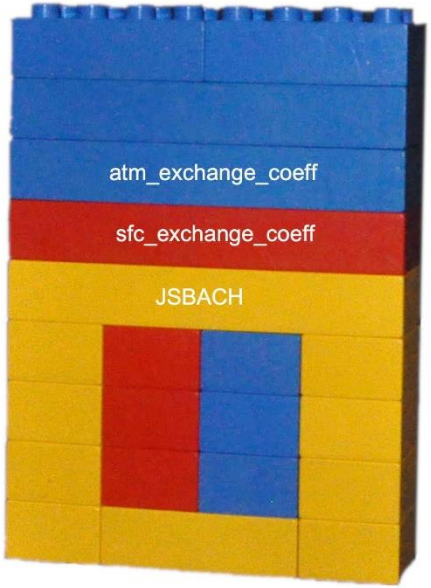
Land-Surface Model

Explicit coupling



Implicit coupling

+ processes:
Carbon cycle, …

ICON-NWP

ICON-ESM

ICON-LAND, current status and future steps

1. Processes

- Atmosphere (Diffusion, radiation, precipitation, …)
- Soil Processes (Hydrologie, Heat transport (freezing+ melting), Vegetation, Runoff, carbon, nitrogen, …)

2. Coupling

- Tiles, time integration (implicit, explicit, …),

3. Software

- ICON-LAND, infrastructure, develop into community land model

4. Plan & Milestones

5. People

Future Development ICON seamless

I. JSBACH + VDIFF in icon-nwp → seamless

II. Rewrite of TERRA in ICON-LAND (evaluate synergies)

III. In cooperation with WarmWorld, coupling to atmosphere

10/22 -06/23 rewrite of TERRA in ICON-LAND
Roland Wirth + icon seamless team

Q3 22: restructuring
Q1 23: implement code structure
Q2 23: process implementation
Q3 23: first tests

Overview over ICON-LAND related activities

ICON seamless	ICON-LAND + VDIFF in ICON-NWP + future development	DWD, MPI-M, MPI-BGC	Roland Wirth + ICON seamless team
	ICON-ART Coupling with land	KIT, MPI-M	H.+B. Vogel, R. Schnur
	External parameters for ICON-LAND (extpar)	MPI-M	T. Raddatz
WarmWorld	Implementation of ParFlow into ICON Land, interface for land-atmosphere coupling	FZJ, DWD, MPI-M	Stefan Kollet, Linda Schlemmer, Reiner Schnur
GLORI	ParFlow LAM, Evaluation of ParFlow in ICON-LAND, ensemble perturbations	FZJ, DWD	Stefan Kollet, Chiara Marsigli
NextGEMS	Estimate carbon stocks and fluxes	MPI-M	C. Hohenegger
Sapphire Physics	Land-atmosphere interaction in high-res, storm-resolving model	MPI-M	C. Hohenegger

Overview over ICON-LAND related activities

Ruby Physics (ICON-ESM)	Cold Region hydrology (Cool-Ruby)	MPI-M	V. Brovkin
	Quantify disturbance impacts on feedbacks between Arctic permafrost and global climate (Q-Arctic)	MPI-M, MPI-BGC	V. Brovkin, M. Göckede, M. Heimann
DETECT	Couple TerrSysMP (CLM + ParFlow) to ICON	DWD	Jan Keller
	Implement irrigation in ICON (add to rain)	Uni Bonn	Arianna Valmassoi
PP CITTA‘	Urban canopy scheme TERRA_URB in ICON	DWD	Jan-Peter Schulz
PT SAINT2	New multi-layer snow model, modular	MeteoSwiss	Sascha Bellaire

Overview over ICON-LAND related activities

USmile	ML-based parameterizations for ICON	MPI-BGC, DLR, …	A. Winckler, M. Reichstein, V. Eyring
CERISE	land surface initial conditions for seasonal forecasts (LAI assimilation)	DWD	Kristina Fröhlich, Gernot Geppert
Data Assimilation	New data assimilation for soil-moisture, snow, SST + Seaice	DWD	G. Geppert, T. Hüther, M. Lange, J. Keller
Promotion GUF	Snow initialisation in subseasonal-to-seasonal forecasting	GUF/DWD	D. Risto, B. Ahrens, K. Fröhlich

Overview over ICON-LAND related activities

ESM2025	ICON-Land, ML, land use transitions, land management	MPI-M, MPI-BGC, LMU	V. Brovkin, S. Zaehle, J. Pongratz
QUINCY	Effects of interacting nutrient cycles on terrestrial biosphere dynamics and their climate feedbacks	MPI-BGC	S. Zaehle
ForExD	Improved representation of disturbance processes and feedbacks in ICON-Land QUINCY	MPI-BGC	Ana Bastos

Suggested Future Priority Tasks/ Priority Projects within COSMO

- offline soil and surface module, in close collaboration with ICON-C, timeline 09.2022 - 09.2024.
- consolidated snow modelling, in close collaboration with ICON-Seamless: integration of SNOWPOLINO in ICON, timeline 09.2022 - 09.2024. Main developments at MeteoSwiss, support from a senior ICON developer (CLM community ?)