

Figure S1.1. Upper row describes monthly averages in 2m air temperature in 50m bands along the elevational gradient for the historic (1971-2000) and projected (2071-2100) reference periods and climate scenarios. Values for RCP2.6 and RCP8.5 are an average of the three global climate models used in the study. Numbers in each square are the average temperature for the month and elevational band rounded to the closest integer. The panel on the lower row displays the standard deviation in the same 50m bands and for each month. This may be interpreted as the magnitude of the local effect, i.e., the effect of mountainside aspect and proximity to Lake Torneträsk.

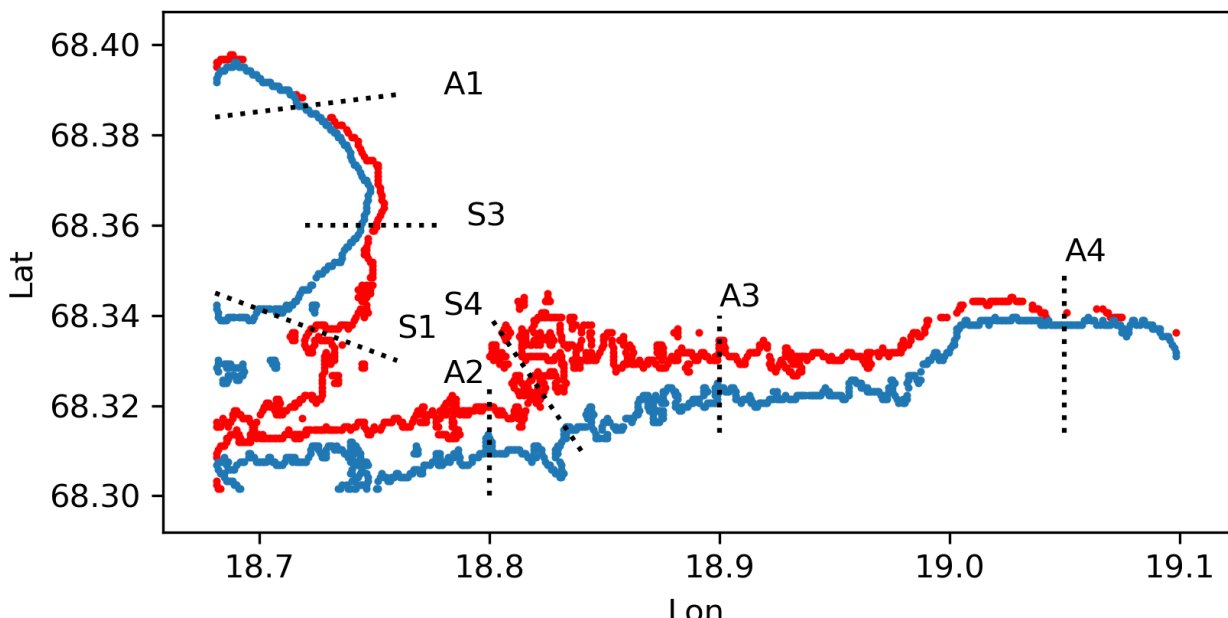


Figure S1.2. Treeline position in year 1915 (red) and 2010 (blue) along with placement of local transects (dashed lines). Transects were selected to represent a broad range of slopes and aspects in the landscape and were used to assess the heterogeneity of treeline advance within the landscape. Transects starting with S were also used by van Bogart et al. (2011).

Table S1.1 - Historical treeline migration rates in local transects with partial comparison to values reported by van Bogart et al. (2011). See Figure S1.2 above for a map of the transect locations

Transect	Elevation shift (m)	Modelled migration rate (m yr ⁻¹)	Reported elevational shifts (m) (van Bogart et al. 2011)
A1	57	0,6	
A2	90	0,95	
A3	112	1,18	
A4	75	0,79	
S1	119	1,25	40 +- 15
S3	78	0,82	60+-15
S4	94	0,99	145+-10

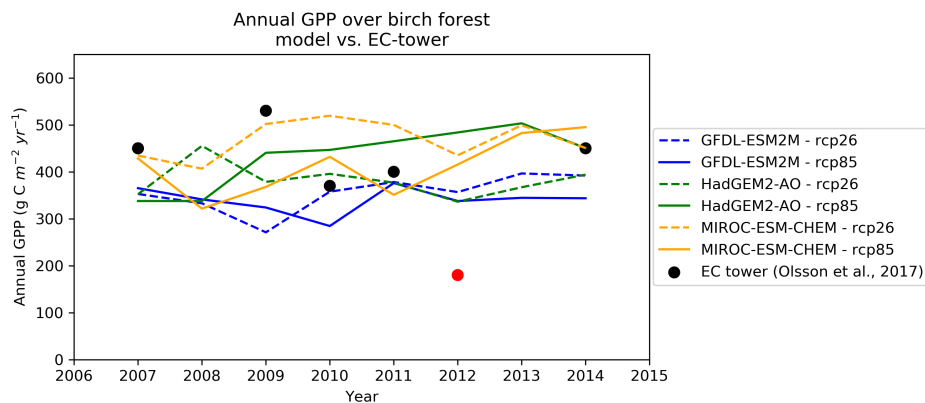


Figure S1.3. Annual GPP in the lower (warmer) section of the birch forest vs. Eddy covariance (EC) data obtained from Olsson et al (2017). Year 2012 (red marker) had a severe moth outbreak during the growing season and thus lower GPP.

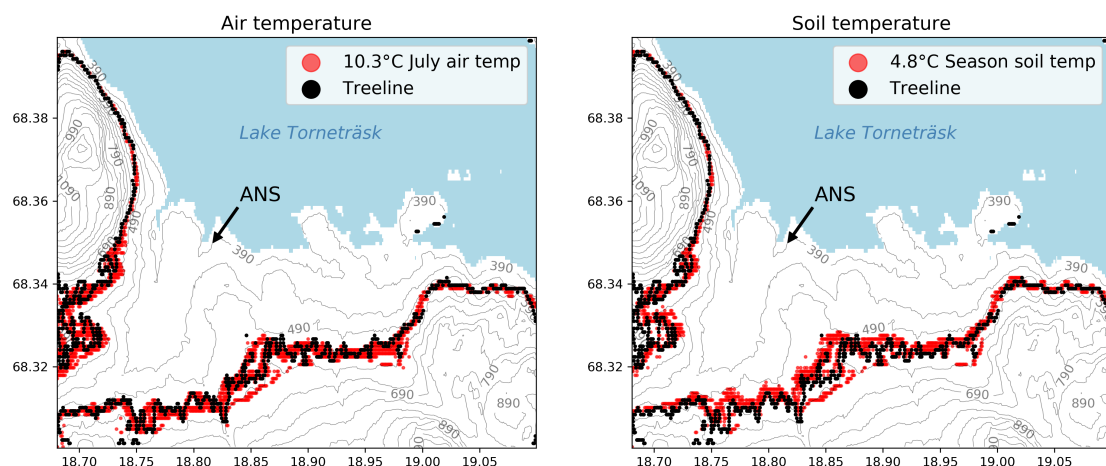


Figure S1.4. Correlation of historic (1990-2000) treeline with average growing season soil temperature and July air temperature. Grayscale indicates landscape relief. The white area marks lake Torneträsk. The Abisko scientific station (ANS) is marked on the map.

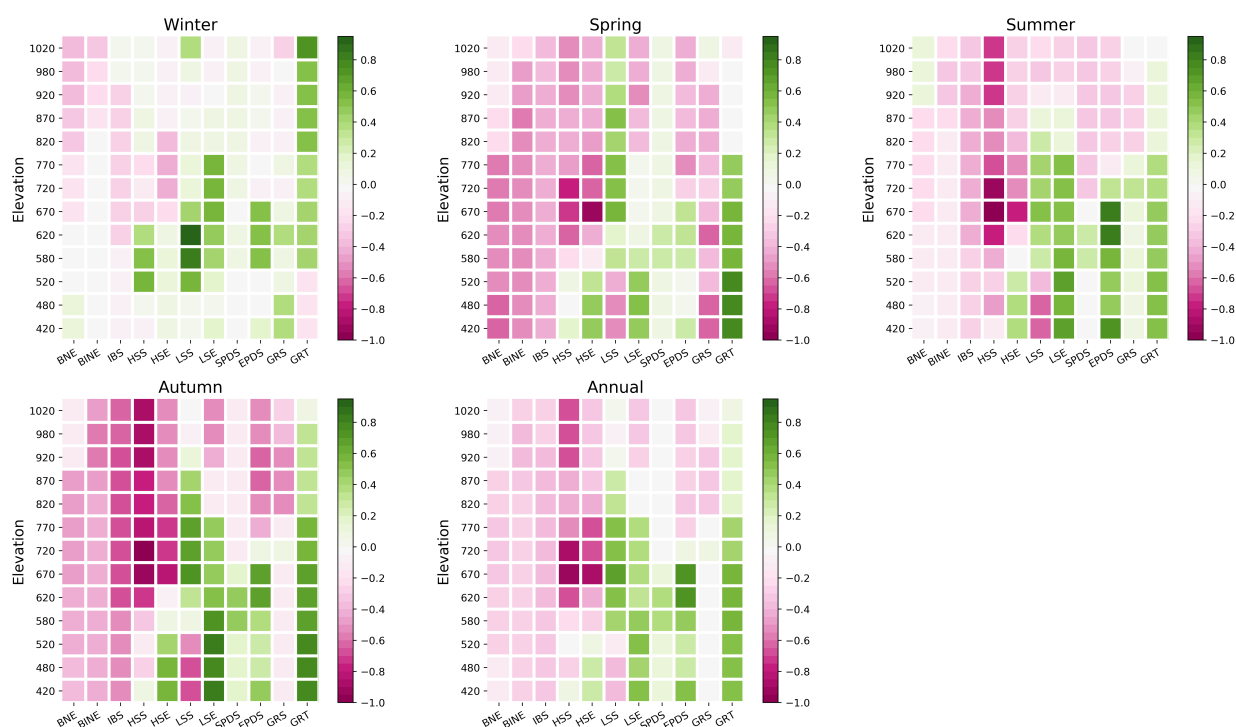


Figure S1.5. Spearman rank correlation between average annual GPP for the years 2090-2100 for each PFT and a-d) seasonal and e) annual precipitation in the forest tundra ecotone for the same time period. Precipitation is controlled by the bias adjusted precipitation output from each global climate model used in the study.

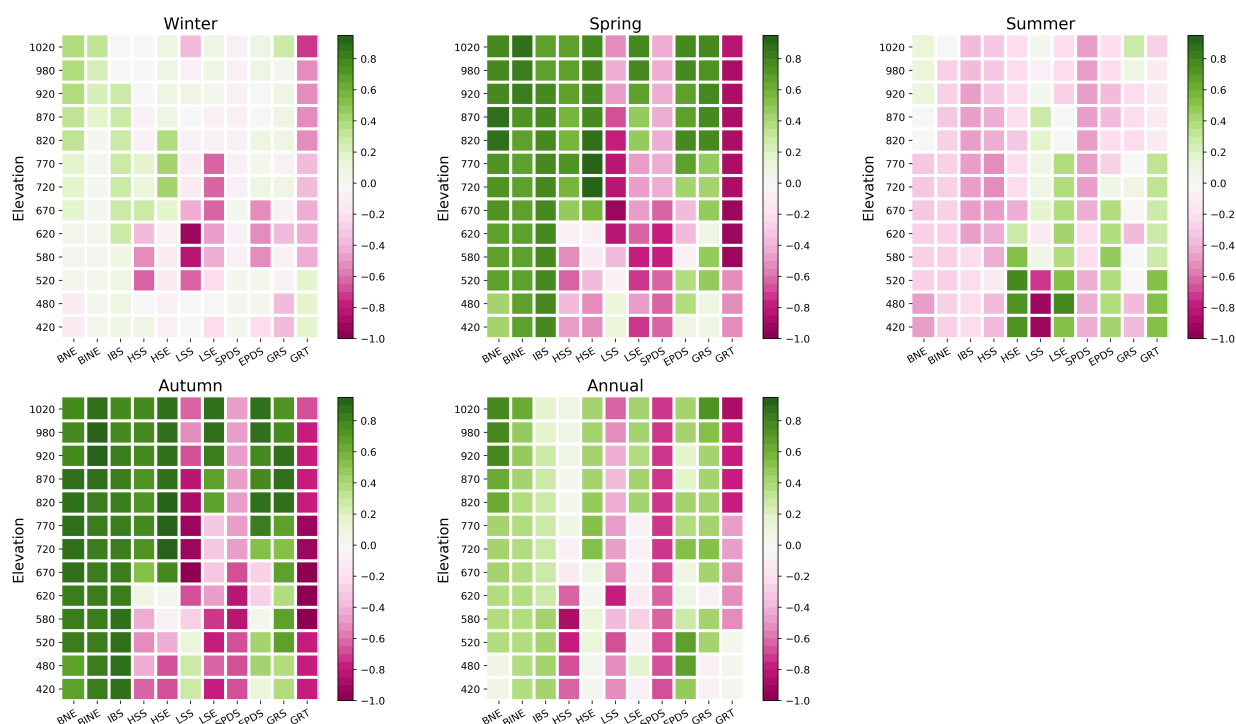


Figure S1.6 Spearman rank correlation between annual GPP for the years 2090-2100 for each PFT and a-d) seasonal and e) annual net shortwave radiation in the forest-tundra ecotone for the same time period. Shortwave radiation is controlled by the bias adjusted downwelling shortwave radiation output from each global climate model used in the study.

References

Olsson, P.-O., Heliasz, M., Jin, H., and Eklundh, L.: Mapping the reduction in gross primary productivity in subarctic birch forests due to insect outbreaks, *Biogeosciences*, 14, 1703-1719, 10.5194/bg-14-1703-2017, 2017.

Van Bogaert, R., Haneca, K., Hoogesteger, J., Jonasson, C., De Dapper, M., and Callaghan, T. V.: A century of tree line changes in sub-Arctic Sweden shows local and regional variability and only a minor influence of 20th century climate warming, *Journal of Biogeography*, 38, 907-921, 10.1111/j.1365-2699.2010.02453.x, 2011.