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*Supplement of*

## **Global rules for translating land-use change (LUH2) to land-cover change for CMIP6 using GLM2**

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## Supplementary

**Table. S1. Legend translation to produce a common forest canopy cover for various land cover datasets based on (Song et al., 2014). For references see Table. 2.**

Products	Land cover class	Fraction
GLCC, MODIS LC	Forest (evergreen needleleaf; deciduous needleleaf; evergreen broadleaf; evergreen needleleaf; mixed)	0.80
	Woody savannas	0.45
	Cropland/Natural Vegetation Mosaic	0.25
	Savannas	0.20
	Open shrublands; closed shrublands; grasslands; croplands; urban and build-up; snow and ice; water bodies; permanent wetlands; barren or sparsely vegetated	0
GLC2000	Tree cover (evergreen broadleaved, closed deciduous broadleaved)	0.70
	Tree cover (evergreen needleleaf; deciduous needleleaf; mixed leaf type; regularly flooded fresh or saline)	0.575
	Mosaic: Tree cover/other natural vegetation	0.50
	Tree cover (open deciduous broadleaved)	0.275
	Mosaic: cropland/tree cover/ other natural vegetation	0.25
	Tree cover burnt; shrub cover (evergreen, deciduous); herbaceous cover; sparse herbaceous or sparse shrub cover; regularly flooded shrub and/or herbaceous cover; cultivated and managed areas; mosaic: cropland / Shrub and/or grass cover; bare areas; water bodies; snow and ice; artificial surfaces and associated areas	0
GlobCover	Closed forest (broadleaved deciduous; needle leaved evergreen)	0.70
	Closed to open forest (broadleaved evergreen or semi-deciduous, mixed broadleaved and needle leaved, broadleaved forest regularly flooded)	0.575
	Open broadleaved deciduous forest/woodland; open needle leaved deciduous or evergreen forest;	0.30
	Mosaic vegetation (grassland/shrubland/forest) / cropland; mosaic forest or shrubland / grassland	0.20
	Mosaic grassland / forest or shrubland	0.175
	Mosaic cropland / vegetation (grassland/shrubland/forest)	0.117
	Post-flooding or irrigated croplands (or aquatic); rainfed croplands; closed to open (broadleaved or needle leaved, evergreen or deciduous); closed to open herbaceous vegetation (grassland, savannas or lichens/mosses); sparse vegetation; closed broadleaved forest or shrubland permanently flooded; closed to open grassland or woody vegetation on regularly flooded or waterlogged soil; artificial surfaces and associated areas; bare areas; water bodies; permanent snow and ice	0

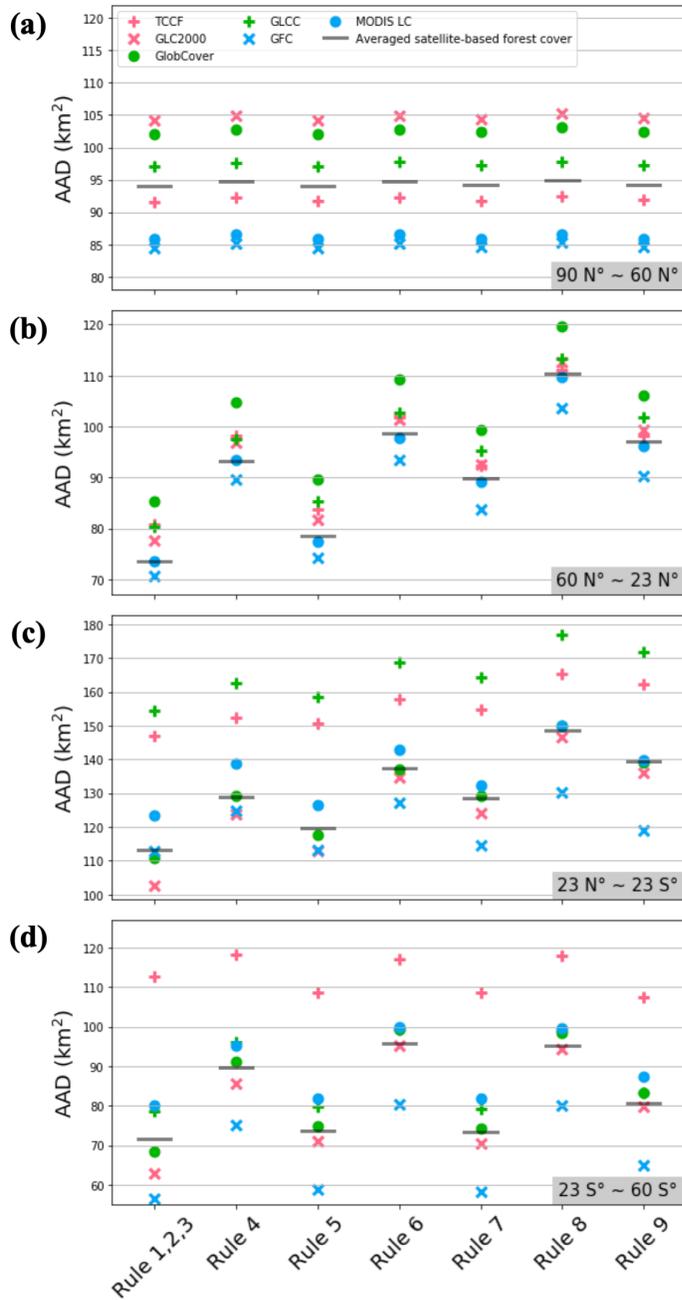
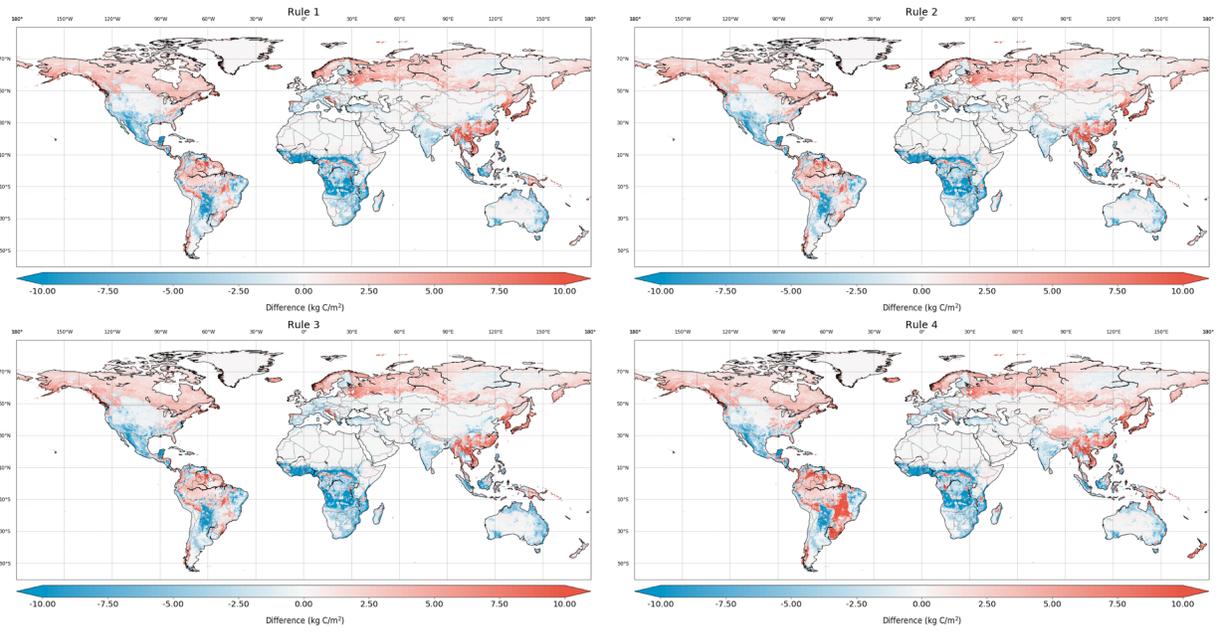
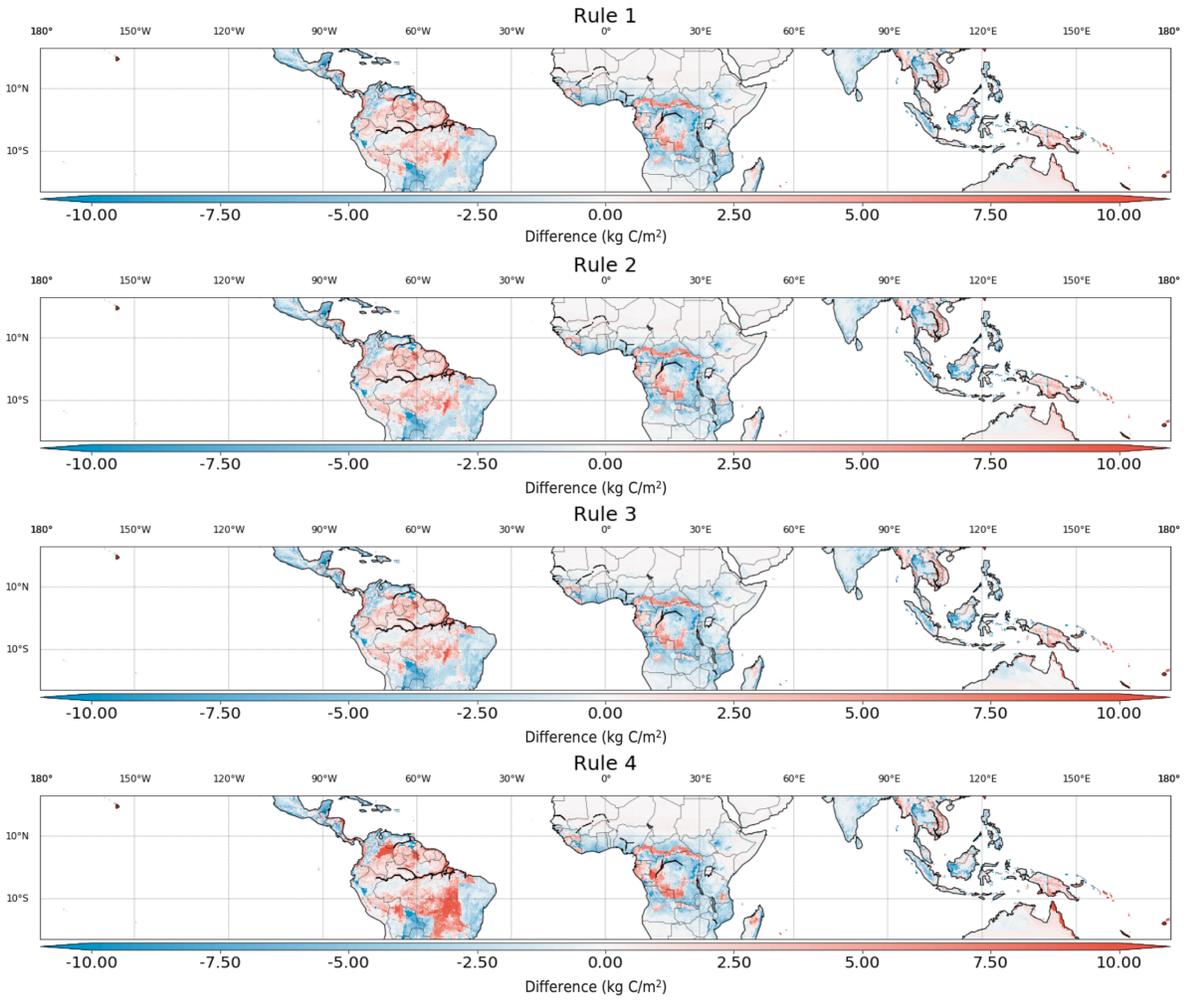


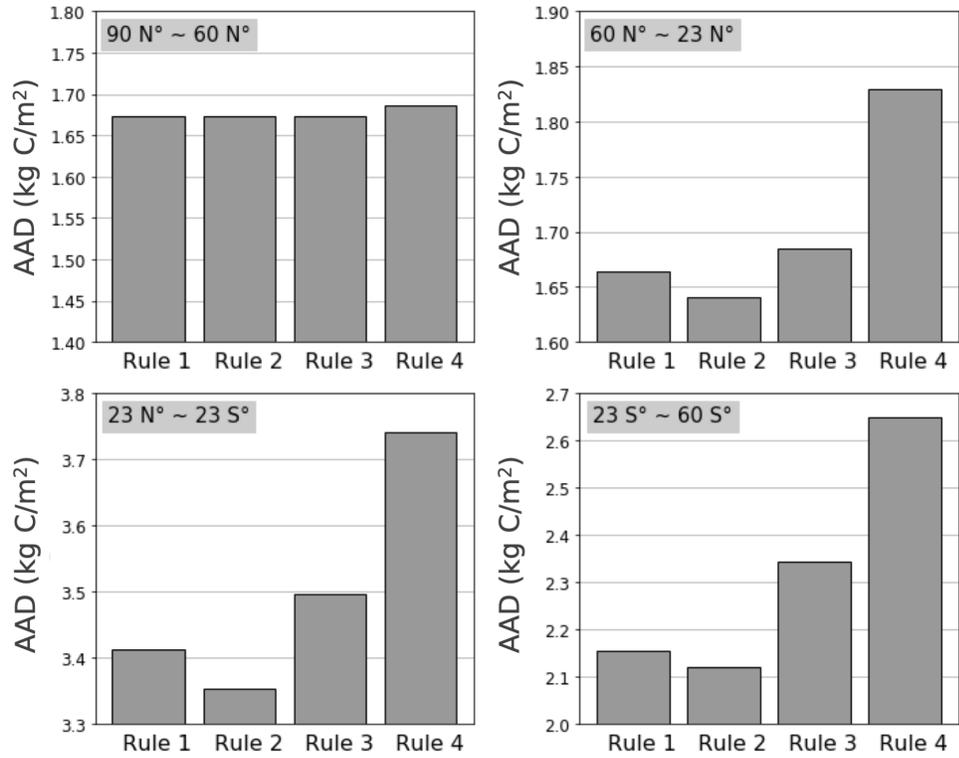
Figure S1. Regional average of absolute difference in forest area between maps estimated by translation rules, and six satellite-based forest cover maps and the averaged satellite-based forest cover map.



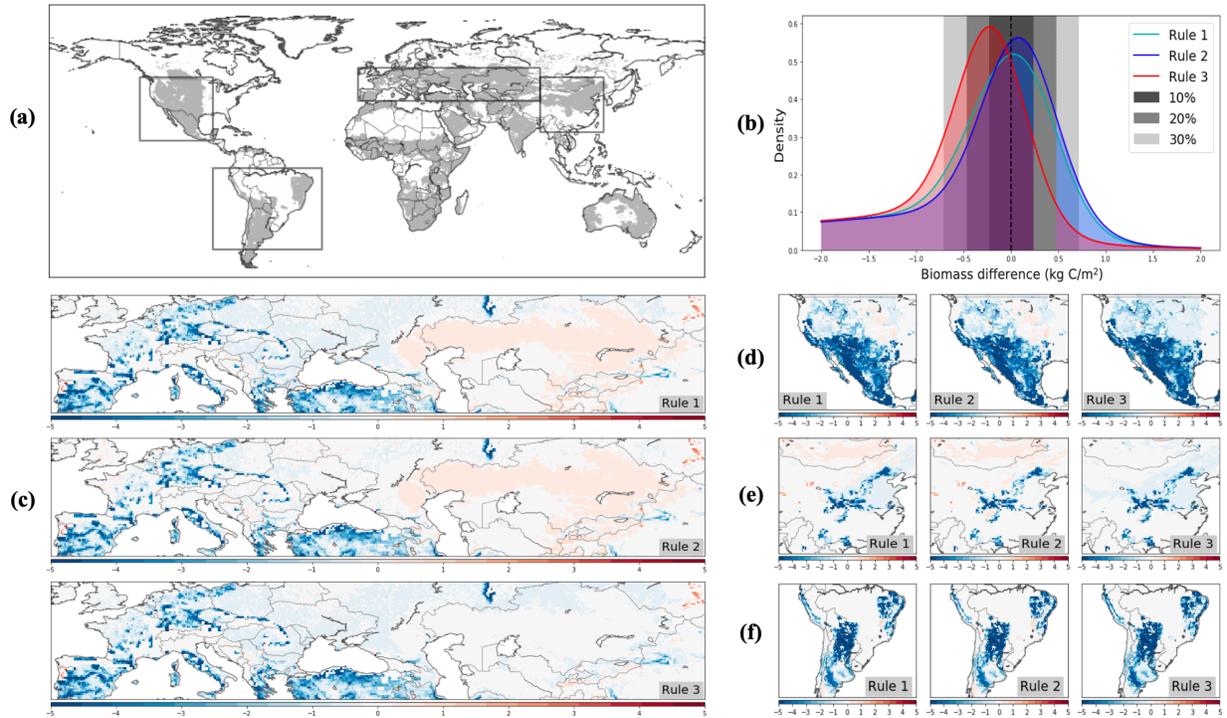
**Figure S2. Global carbon density difference between IPCC biomass Tier-1 (Figure 7a) density map and estimates of Rules 1-4 from (a) to (d).**



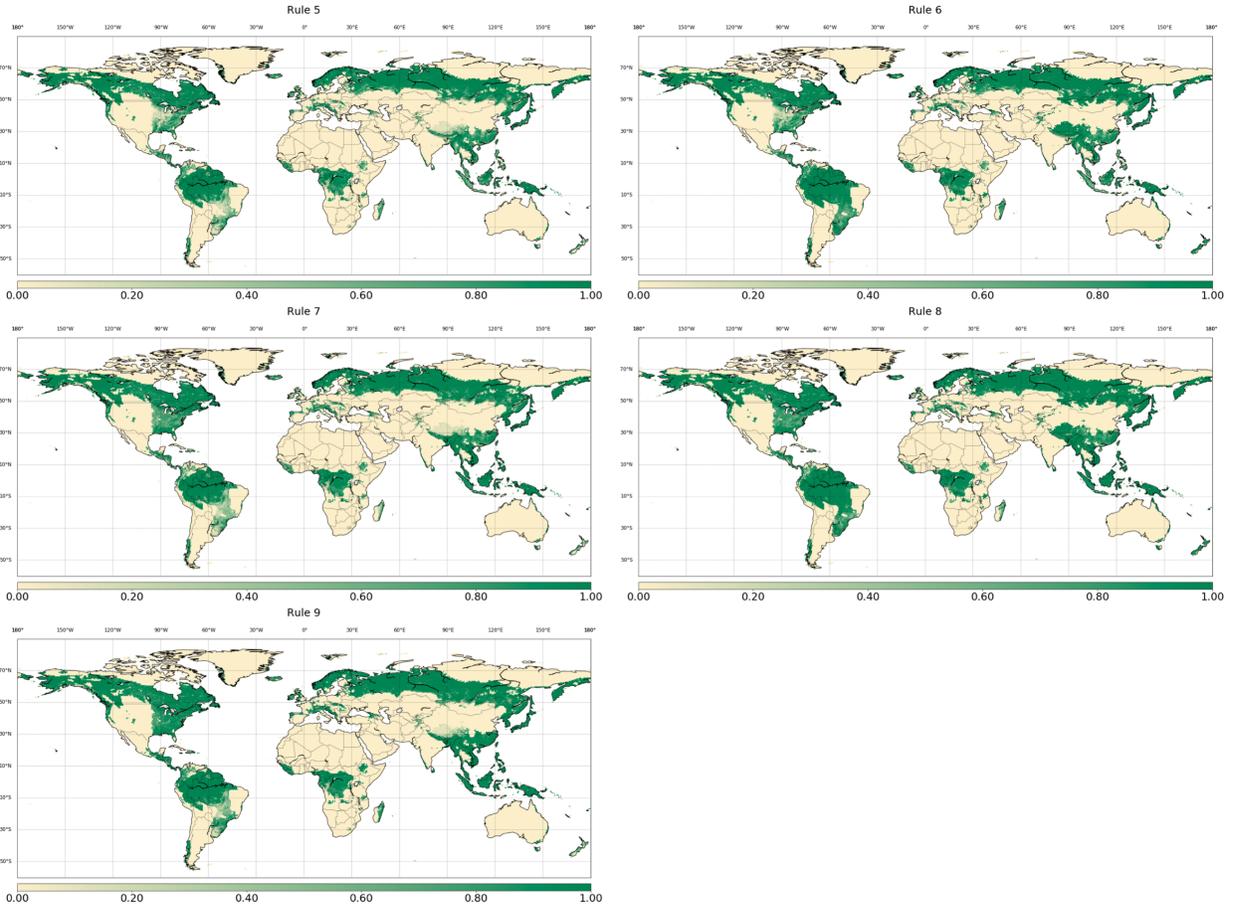
**Figure S3. Global carbon density difference between the Baccini's product (Figure 7b) and estimates of Rules 1-4 from (a) to (d).**



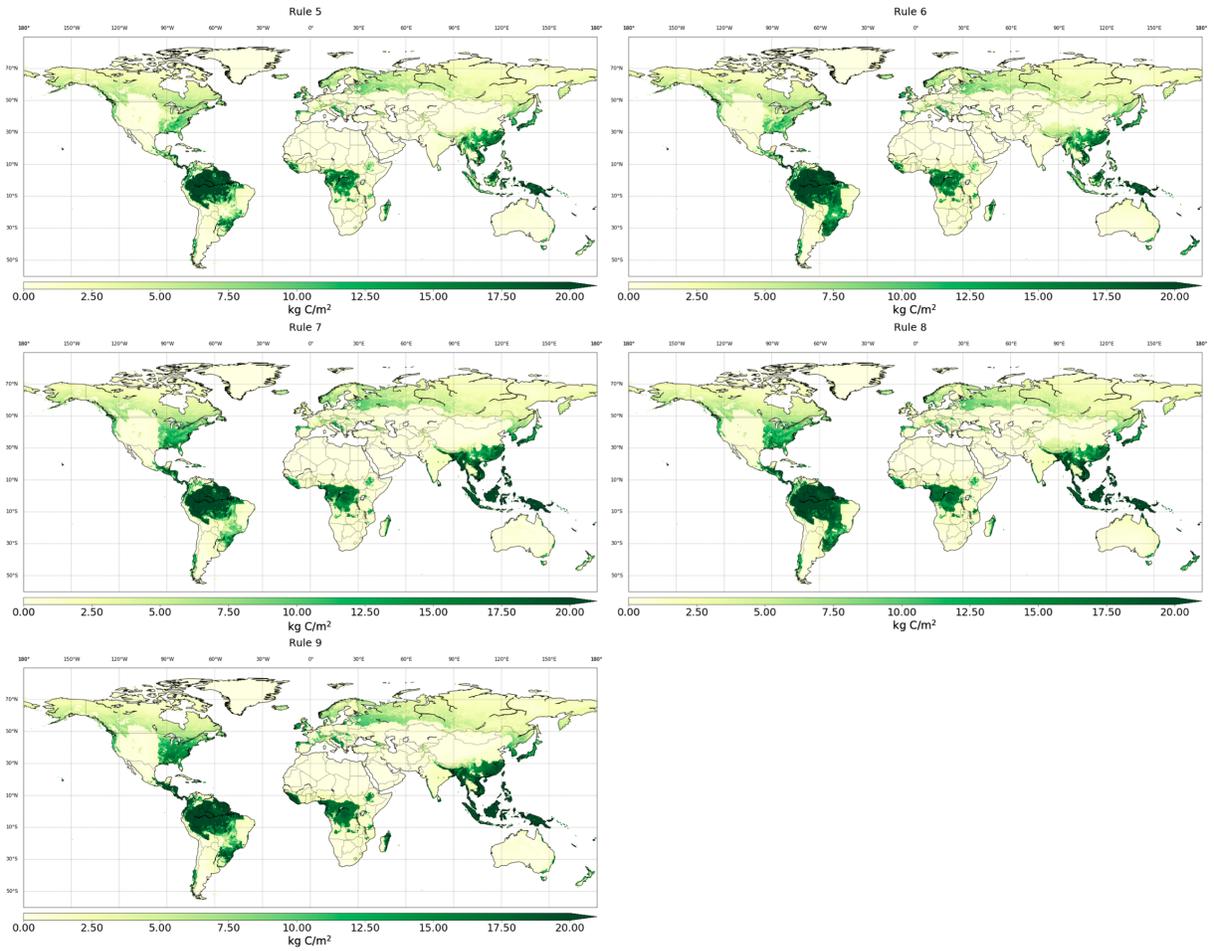
**Figure S4. Average of absolute difference in carbon density between estimations of the Rules 1-4 and the IPCC Tier-1 biomass density map at different latitudinal band zones.**



**Figure S5. Carbon density difference comparison between the IPCC Tier-1 biomass density map and estimation of Rules 1-3. (a) Shaded regions represent where Rules 1-3 differ in estimates of carbon density; (b) Histogram of carbon density difference of shaded regions in (a), shared bounds present shift range of zero line under three assumed bias levels of the IPCC Tier-1 biomass. (c) – (f) are regional comparison of carbon density difference of Rules 1-3, regions where Rules 1-3 have the same estimate of carbon density are not shown.**



**Figure S6. Forest cover in 2000 from the Rules 5-9 respectively.**



**Figure S7. Global carbon density (above- and below-ground) maps estimated by Rules 5-9 respectively.**