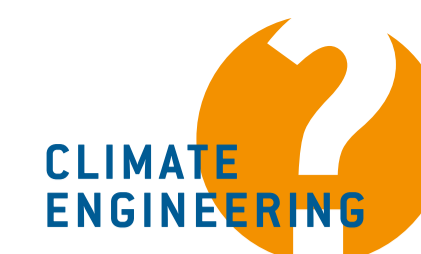


Overview on modelling in the SPP 1689



Risks, Challenges
Opportunities?

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CE-Method(s)	Scientific Aim	Type of Model	Model Name	Domain / region	Resolution	Time Period	Forcing	Name of model run(s)	Link to data	Link to publication	SPP 1689 Project	Contact
Afforestation	assess uncertainty	Earth system model of intermediate complexity	University of Victoria Earth System Climate Model (UVic)	global	1.8° latitude by 3.6° longitude	years 2020 - 2100	RCP 8.5 (all; CO ₂ emission driven)	perturbed parameter ensemble	not yet available	in prep	ComparCE	David Keller
Reforestation	assess carbon sequestration potential and annual mean and extreme climate effects	Earth system model	Max Planck Institute Earth System Model (MPI-ESM)	global	atmosphere: 1.9° horizontal, 47 levels; ocean: 1.5° horizontal, 40 levels	2006 - 2100	RCP 4.5 land-use, all other forcing RCP8.5, CO ₂ emission driven	reforestation scenario	DKRZ	http://dx.doi.org/10.1002/2016GL068824	ComparCE	Sebastian Sonntag
Stratospheric aerosol injection	assess climate effects	Earth system model	Max Planck Institute Earth System Model (MPI-ESM)	global	atmosphere: 1.9° horizontal, 47 levels; ocean: 1.5° horizontal, 40 levels	2006 - 2100	RCP 8.5, CO ₂ emission driven	solar radiation management	DKRZ	under review	ComparCE	Sebastian Sonntag
Ocean alkalization	assess climate effects	Earth system model	Max Planck Institute Earth System Model (MPI-ESM)	global	atmosphere: 1.9° horizontal, 47 levels; ocean: 1.5° horizontal, 40 levels	2006 - 2100	RCP 8.5, CO ₂ emission driven	ocean alkalization	DKRZ	http://dx.doi.org/10.1002/2016GL068576	ComparCE	Miriam Ferrer Gonzalez
Solar radiation management / afforestation / artificial ocean upwelling	Comparison of CE methods, uncertainty assessment	Earth system model of intermediate complexity	University of Victoria Earth System Climate Model (UVic)	global	1.8° latitude by 3.6° longitude	2006 - 2100	RCP 8.5, CO ₂ emission driven	perturbed parameter ensemble	not yet available		ComparCE-2	Giang Tran
Bioenergy	estimate potentials, side effects, uncertainties	Dynamic Global Vegetation Model	Lund-Potsdam Jena managed Land model (LPJmL)	global	0.5°	typically 2020 - 2100	historic and future climate (RCPs) and CO ₂ concentration	n.a. (various scenarios)	not yet available	in prep	CE-LAND+	Dieter Gerten
Afforestation	estimate potentials, side effects, uncertainties	Earth system / land	MPI-ESM/JSBACH	global	~1.8°	2006 - 2100, possibly historical and present-day	RCPs	TBD	not yet available	in prep	CE-LAND+	Julia Pongratz, Lena Boysen
Bioenergy	estimate potentials, side effects, uncertainties	Earth system / land	MPI-ESM/JSBACH	global	~1.8°	2006 - 2100	RCP 8.5 fossil-fuel scenario	TBD	not yet available	in prep	CE-LAND	Julia Pongratz, Dorothea Mayer
Stratospheric aerosol injection	Integrated analysis together with mitigation under climate and SRM risks	Integrated assessment model	MIND	global	climate: 26 Giorgi regions; economy: none	1995 - 2200	welfare optimal, constrained by 2° target	SRM / mitigation scenarios	not yet available	http://www.webmeets.com/eaere/2016/prog/viewpaper.asp?pid=848	CEMICS	Elnaz Roshan, Hermann Held
BECCS, enhanced weathering, direct air capture	integrated analysis of CDR availability	Integrated assessment model	REMIND	global	11 world regions	2005 - 2100	welfare optimal, constrained by 2° / 1.5° target	n.a. (various scenarios)	not yet available	in prep	CEMICS	Jessica Strefler, Nico Bauer, Elmar Kriegler
BECCS, enhanced weathering, direct air capture, afforestation	integrated analysis of trade-offs between different CDR technologies	Integrated assessment model	REMIND-MAgPIE	global	11 world regions	2005 - 2100	welfare optimal, constrained by 2° / 1.5° target	n.a. (various scenarios)	not yet available	in prep	CEMICS	Jessica Strefler, Nico Bauer, Elmar Kriegler, Alexander Popp
Bioenergy, afforestation	trade-offs between large-scale bioenergy/afforestation and other sustainability goals	economic land-use optimization model	MAgPIE (Model of Agricultural Production and its Impacts on the Environment)	global	economic: 10 world regions biophysical: 0.5 degree	2005 - 2100	-	n.a. (various scenarios)	not yet available	under review	CEMICS	Alexander Popp, Florian Humpenöder
Stratospheric aerosol injection	assess mid-latitude ozone loss	Lagrangian Chemistry Transport Model	ClAMS	global	horizontal resolution of 100 km, maximum vertical resolution of ~ 400 m near the tropopause	N.N.		N.N.	not yet available		CE-03	Bärbel Vogel
Idealized CO ₂ direct air capture and storage	investigate climate reversibility	multiple (model intercomparison study)	multi-models, list available at http://www.kiel-earth-institute.de/participating-models.html	global	multiple	N.A.	1% CO ₂ increase and decrease; concentration driven	CDR-MIP C1	http://www.kiel-earth-institute.de/cdr-mip-data.html	in prep	CDR-MIA	David Keller
Pulsed CO ₂ direct air capture and storage	assess climate-carbon cycle feedbacks; CDR global cooling potential metric	multiple (model intercomparison study)	multi-models, list available at http://www.kiel-earth-institute.de/participating-models.html	global	multiple	N.A.	none (equilibrium state) or historical; CO ₂ emission driven	CDR-MIP C2.1 and C2.2	http://www.kiel-earth-institute.de/cdr-mip-data.html	in prep	CDR-MIA	David Keller
Idealized bioenergy with carbon capture and storage (BECCS)	assess climate-carbon cycle feedbacks, estimate potentials, side effects, uncertainties	multiple (model intercomparison study)	multi-models, list available at http://www.kiel-earth-institute.de/participating-models.html	global	multiple	N.A.	SSP5-3.4-OS scenario, CO ₂ emission driven	CDR-MIP C2.3	http://www.kiel-earth-institute.de/cdr-mip-data.html	in prep	CDR-MIA	David Keller
Afforestation / reforestation	assess climate-carbon cycle feedbacks, estimate potentials, side effects, uncertainties	multiple (model intercomparison study)	multi-models, list available at http://www.kiel-earth-institute.de/participating-models.html	global	multiple	N.A.	long-term extension of the LUMIP esm-ssp585-spp126Lu experiment	CDR-MIP C3	http://www.kiel-earth-institute.de/cdr-mip-data.html	in prep	CDR-MIA	David Keller
Ocean alkalization	assess climate-carbon cycle feedbacks, estimate potentials, side effects, uncertainties	multiple (model intercomparison study)	multi-models, list available at http://www.kiel-earth-institute.de/participating-models.html	global	multiple	N.A.	SSP5-8.5	CDR-MIP C4	http://www.kiel-earth-institute.de/cdr-mip-data.html	in prep	CDR-MIA	David Keller
Cloud brightening / cirrus thinning	assess detectability and impacts of limited-area climate engineering	Earth system model	Max Planck Institute Earth System Model (MPI-ESM)	global	atmosphere: 1.9° horizontal, 47 levels; ocean: 1.5° horizontal, 40 levels	30-year periods branching off pre-industrial equilibrium	patterned cloud modification (regional scale)	LEAC-II	DKRZ	in prep	LEAC-II	Johannes Quaas, Dipu Sudhakar
ocean albedo enhancement	increases reflexivity of ocean surface	Earth system model	Max Planck Institute Earth System Model (MPI-ESM)	global	atmosphere: 1.9° horizontal, 47 levels; ocean: 1.5° horizontal, 40 levels	50 years	4xCO ₂	G1oceanalbedo	pers contact	in prep	CEIBRAL	Ulrike Niemeier
marine cloud brightening	increase reflectivity of marine clouds	Earth system model	Max Planck Institute Earth System Model (MPI-ESM)	global	atmosphere: 1.9° horizontal, 47 levels; ocean: 1.5° horizontal, 40 levels	2020 - 2070	RCP4.5	G4CDNC	pers contact	in prep	CEIBRAL	Ulrike Niemeier
Stratospheric sulfur injection	Evolution, transport and climate forcing of sulfate	GCM + aerosol microphysical model	ECHAM5-HAM	global	atmosphere: 2.8° horizontal, 39 levels;	10 years	SO ₂ injection, present day climate	Geo1 to Geo100	pers contact	Niemeier and Timmreck (2015), ACP	CEIBRAL	Ulrike Niemeier
Stratospheric sulfur injection	Impact of sulfate warming on stratosphere dynamics and QBO	GCM + aerosol microphysical model	ECHAM5-HAM	global	atmosphere: 2.8° horizontal, 90 levels;	10 years	SO ₂ injection, present day climate	4Tg60 to 50Tg60	pers contact	Niemeier and Schmidt (2017), ACP	CELARIT	Ulrike Niemeier
Stratospheric sulfur injection	evolution of particle size, forcing efficiency of sulfate, sensitivity to injection height, impact on the stratosphere and at the surface	GCM + aerosol microphysical model	LMDZ-S3A	global	1.9° latitude by 3.8° longitude, 79 levels	5 - 10 years	SO ₂ injection, present day climate	n.a. (various scenarios)	pers contact	model: http://www.geosci-model-dev-discuss.net/gmd-2017-31/ , SRM simulations: in prep.	RADMAN	Christoph Kleinschmitt, Olivier Boucher