

## 8 Biomes

### 8.1 Experiments

**Table 17** provides an overview of all experiments to be run in the biomes sector in ISIMIP2a.

**Table 17:** Experiment summary for Biomes models. For an explanation of the varsoc, pressoc and nat settings see **Table 7** (and **Table 10** if your model is also a water model). If varsoc is not possible, please submit the pressoc run.

Climate Data	Scenario	Human impacts (see Table 7)	Other settings (sens-scenario)	# runs
WATCH-WFDEI	hist	varsoc	historical CO2 (co2)	1
GSWP3-W5E5	hist	varsoc	historical CO2 (co2)	1
GSWP3-EWEMBI	hist	varsoc	historical CO2 (co2)	1
GSWP3	hist	varsoc	historical CO2 (co2)	1
PGMFD v.2 (Princeton)	hist	varsoc (see Table 10)	historical CO2 (co2)	1
WATCH (WFD)	hist	varsoc	historical CO2 (co2)	1
<b>Additional sector-specific run:</b> PGMFD v.2 (Princeton)	hist	nat	historical CO2 (co2)	1
<b>Additional sector-specific run:</b> PGMFD v.2 (Princeton)	hist	varsoc	fix at pre-industrial levels (pico2) = 280ppm	1
				<b>8</b>

**Please note:** these tables do not include all necessary information and should be used as a reference only once the sector-specific and cross-sectoral protocol has been read in full.

## 8.2 Output data

*IMPORTANT: The output variables reported for the biomes sector are also appropriate for use in the permafrost sector described in Section 11.*

**Table 18:** Variables to be reported by biomes models.

Variable (long name)	Variable name	Unit (NetCDF format)	Resolution	Comment	
<b>Essential outputs</b>					
<b>Pools</b>					
Carbon Mass in Vegetation biomass	<b>cveg-&lt;pft&gt;</b>	kg m-2	per pft and gridcell total	year	Gridcell total is essential. Per PFT information is desirable.
*Carbon Mass in aboveground vegetation biomass	<b>cvegag-&lt;pft&gt;</b>	kg m-2	per pft and gridcell total	year	Gridcell total cvegag is essential. Per PFT information is desirable.
*Carbon Mass in belowground vegetation biomass	<b>cvegbg-&lt;pft&gt;</b>	kg m-2	per pft and gridcell total	year	Gridcell total cvegbg is essential. Per PFT information is desirable.
Carbon Mass in Litter Pool	<b>clitter-&lt;pft&gt;</b>	kg m-2	per pft and gridcell total	year	Info for each individual pool.
Carbon Mass in Soil Pool	<b>csoil-&lt;pft&gt;</b>	kg m-2	per pft and gridcell total	year	Info for each individual pool.
<b>Fluxes</b>					
Carbon Mass Flux out of atmosphere due to Gross Primary Production on Land	<b>gpp-&lt;pft&gt;</b>	kg m-2 s-1	per pft and gridcell total	day (mon)	
Carbon Mass Flux into atmosphere due to Autotrophic (Plant) Respiration on Land	<b>ra-&lt;pft&gt;</b>	kg m-2 s-1	per pft and gridcell total	day (mon)	
Carbon Mass Flux out of atmosphere due to Net	<b>npp-&lt;pft&gt;</b>	kg m-2 s-1	per pft and gridcell total	day (mon)	

Primary Production on Land					
Net Primary Production on Land allocated to leaf biomass	<b>npplandleaf-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and per gridcell	day (mon)	
Net Primary Production on Land allocated to fine root biomass	<b>npplandroot-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and per gridcell	day (mon)	
Net Primary Production on Land allocated to above ground wood biomass	<b>nppabovegroundwood-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and per gridcell	day (mon)	
Net Primary Production on Land allocated to below ground wood biomass	<b>nppbelowgroundwood-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and per gridcell	day (mon)	
Carbon Mass Flux into atmosphere due to Heterotrophic Respiration on Land	<b>rh-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and gridcell total	day (mon)	
Carbon Mass Flux into atmosphere due to total Carbon emissions from Fire	<b>fireint-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and gridcell total	day (mon)	
Fraction of cell burnt by fire	<b>firefrac-&lt;pft&gt;</b>	Fractional	Per pft and gridcell total		Burnt area fraction: single value for each scenario corresponding to year 2100.
Carbon Mass Flux out of Atmosphere due to Net biome Production on Land (NBP) (please specify if NBP≠NPP+HR+Fires in your model)	<b>ecoatmfluxc-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and gridcell total	day (mon)	This is the net mass flux of carbon between land and atmosphere. calculated as photosynthesis MINUS the sum of plant and soil respiration, carbonfluxes from fire, harvest, grazing and land use change. Positive flux is into the land.
Root autotrophic respiration	<b>rr-&lt;pft&gt;</b>	kg m <sup>-2</sup> s <sup>-1</sup>	per pft and gridcell total	day (mon)	

## Structure

Fraction of absorbed photosynthetically active radiation	<b>fapar-&lt;pft&gt;</b>	%	per pft and gridcell average	day (mon)	
Leaf Area Index	<b>lai-&lt;pft&gt;</b>	1	per pft and gridcell average	day (mon)	
Plant Functional Type Grid Fraction	<b>pft-&lt;pft&gt;</b>	%	per gridcell	year (or once if static)	The categories may differ from model to model, depending on their PFT definitions. This may include natural PFTs, anthropogenic PFTs, bare soil, lakes, urban areas, etc. Sum of all should equal the fraction of the grid-cell that is land.
<b>Hydrological variables</b>					
Total Evapo-Transpiration	<b>evap-&lt;pft&gt;</b>	kg m-2 s-1	per pft and gridcell	day (mon)	
Evaporation from Canopy (interception)	<b>intercep-&lt;pft&gt;</b>	kg m-2 s-1	per pft and gridcell	day (mon)	The canopy evaporation+sublimation (if present in model).
Water Evaporation from Soil	<b>esoil</b>	kg m-2 s-1	per gridcell	day (mon)	Includes sublimation.
Transpiration	<b>trans-&lt;pft&gt;</b>	kg m-2 s-1	per pft and gridcell	day (mon)	
Total Runoff	<b>qtot</b>	kg m-2 s-1	per gridcell	day (mon)	The total runoff (including "drainage" through the base of the soil model) leaving the land portion of the grid cell.
Soil Moisture	<b>soilmoist</b>	kg m-2	per gridcell	day (mon)	If possible, please provide soil moisture for all depth layers (i.e. 3D-field), and indicate depth in m. Otherwise, provide soil moisture of entire column.
Surface Runoff	<b>qs</b>	kg m-2 s-1	per gridcell	day (mon)	The total surface runoff leaving the land portion of the grid cell.
Frozen soil moisture for each layer	<b>soilmoistfroz</b>	kg m-2	per gridcell	mon	Please provide soil moisture for all depth levels and indicate depth in m.

					Please provide for purposes of permafrost sector.
Snow depth	<b>snd</b>	m	per gridcell	mon	Grid cell mean depth of snowpack. Please provide for purposes of permafrost sector.
Snow water equivalent	<b>swe</b>	kg m-2	per gridcell	mon	Snow depth x snow density.
Annual maximum thaw depth	<b>thawdepth</b>	m	per gridcell	year	Calculated from daily thaw depths.
<b>Optional outputs</b>					
Carbon Mass in Leaves	<b>cleaf-&lt;pft&gt;</b>	kg m-2	per pft and gridcell	year	
Carbon Mass in Wood	<b>cwood -&lt;pft&gt;</b>	kg m-2	per pft and gridcell	year	Including sapwood and hardwood.
Carbon Mass in Roots	<b>croot-&lt;pft&gt;</b>	kg m-2	per pft and gridcell	year	Including fine and coarse roots.
<b>Others</b>					
Temperature of Soil	<b>tsl</b>	K	per gridcell	day (mon)	Temperature of each soil layer. Reported as "missing" for grid cells occupied entirely by "sea". <b>THIS IS THE MOST IMPORTANT VARIABLE FOR THE PERMAFROST SECTOR.</b> Also need depths in meters. Daily would be great, but otherwise monthly would work.
Burnt Area Fraction	<b>burntarea</b>	%	per gridcell	day (mon)	Fraction of entire grid cell that is covered by burnt vegetation.

**Note:** If you cannot provide the data at the temporal or spatial resolution specified, please provide it the highest possible resolution of your model. Please contact the coordination team ([Info@isimip.org](mailto:Info@isimip.org)) for any further clarification, or to discuss the equivalent variable in your model.

## 15 References

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