

# The Case Study of Pirkanmaa

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# INTRODUCTION

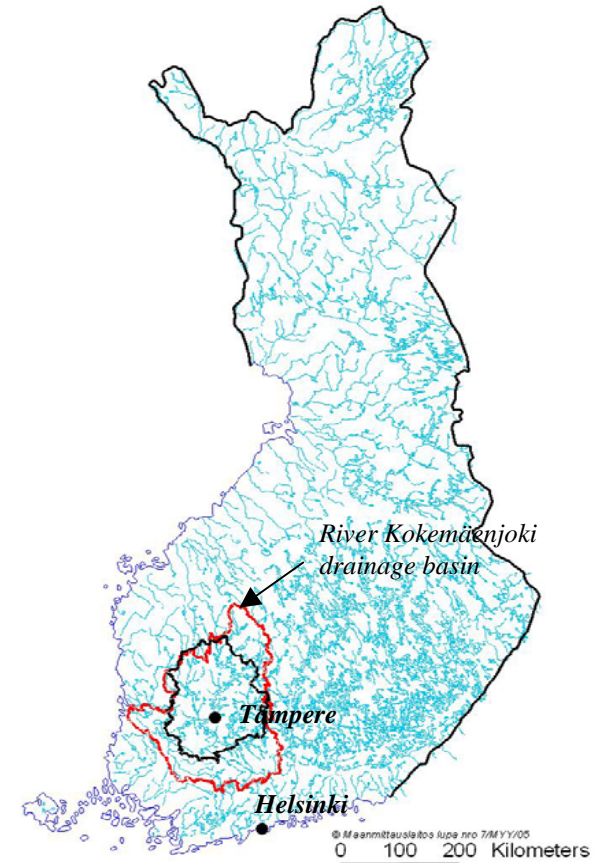


In the case study, the impacts of climate change on nutrient flows into lakes and to the Baltic Sea from the drainage basin of River Kokemäenjoki are estimated.

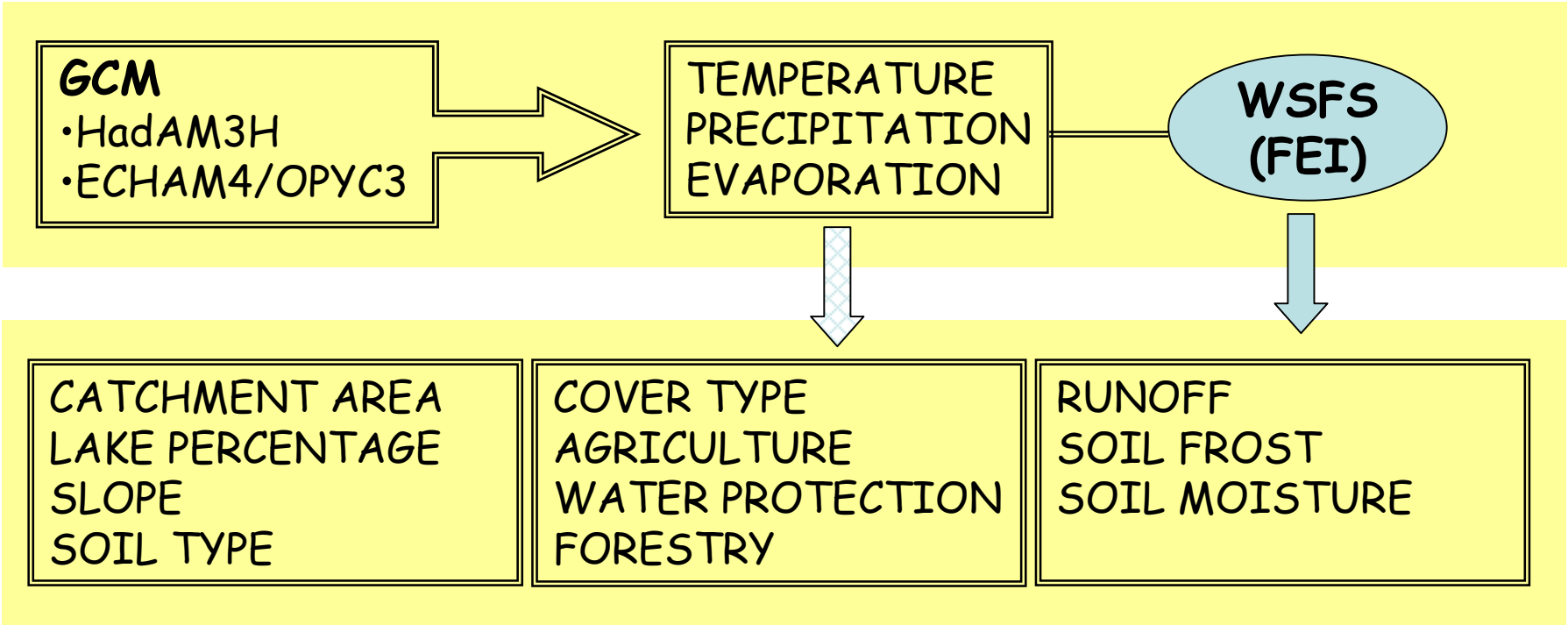
Eutrophication of the Baltic Sea and inland waters is a major environmental problem in Finland.

The reason for eutrophication is increased input of nutrients. Both phosphorus and nitrogen are important.

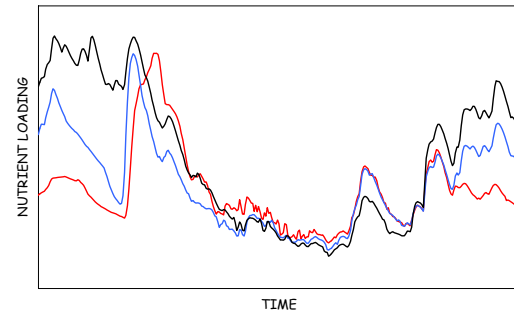
In lakes, phosphorus is a more important eutrophying factor, whereas in the Baltic Sea nitrogen is generally considered to be more important.

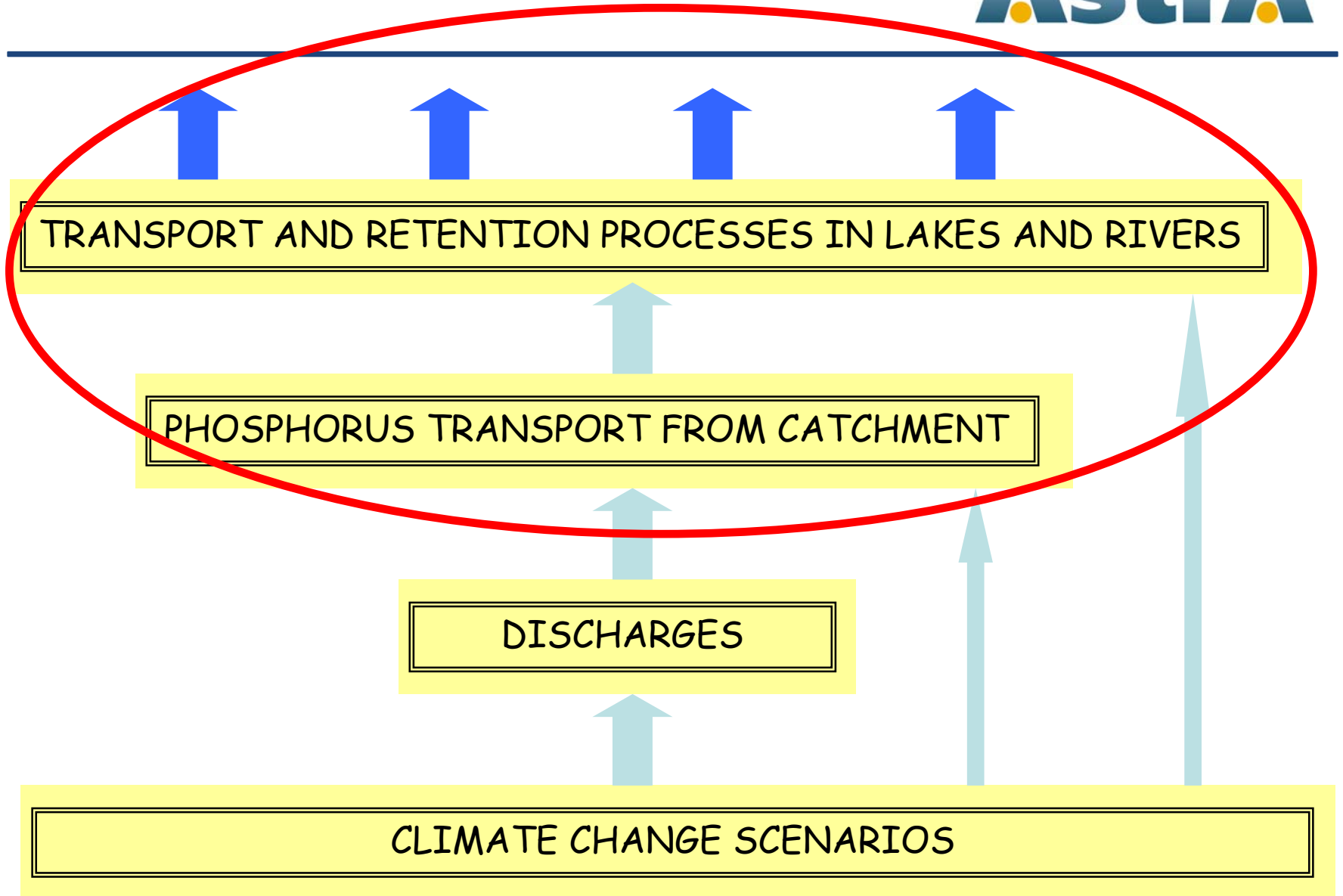


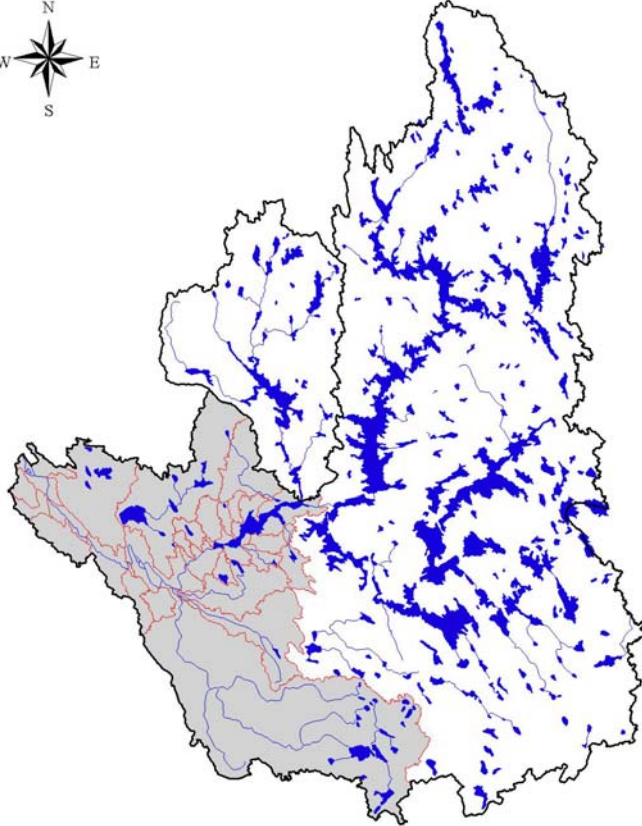
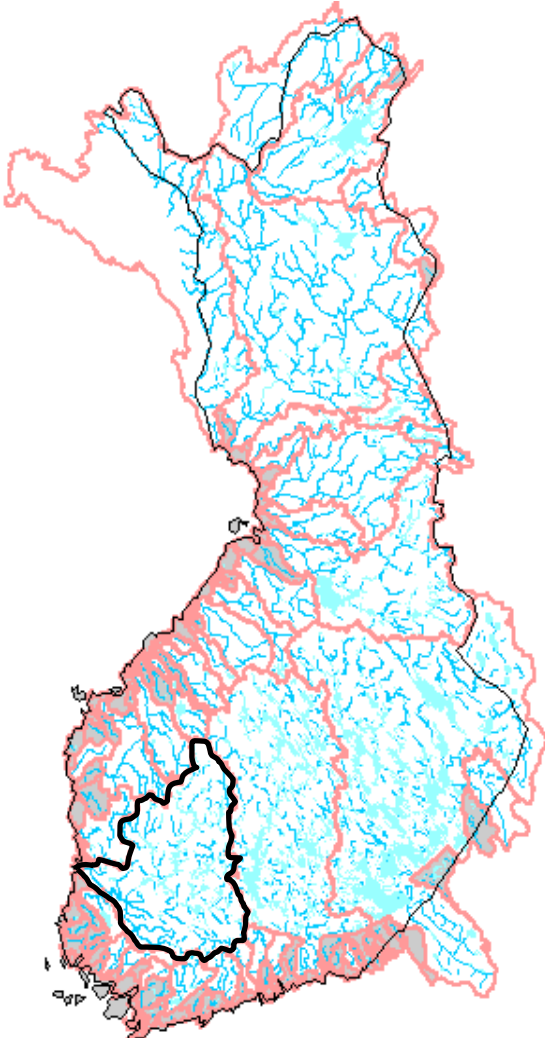
© Maanmittauslaitos Aune nro 7/MYY/05  
0 100 200 Kilometers



ASSESSED NUTRIENT  
LOADING IN CLIMATE  
CHANGE



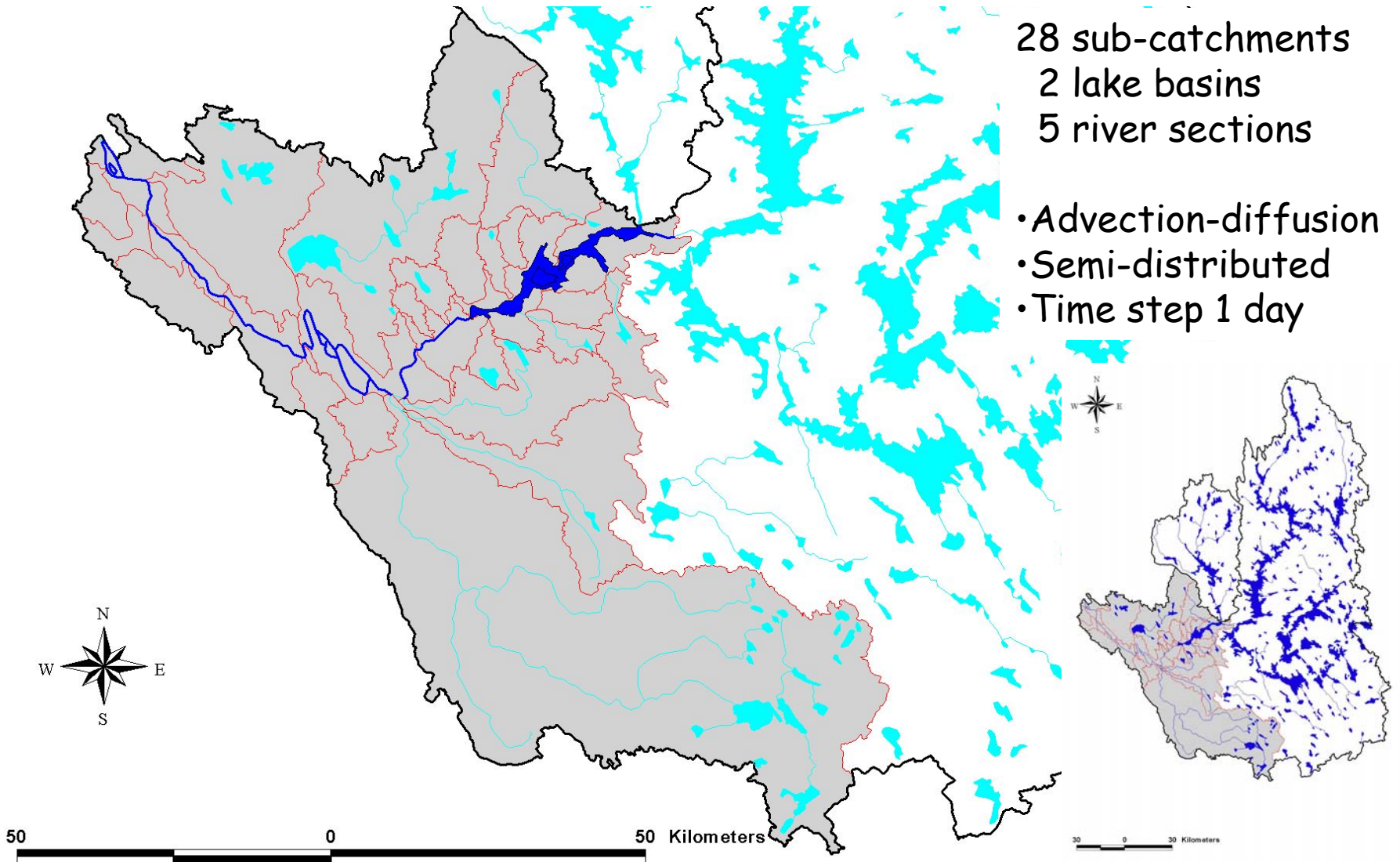




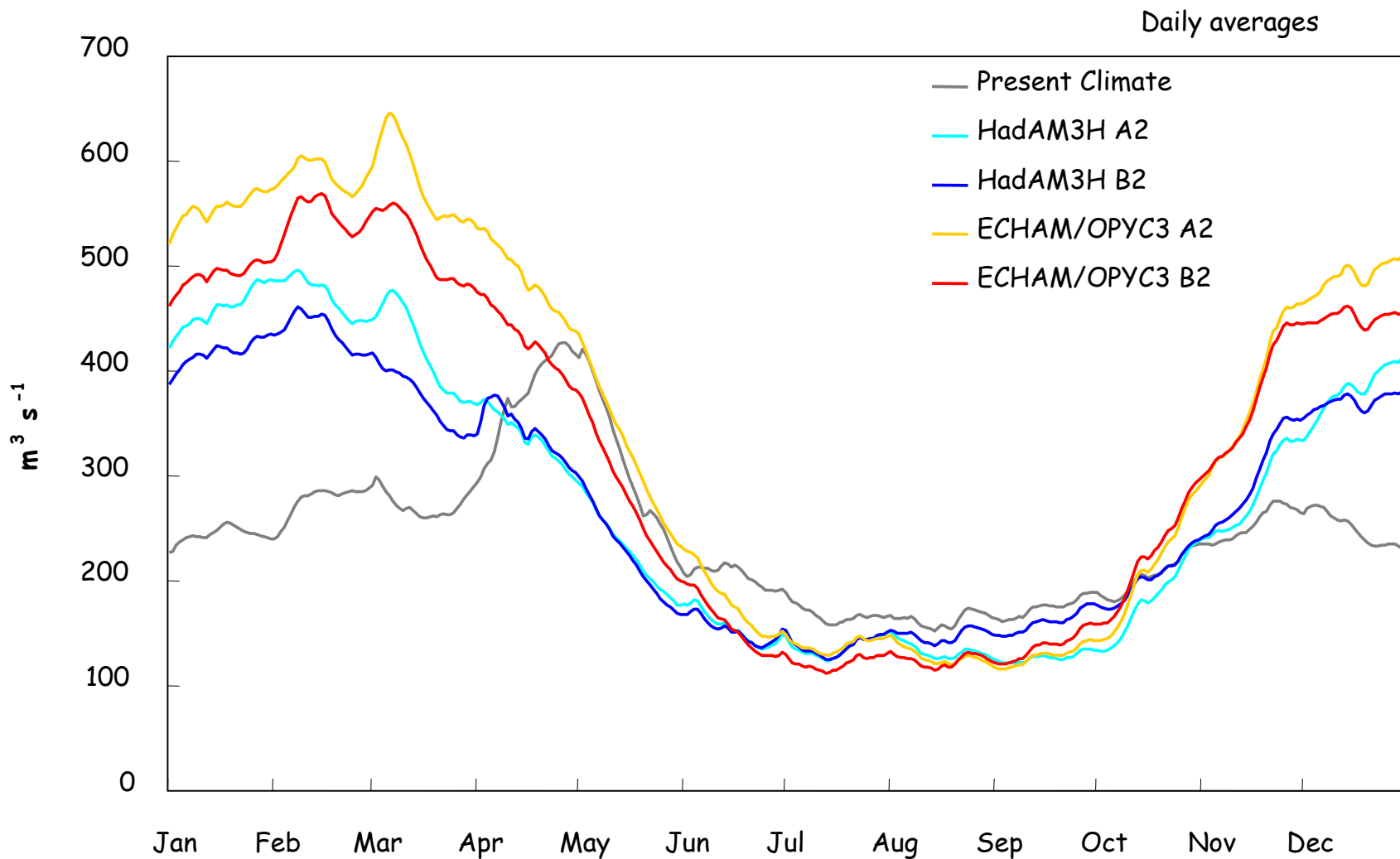
30 0 30 Kilometers

28 sub-catchments  
2 lake basins  
5 river sections

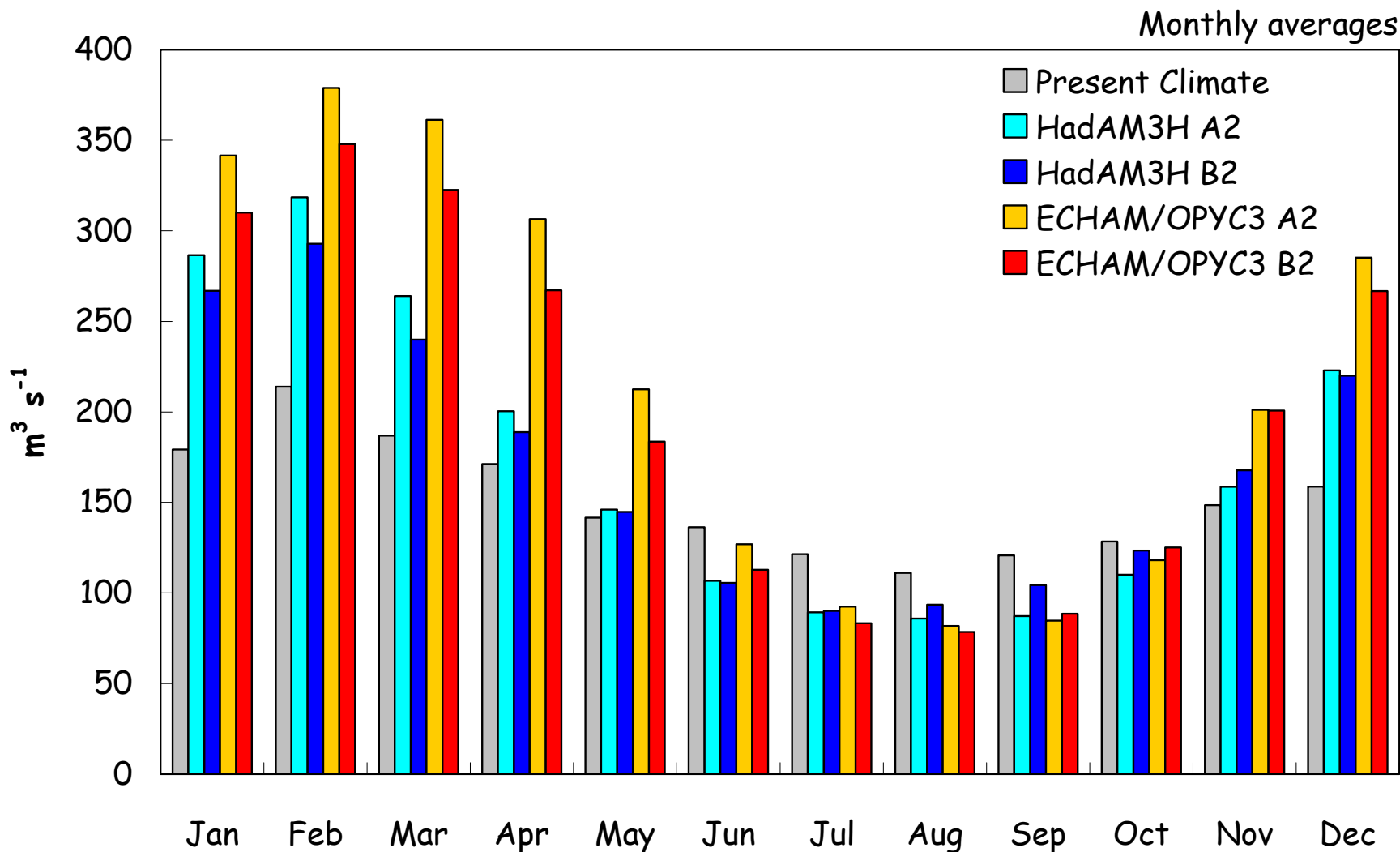
- Advection-diffusion
- Semi-distributed
- Time step 1 day



# Discharge at the outlet of River Kokemäenjoki catchment



# Discharge at the outlet of River Kokemäenjoki catchment



# Monthly relative changes to discharge from River Kokemäenjoki catchment to Baltic Sea



Month	HadAM3H A2	HadAM3H B2	ECHAM/OPYC3 A2	ECHAM/OPYC3 B2
Jan	188 %	171 %	228 %	202 %
Feb	172 %	159 %	213 %	198 %
Mar	154 %	137 %	213 %	190 %
Apr	90 %	91 %	130 %	114 %
May	74 %	72 %	105 %	90 %
Jun	76 %	75 %	88 %	77 %
Jul	82 %	82 %	83 %	73 %
Aug	82 %	91 %	78 %	76 %
Sep	73 %	92 %	74 %	79 %
Oct	88 %	99 %	102 %	108 %
Nov	111 %	117 %	149 %	146 %
Dec	153 %	148 %	197 %	181 %
	114 %	113 %	145 %	133 %

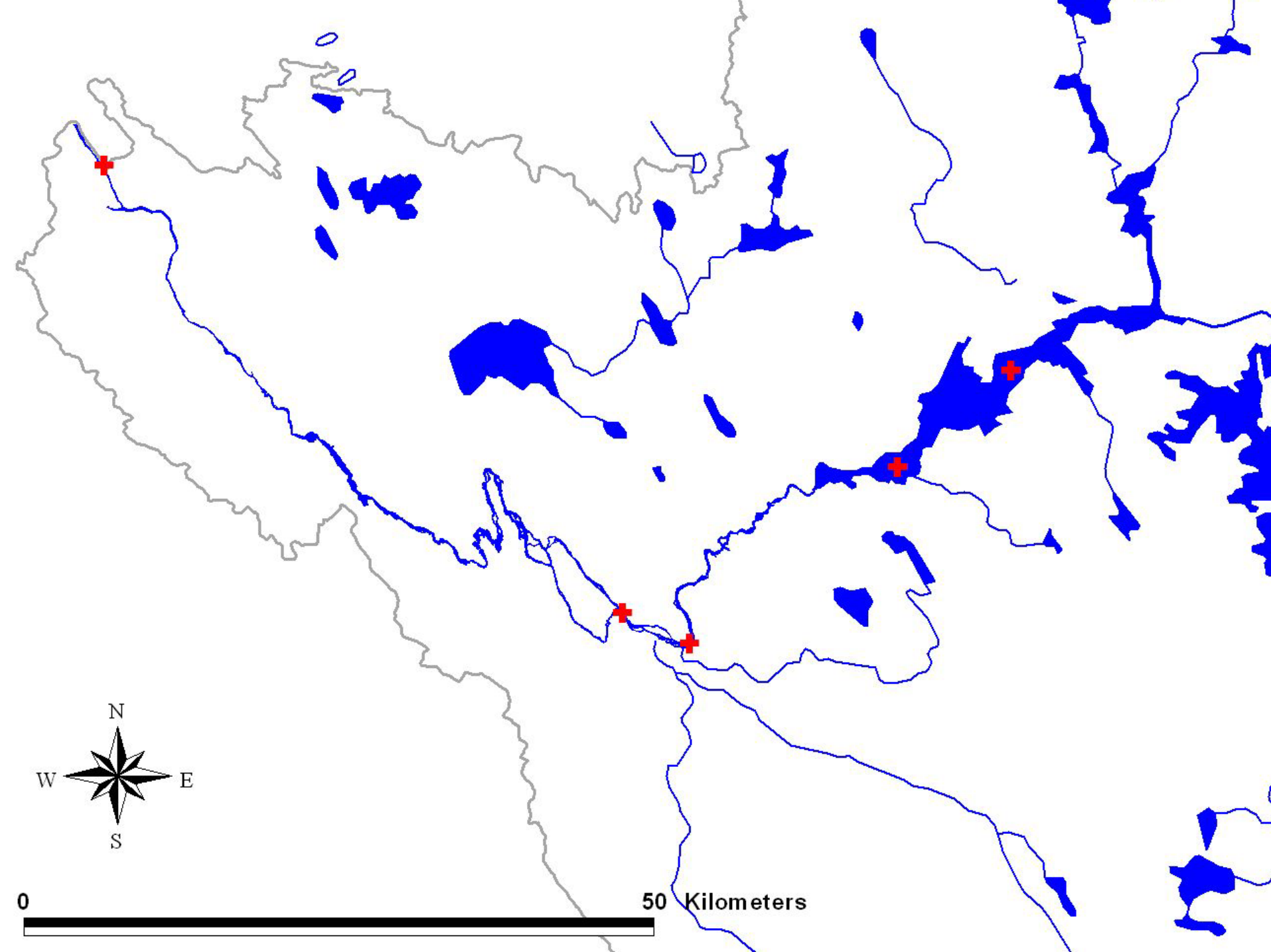
~~Next Step~~  
In Progress



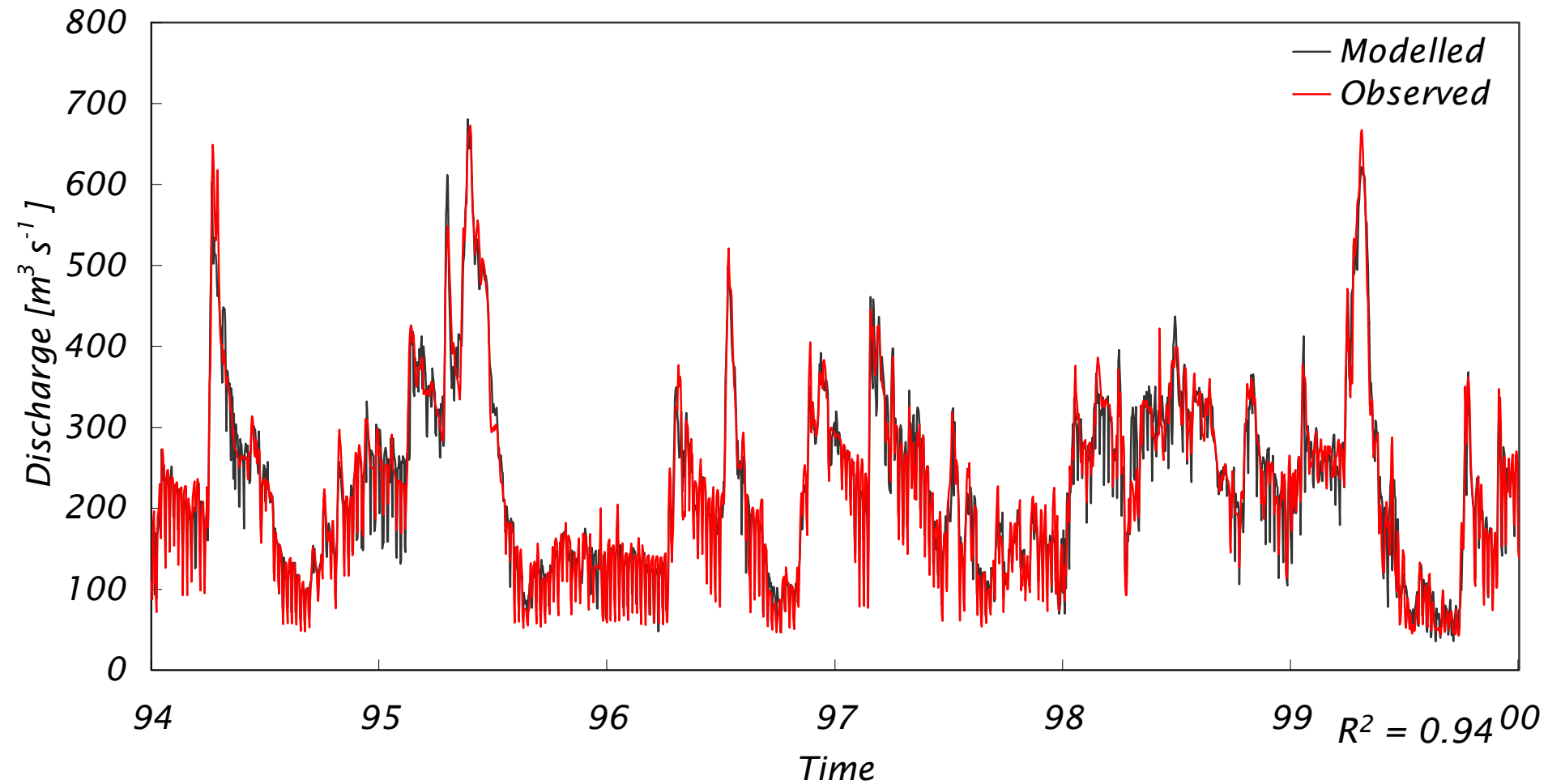
- 
- ✓ To implement water quality (simulations) into the modelling system

i.e.

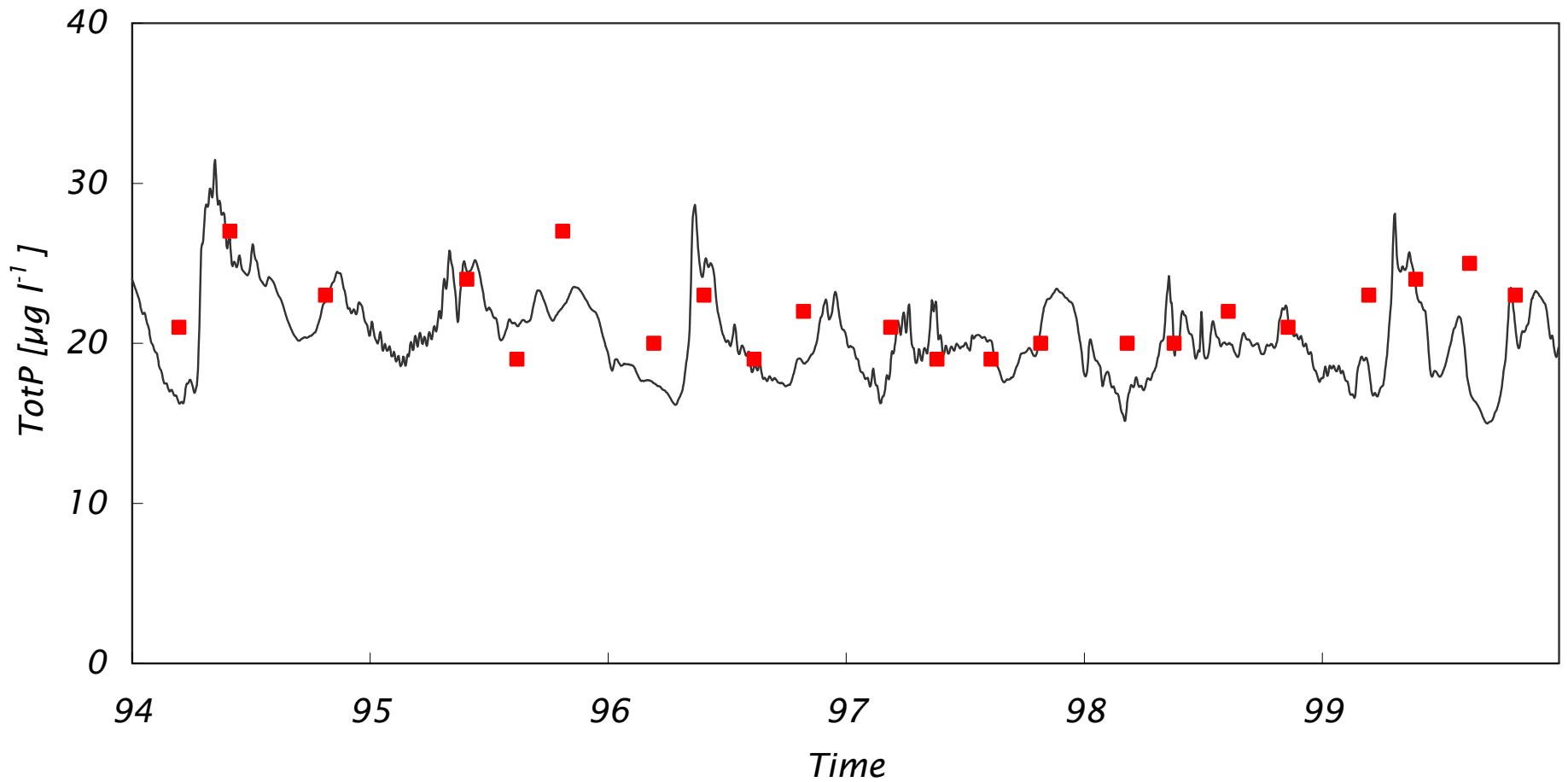
- ✓ Integration of hydrological, nutrient loading and lake & river section models



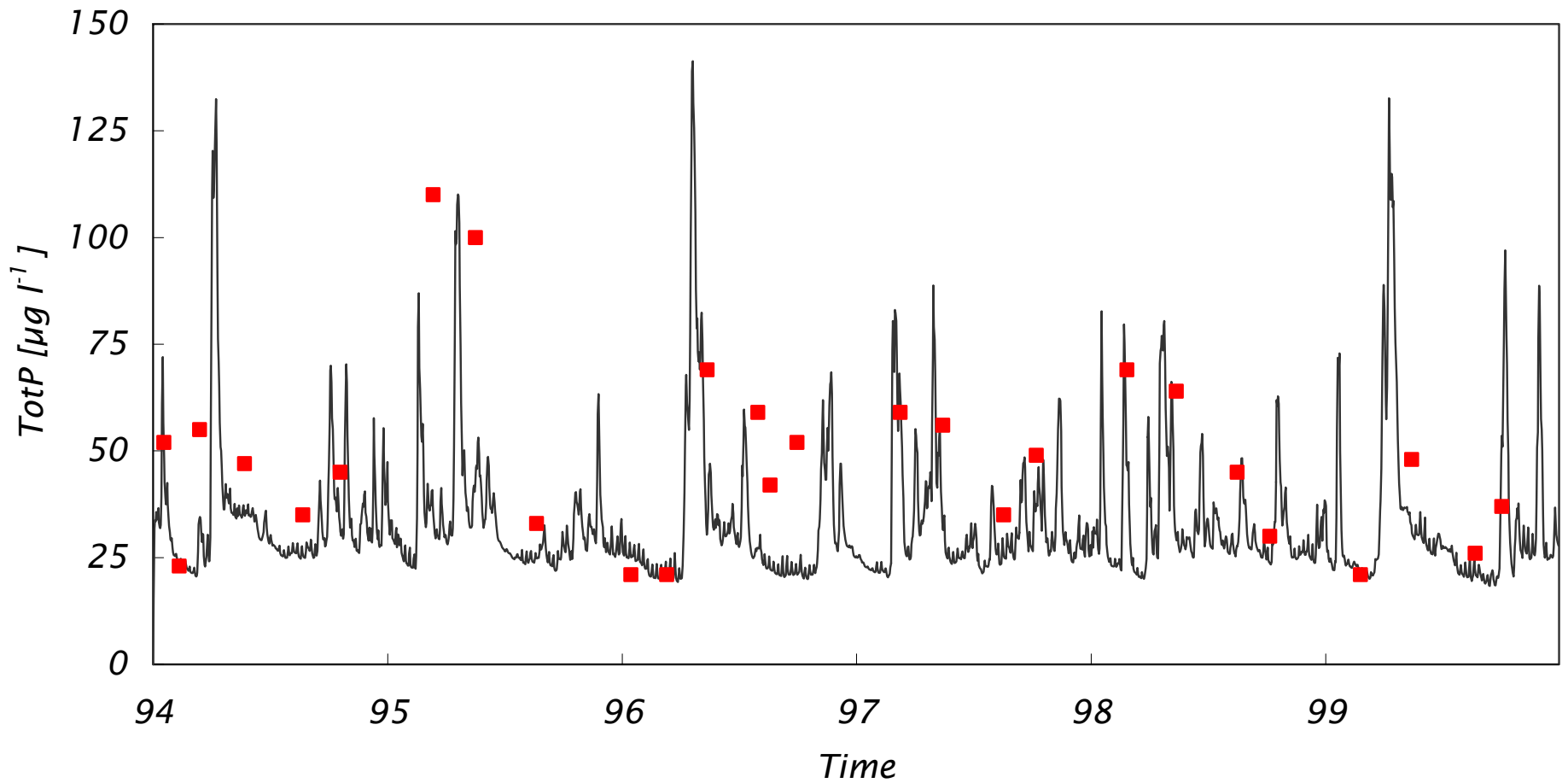
*Pori - Outflow*



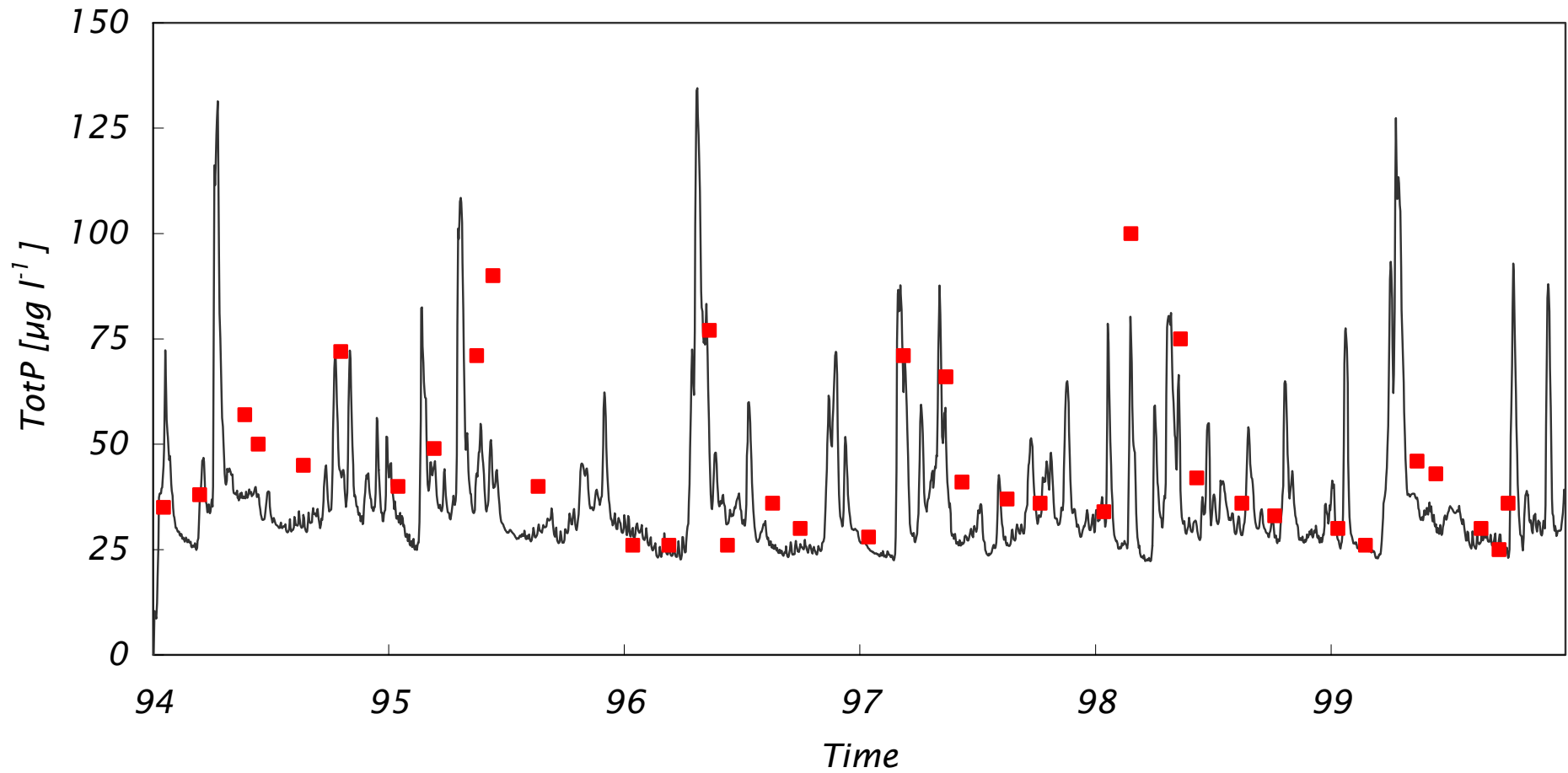
*Kulovesi*



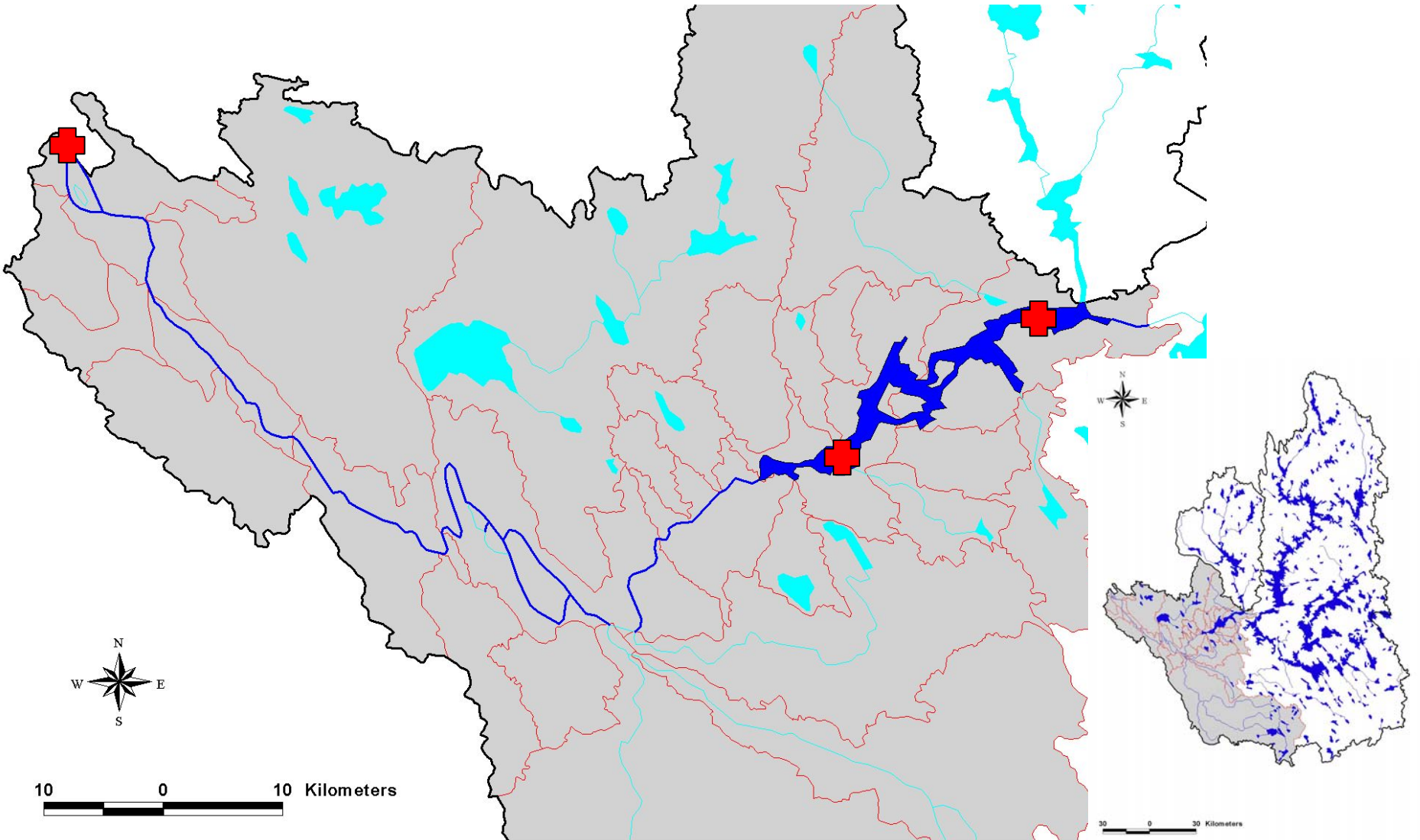
*Kojo 13 Kiettareen yp*



*Pori*







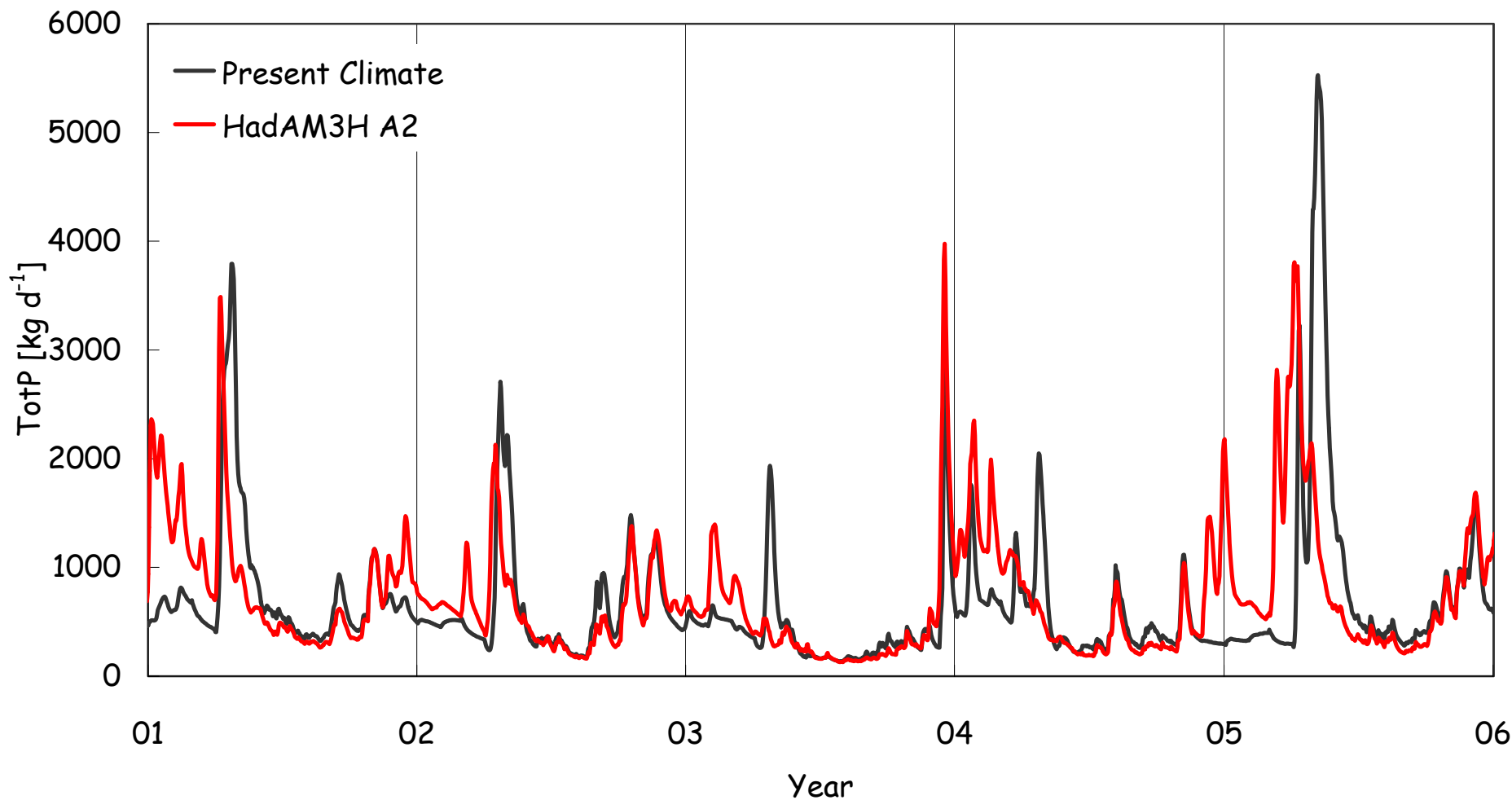
# Temperature and precipitation changes in River Kokemäenjoki catchment (RCAO)



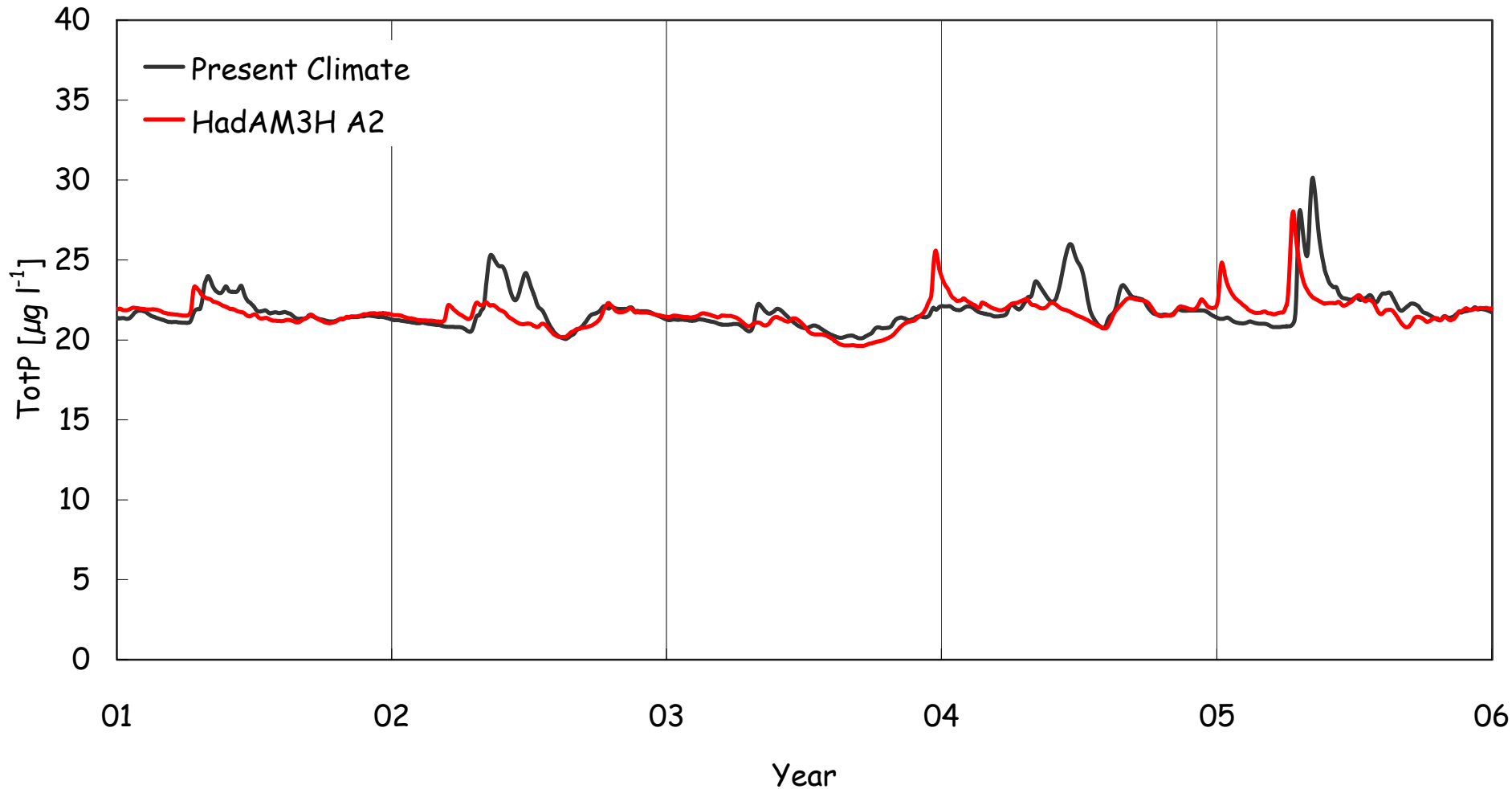
Month	1	2	3	4	5	6	7	8	9	10	11	12
Temperature change [°C] HadAM3 A2	5,48	3,77	3,92	4,45	4,33	2,83	3,00	2,91	3,71	4,05	4,67	5,57
HadAM3 B2	4,40	3,24	3,13	3,46	2,78	1,15	0,72	1,82	2,63	3,04	3,48	3,75
ECHAM4 A2	7,04	7,34	6,34	4,69	3,54	2,83	2,98	3,64	3,77	4,36	5,54	5,34
ECHAM4 B2	5,38	5,97	5,31	3,53	2,95	2,34	2,14	2,68	2,84	3,16	4,44	4,23
Precipitation change [%] HadAM3 A2	51,0	28,3	3,5	8,2	19,2	30,5	8,2	-16,3	-12,1	16,3	12,7	28,3
HadAM3 B2	23,3	28,4	-3,7	8,1	-1,2	43,5	11,0	-3,1	4,8	-0,3	18,8	19,4
ECHAM4 A2	60,8	70,7	58,0	51,2	22,8	11,1	2,4	-22,9	-1,5	38,5	47,7	43,3
ECHAM4 B2	40,8	70,7	32,7	29,0	10,2	4,8	0,8	-12,4	8,6	33,5	40,8	26,7

- the Rossby Centre coupled Regional Climate Model RCAO
- two Global Climate Models : HadAM3H and ECHAM4/OPYC3 and emissions scenarios (SRES A2 and B2).

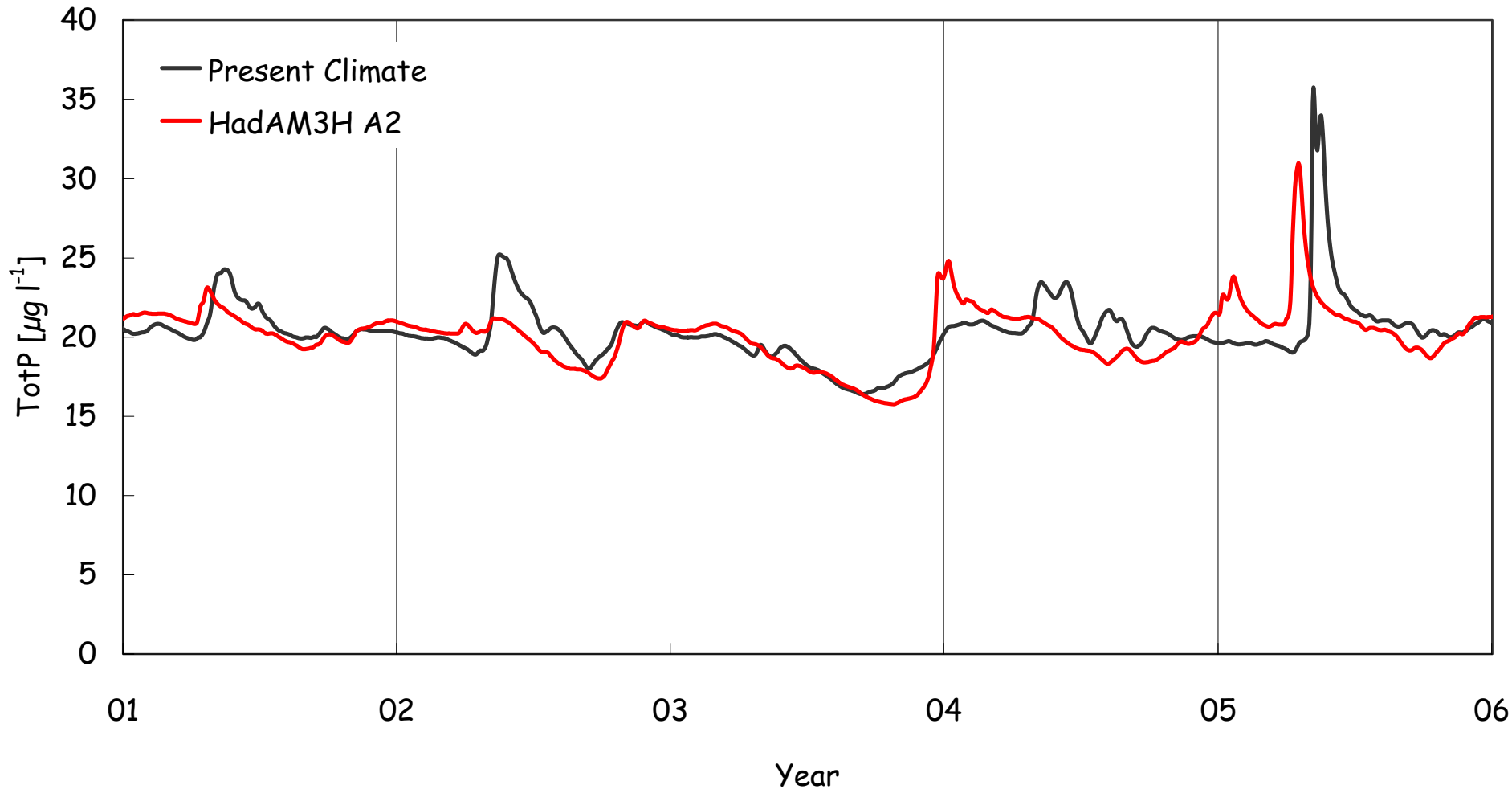
# Phosphorus Loading at the outlet of River Kokemäenjoki catchment



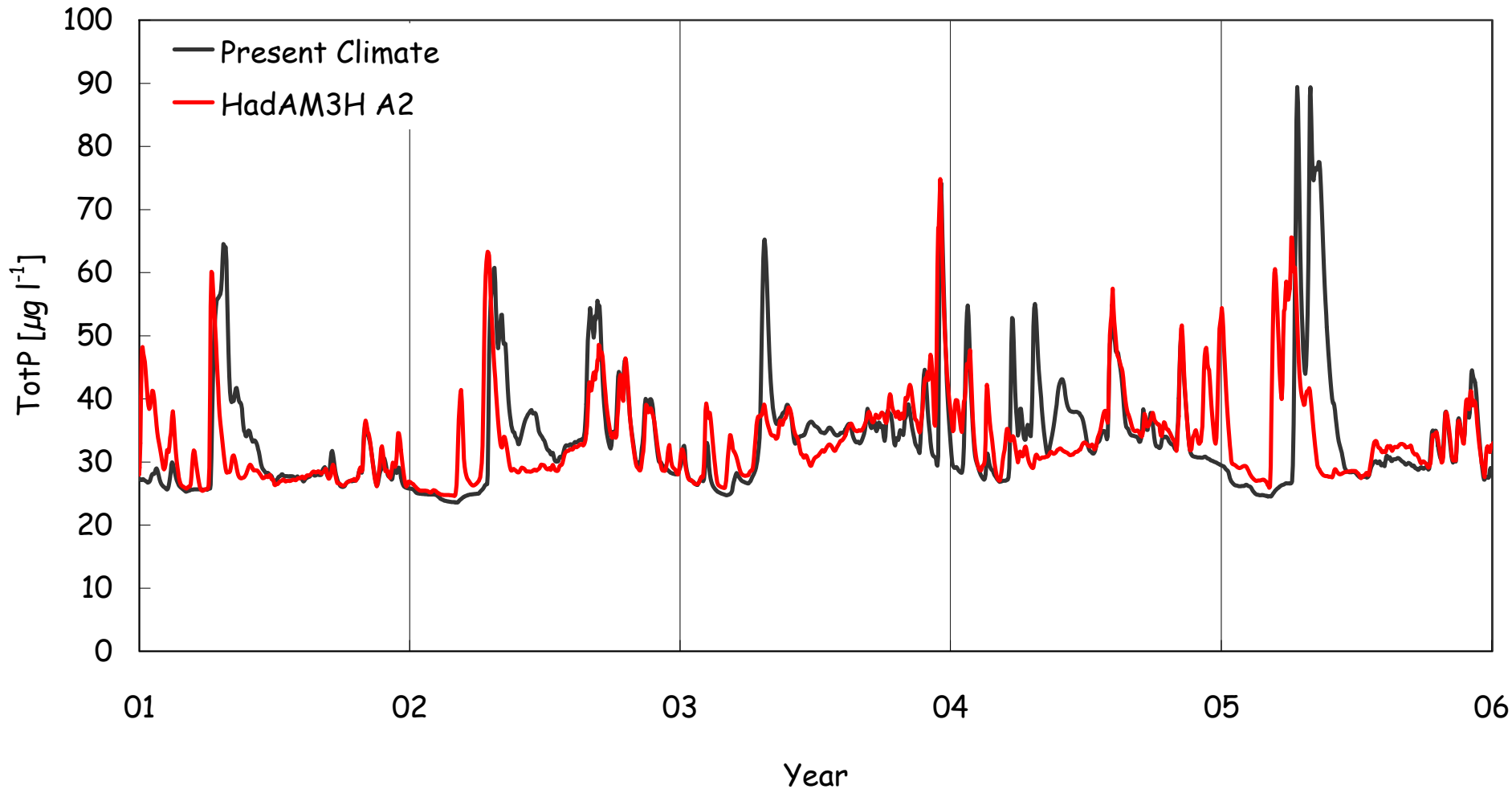
# Phosphorus Concentration Lake Kulovesi



# Phosphorus Concentration Lake Rautavesi



# Phosphorus Concentration at the outlet of River Kokemäenjoki catchment



# Thank You



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