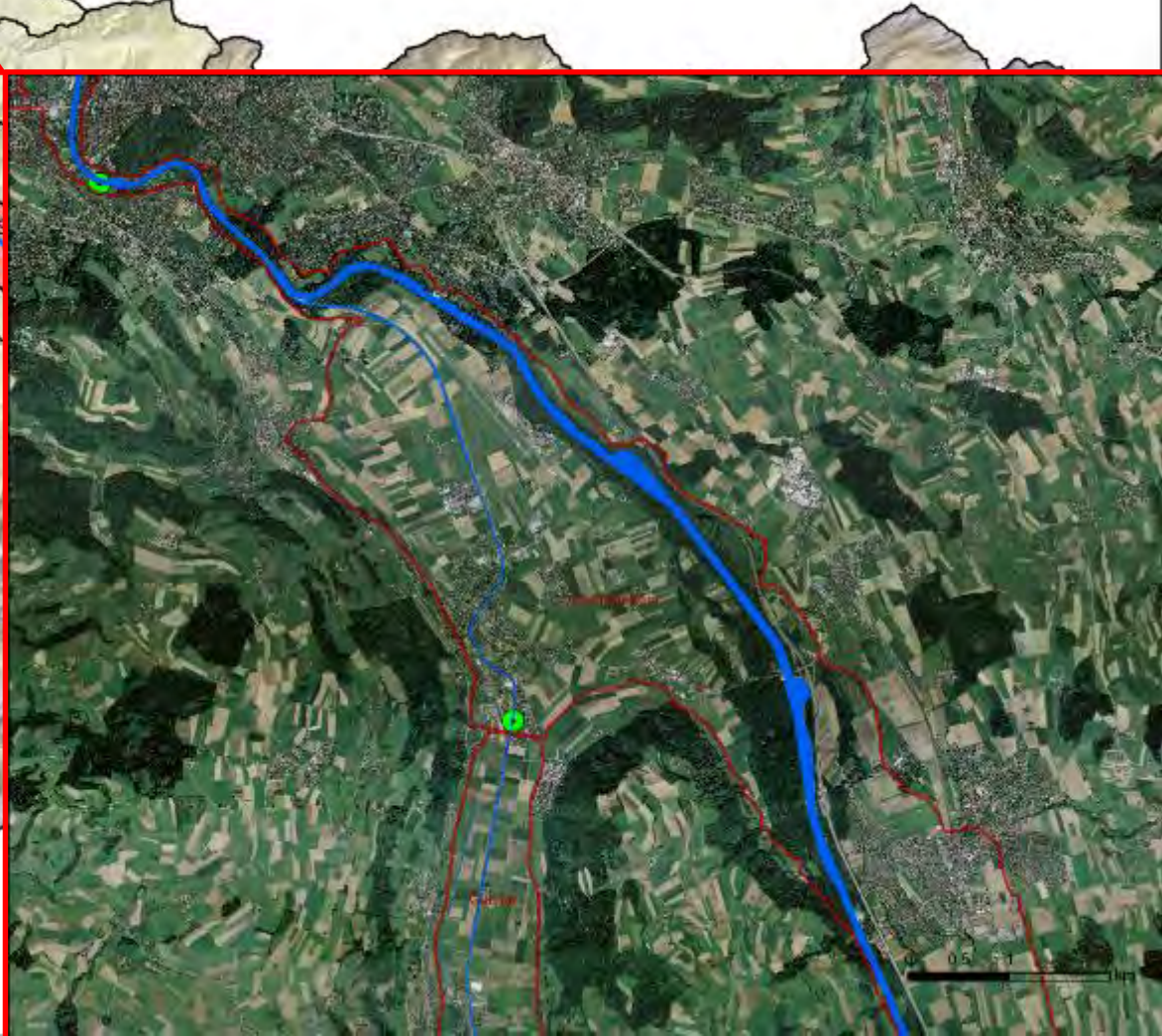
Aare river catchment – spatial setup



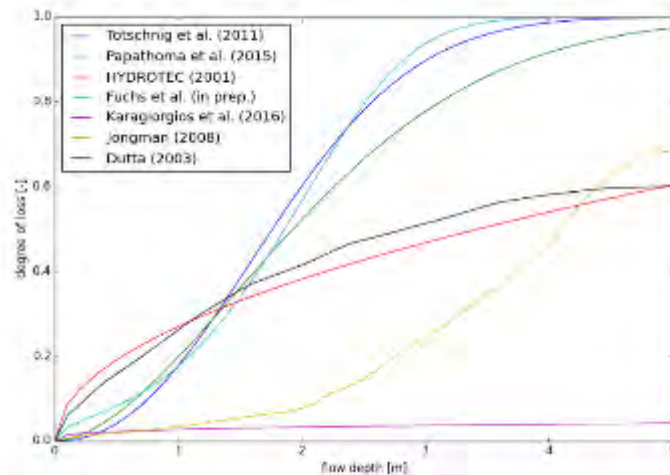
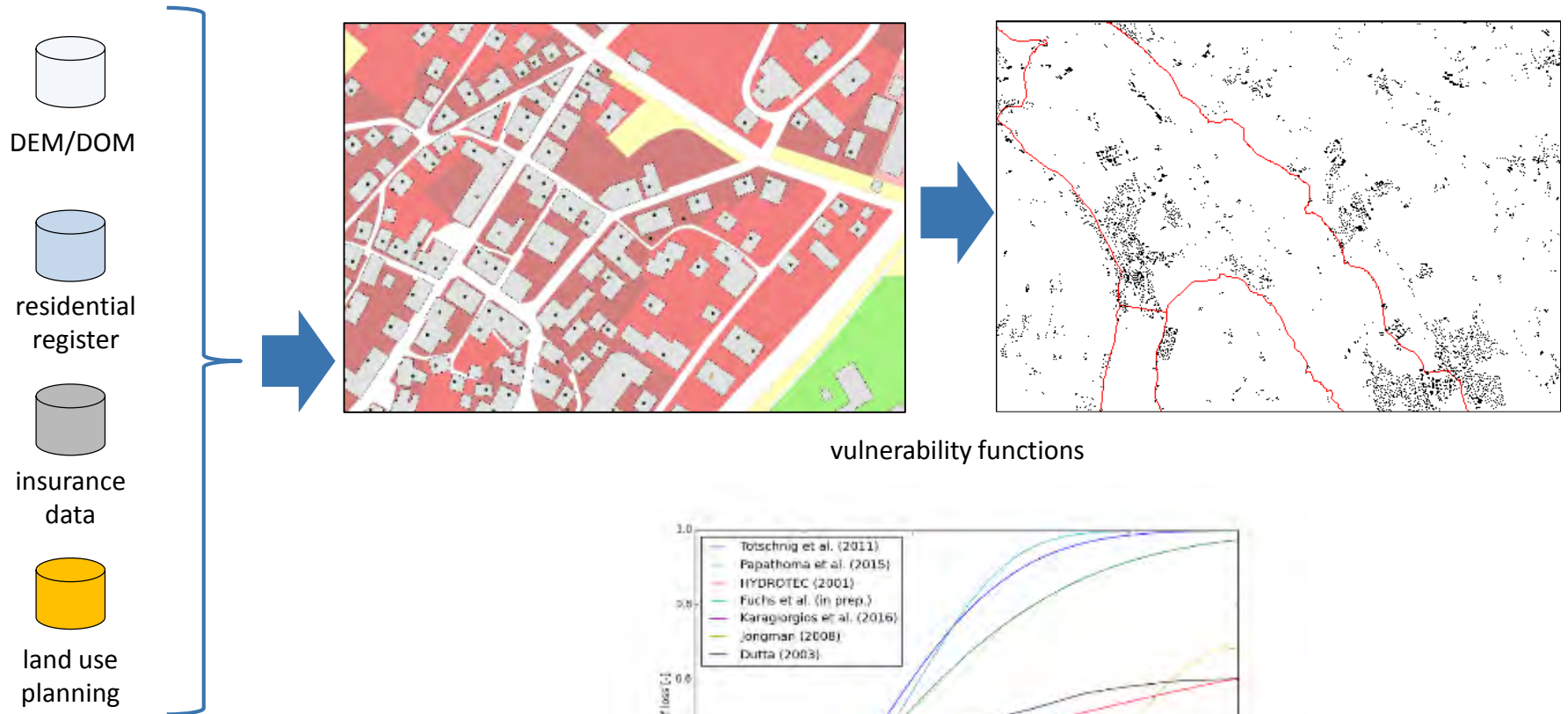
Aare river catchment – spatial setup



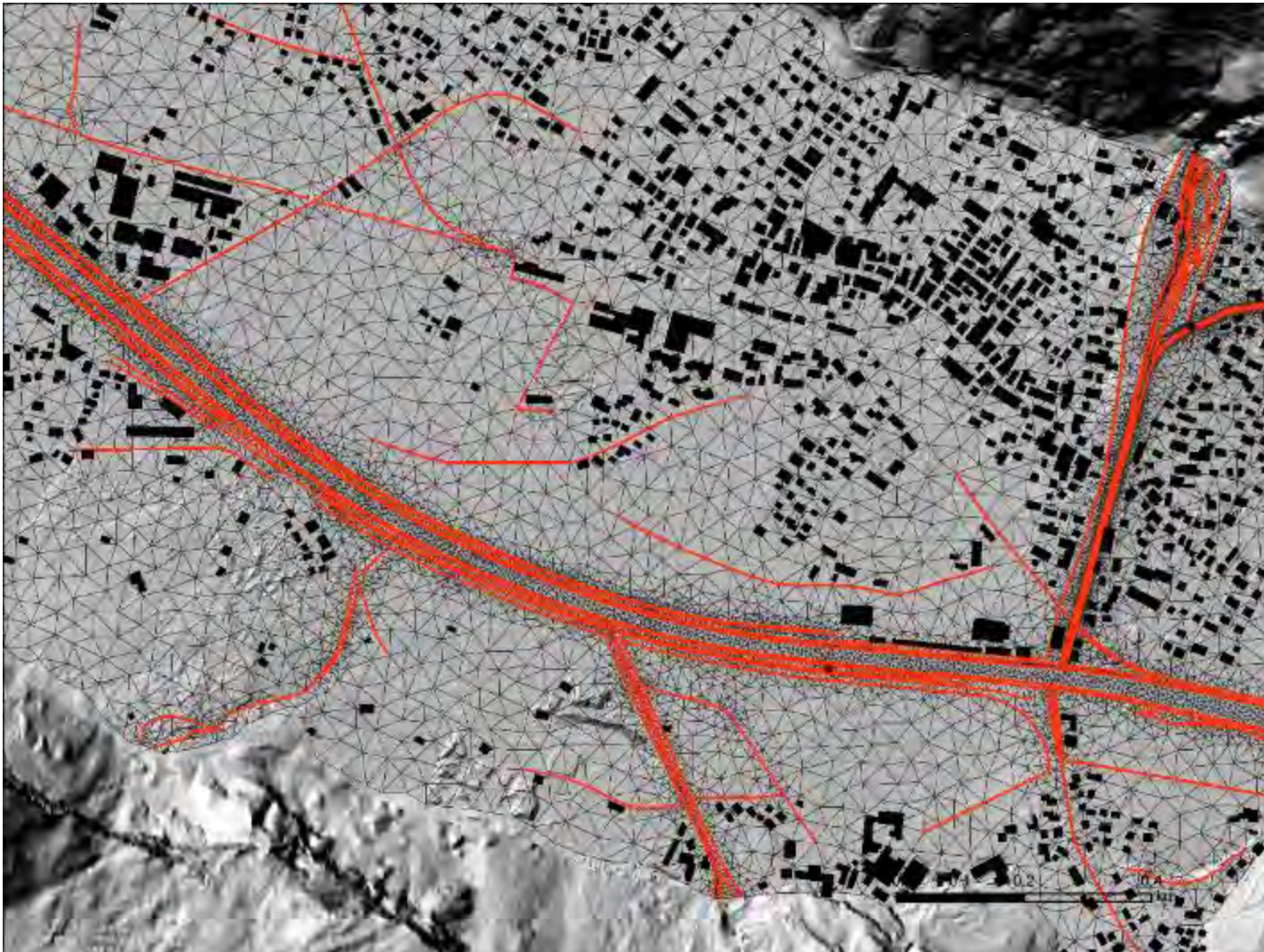
Aare river catchment – spatial setup



Flood loss model



Inundation modelling: BASEMENT 2D



2.) Generierung von Meshs von historischen Flussläufen

Aare bei Bern
um 1784 (Aberli)



Thun Allment










Copia Plan

von dem

AARBETT

ZWISCHEN der THUN-ALLEMENT
und der UTTIGEN-FLUH

Erklärung

-  neu ausgegrabener Canal
-  durch Sperrn ungedämmtes Oberrbett
-  gepflastete Sperrn
-  bereits ausgeführte Wasser-Bauten
-  Sicherheits Dämme bei hohem Wasserstand
-  Quer Profile, gemessen bei niedrigem Wasserstand
-  durch Herrn Döllin gesetzte Markstein

Ausser Fädeli

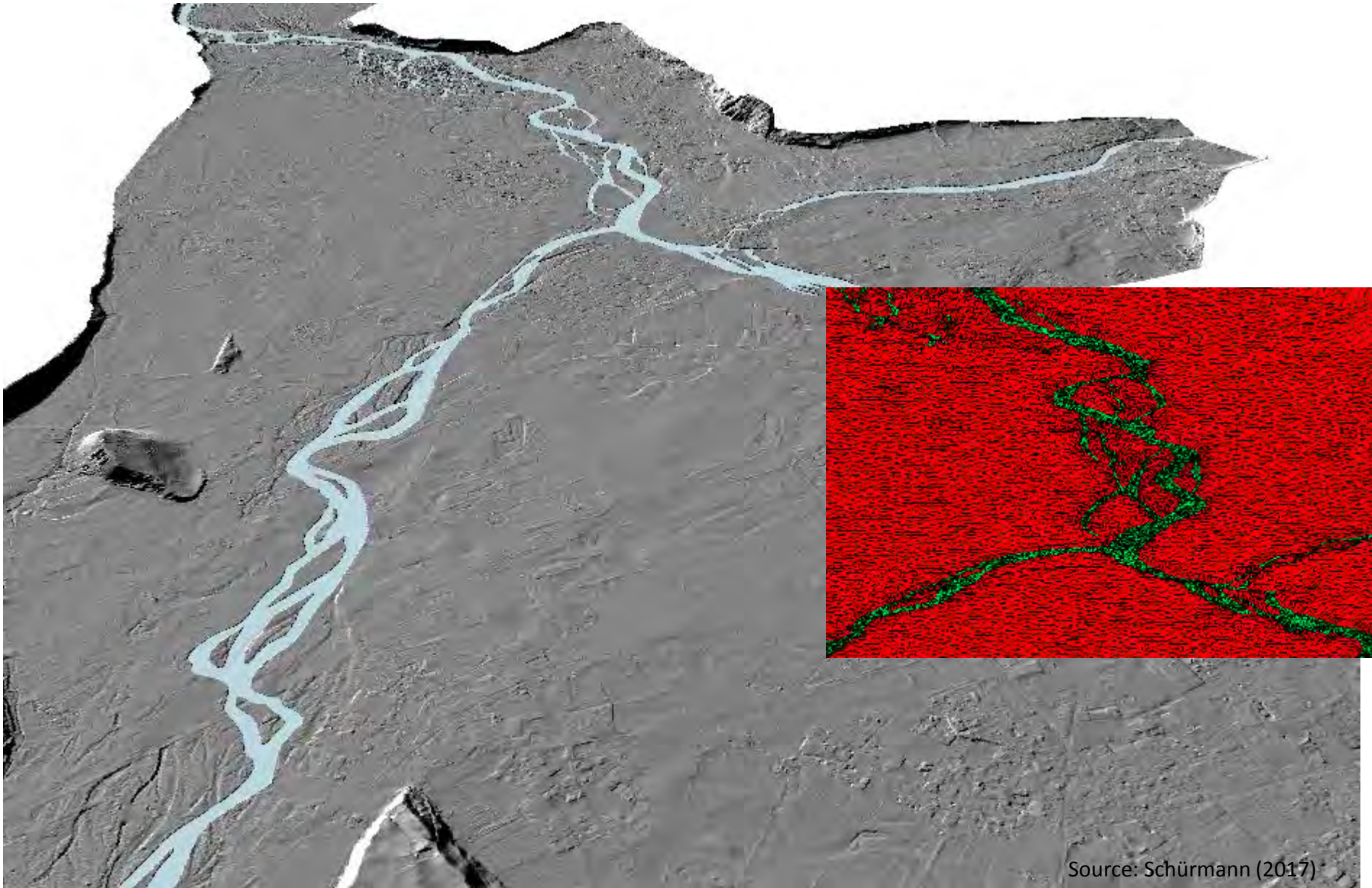
Quer Profile des Aarbells zwischen der Thun Allmend und der Ulligen-Fluh aufgenommen im Herbst 1851 durch H. Baugy



Ulligen-Fluh



Mesh



Aare river catchment, Switzerland

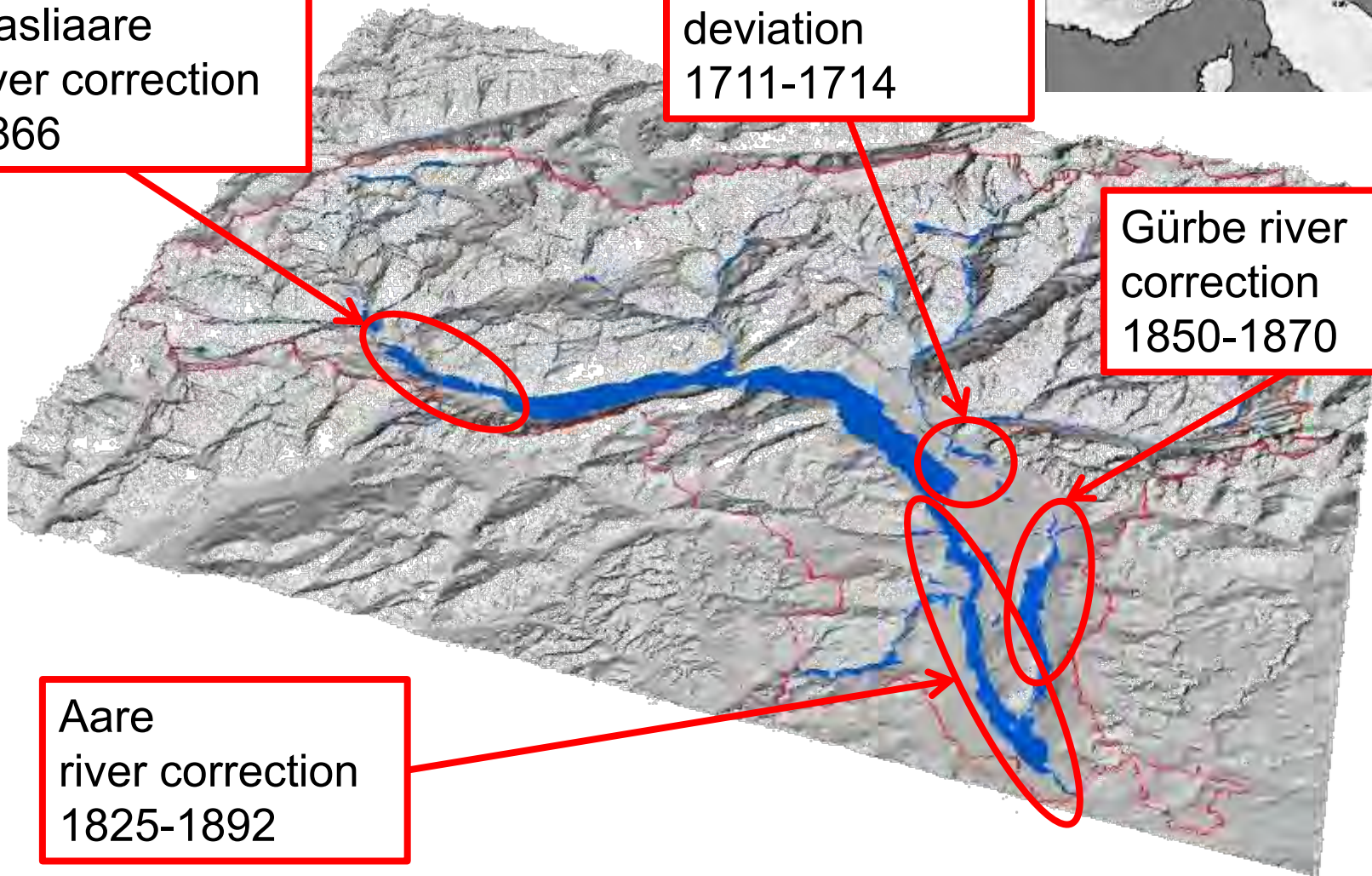


Hasliaare
river correction
1866

Kander river
deviation
1711-1714

Gürbe river
correction
1850-1870

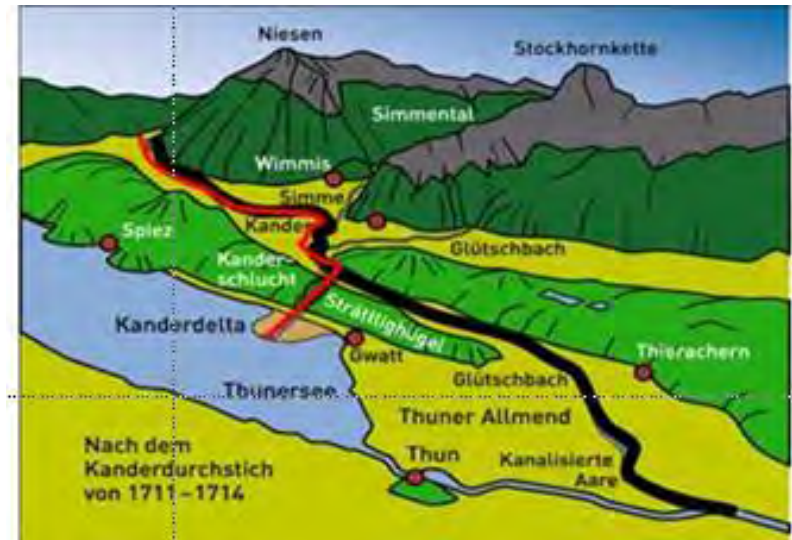
Aare
river correction
1825-1892



Kanderdurchstich 1714



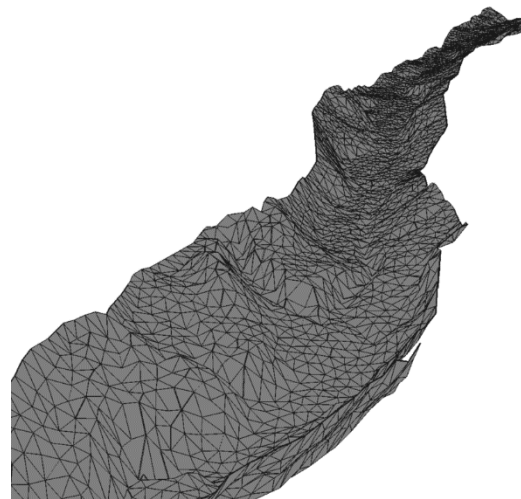
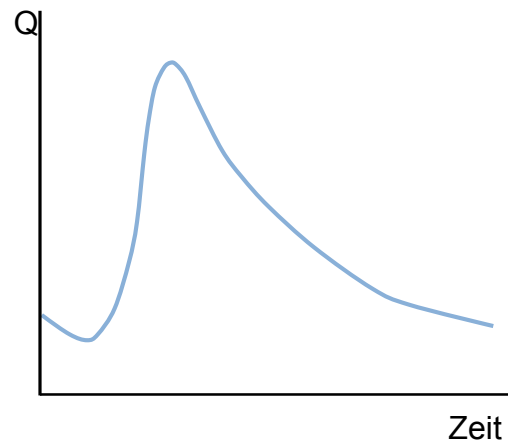
source: Vischer 2005



source: Hydrologischer Atlas

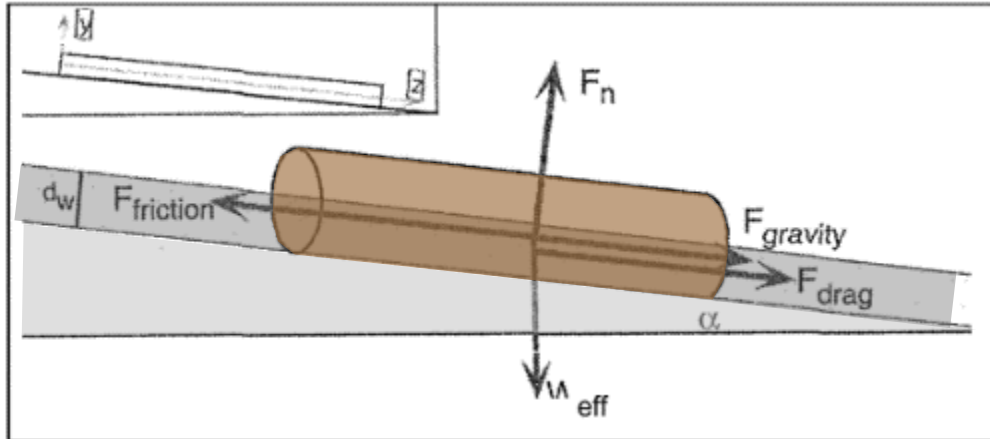
3.) Modellierung von Schwemmholz-Recruitment und – Transport auf Basis von BASEMENT

Modellkonzept LWDsimR

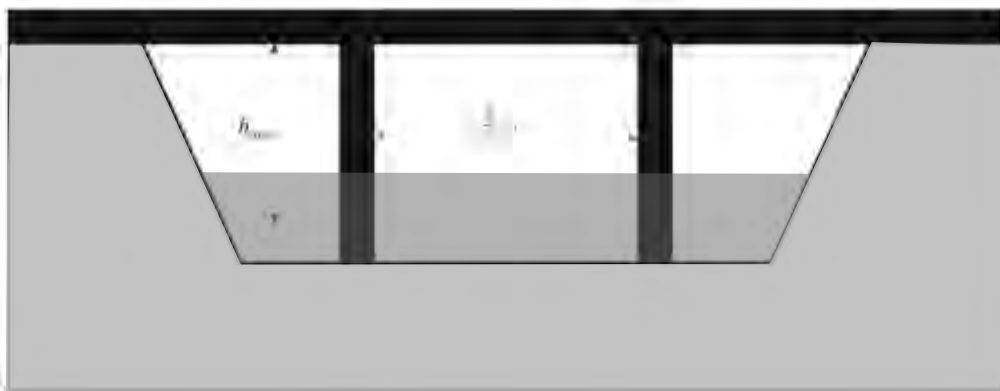


ID	xcoord	ycoord	BHD	Status	Wurzel	Laenge	Waldzustand
1	627232.5	181729.6	0.27	2	1.35	22	2
2	629016.4	181642.8	0.30	1	1.50	12	2
3	629145.3	181647.6	0.23	1	1.15	8	1
4	627574.3	181838.7	0.26	1	1.30	25	1
5	627177.6	181798.7	0.25	1	1.25	17	2
6	627617.5	181752.7	0.24	1	1.20	23	1

Schwemmholz- Transport

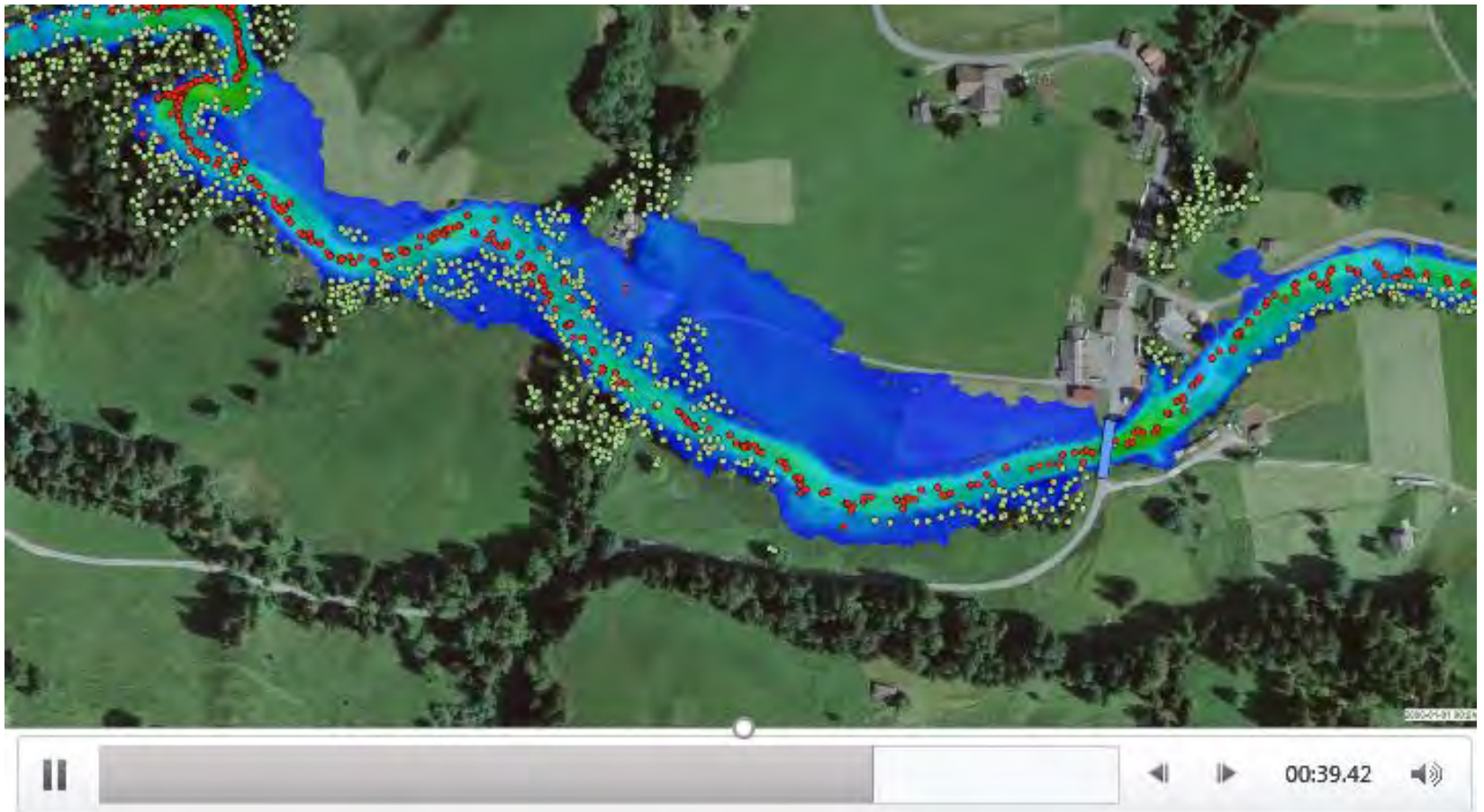


- *Schwimmend*: $h/d > 1$
- *Rollend/ rutschend*: $h/d < 1$ & $F > R$
- *Kein Transport*: $h/d < 1$ & $F < R$



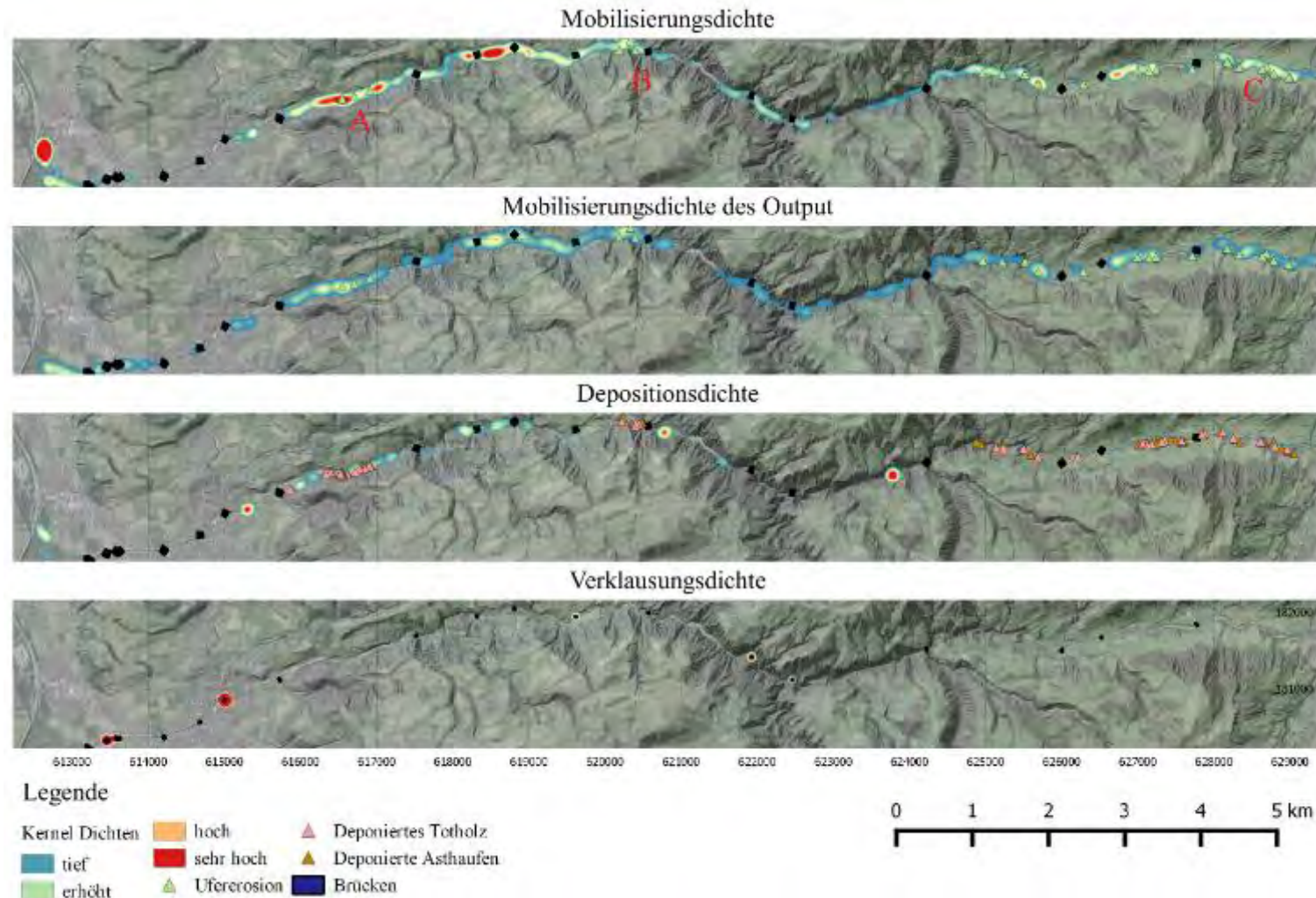
- Einzelner Pfeiler
- Zwischen zwei Pfeilern
- Am Überbau der Brücke

Modellierung



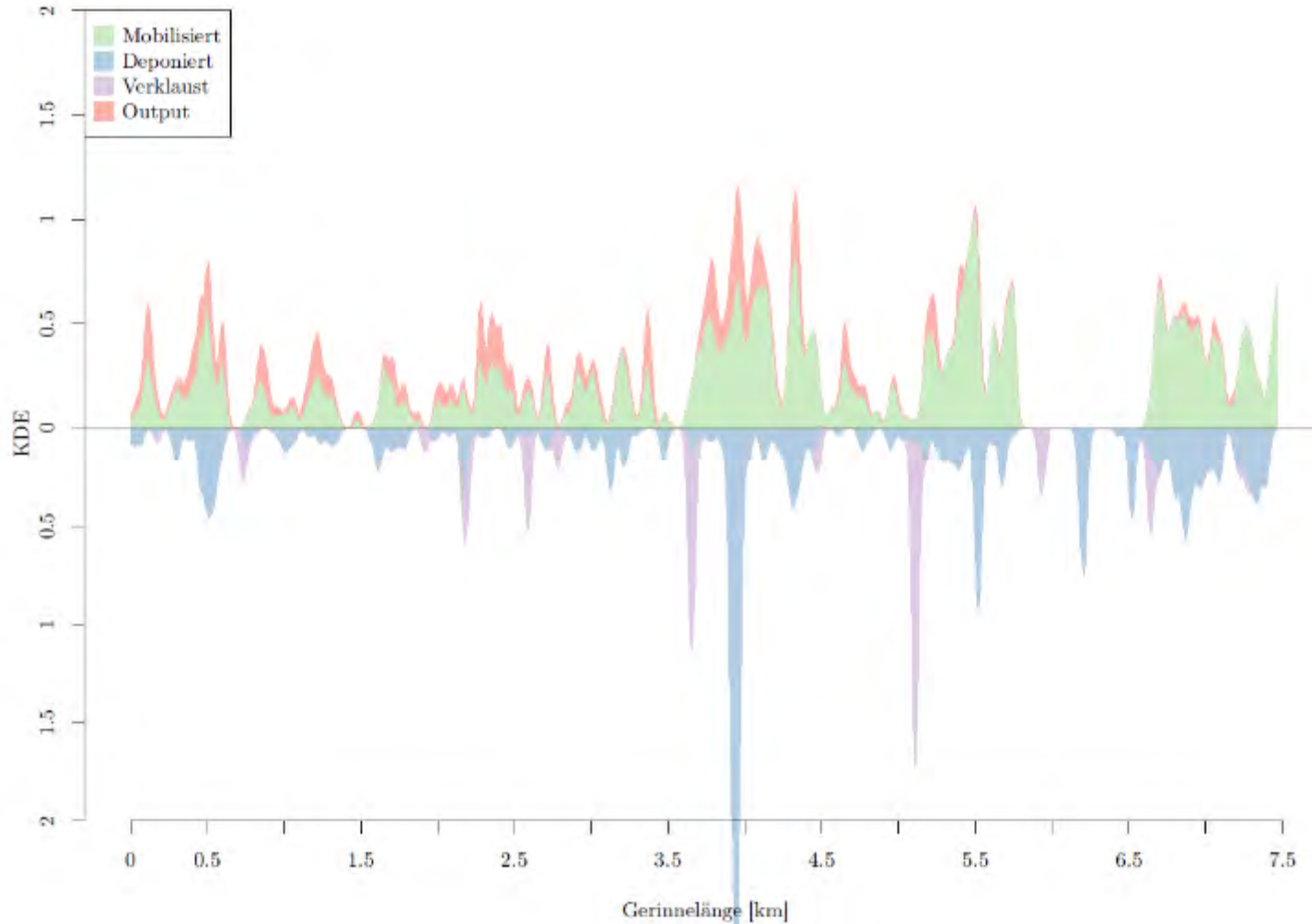
Schwemmholz- Deposition

Modellierung eines worst-case Ereignisses mit $Q = 250\text{m}^3/\text{s}$



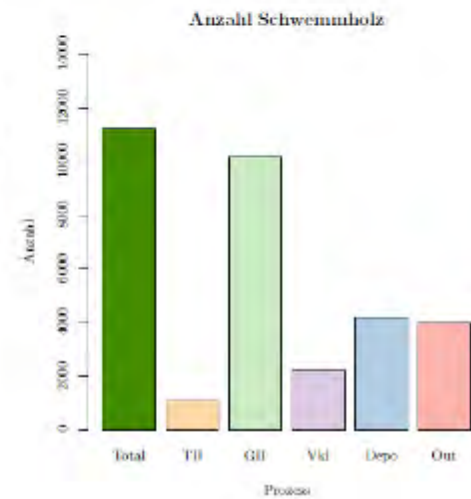
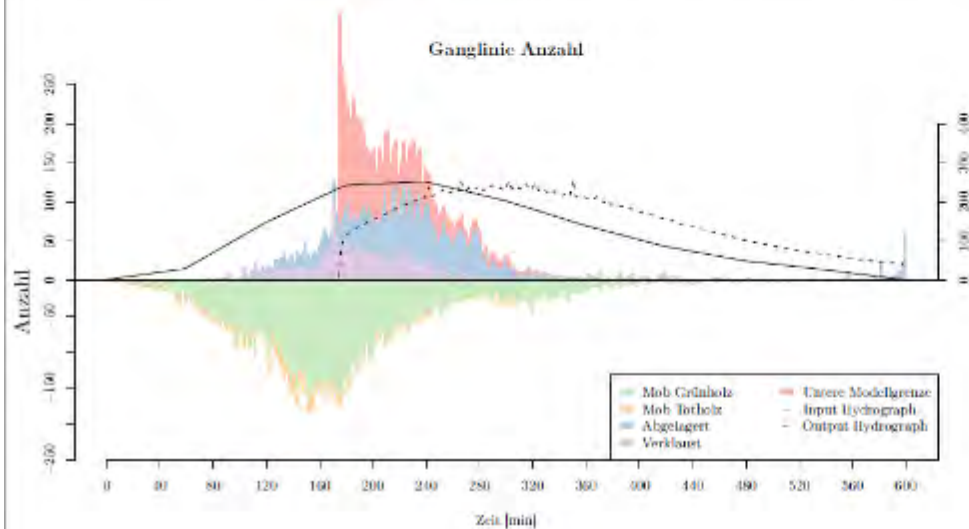
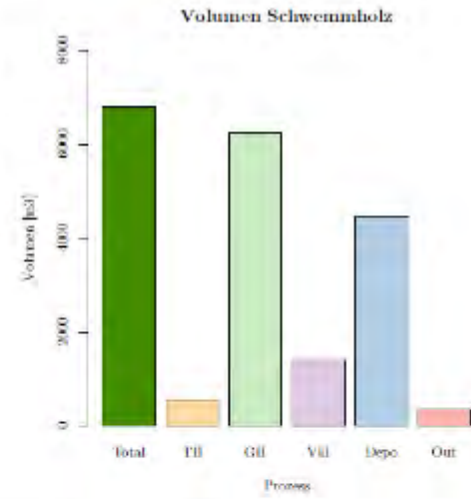
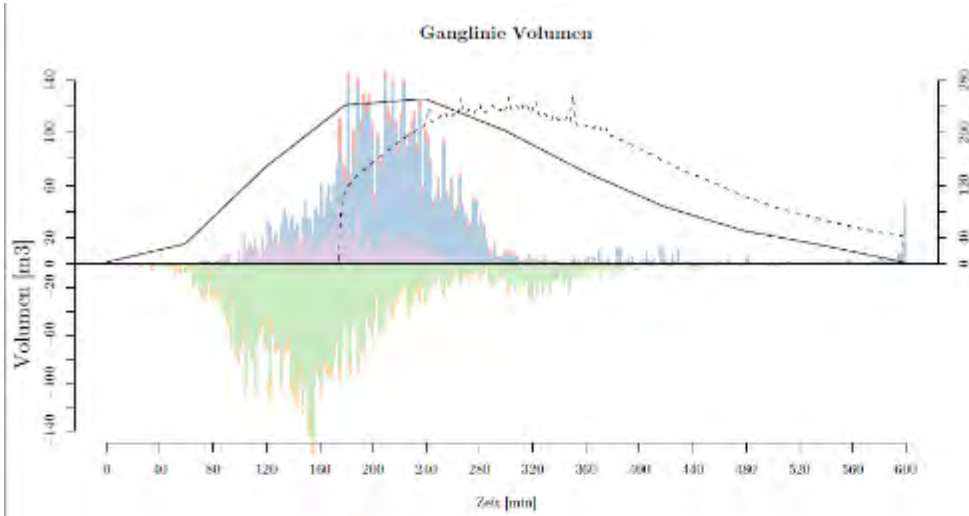
Beispiele von Auswertungen

- > Schwemmhohldynamik über Gerinnelänge



Beispiele von Auswertungen

> Schwemmholzganglinie



Schwemmholzmodell

- > Open Source R scripts
- > Download auf zenodo DOI: 10.5281/zenodo.252547
- > oder auf www.mobililarlab.unibe.ch

The screenshot shows the Zenodo repository page for the software 'LWDsimR: Simulation of Woody Debris Dynamics during Floods'. The page is dated January 19, 2017, and is categorized as 'Software' with 'Open Access'. The authors listed are Galatioto, Niccolò; Zischg, Andreas Paul. The abstract describes a vector-based and object-oriented simulation of woody debris dynamics during floods on the basis of irregular meshes and hydrodynamic 2D models. It details the simulation of mobilization, transport, deposition, and entrapment of woody material. The software is written in R, and pre- and post-processing scripts are available. A preview of the software package is shown at the bottom, with the filename 'LWDsimR_Simulation of Woody Debris Dynamics during Floods.zip'. On the right side, there are sections for 'Publication date', 'DOI' (10.5281/zenodo.252547), 'Keyword(s)' (Large wood, Woody debris dynamics, Modelling, Floods), 'License (for files)' (CC BY 4.0), 'Share' (with social media icons), and 'Cite as' (Galatioto, Niccolò, & Zischg, Andreas Paul. (2017). LWDsimR: Simulation of Woody Debris Dynamics during Floods [Data set]. Zenodo. http://doi.org/10.5281/zenodo.252547).

Für detailliertere Infos:

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Literatur:

Felder, G.; Weingartner, R. An approach for the determination of precipitation input for worst-case flood modelling. *Hydrological Sciences Journal* 2016, 61, 2600–2609.

Zischg, Andreas Paul; Felder, Guido; Weingartner, Rolf; Gomez, Juan Jose; Röthlisberger, Veronika; Bernet, Daniel Benjamin; Rössler, Ole Kristen; Raible, Christoph; Keiler, Margreth; Martius, Olivia (2016). M-AARE - Coupling atmospheric, hydrological, hydrodynamic and damage models in the Aare river basin, Switzerland. In: 13th Congress Interpraevent 2016 (pp. 444-451).

Zischg, Andreas Paul (2016). River corrections and long-term changes in flood risk in the Aare valley, Switzerland. *E3S Web of Conferences*, 7(11010), p. 11010. EDP Sciences 10.1051/e3sconf/20160711010

Röthlisberger, V.; Zischg, A.; Keiler, M.; Lang, M.; Klijn, F.; Samuels, P. Spatiotemporal aspects of flood exposure in Switzerland. *E3S Web Conf.* 2016, 7, 8008. <http://dx.doi.org/10.1051/e3sconf/20160708008>

Masterarbeiten zu den vorgestellten Themen:

Kartierung und Modellierung von Mobilisierungsflächen, Transport und Deposition von Schwemmholz im Flusssystem Aare zwischen Thun und Bern (Niccolò Galatioto, 2016)

Erhebung der Herkunftsflächen und des potentiellen Volumens von Schwemmholz im Einzugsgebiet der Zuflüsse des Thunersees im Hochwasserfall (Silvana Deplazes, 2016)

Hydrologisch-hydraulische Fragen in Zusammenhang mit der Kanderkorrektion (Stefan Schürmann, 2017)