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*Supplement of*

## **Quantifying uncertainties of permafrost carbon–climate feedbacks**

**Eleanor J. Burke et al.**

*Correspondence to:* Eleanor J. Burke ([eleanor.burke@metoffice.gov.uk](mailto:eleanor.burke@metoffice.gov.uk))

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		2100		2300	
Vegetation carbon (Gt C)	Scenario	JULES	ORCHIDEE-MICT	JULES	ORCHIDEE-MICT
> 60 °N	RCP 2.6	10 (8-13)	22 (18-29)	9 (6-13)	19 (12-24)
	RCP 4.5	13 (10-16)	28 (22-35)	18 (13-24)	41 (29-50)
	RCP 8.5	16 (13-20)	35 (29-47)	36 (27-53)	71 (56-94)
> 55 °N	RCP 2.6	20 (17-26)	35 (28-44)	18 (13-26)	30 (20-37)
	RCP 4.5	26 (22-32)	42 (35-55)	35 (28-48)	58 (44-73)
	RCP 8.5	32 (28-40)	54 (45-72)	66 (49-90)	103 (85-135)
Observed permafrost area	RCP 2.6	26 (22-31)	52 (46-65)	21 (16-28)	42 (32-51)
	RCP 4.5	34 (29-40)	65 (46-65)	43 (34-55)	87 (71-101)
	RCP 8.5	44 (38-51)	84 (76-108)	97 (75-132)	167 (134-197)
Simulated permafrost in 1860	RCP 2.6	11 (9-14)	53 (45-64)	10 (7-15)	43 (32-50)
	RCP 4.5	14 (12-18)	65 (57-82)	21 (15-30)	87 (67-100)
	RCP 8.5	18 (14-23)	84 (75-109)	50 (34-77)	173 (134-209)

Table S1: The change in vegetation carbon over four different regions (polewards of 60° north, polewards of 55° north, the land surface where permafrost is observed and the land surface where permafrost is simulated by each model version in 1860) for the different model versions and future scenarios. The 50<sup>th</sup> percentile value is shown with the 5<sup>th</sup> to 95<sup>th</sup> percentile range indicated in brackets.

		2100			2300		
Non-permafrost soil carbon (Gt C)	Scenario	JULES-deepR <sub>esp</sub>	JULES-suppressR <sub>esp</sub>	ORCHIDEE-MICT	JULES-deepR <sub>esp</sub>	JULES-suppressR <sub>esp</sub>	ORCHIDEE-MICT
	RCP 2.6	43 (40-50)	49 (40-65)	55 (38-64)	70 (67-83)	71 (57-96)	40 (34-51)
> 60 °N	RCP 4.5	45 (42-53)	58 (47-75)	70 (49-86)	79 (67-88)	108 (84-139)	70 (54-83)
	RCP 8.5	42 (30-51)	57 (44-77)	83 (66-90)	4 (-113,78)	121 (79-146)	86 (52-119)
	RCP 2.6	46 (37-51)	61 (53-78)	69 (51-83)	74 (60-82)	46 (37-51)	61 (49-76)
> 55 °N	RCP 4.5	47 (34-56)	72 (62-91)	77 (59-91)	76 (30-94)	47 (34-56)	73 (56-90)
	RCP 8.5	19 (48-60)	74 (64-95)	88 (65-96)	-49 (-219 to 74)	48 (19-60)	21 (-9 to 40)
	RCP 2.6	60 (47-70)	84 (77-99)	88 (70-106)	88 (68-101)	112 (98-134)	89 (76-105)
Observed permafrost area	RCP 4.5	63 (45-77)	101 (91-117)	100 (79-113)	95 (29-131)	175 (155-202)	109 (90-128)
	RCP 8.5	76 (45-98)	112 (100-132)	105 (83-117)	-37 (-271 to 147)	214 (81-285)	23 (-22 to 57)
	RCP 2.6	60 (55-66)	69 (59-86)	96 (77-112)	93 (86-103)	96 (80-122)	98 (84-113)
Simulated permafrost in 1860	RCP 4.5	65 (58-70)	82 (70-102)	109 (84-120)	106 (76-120)	149 (123-186)	117 (90-134)
	RCP 8.5	73 (62-82)	89 (72-111)	109 (86-122)	31 (-125 to 146)	201 (140-231)	-14 (-55 to 28)

Table S3: The change in non-permafrost soil carbon over four different regions (polewards of 60° north, polewards of 55° north, the land surface where permafrost is observed and the land surface where permafrost is simulated by each model version in 1860) for the different model versions and future scenarios. The 50<sup>th</sup> percentile value is shown with the 5<sup>th</sup> to 95<sup>th</sup> percentile range indicated in brackets.

Total soil carbon (Gt C)	Scenario	2100			2300		
		JULES-deepR <sub>esp</sub>	JULES-suppressR <sub>esp</sub>	ORCHIDEE-MICT	JULES-deepR <sub>esp</sub>	JULES-suppressR <sub>esp</sub>	ORCHIDEE-MICT
> 60 °N	RCP 2.6	12 (5-19)	34 (26-49)	-10 (-19 to 0)	13 (-1 to 23)	45 (33-67)	-10 (-18 to 2)
	RCP 4.5	12 (1-19)	42 (32-60)	-12 (-24 to -7)	3 (-42 to 29)	79 (58-110)	-28 (-41 to -15)
	RCP 8.5	14(-7 to 22)	43 (31-63)	-17 (-37 to -11)	-135 (-311 to -8)	87 (37-114)	-161(-233 to -113)
> 55 °N	RCP 2.6	13 (-4 to 20)	44 (38-60)	-1 (-7 to 11)	9 (-21 to 24)	55 (44-76)	2 (-4 to 19)
	RCP 4.5	12 (-13 to 22)	55 (46-72)	-4 (-16 to 2)	-6 (-83 to 31)	96 (78-124)	-24 (-38 to -3)
	RCP 8.5	18 (-21 to 34)	57 (48-78)	-13 (-40 to -5)	-197 (-441 to -21)	90 (-19 to 135)	-236 (-306 to -147)
Observed permafrost area	RCP 2.6	21 (0-36)	65 (57-79)	16 (7-27)	15 (-26 to 40)	76 (65-96)	25 (16-42)
	RCP 4.5	21 (-7 to 41)	81 (71-97)	12 (-3 to 19)	0 (-103 to 57)	134 (119-160)	-3 (-27 to 21)
	RCP 8.5	38 (-5 to 68)	93 (81-112)	1 (-31 to 10)	-216 (-557 to 39)	167 (20-248)	-262 (-256 to -155)
Simulated permafrost in 1860	RCP 2.6	21 (11-28)	50 (41-65)	17 (7-27)	19 (-2 to 33)	61 (47-85)	26 (17-43)
	RCP 4.5	23 (8-32)	61 (47-85)	14 (-5 to 21)	13 (-58 to 47)	110 (87-143)	-3 (-30 to 23)
	RCP 8.5	36 (11-50)	70 (54-90)	-1 (-36 to 8)	-156 (-408 to 33)	154 (84-184)	-301 (-399 to -178)

Table S2: The change in total soil carbon over four different regions (polewards of 60° north, polewards of 55° north, the land surface where permafrost is observed and the land surface where permafrost is simulated by each model version in 1860) for the different model versions and future scenarios. The 50<sup>th</sup> percentile value is shown with the 5<sup>th</sup> to 95<sup>th</sup> percentile range indicated in brackets.