



HYDROPEAK

WP2 – PhD prosjekt

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Målet med arbeidet

- Utvikle rutiner for å simulere avrenning med kort tidsoppløysing
 - Utprøving av ulike modellar for avrenning
 - Modellopløysing
 - Krav til data
 - Kalibreringsmetoder
 - Implementasjon i ENKI rammeverket
- Forsøk med både lokal og regional kalibrering og evaluering.
- Regional metode -> avrenning i umålte felt.

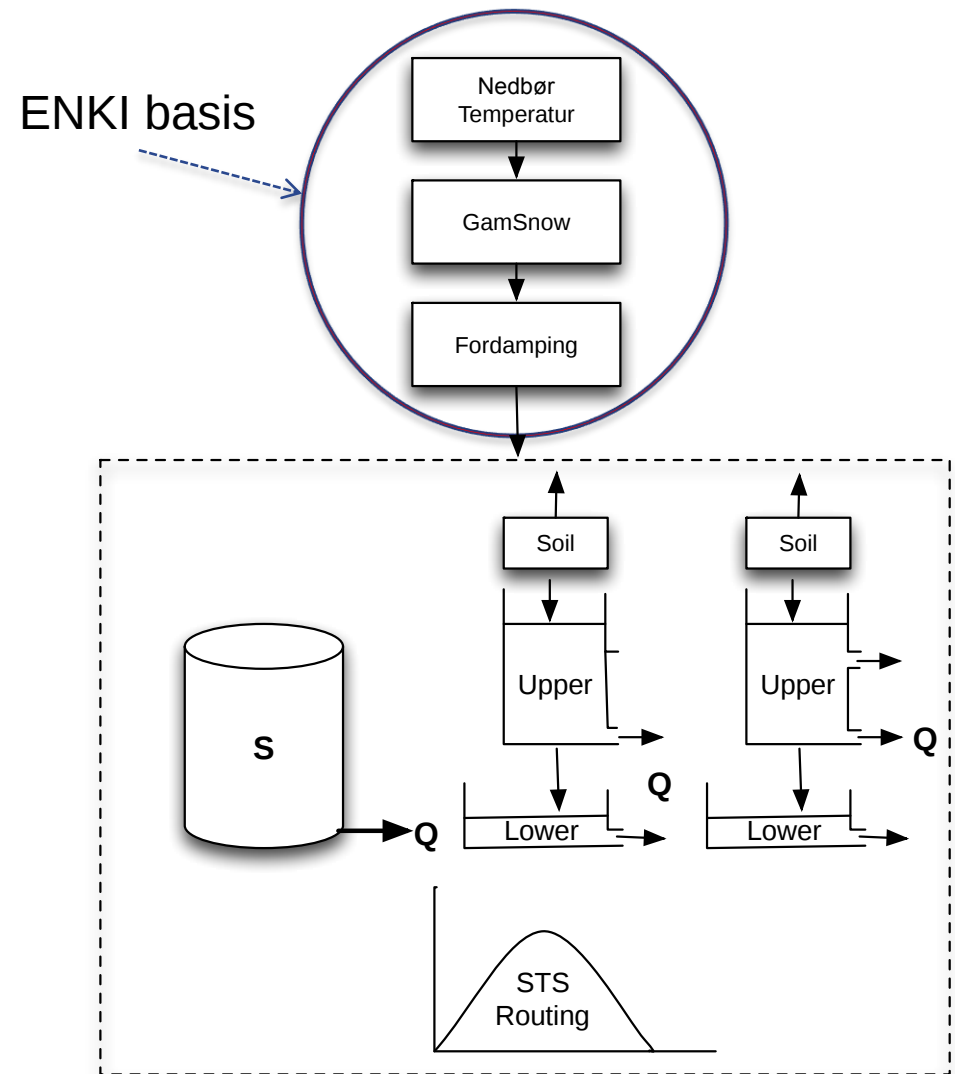
ENKI



- Modulært rammeverk for utvikling av hydrologiske modellar.
- Distribuert modell som koplar hydrologiske simuleringsrutiner og geografiske data.
- Utvikla av SINTEF Energi, Open Source.
- I ferd med å bli klargjort for operativ bruk i eit prosjekt med bla SINTEF, Powel og fleire kraftselskap

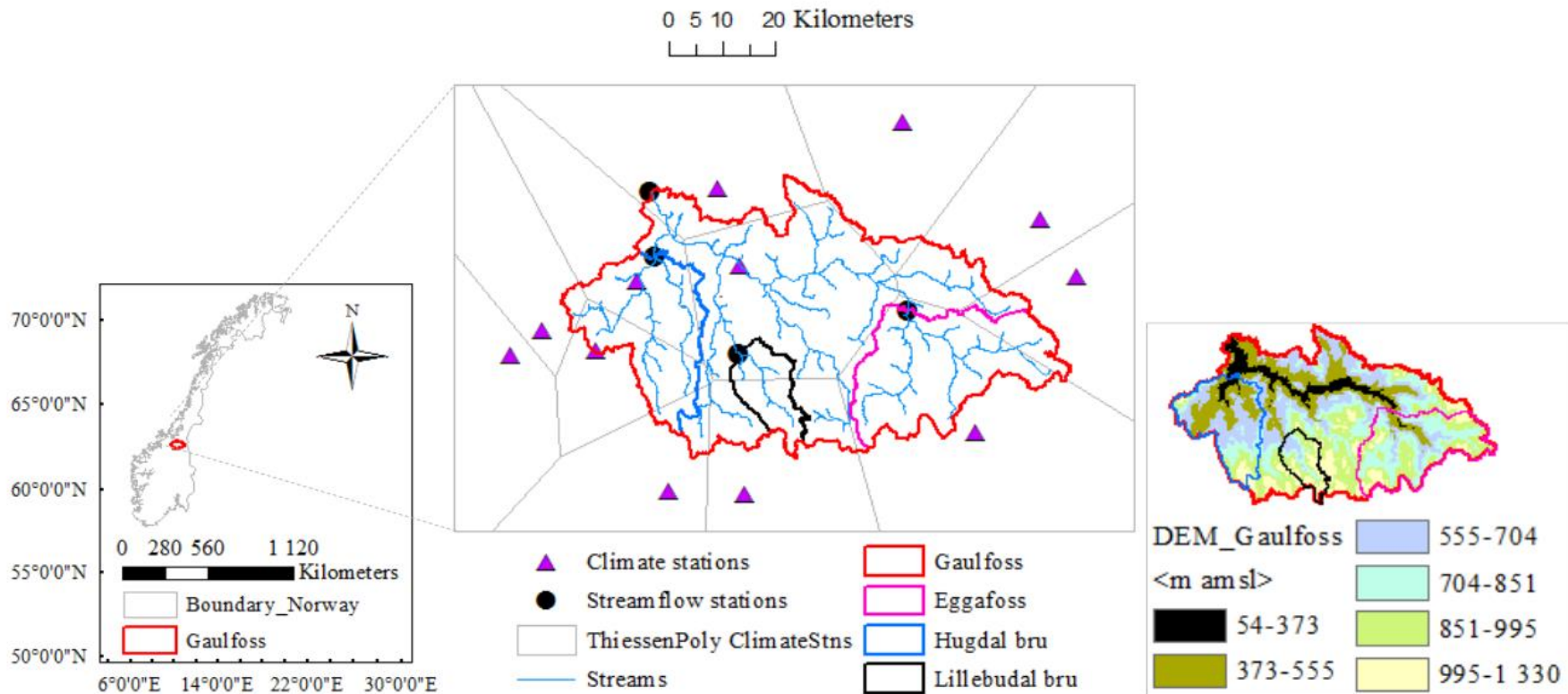
Modellar for korttidsavrenning

- PDM
 - Probability Distributed Model
 - Grid eller delfelt?
- HBV
 - Ulike konfigurasjonar
 - Ulikt tal på parametre
 - Lineær/ulineær
- Kirchener
 - $S - Q$ samanheng



Modelltest – Studieområde

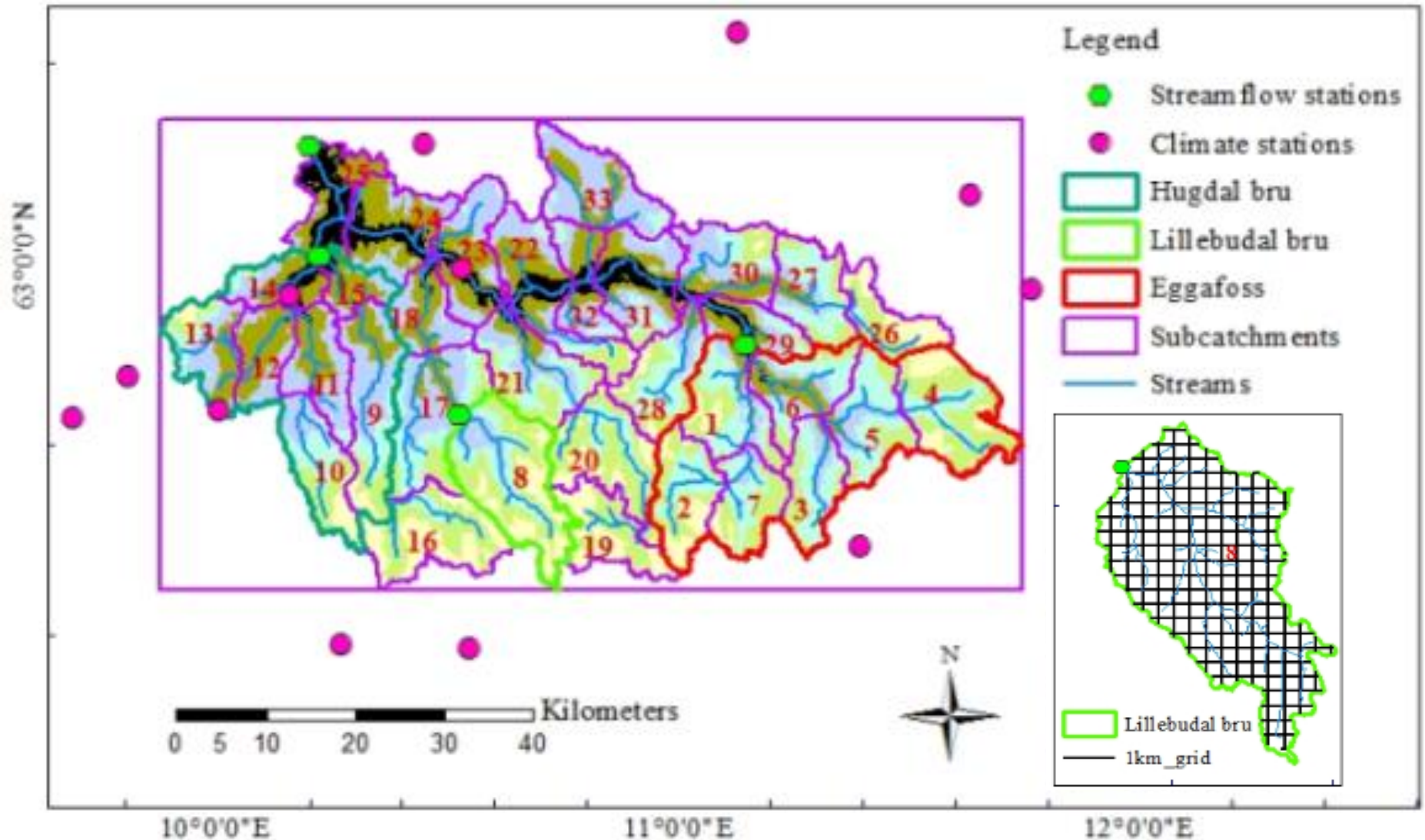
Gaula – Gaulfoss/Hugdalen/Eggafoss/Lillebudal



Kalibrering

- Alle oppsett kalibrert på timebasis
- “Split sample” & “proxy basin” metode for evaluering av simulering
- DREAM for automatisk kalibrering
- Ulike mål på kor god kalibereringa er: NSE, NSEIn, vassbalanse, parameteranalyse

Kva effekt har oppløysing?

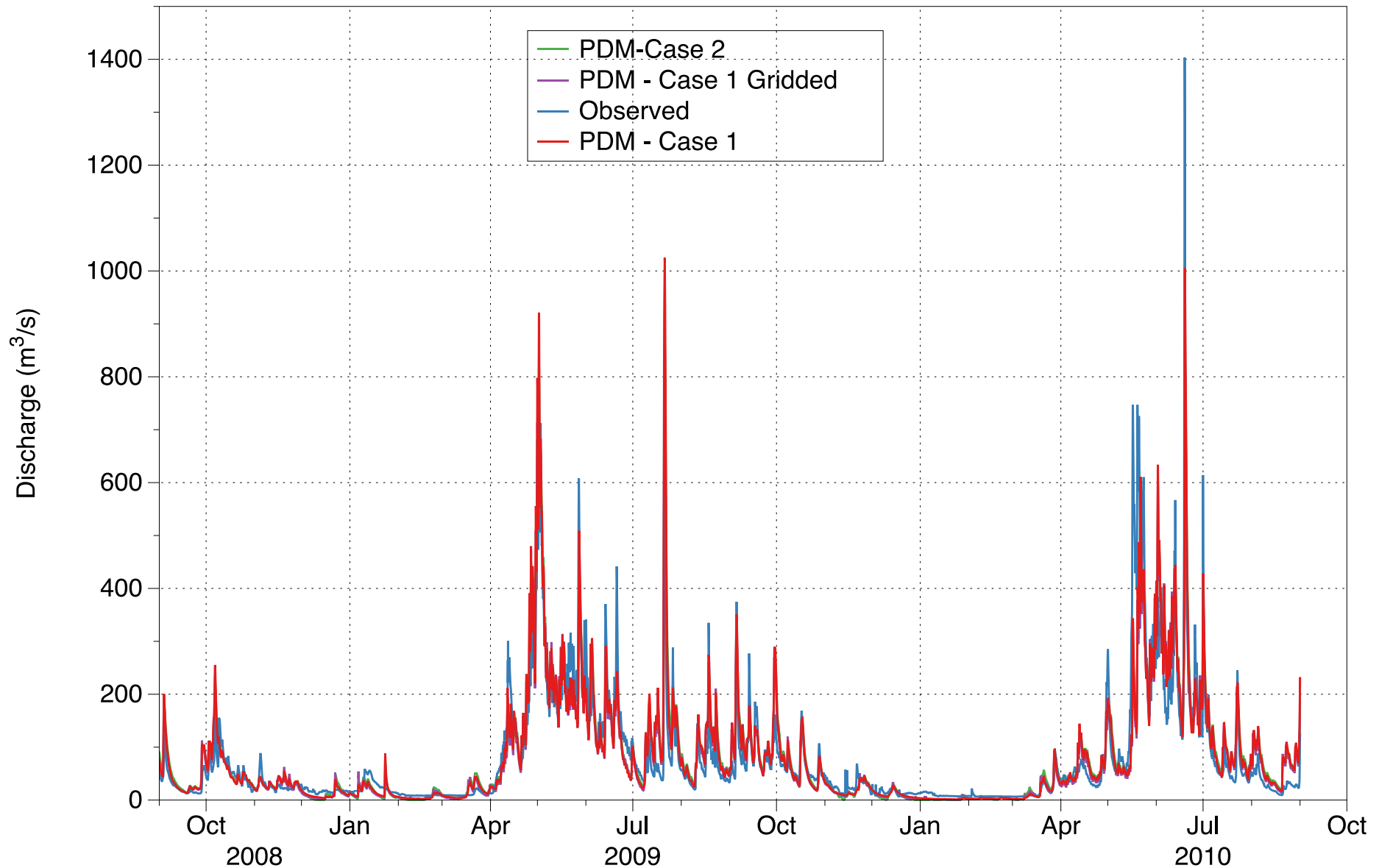


Metoder som er testa i PDM

Cases	Scales of representation of spatial heterogeneity and computation or calibration				
	Heterogeneity by a probability distribution	$S_{\max}$	Shape parameter 'b' of the distribution	Runoff generation (response)	STS runoff routing
1	Subcatchment	Catchment (calibrated)	Catchment (calibrated)	Element	Grid
2	Subelement	Element (from topographic gradient)	Element (from topographic gradient)	Element	Grid
3	-	Catchment (calibrated)	-	Element	Grid
1G	Subgrid	Catchment (calibrated)	Catchment (calibrated)	Grid	Grid
2G	Subgrid	Grid (from topographic gradient)	Grid (from topographic gradient)	Grid	Grid
3G	-	Catchment (calibrated)	-	Grid	Grid

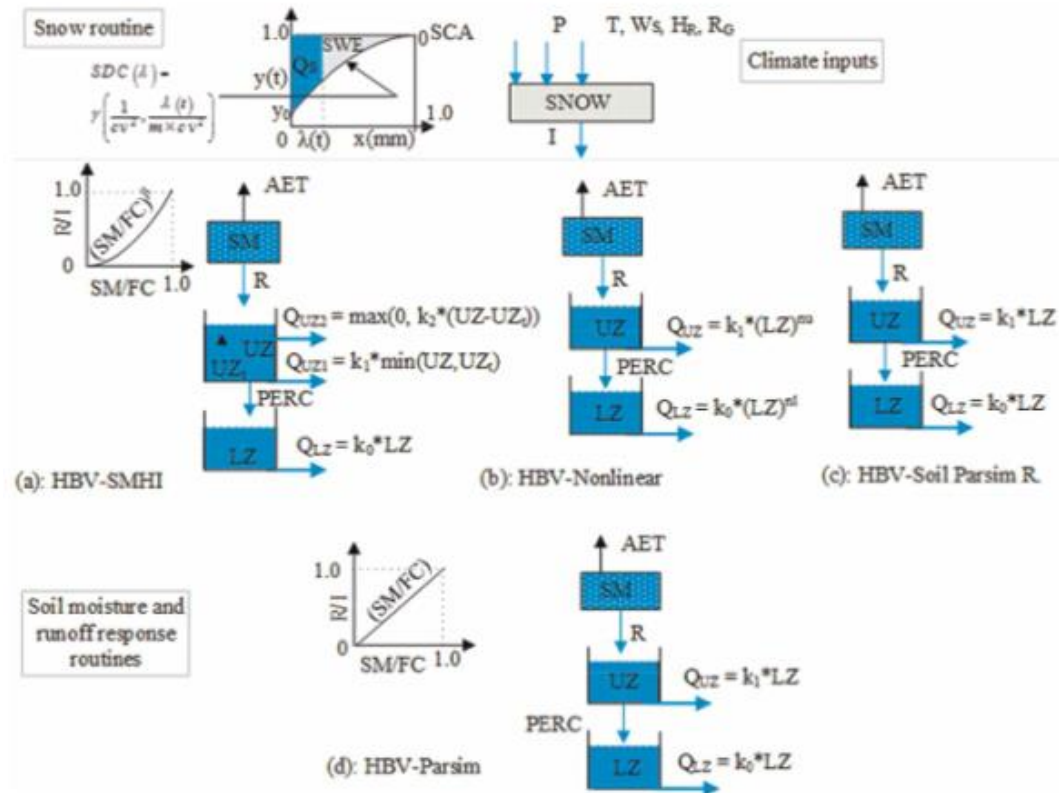
$S_{\max}$: maximum subsurface storage capacity and STS: source-to-sink routing.

Gaulfoss

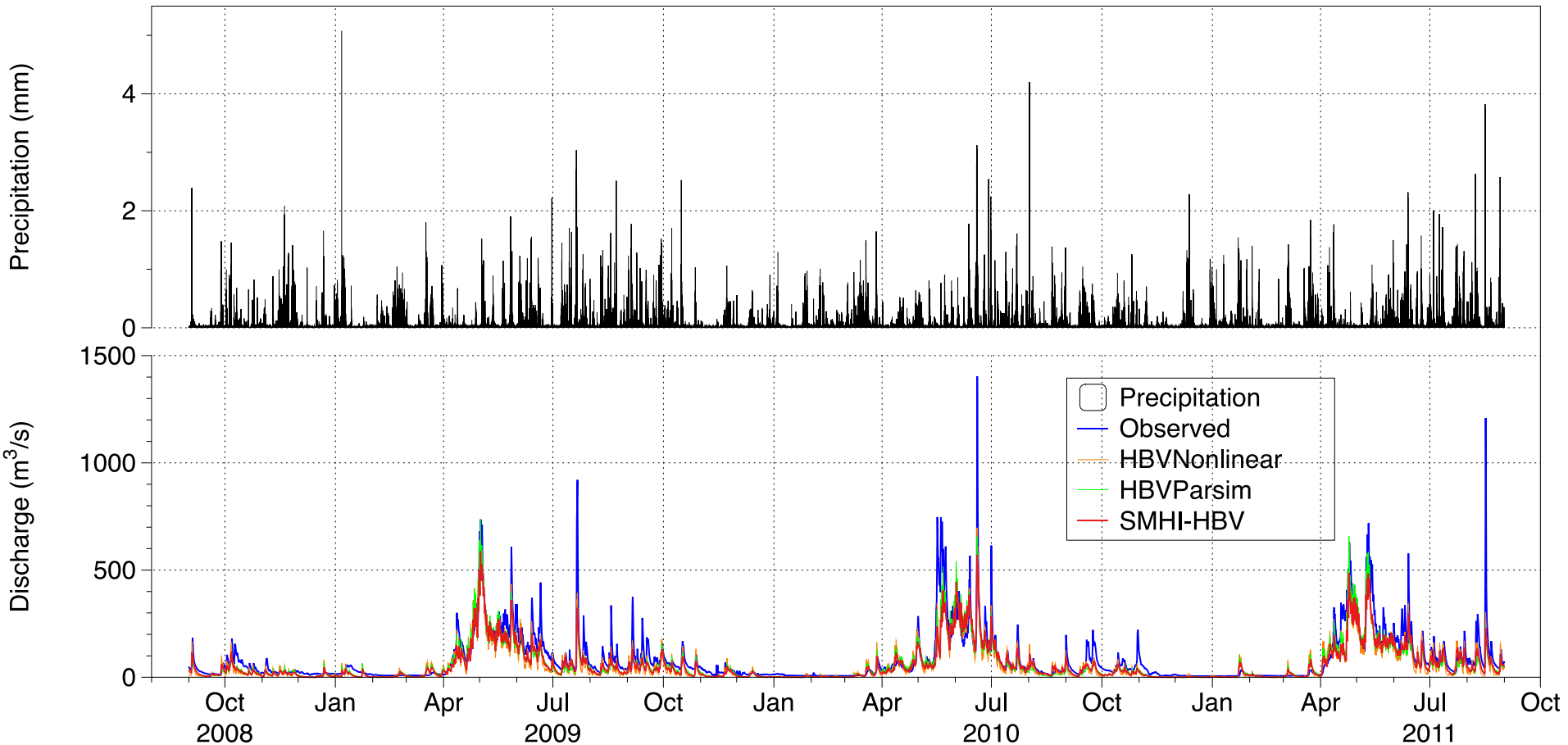


HBV modellen

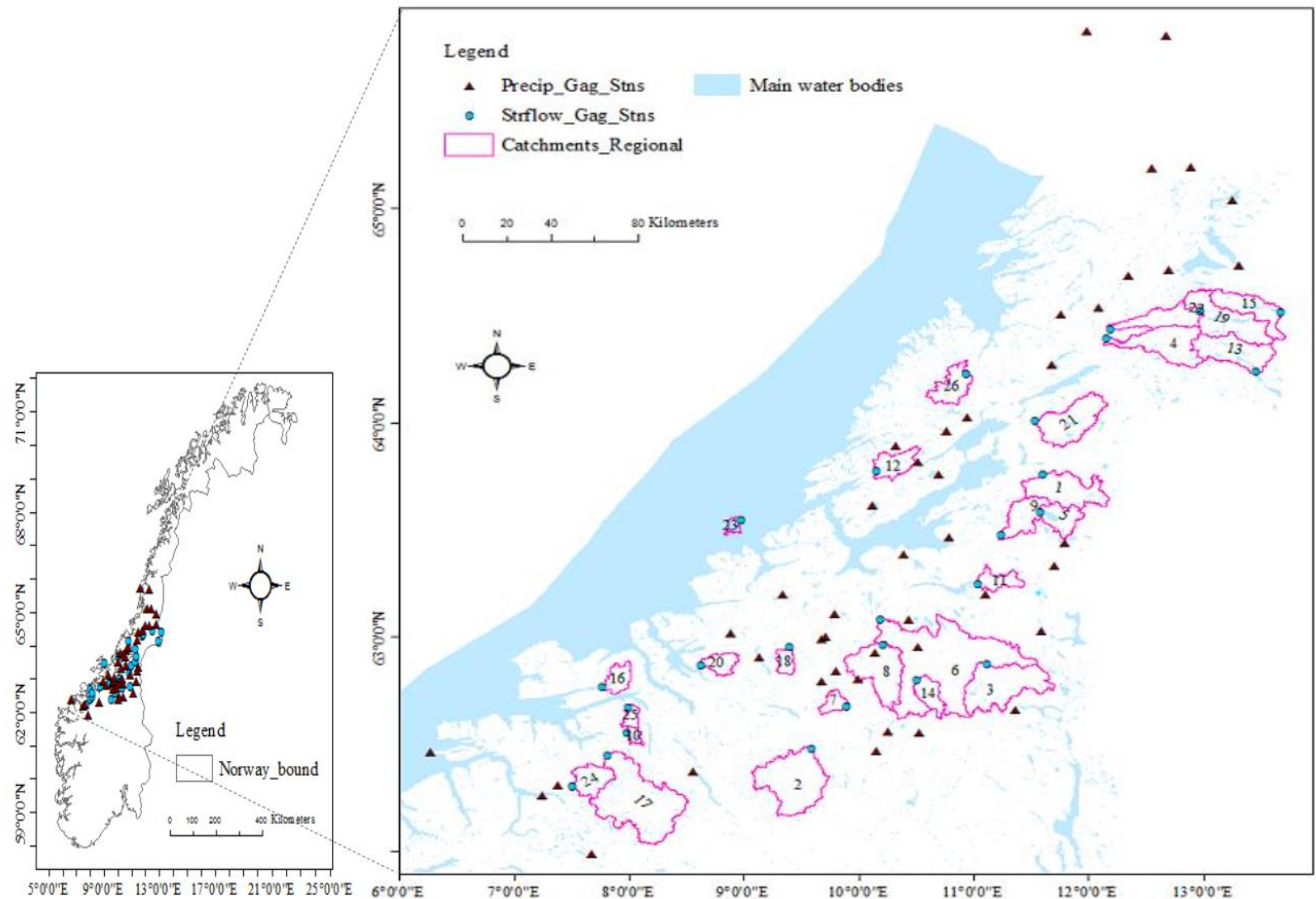
- Kva skjer om vi forenkler modellen?
- Ulike variantar av markvassrutina
- Ulik konfigurasjon av øvre og nedre sone.



HBV Comparison

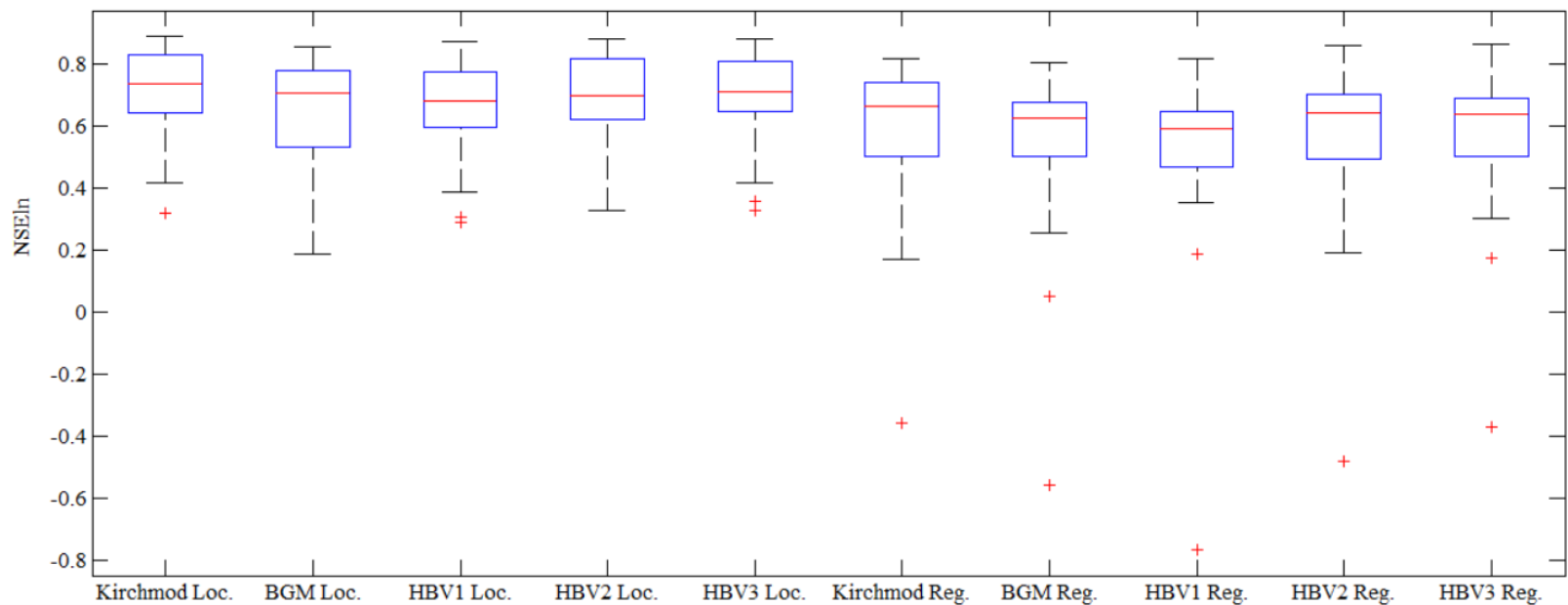
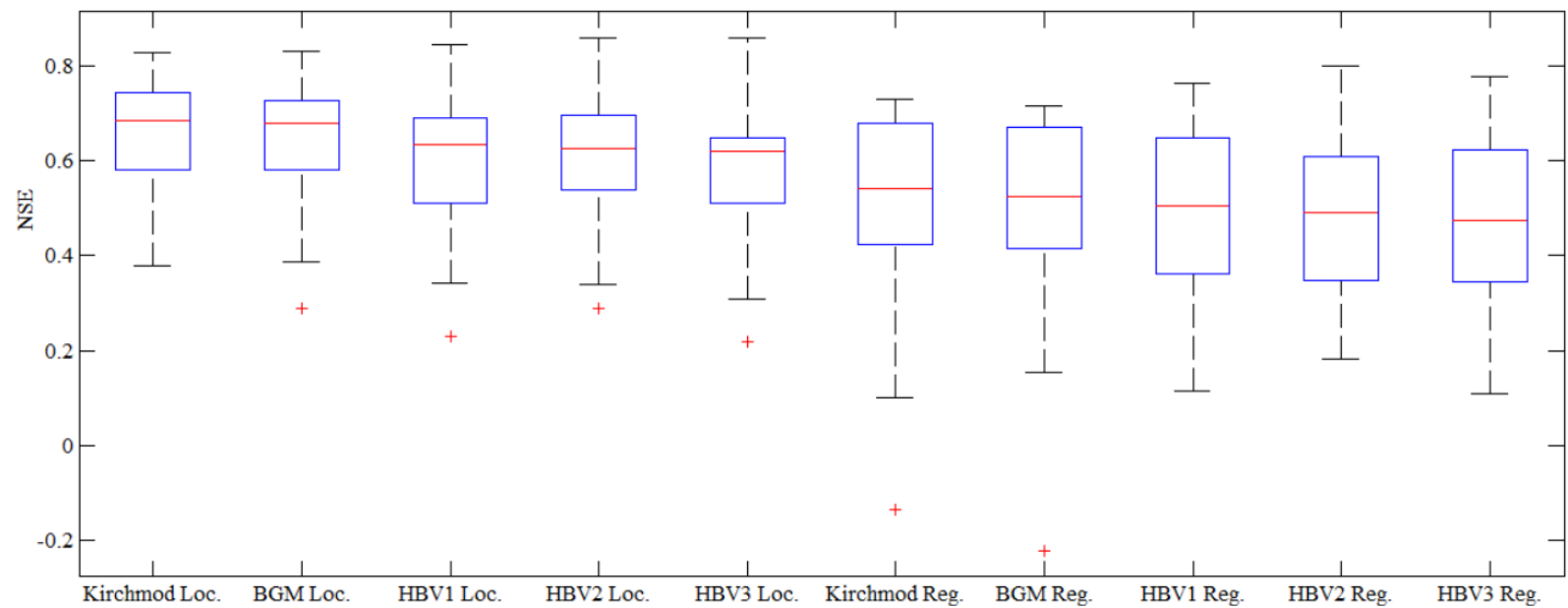


Regional kalibrering

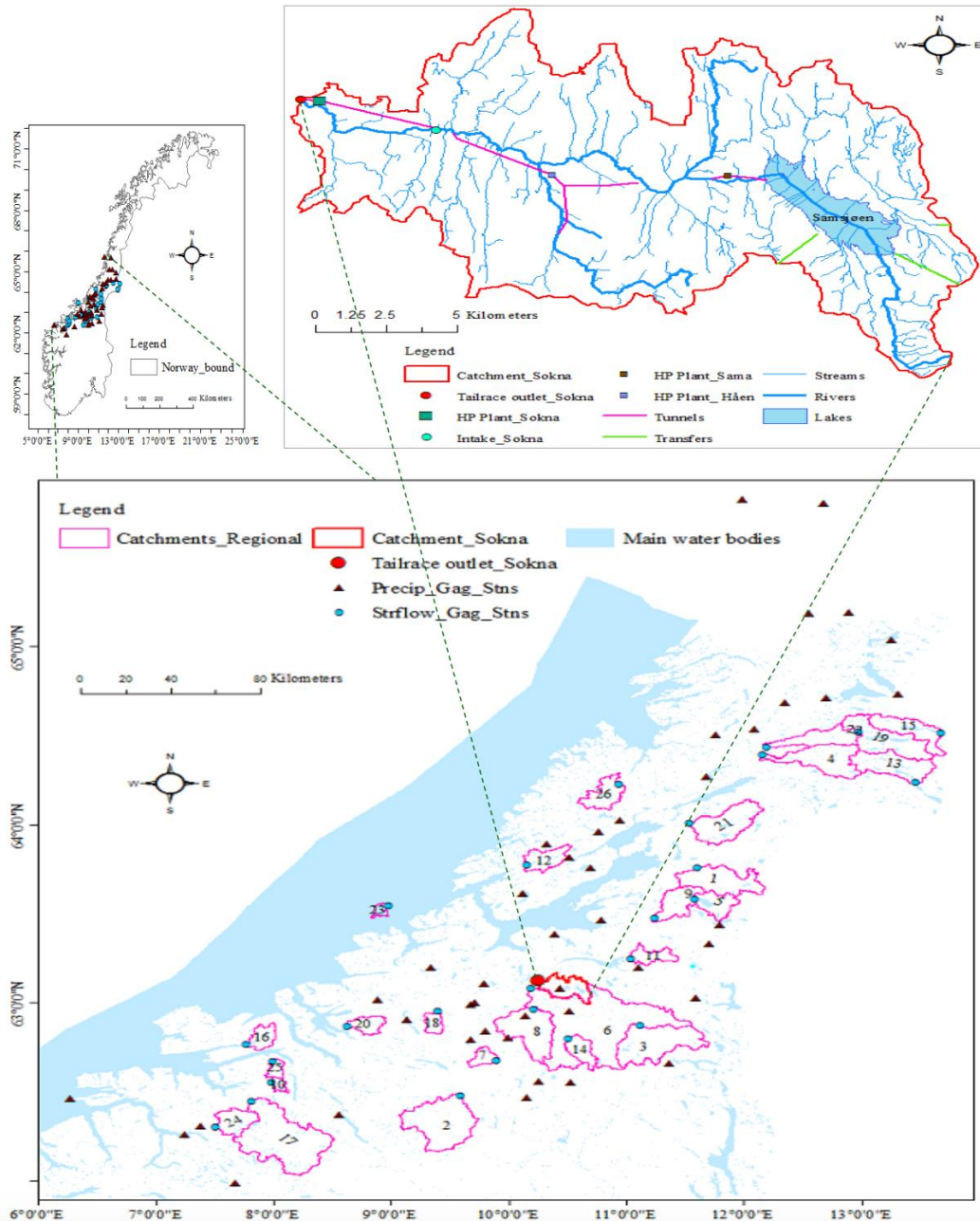


Strategiar

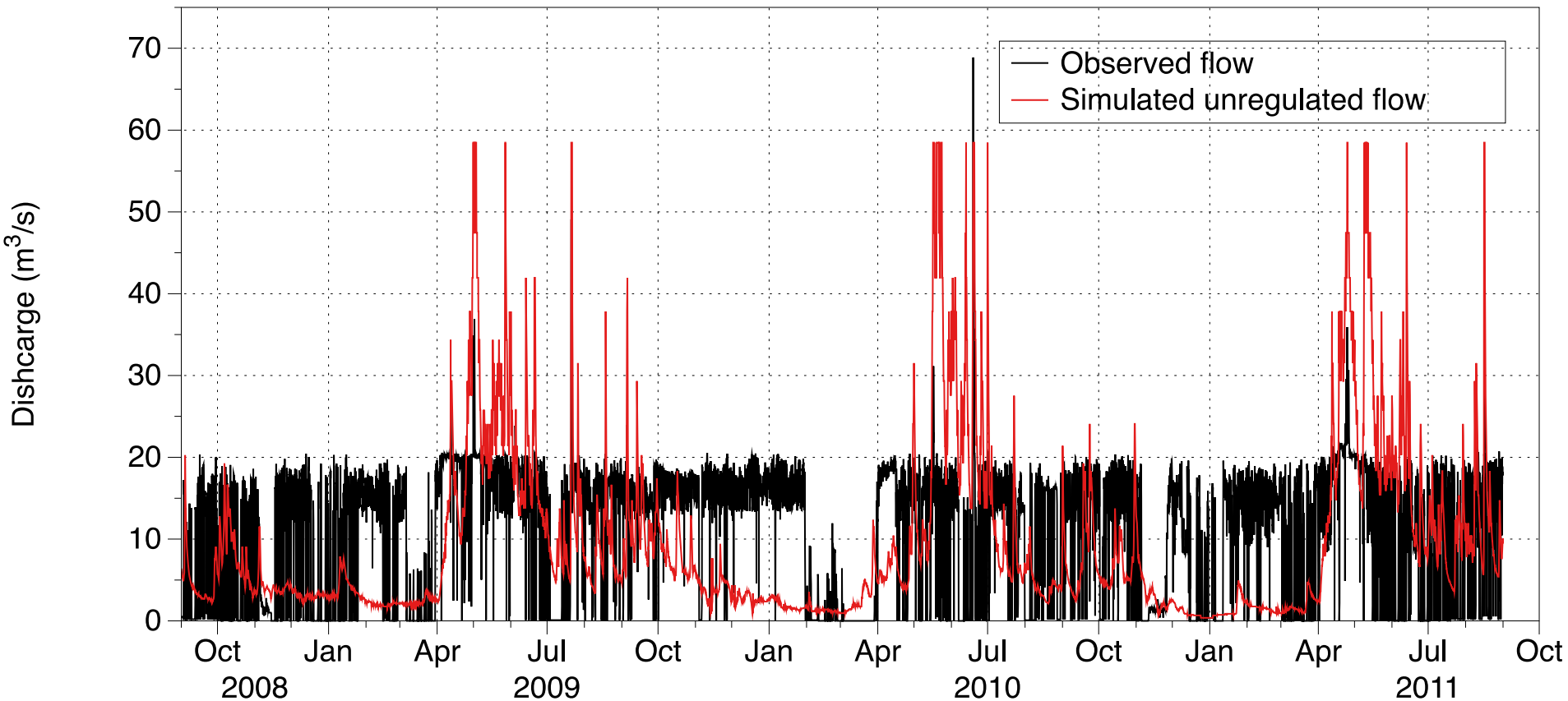
- Samanlikne beste lokale parametersett med regionale parametersett
- Ulike metoder for å finne det regionale settet
 - Maksimalt regionalt vekta gjennomsnitt
 - Median
 - Næraste nabo
 - Fysisk likskap
- Ulike metoder for å generere avrenning
 - HBV, Kirchener



Models and calibration (local or Loc. and regional or Reg.)



Simulated unregulated flow



Resultat frå prosjektet

- Artiklar om erfaringane som er gjort med timesimulering.
- Programmodular klare for bruk i ENKI
- 1 PhD

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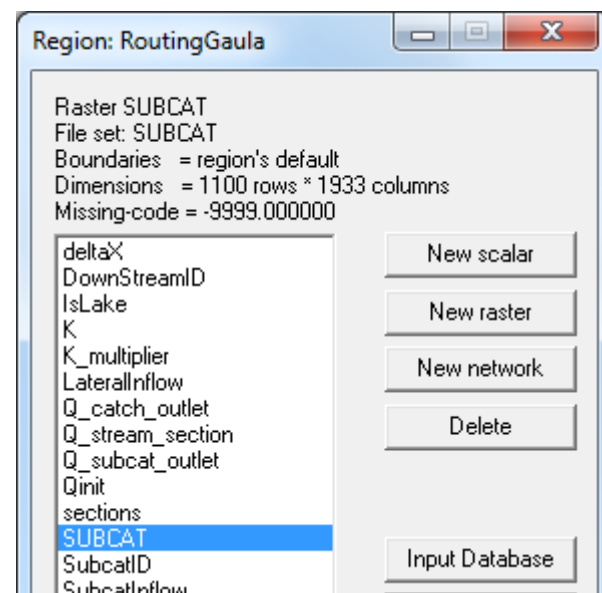
Comparative evaluation of performances of different conceptualisations of distributed HBV runoff response routines for prediction of hourly streamflow in boreal mountainous catchments

Teklu T. Hailegeorgis and Knut Alfredsen

ABSTRACT

Unidentifiability and equifinality of parameters pose challenges to calibration and prediction by conceptual precipitation-runoff models. Evaluation of prediction performances of parametrical

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Litteratur

- Hailegeorgis, TT, K. Alfredsen, YS. Abdella and S. Kolberg "Evaluation of different parameterizations of the spatial heterogeneity of subsurface storage capacity for hourly runoff simulation in boreal mountainous watershed" (*In review Journal of Hydrology*)
- Hailegeorgis, TT. and K. Alfredsen. (2014) "Comparative evaluation of performances of different conceptualizations of distributed HBV runoff response routines for prediction of hourly streamflow in boreal mountainous catchments". *Hydrology Research*
- Hailegeorgis, TT, K. Alfredsen, YS. Abdella and S. Kolberg "Distributed hourly runoff computations in mountainous boreal catchments from 'catchments as simple dynamical systems' storage-discharge relationships". (*in review*)
- Hailegeorgis, TT, K. Alfredsen, YS. Abdella and S. Kolberg. "Evaluation of regionalization methods for hourly continuous streamflow simulation using distributed models in boreal catchments" (*in review, Journal of Hydrologic Engineering*)
- Hailegeorgis, TT and K. Alfredsen. "Multi-basin and regional calibration based identification of distributed Precipitation-Runoff models for prediction of hourly streamflow on 26 catchments in mid-Norway" (*in review, Hydrology Research*)
- Hailegeorgis, TT and K. Alfredsen. "Regional statistical and Precipitation-Runoff modelling for ecological applications: prediction of hourly streamflow in regulated rivers and ungauged basins" (*in review*)
- Hailegeorgis, T.T., Alfredsen, K and Thorolfsson, S.T. Regional Frequency Analysis of Extreme Precipitation with Consideration of Uncertainties to Update IDF Curves for the City of Trondheim. *Journal of Hydrology*, 498, pp.305-318.