



Update on LUMIP and CMCC-ESM2 state

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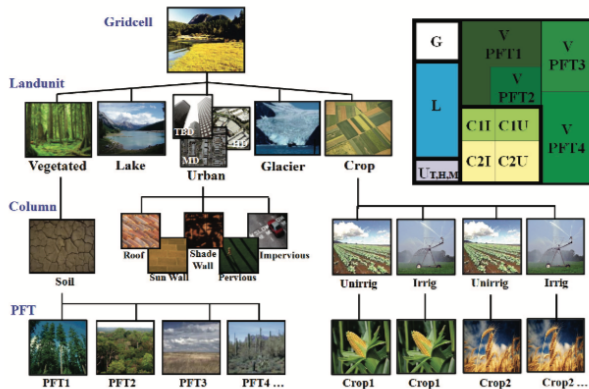
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Snowmass 17 September 2019





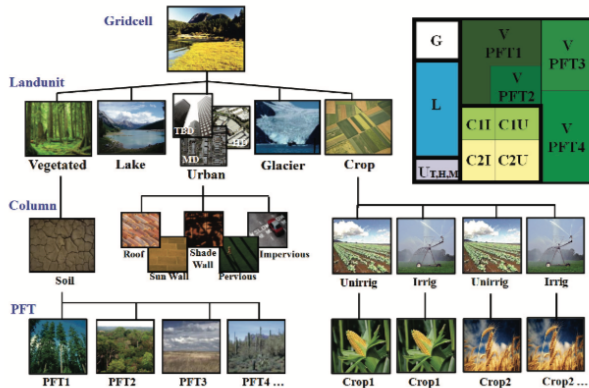
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- ▶ active C-N interaction cycles;
- ▶ fire module activated;
- ▶ no specific crop model activated;
- ▶ missing pasture representation.



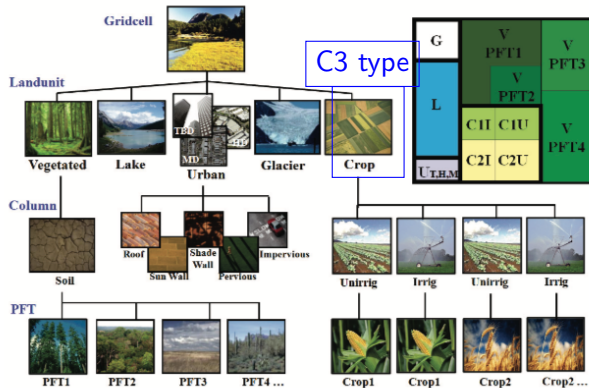
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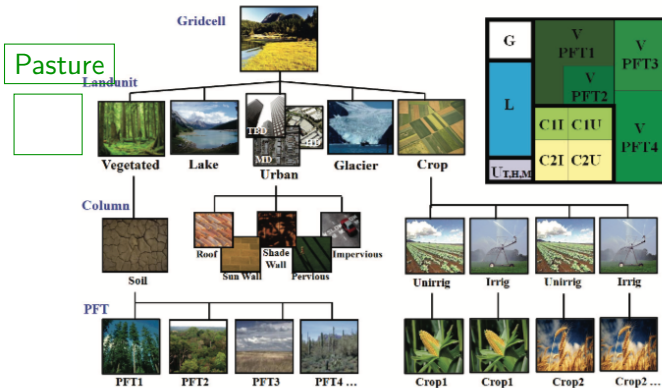
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Feature	Model State
LULCC transition	net transition
Crop representation	1 PFT of C3 crop type
Crop module	absent
Irrigation	absent
Fertilization	absent
Tillage	absent
Pasture representation	missing, grassland
Harvest	wood
Fire	based on natural ignition and socio-economic condition prescribed starting from LUH2
PFT distribution	



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Active features



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Fertilization	absent
Tillage	absent
Pasture representation	missing, grassland
Harvest	wood
Fire	based on natural ignition and socio-economic condition
PFT distribution	prescribed starting from LUH2

Simplified or absent features



Simulation	Model	State
pi-control	CMCC-ESM2	in progress
historical	CMCC-ESM2	TBD
DECK	CMCC-ESM2	TBD
scenarios	CMCC-ESM2	TBD
deforest-glob	CMCC-ESM2	TBD
land-hist	Land	Done*
land-noLu	Land	Done*
land-hist-altStartYear	Land	TBD
hist-noLu	CMCC-ESM2	TBD
ssp370-ssp126Lu	CMCC-ESM2	TBD
ssp126-ssp370Lu	CMCC-ESM2	TBD
esm-ssp585-ssp126Lu	CMCC-ESM2	TBD

* working on CMOR and ESGF publication



Simulation	Model change	State
land-cCO2	forcing	possible
land-cClim	forcing	possible
land-crop-grass	crop	not possible
land-crop-noIrrigFert	crop	not possible
land-crop-noIrrig	irrigation	not possible
land-crop-noFert	fertilization	not possible
land-noPasture	pasture	not possible
land-noWoodHarv	harvesting	possible
land-noShiftcultivate	crop	not possible
land-noFire	fire	possible



Possible contribution to presented analysis projects:

- ▶ **Climate response to idealized deforestation** → possibility to **provide requested simulations** (piControl and deforest-glob) based on analysis schedule;
- ▶ **Benchmarking LUMIP models** → possibility to **provide requested simulations** (land-hist and land-noLu available, historical TBD) based on analysis schedule;
- * **Simulated historical land-use emissions** → hist and hist-noLu **difficult** to be available soon;
- * **Detection and attribution of LULCC influences on historical trends in climate extremes** → land-hist and land-noLu are **available**, but **more time needed** to complete piControl, hist, and hist-noLu

Interest/Analysis plan:

- ▶ Urbanization impact on climate.



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- ▶ Urbanization impact on climate.



- ▶ finalize CMOR and publication on ESGF of completed simulations;
- ▶ finalize CMCC-ESM2 spin-up and coupled simulations;
- ▶ test and provide tier 2 simulations;
- ▶ test and propose LULCC analysis.



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- ▶ for short-term analysis, is possible to provide raw data or CMOR-data outside ESGF?
 - ▶ on proposed analysis, which time schedule is requested to be included as simulation provider?
 - ▶ given the differences between LSMs, can a sub-sample of tier 2 simulations informative?





- Koven, C. D., Riley, W. J., Subin, Z. M., Tang, J. Y., Torn, M. S., Collins, W. D., Bonan, G. B., Lawrence, D. M., and Swenson, S. C. The effect of vertically resolved soil biogeochemistry and alternate soil C and N models on C dynamics of CLM4. *Biogeosciences*, 10:7109–7131, 2013. doi: 10.5194/bg-10-7109-2013.
- Oleson, K. W., Lawrence, D., Bonan, G., Drewniak, B., Huang, M., Koven, C., Levis, S., Li, F., Riley, W., Subin, Z., Swenson, S., Thornton, P., Bozbiyik, A., Fisher, R., Kluzek, E., Lamarque, J.-F., Lawrence, P., Leung, L., Lipscomb, W., Muszala, S., Ricciuto, D., Sacks, W., Sun, Y., Tang, J., and Yang, Z.-L. Technical description of version 4.5 of the community land model (CLM). Ncar Technical Note NCAR/TN-503+STR, National Center for Atmospheric Research, Boulder, CO, 2013.

