Efnaflutningar straumvatna

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University of Iceland

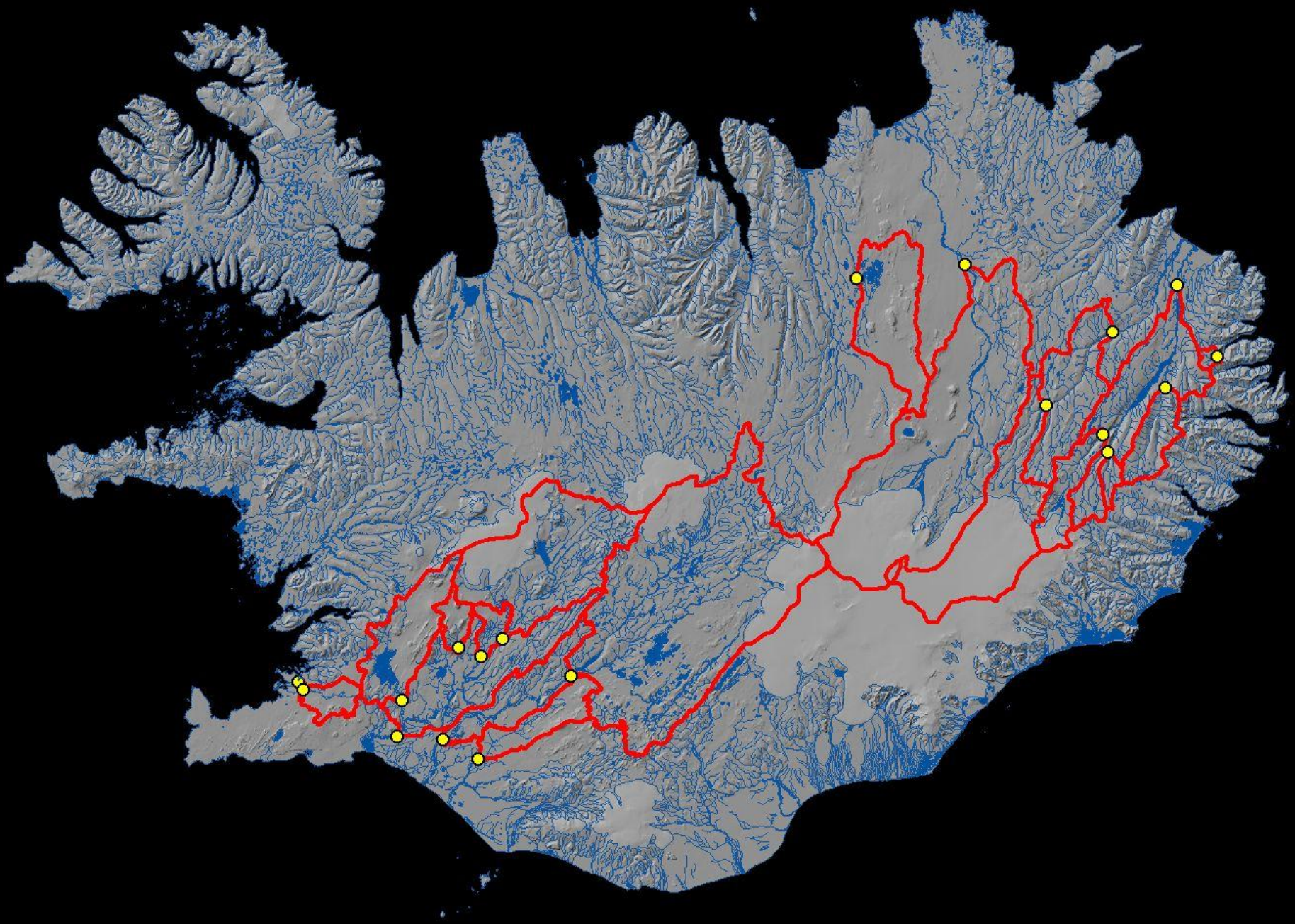
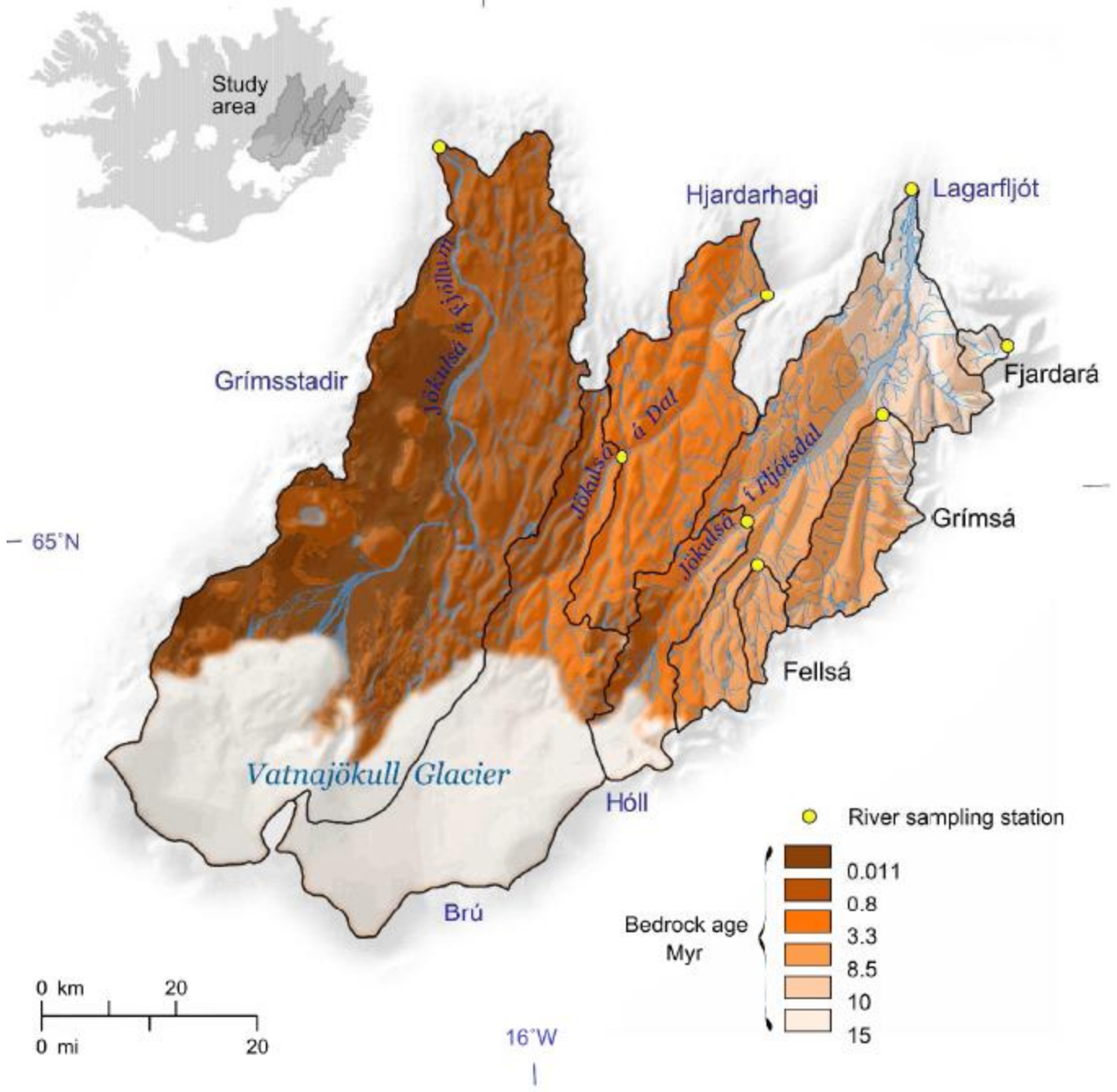
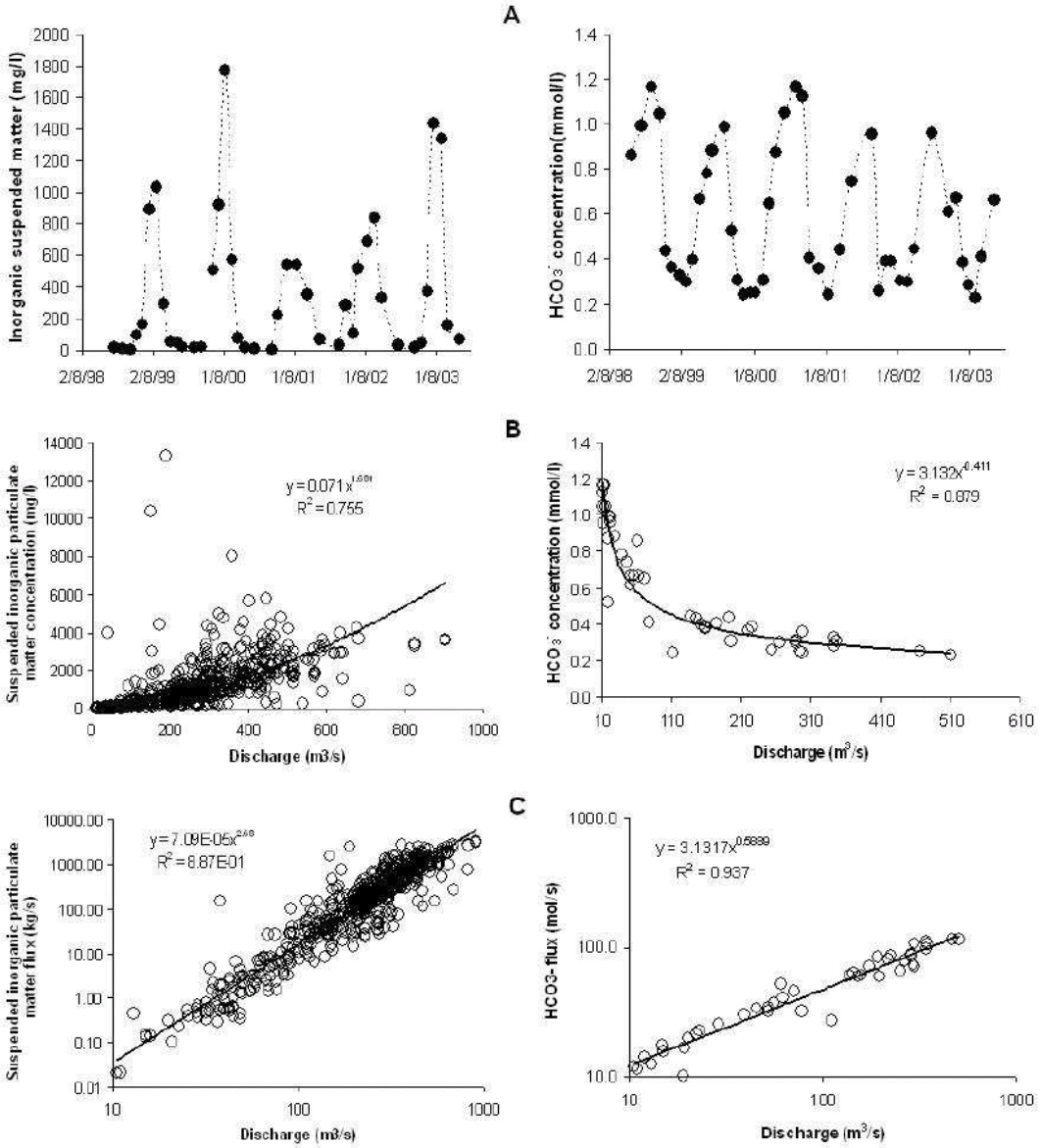


Photo: E. S. Eiríksdóttir

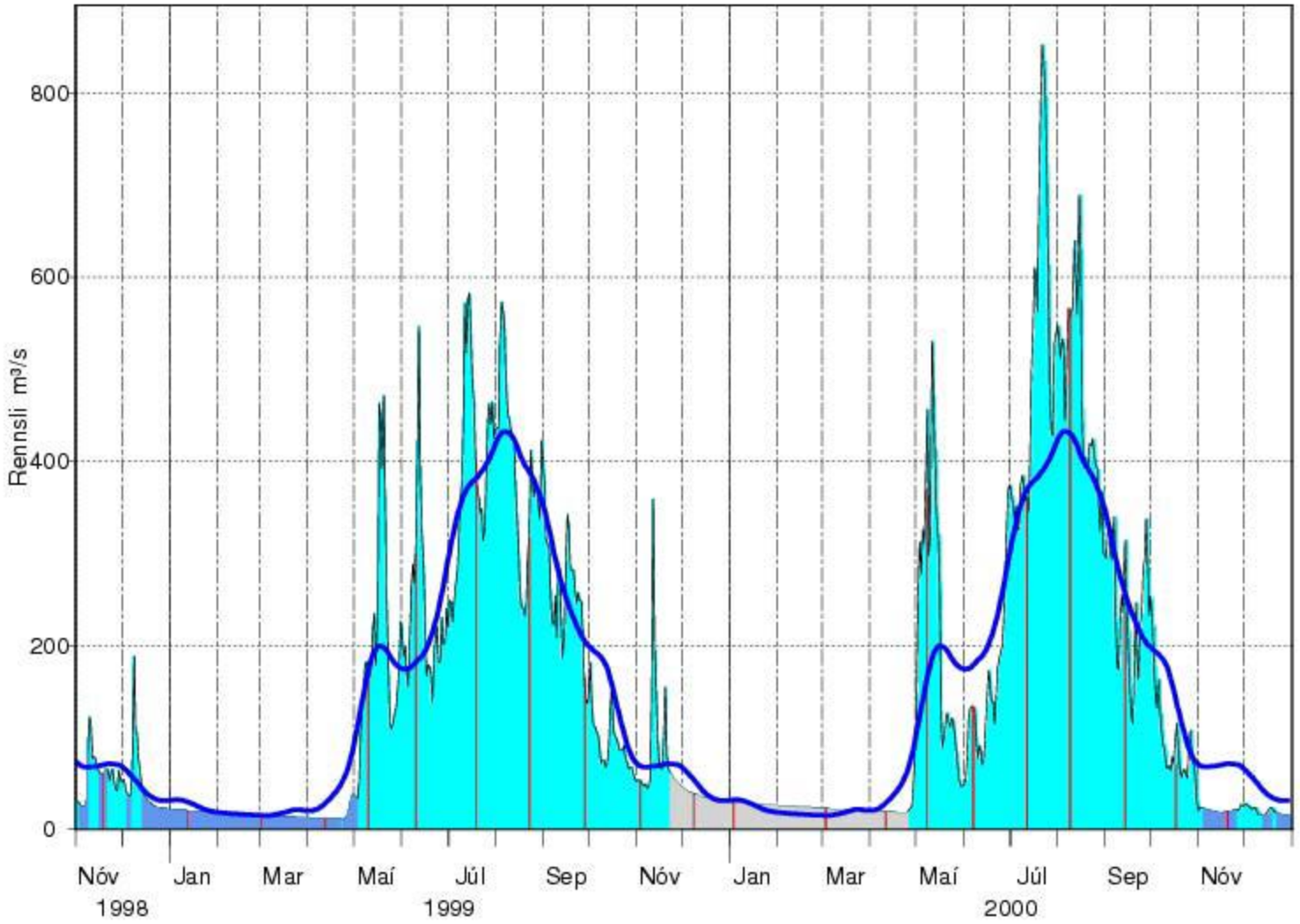

Study area
Hjardarhagi
Lagarfljót
Fjardará
Grímsstadir
Jökulsá á Fjöllum
Jökulsá á Dal
Jökulsá í Fljótsdal
Grímsá
Fellsá
Vatnajökull Glacier
Hóll
Brú
65°N
16°W
River sampling station
Bedrock age Myr
0.011
0.8
3.3
8.5
10
15
0 km 20
0 mi 20



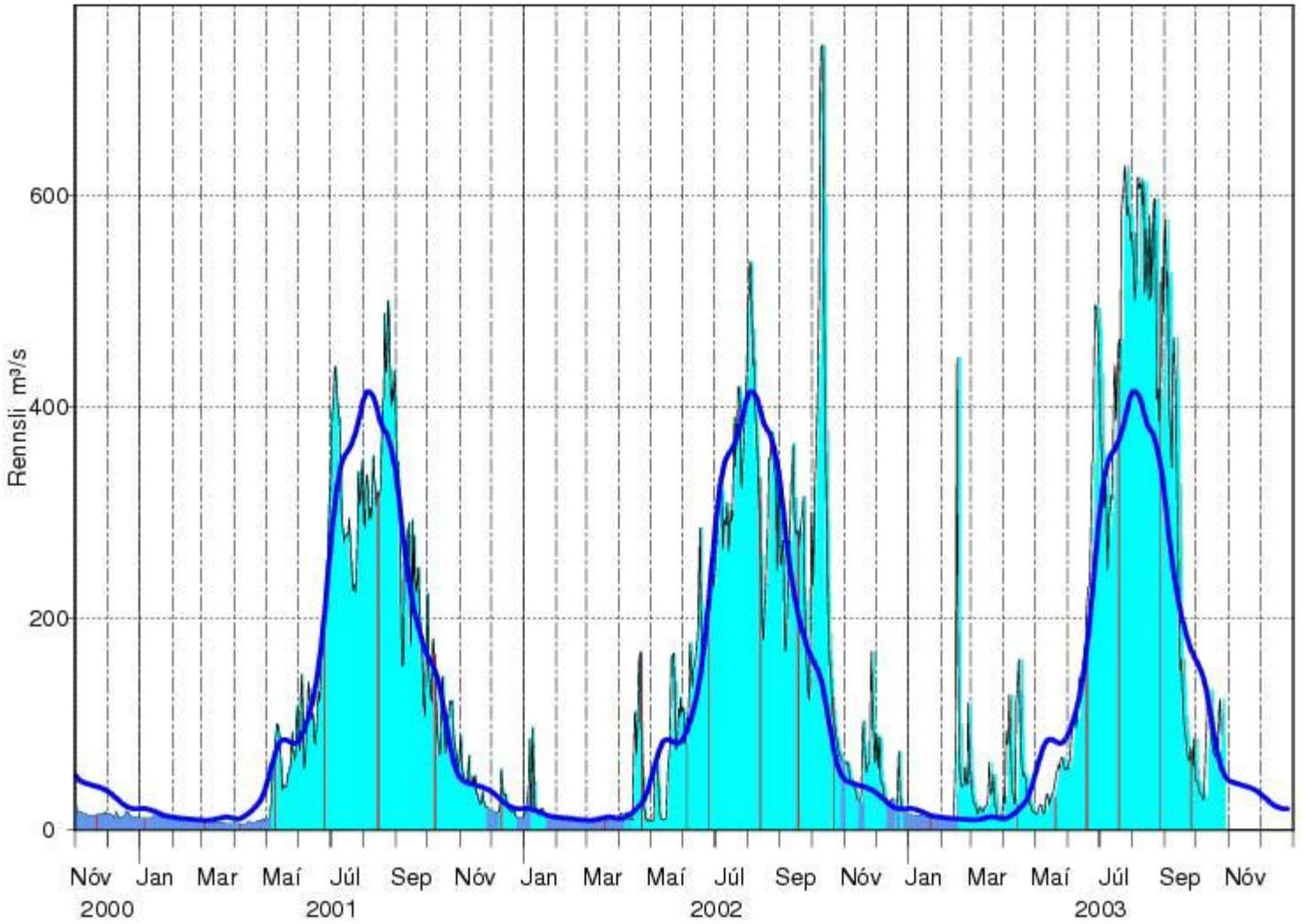
Gislason Jökull 2008

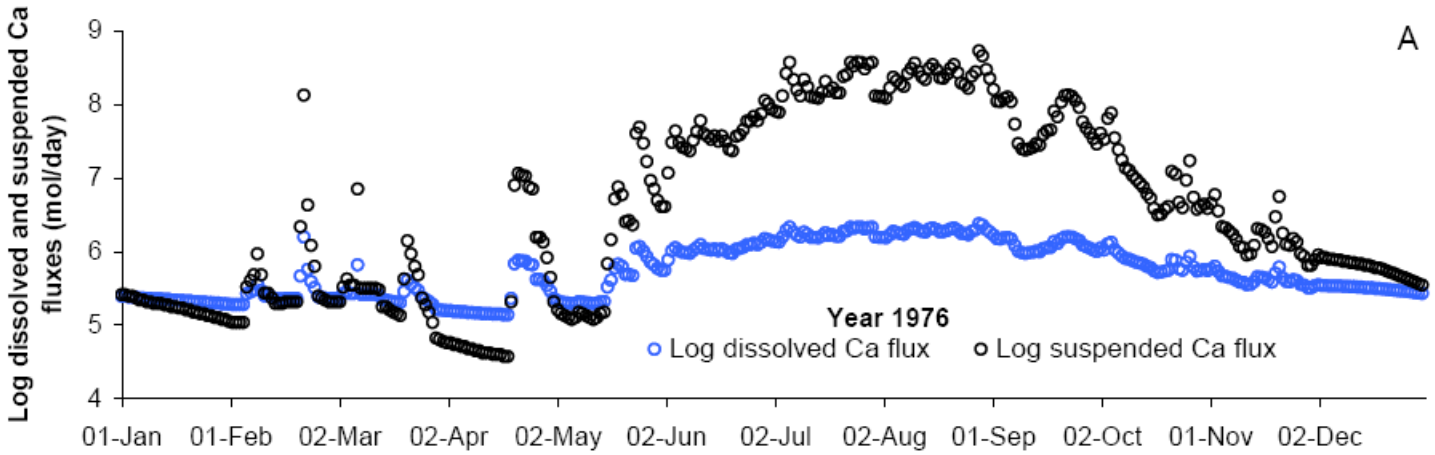
Figure 2. River suspended and dissolved concentrations and discharge at the Hjardarhagi station on the River Jökulsá á Dal. A) River suspended inorganic particulate matter (mg/l) and dissolved HCO_3- concentrations versus time. B) River suspended inorganic particulate matter (mg/l) and dissolved HCO_3- concentrations versus discharge. C) River suspended inorganic particulate matter flux (kg/s) and dissolved HCO_3- flux (mol/s) versus discharge. The data are from; Pálsson and Vigfússon 1996; Gislason *et al.*, 2004. – *Svifaur, uppleyst efni og*

Jökulsá á Dal; Hjarðarhagi vhm110 frá nóvember 1998 til desember 2000



Jökulsá á Dal; brú vhm236 frá nóvember 2000 til desember 2003



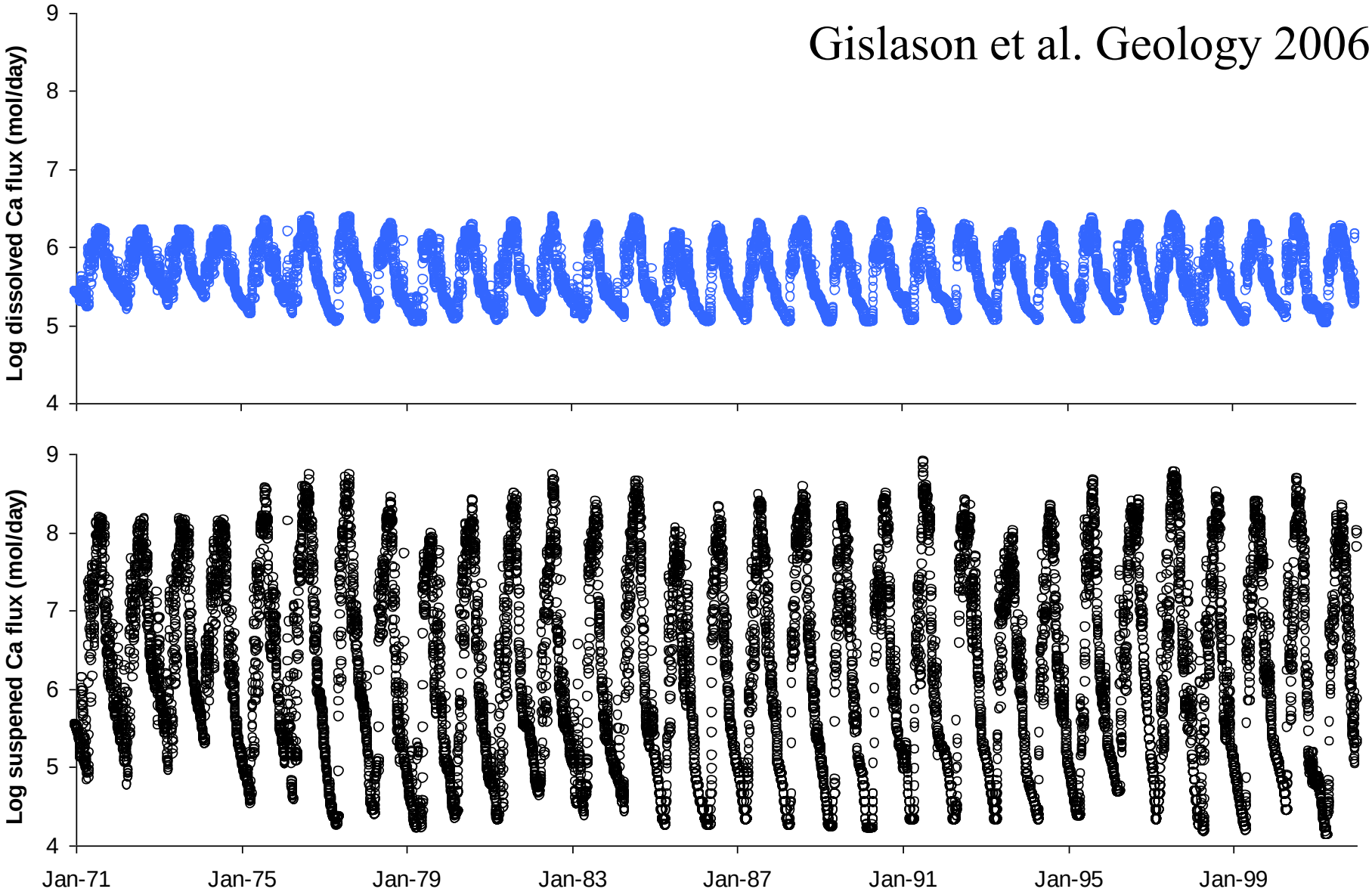


Gislason, Oelkers and Snorrason, Geology 2006

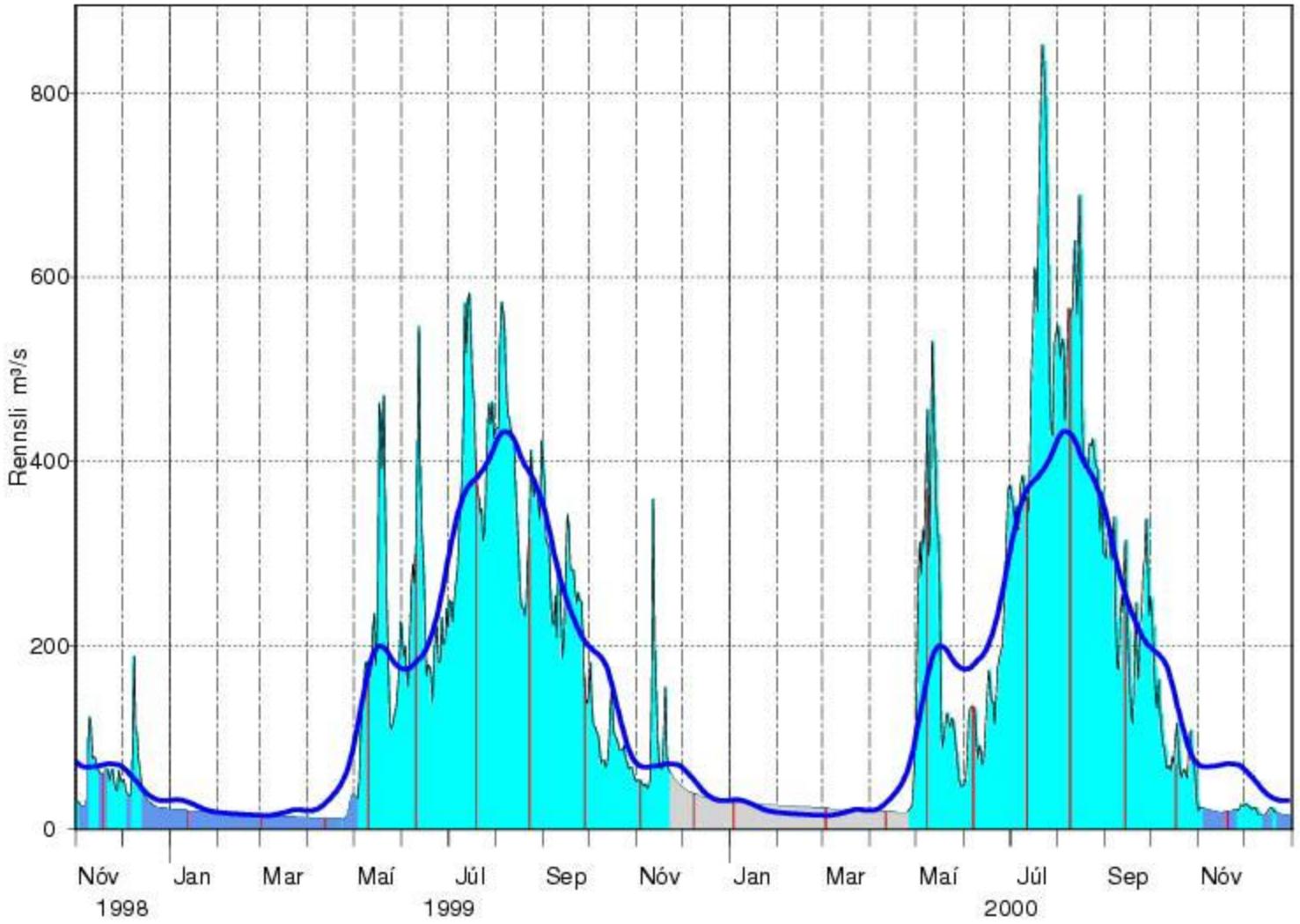
Continuous discharge measurements for the last 40 years

photo.: Guðrún Gísladóttir

Daily average suspended and dissolved Ca-fluxes in river Jökulsá á Dal at Brú for the last 3 decades



Jökulsá á Dal; Hjarðarhagi vhm110 frá nóvember 1998 til desember 2000



Both plagioclase and volcanic glass are unstable in seawater. As soon as they are exposed to seawater they start to dissolve.

(Brady and Gislason 1997 GCA; Stefánsdóttir and Gislason EPSL 2005)

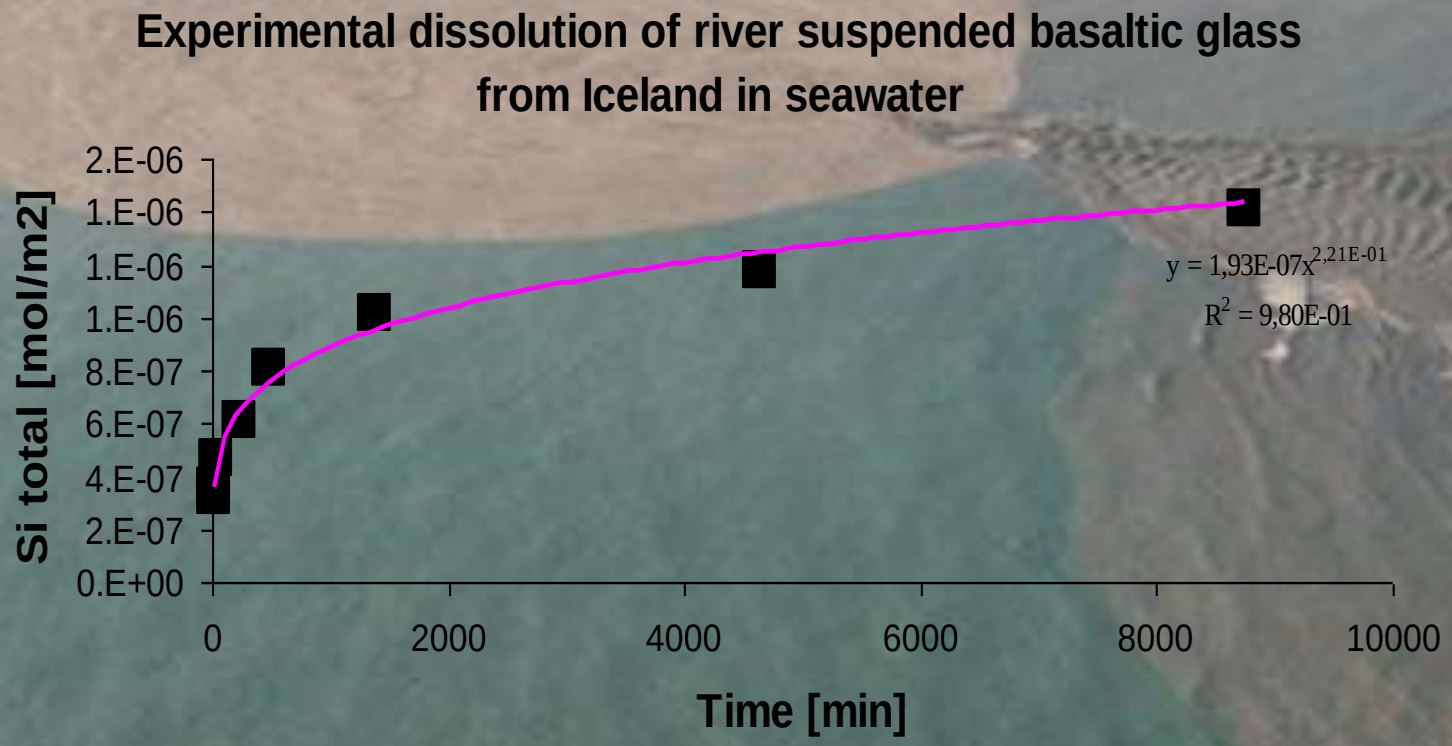


Photo: M.T. Gudmundsson

CO_2 fixation by photosynthesis

$$CO_2 + H_2O \longrightarrow \mathbf{CH_2O} + O_2$$

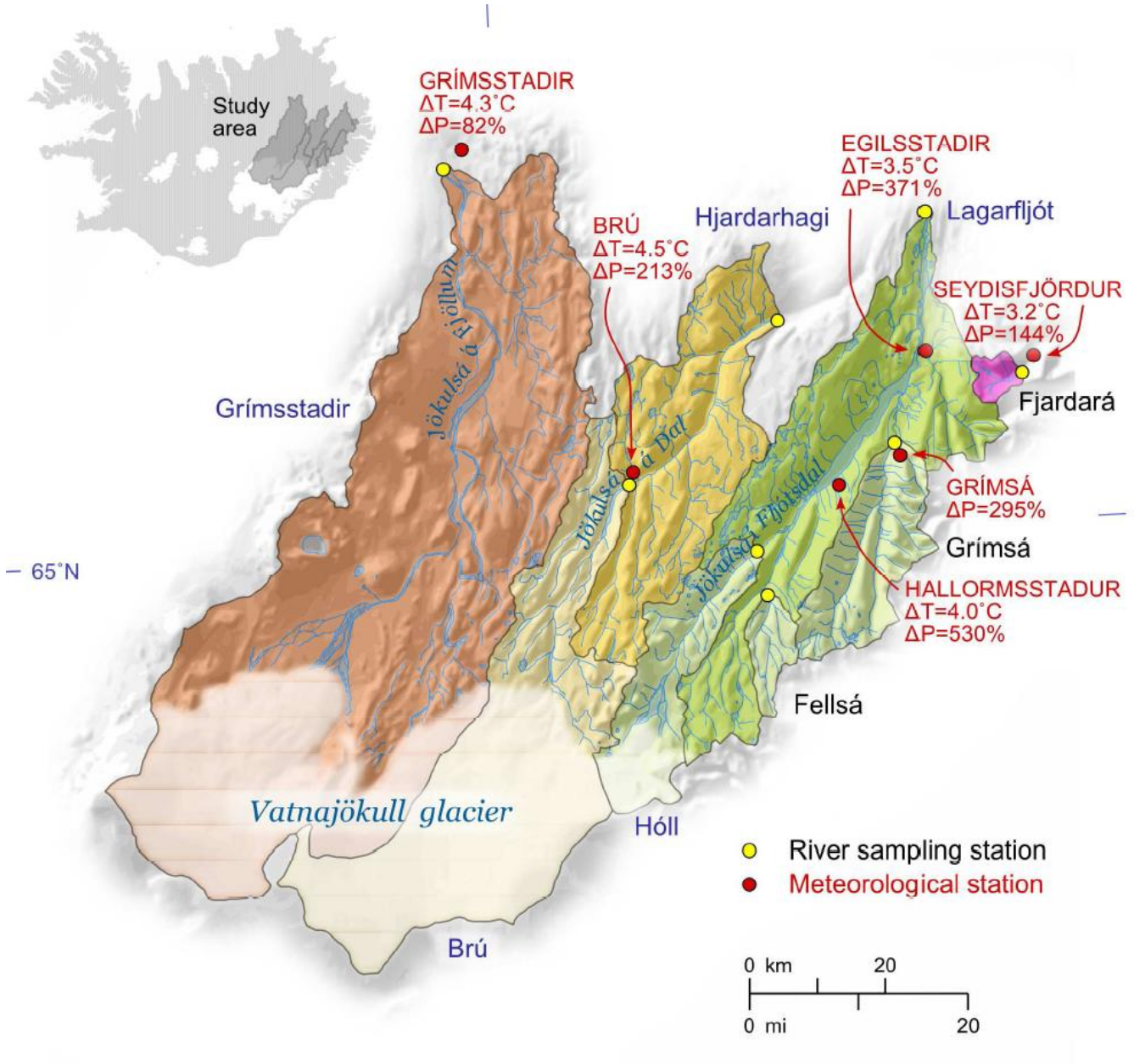
CO_2 fixation by chemical weathering of basalt

$$\mathbf{CaAl_2Si_2O_8} + 2\,CO_2 + 3H_2O \longrightarrow$$

$$\mathbf{Al_2Si_2O_5(OH)_4} + Ca^{++} + 2HCO_3^- \ldots>$$

$$\ldots \mathbf{CaCO_3} + CO_2 + H_2O$$

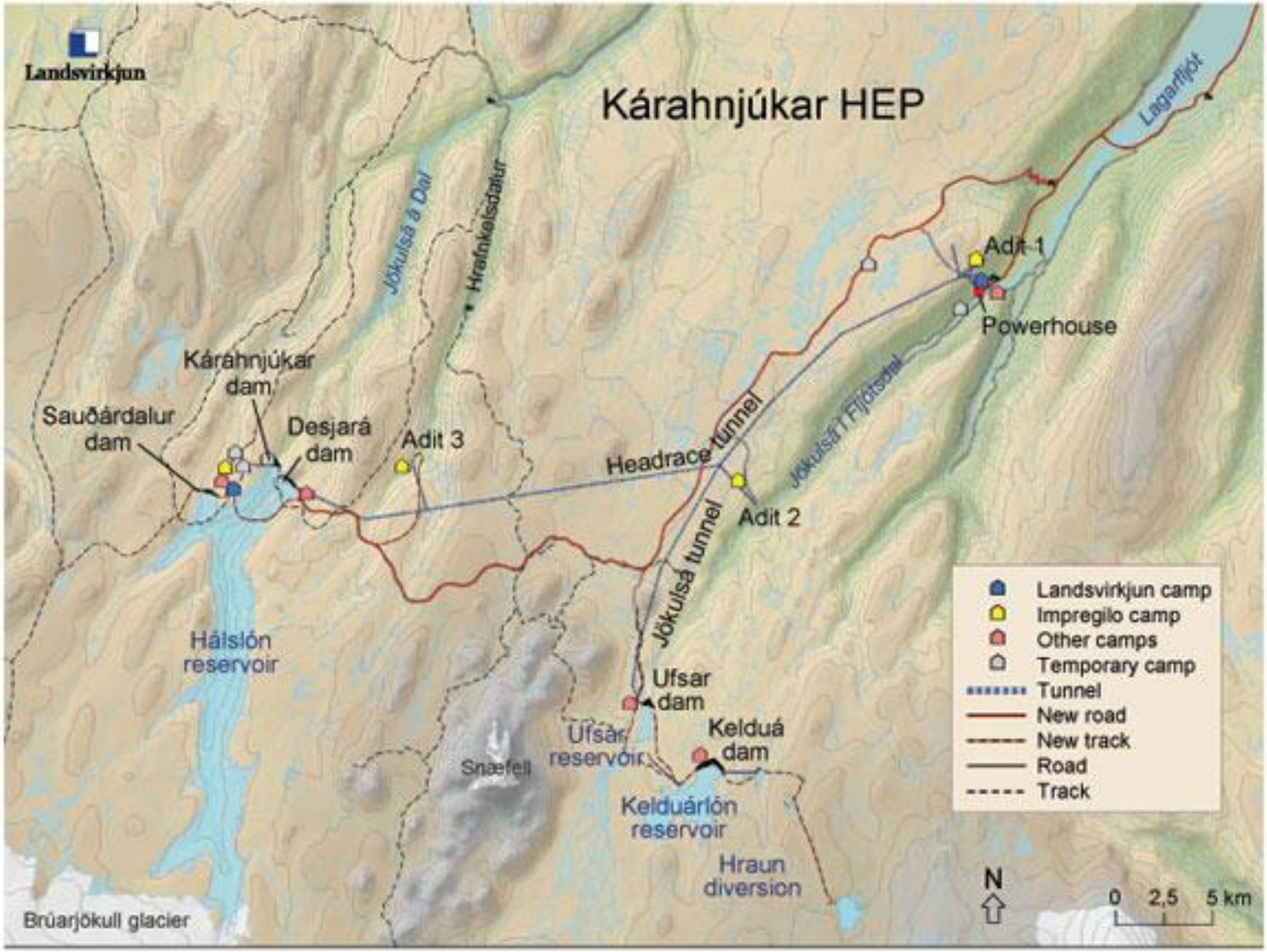
Annual average temperature and precipitation **variation** during the last 40 years



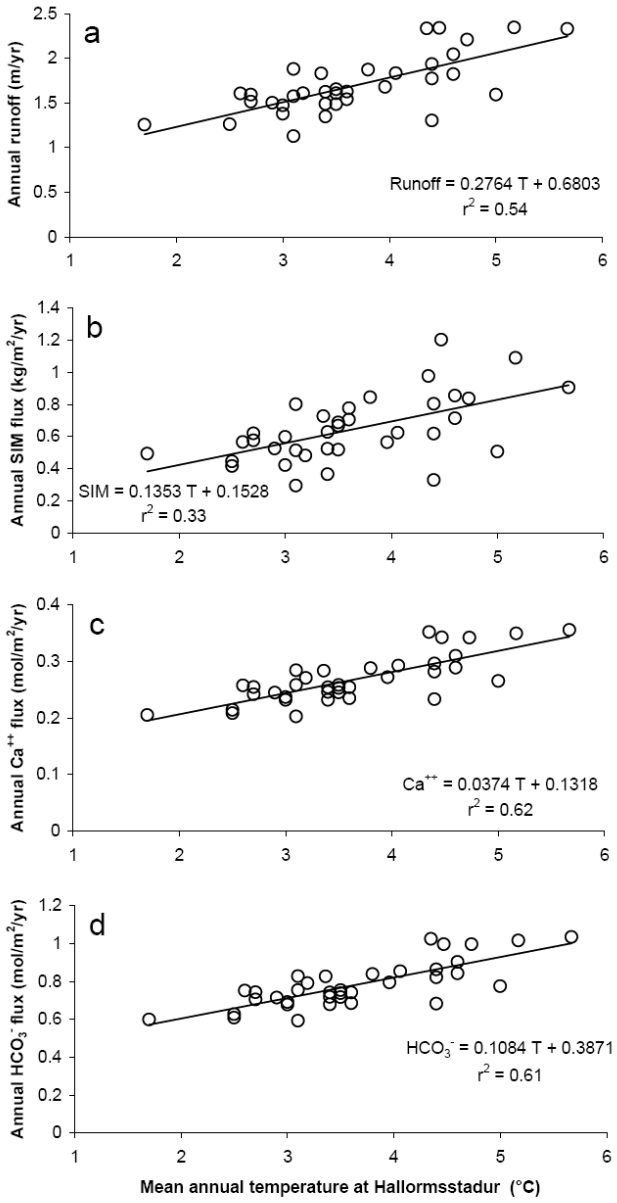
Gislason et al. EPSL in review

Photo: G.Gísladóttir


Photo: G.Gísladóttir


Landsvirkjun
Kárahnjúkar HEP
Jökulsá á Dal
Hrafnkelsdalur
Lagarfljót
Adit 1
Powerhouse
Kárahnjúkar dam
Sauðárdalur dam
Desjará dam
Adit 3
Headrace tunnel
Jökulsá í Fljótsdal
Adit 2
Jökulsá tunnel
Hálslón reservoir
Ufsar dam
Ufsar reservoir
Kelduá dam
Snæfell
Kelduárlón reservoir
Hraun diversion
Brúarjökull glacier
Landsvirkjun camp
Impregilo camp
Other camps
Temporary camp
Tunnel
New road
New track
Road
Track
N
0 2,5 5 km

The annual average temperature at the nearest meteorological station versus the annual fluxes from the Hóll catchment



Gislason et al. EPSL 2009

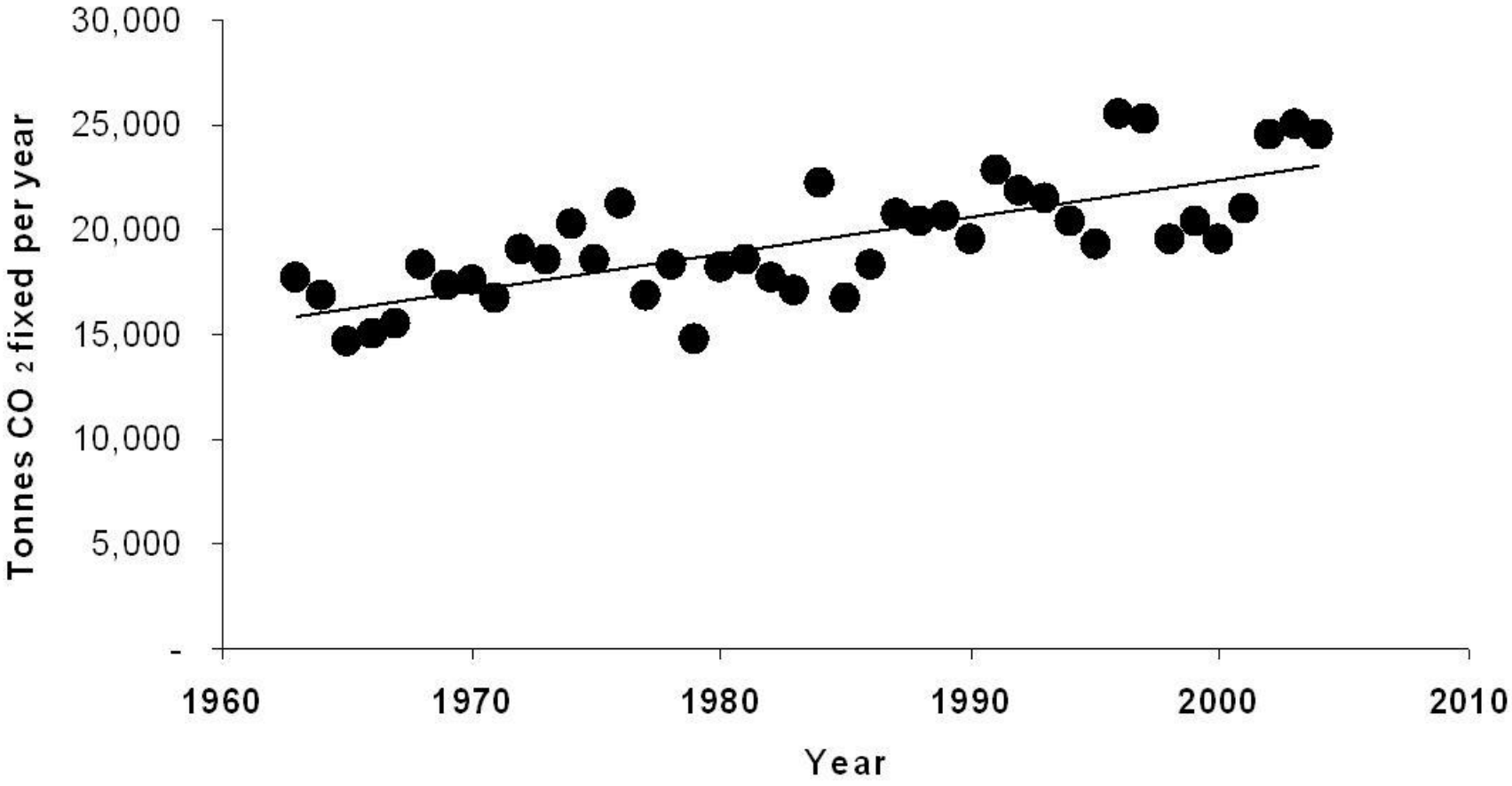
Table 4. Fit equations and coefficients of determinations of annual river fluxes as a function of annual mean air temperature (T) at the respective meteorological stations, percent change in the respective fluxes per one °C change in temperature and the apparent activation energy.

River catchment Meteorol. station	flux	Linear Least Squares fit	r^2	% change per one °C	Act. energy kJ/mol *
Grímsstadir	Ca^{++}	= 0.0087 T + 0.1479	0.38	5.6	34.5(10.5)
Grímsstadir	HCO_3^-	= 0.0367 T + 0.8473	0.39	4.1	25.8(7.7)
	runoff	= 0.0723 T + 1.0025	0.37	6.8	
	SIM	= 0.541 T + 1.366	0.25	29.9	
Brú	Ca^{++}	= 0.0099 T + 0.1111	0.40	8.1	53.0(11.6)
Brú	HCO_3^-	= 0.0367 T + 0.4443	0.40	7.6	49.5(10.4)
	runoff	= 0.2011 T + 1.5722	0.38	11.2	
	SIM	= 0.6081 T + 2.1297	0.27	21.9	
Hjardarhagi	Ca^{++}	= 0.0079 T + 0.1138	0.43	6.5	41.7(8.5)
Brú	HCO_3^-	= 0.0287 T + 0.4542	0.44	5.9	38.2(7.6)
	runoff	= 0.2011 T + 1.5722	0.38	8.6	
	SIM	= 0.3219 T + 1.5146	0.15	17.4	
Hóll	Ca^{++}	= 0.0374 T + 0.1318	0.61	14.0	86.6(11.9)
Hallormsstadur	HCO_3-	= 0.1084 T + 0.3871	0.61	13.9	86.0(11.8)
	runoff	= 0.2764 T + 0.6803	0.54	16.3	
	SIM	= 0.1353 T + 0.1528	0.33	21.0	
Fellsá	Ca^{++}	= 0.0108 T + 0.0439	0.43	13.6	89.6(23.7)
Egisstadir	HCO_3^-	= 0.0512 T + 0.205	0.43	12.1	90.2(24.0)
	runoff	= 0.2728 T + 0.9079	0.37	15.1	
	SIM	= 0.0028 T + 0.0079	0.32	16.3	
Lagarfljót	Ca^{++}	= 0.0137 T + 0.1184	0.32	8.4	53.0(13.9)
Egilstadir	HCO_3^-	= 0.0465 T + 0.404	0.34	8.3	52.8(13.8)
	runoff	= 0.1104 T + 0.9416	0.29	8.4	
	SIM	= 0.0025 T + 0.0213	0.29	8.4	
Grímsá	Ca^{++}	= 0.0205 T + 0.1093	0.38	11.9	74.5(16.6)
Egilsstadir	HCO_3^-	= 0.0668 T + 0.3483	0.37	12.1	75.4(17.0)
	runoff	= 0.2127 T + 0.949	0.33	13.3	
	SIM	= 0.0021 T + 0.0076	0.25	14.9	
Fjardará	Ca^{++}	= 0.0037 T + 0.0504	0.13	5.7	36.2(17.2)
Seydisfjördur	HCO_3^-	= 0.0174 T + 0.2369	0.13	5.7	36.2(17.2)
	runoff	= 0.1118 T + 1.5049	0.09	5.8	
	SIM	= 0.0008 T + 0.0125	0.03	5.1	

* Standard errors are provided in parentheses
Shaded results are not statistically significant

Gislason et al. EPSL 2009

Annual fixation of CO_2 within the Hóll catchment during the last 40 years



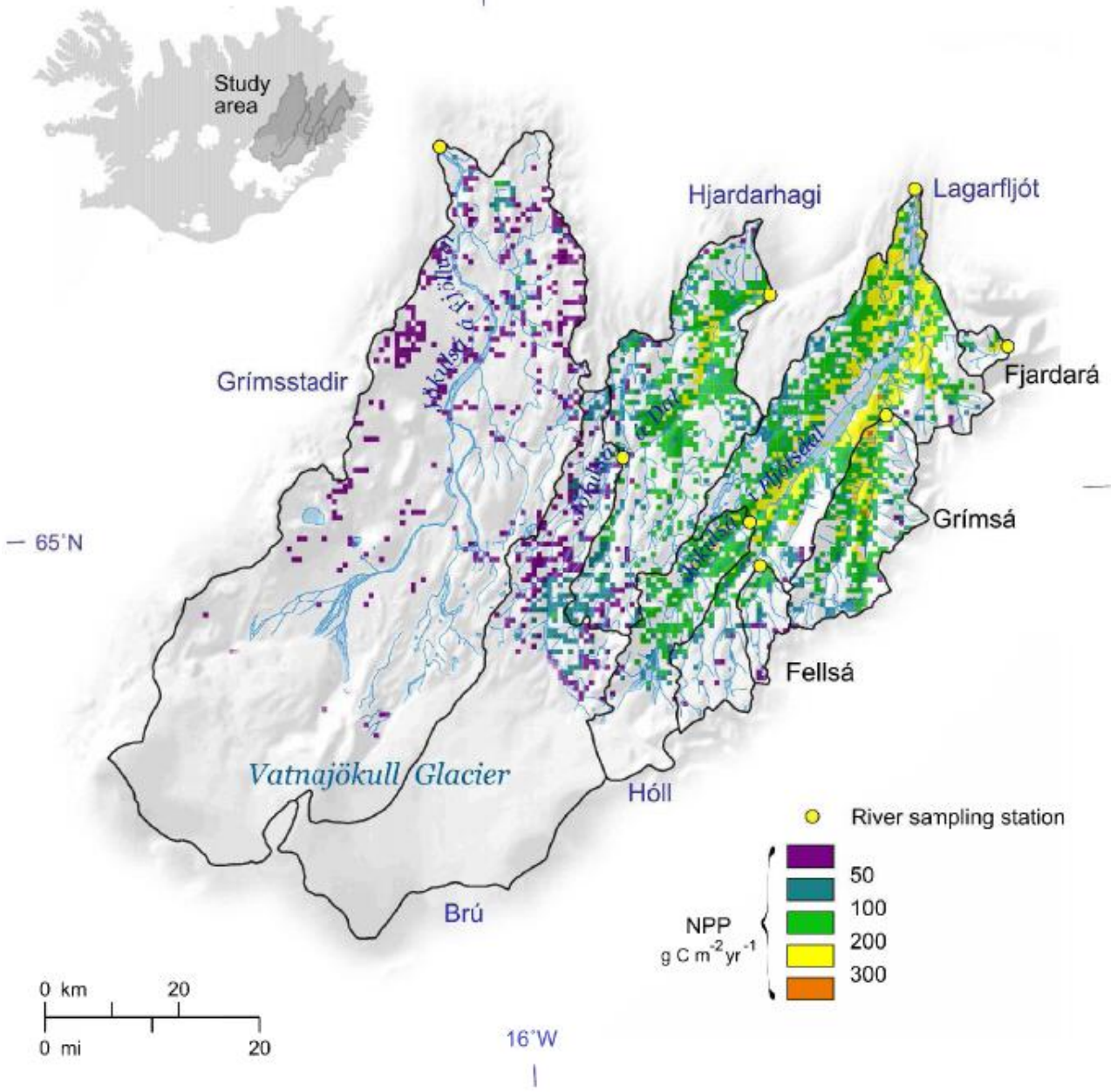
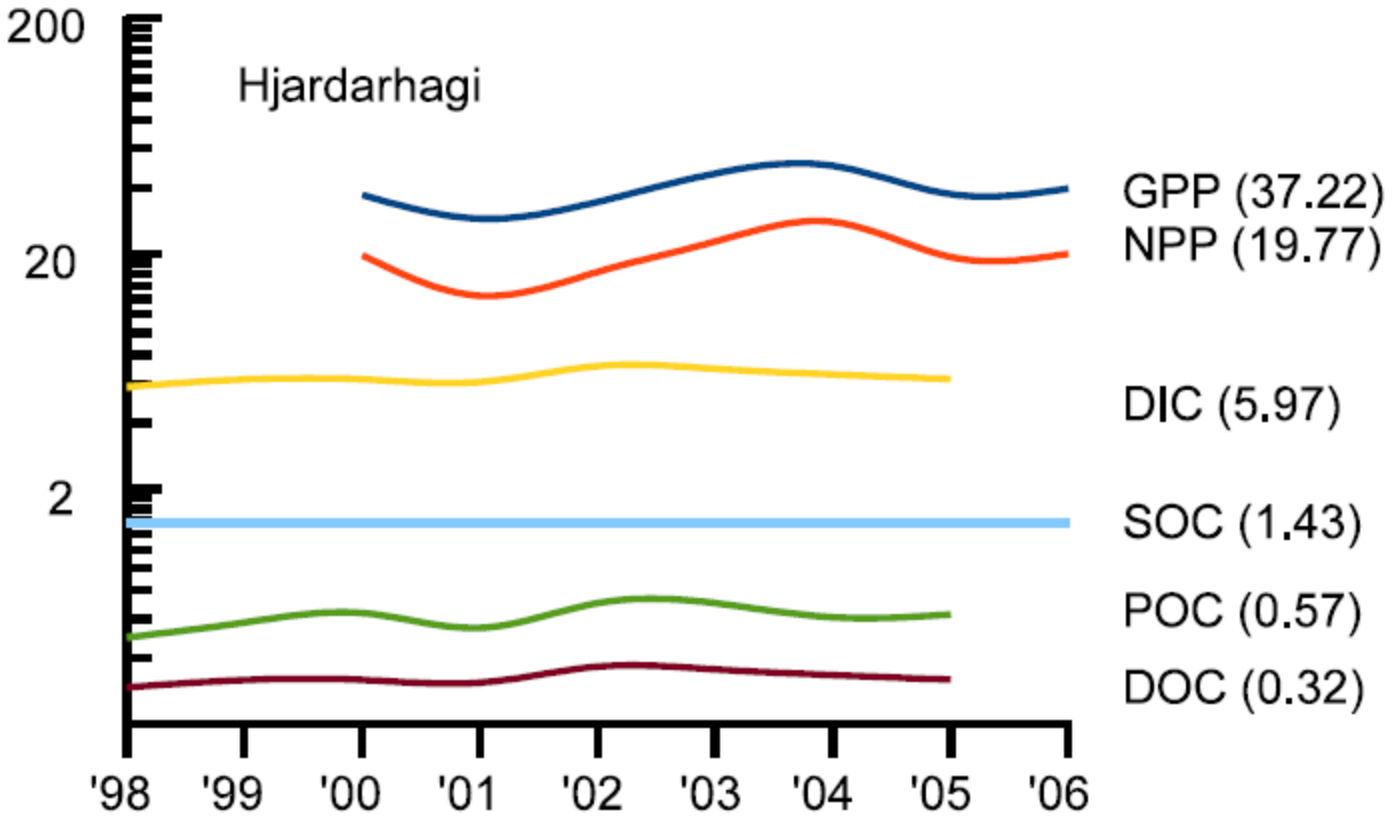
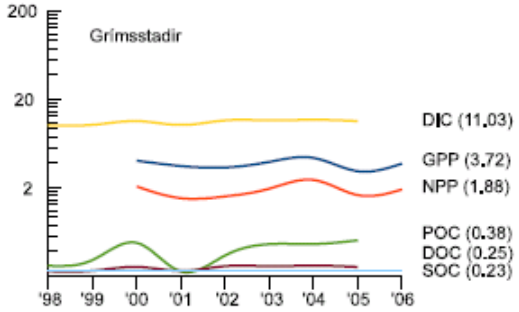


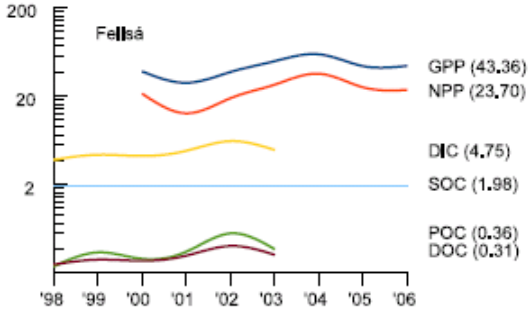
Figure 4.6b. Spatial pattern of annual average net primary production (MODIS NPP) of catchment vegetation for 2000 to 2006 estimated.

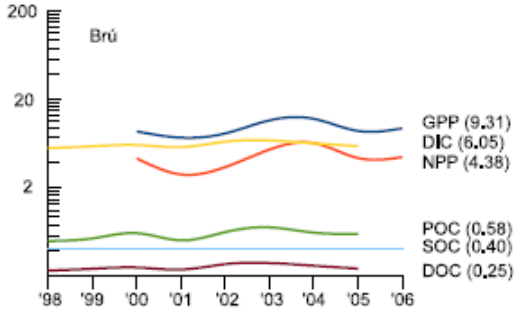
World average	GPP:700	NPP:400	DIC:3.6	DOC:1.2
Iceland average	GPP:174	NPP:100	DIC:8.2	DOC:0.4

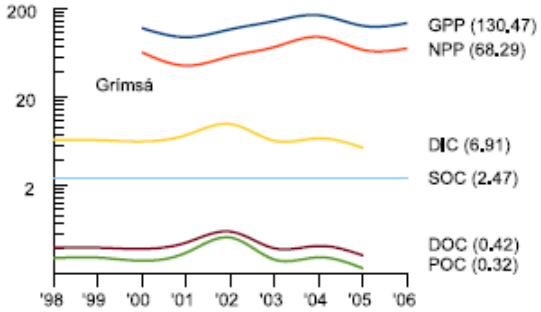


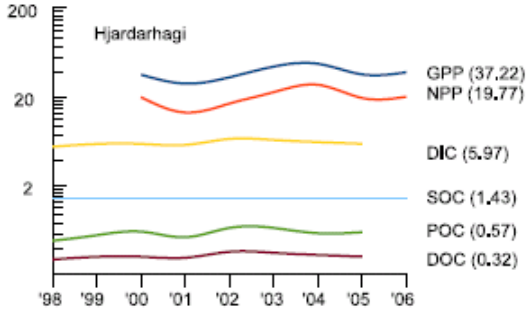
Kardjilov, Gislason, Gisladottir GBC in review

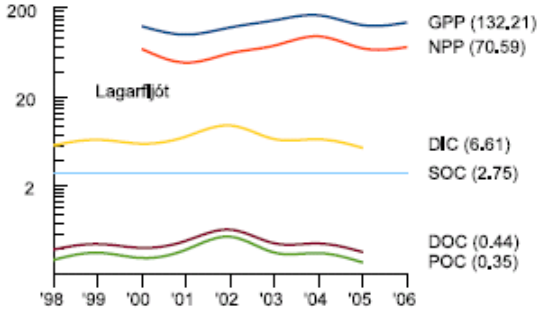

Grímsstadir
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
DIC (11.03)
GPP (3.72)
NPP (1.88)
POC (0.38)
DOC (0.25)
SOC (0.23)

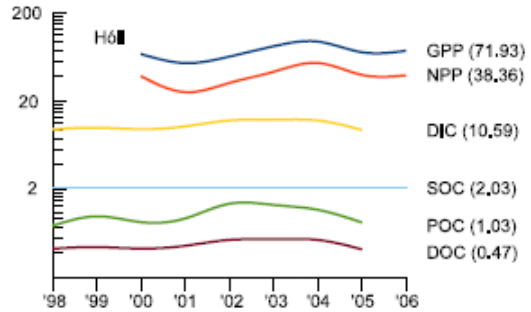

Fellsá
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (43.36)
NPP (23.70)
DIC (4.75)
SOC (1.98)
POC (0.36)
DOC (0.31)

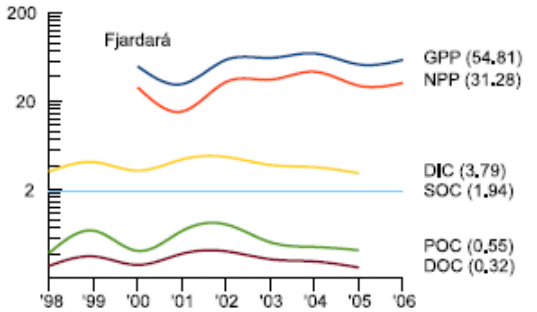

Brú
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (9.31)
DIC (6.05)
NPP (4.38)
POC (0.58)
SOC (0.40)
DOC (0.25)


Grímsá
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (130.47)
NPP (68.29)
DIC (6.91)
SOC (2.47)
DOC (0.42)
POC (0.32)


Hjardarhagi
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (37.22)
NPP (19.77)
DIC (5.97)
SOC (1.43)
POC (0.57)
DOC (0.32)


Lagarfljót
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (132.21)
NPP (70.59)
DIC (6.61)
SOC (2.75)
DOC (0.44)
POC (0.35)


Hól
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (71.93)
NPP (38.36)
DIC (10.59)
SOC (2.03)
POC (1.03)
DOC (0.47)


Fjardará
200
20
2
'98 '99 '00 '01 '02 '03 '04 '05 '06
GPP (54.81)
NPP (31.28)
DIC (3.79)
SOC (1.94)
POC (0.55)
DOC (0.32)