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Supplement of

Downscaling land use and land cover from the Global Change Assessment Model for coupling with Earth system models

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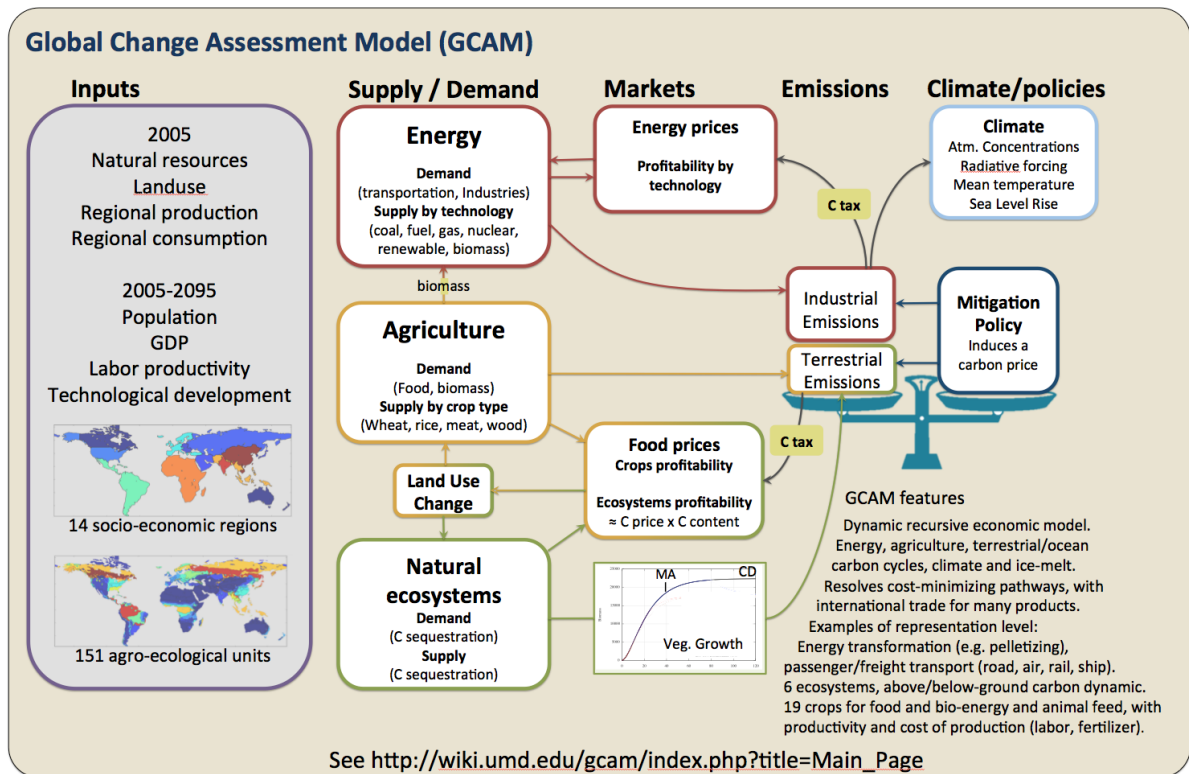
A. GCAM overview

Figure S1. GCAM diagram.

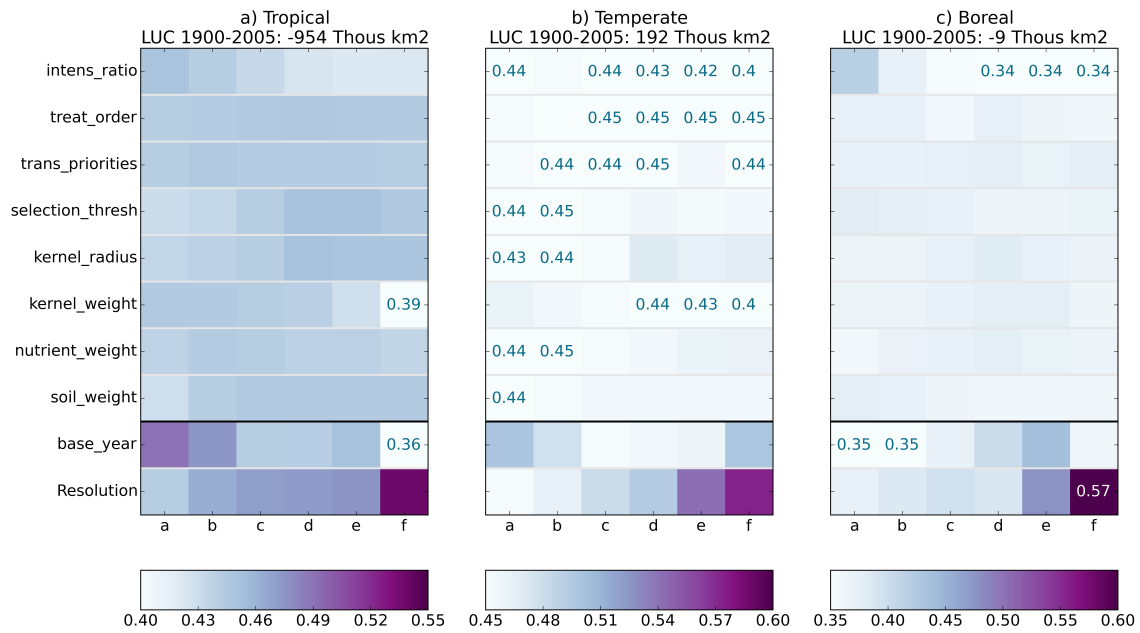# B. Evaluation of the downscaling for forests

Figure S2. Results of the performance and sensitivity analysis for forests.

C. Configuration to downscale 4 types of forests, instead of one single forest type

Table S1: User-defined aggregation of the spatial data to downscale 4 types of forests separately. ENF: Evergreen needle-leaf forest; EBF Evergreen broadleaf forest; DNF: Deciduous needle-leaf forest; DBF: Deciduous broadleaf forest.

Spatial land types (MODIS PFTs)	Final land types (FLTs) for downscaling									
	ENF	EBF	DNF	DBF	shrub	grass	crops	urban	snow	sparse
ev. needl. (ENF)	**1**	0	0	0	0	0	0	0	0	0
ev. broad. (EBF)	0	**1**	0	0	0	0	0	0	0	0
dec. needl. (DNF)	0	0	**1**	0	0	0	0	0	0	0
dec. broad. (DBF)	0	0	0	**1**	0	0	0	0	0	0
shrub	0	0	0	0	**1**	0	0	0	0	0
grass	0	0	0	0	0	**1**	0	0	0	0
crops	0	0	0	0	0	0	**1**	0	0	0
urban	0	0	0	0	0	0	0	**1**	0	0
snow	0	0	0	0	0	0	0	0	**1**	0
sparse	0	0	0	0	0	0	0	0	0	**1**

Table S2: User-defined aggregation of the GCAM data to downscale 4 types of forests separately. ENF: Evergreen needle-leaf forest; EBF Evergreen broadleaf forest; DNF: Deciduous needle-leaf forest; DBF: Deciduous broadleaf forest.

GCAM land types	Final land types (FLTs) for downscaling									
	ENF	EBF	DNF	DBF	shrub	grass	crops	urban	snow	sparse
Corn	0	0	0	0	0	0	1	0	0	0
Wheat	0	0	0	0	0	0	1	0	0	0
Rice	0	0	0	0	0	0	1	0	0	0
Root_Tuber	0	0	0	0	0	0	1	0	0	0
OilCrop	0	0	0	0	0	0	1	0	0	0
SugarCrop	0	0	0	0	0	0	1	0	0	0
OtherGrain	0	0	0	0	0	0	1	0	0	0
FiberCrop	0	0	0	0	0	0	1	0	0	0
FodderGrass	0	0	0	0	0	0	1	0	0	0
FodderHerb	0	0	0	0	0	0	1	0	0	0
Biomass	0	0	0	0	0	0	1	0	0	0
MiscCrop	0	0	0	0	0	0	1	0	0	0
OtherArableLand	0	0	0	0	0	0	1	0	0	0
PalmFruit	0	0	0	0	0	0	1	0	0	0
Pasture	0	0	0	0	0	1	0	0	0	0
UnmanagedPasture	0	0	0	0	0	1	0	0	0	0
UrbanLand	0	0	0	0	0	0	0	1	0	0
willow	1	1	1	1	0	0	0	0	0	0
Forest	1	1	1	1	0	0	0	0	0	0
UnmanagedForest	1	1	1	1	0	0	0	0	0	0
Shrubland	0	0	0	0	1	0	0	0	0	0
Grassland	0	0	0	0	0	1	0	0	0	0
Tundra	0	0	0	0	0	1	0	0	0	0
RockIceDesert	0	0	0	0	0	0	0	0	1	1

Table S3: User-defined treatment order to downscale 4 types of forests separately. ENF: Evergreen needle-leaf forest; EBF Evergreen broadleaf forest; DNF: Deciduous needle-leaf forest; DBF: Deciduous broadleaf forest.

Final land types (FLTs)	Treatment order
ENF	5
EBF	6
DNF	7
DBF	8
shrub	10
grass	9
crops	4
urban	1
snow	2
sparse	3

Table S4: User-defined transition priorities to downscale 4 types of forests separately. ENF: Evergreen needle-leaf forest; EBF Evergreen broadleaf forest; DNF: Deciduous needle-leaf forest; DBF: Deciduous broadleaf forest.

Final land types (FLTs)	Final land types (FLTs) for downscaling									
	ENF	EBF	DNF	DBF	shrub	grass	crops	urban	snow	sparse
ENF	0	1	2	3	4	5	6	7	8	9
EBF	1	0	2	3	4	5	6	7	8	9
DNF	1	2	0	3	4	5	6	7	8	9
DBF	1	2	3	0	4	5	6	7	8	9
shrub	5	6	7	8	0	4	9	1	3	2
grass	6	7	8	9	5	0	4	1	3	2
crops	4	5	6	7	3	2	0	1	9	8
urban	5	6	7	8	3	2	4	0	9	1
snow	6	7	8	9	5	4	3	2	0	1
sparse	6	7	8	9	4	2	3	5	1	0