VEMAP Phase I
The Vegetation/Ecosystem Modeling and Analysis Project

VEMAP 1: Selected Model Results

Selected model results from the VEMAP Phase I modeling exercise are now available through the ORNL DAAC.

For a description of the models employed in the VEMAP 1 project and a discussion of the results please refer to the following publication:

> VEMAP Members. 1995. Vegetation/Ecosystem Modeling and Analysis Project: Comparing biogeography and biogeochemistry models in a continental-scale study of terrestrial ecosystem responses to climate change and CO_2 doubling. *Global Biogeochem. Cycles* 9:407-437.

These individual model output data files were the basis for the described model intercomparisons.

Appendix A of this document contains a table of all output files for the selected models and variables that are available on the ORNL DAAC and README files to provide the user with model, vegetation, climate scenario, and data file naming information.

Appendix B of this document contains brief description of the models used during VEMAP 1.

Selected Model Output

Biogeography Models

Each biogeography model was run under 3 climate change scenarios plus the contemporary (VEMAP) climate. We are releasing model output for 2 variables.

BIOME2

DOLY (Dynamic Global Phytogeography Model)

MAPSS (Mapped Atmosphere-Plant Soil system)

Output available for the following variables:

Vegetation Type

Evapotranspiration (MAPSS only)

Biogeochemistry Models

Each biogeochemistry model was run under 3 climate change scenarios plus the contemporary (VEMAP) climate, with 4 vegetation distributions. We are releasing model output for 5 variables.

BIOME-BGC (BioGeochemical Cycles)

CENTURY

TEM (Terrestrial Ecosystem Model)

GCM Climate Change Scenarios

GFDR-R30 [R30 2.22 x 3.75 degree grid run. High resolution GCM experiment. (Manabe and Wetherald 1990, Wetherald and Manabe 1990)]

OSU [Oregon State University. (Schlesinger and Zhao 1989)]

UKMO [UKLO, low resolution run, Wilson and Mitchell 1987). UK Meteorological Office model.]

Contemporary Climate (VEMAP)

Vegetation Distributions

BIOME2
Contemporary VEMAP (vveg.v1)
DOLY (Dynamic Global Phytogeography Model)
MAPSS (Mapped Atmosphere-Plant Soil system)

Output available for the following variables:

Net Primary Productivity (NPP)
Evapotranspiration (ET)

Soil Carbon (SOLC)

Vegetation Carbon Carbon (VEGC)
Nitrogen Mineralization (NMIN)

References

Manabe, S. and Wetherald, R.T. (1990) [Reported in: Mitchell, J.F.B., S. Manabe, V. Meleshko, T. Tokioka. Equilibrium Climate Change and its Implications for the Future. Pp. 131-172, in: Climate Change: The IPCC Scientific Assessment. Houghton, J.T., G.J. Jenkins, and J.J. Ephraums (eds). Cambridge University Press, Cambridge, UK.]

Schlesinger, M.E. and Z.C. Zhao (1989) Seasonal climate changes induced by doubled CO_2 as simulated by the OSU atmospheric GCM-mixed layer ocean model. *J. Climate* 2:459-495.

Wetherald, R.T. and S. Manabe (1990) [Reported in: Cubasch, U., and R.D. Cess. Processes and Modeling. Pp. 69-91, in: Climate Change: The IPCC Scientific Assessment. Houghton, J.T., G.J. Jenkins, and J.J. Ephraums (eds). Cambridge University Press, Cambridge, UK.]

Wilson, C.A. and J.F.B. Mitchell (1987) A doubled CO_2 climate sensitivity experiment with a global climate model including a simple ocean. *J. Geophys. Res.* 92 (D11):13,315-13,343.

Appendix A

Table of VEMAP Phase 1 output files for selected models and variables that are available on the ORNL DAAC ftp site. [ftp://daac.ornl.gov/data/vemap-1_results] .

- Column values in the table reflect the ftp site path to the respective data files (after UCAR ftp site structure).
- Note that there is some variation as to which column/level the data files might appear.
- README files are referenced/linked at the appropriate rows in the table to provide the user with model, vegetation, climate scenario, and data file naming information. The README files are included following the table.

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
bgc				
bgc_README.biome2	biome2_vveg			
		contemp		
			bgc_b2_355con.etr3	
			bgc_b2_355con.nminr3	
			bgc_b2_355con.nppr3	
			bgc_b2_355con.soilcr3	
			bgc_b2_355con.vegcr3	
		gf3		
			bgc_b2_710gf3.etv4	
			bgc_b2_710gf3.nminv4	
			bgc_b2_710gf3.nppv4	
			bgc_b2_710gf3.soilcv4	
			bgc_b2_710gf3.vegcv4	
		osu		
			bgc_b2_710osu.etv4	
			bgc_b2_710osu.nminv4	
			bgc_b2_710osu.nppv4	
			bgc_b2_710osu.soilcv4	
			bgc_b2_710osu.vegcv4	
		README.qc		
		sum_tables		
			bgc_b2_355con.sumr3	
			bgc_b2_710gf3.sumr4	
			bgc_b2_710osu.sumr4	
			bgc_b2_710ukm.sumr4	
		ukm		
			bgc_b2_710ukm.etv4	
			bgc_b2_710ukm.nminv4	
			bgc_b2_710ukm.nppv4	
			bgc_b2_710ukm.soilcv4	
			bgc_b2_710ukm.vegcv4	
bgc_README.con	contemp_vveg			
		contemp		
			bgc355con.etr3	
			bgc355con.nminr3	
			bgc355con.nppr3	
			bgc355con.soilcr3	
			bgc355con.vegcr3	
			bgc710con.etr3	
			bgc710con.nminr3	
			bgc710con.nppr3	
			bgc710con.soilcr3	
			bgc710con.vegcr3	
			sum_tables	
				bgc355con.sumr3
				bgc710con.sumr3
bgc_README.gfdlr30		GFDLR30gcm		
			bgc355gf3.etr3	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			bgc355gf3.nminr3	
			bgc355gf3.nppr3	
			bgc355gf3.soilcr3	
			bgc355gf3.vegcr3	
			bgc710gf3.etr3	
			bgc710gf3.nminr3	
			bgc710gf3.nppr3	
			bgc710gf3.soilcr3	
			bgc710gf3.vegcr3	
			sum_tables	
				bgc355gf3.sumr3
				bgc710gf3.sumr3
bgc_README.osu		OSUgcm		
			bgc355osu.etr3	
			bgc355osu.nminr3	
			bgc355osu.nppr3	
			bgc355osu.soilcr3	
			bgc355osu.vegcr3	
			bgc710osu.etr3	
			bgc710osu.nminr3	
			bgc710osu.nppr3	
			bgc710osu.soilcr3	
			bgc710osu.vegcr3	
			sum_tables	
				bgc355osu.sumr3
				bgc710osu.sumr3
		README.con		
		README.gfdlr30		
		README.osu		
		README.qc		
		README.ukmo		
bgc_README.ukmo		UKMOgcm		
			bgc355ukm.etr3	
			bgc355ukm.nminr3	
			bgc355ukm.nppr3	
			bgc355ukm.soilcr3	
			bgc355ukm.vegcr3	
			bgc710ukm.etr3	
			bgc710ukm.nminr3	
			bgc710ukm.nppr3	
			bgc710ukm.soilcr3	
			bgc710ukm.vegcr3	
			sum_tables	
				bgc355ukm.sumr3
				bgc710ukm.sumr3
bgc_README.bgc_doly	doly_vveg			
		contemp		
			bgc_do_355con.etr3	
			bgc_do_355con.nminr3	
			bgc_do_355con.nppr3	
			bgc_do_355con.soilcr3	
			bgc_do_355con.vegcr3	
		gfdlr30		
			bgc_do_710gf3.etr3	
			bgc_do_710gf3.nminr3	
			bgc_do_710gf3.nppr3	
			bgc_do_710gf3.soilcr3	
			bgc_do_710gf3.vegcr3	
		osu		
			bgc_do_710osu.etr3	
			bgc_do_710osu.nminr3	
			bgc_do_710osu.nppr3	
			bgc_do_710osu.soilcr3	
			bgc_do_710osu.vegcr3	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
		README.bgc_doly		
		README.qc_doly		
		sum_tables		
			bgc_do_355con.sumr3	
			bgc_do_710gf3.sumr3	
			bgc_do_710osu.sumr3	
			bgc_do_710ukm.sumr3	
		ukmo		
			bgc_do_710ukm.etr3	
			bgc_do_710ukm.nminr3	
			bgc_do_710ukm.nppr3	
			bgc_do_710ukm.soilcr3	
			bgc_do_710ukm.vegcr3	
bgc_README.mapss	mapss_vveg			
		contemp		
			bgc_ma_355con.etr3	
			bgc_ma_355con.nminr3	
			bgc_ma_355con.nppr3	
			bgc_ma_355con.soilcr3	
			bgc_ma_355con.vegcr3	
		gfdlr30		
			bgc_ma_710gf3.etr3	
			bgc_ma_710gf3.nminr3	
			bgc_ma_710gf3.nppr3	
			bgc_ma_710gf3.soilcr3	
			bgc_ma_710gf3.vegcr3	
		osu		
			bgc_ma_710osu.etr3	
			bgc_ma_710osu.nminr3	
			bgc_ma_710osu.nppr3	
			bgc_ma_710osu.soilcr3	
			bgc_ma_710osu.vegcr3	
		README.bgc		
		README.qc		
		sum_tables		
			bgc_ma_355con.sumr3	
			bgc_ma_710gf3.sumr3	
			bgc_ma_710osu.sumr3	
			bgc_ma_710ukm.sumr3	
		ukmo		
			bgc_ma_710ukm.etr3	
			bgc_ma_710ukm.nminr3	
			bgc_ma_710ukm.nppr3	
			bgc_ma_710ukm.soilcr3	
			bgc_ma_710ukm.vegcr3	
biome2				
biome2_readme.new	gf3_355.v4			
	gf3_710.v4			
	osu_355.v4			
	osu_710.v4			
	pres_355_v1			
	pres_710_v1			
	README.new			
	README.qc			
	ukm_355.v4			
	ukm_710.v4			
century				
century_README.biome2	biome2_vveg			
		contemp		
			cent_et.355contemp_biome2.v6	
			cent_nmin.355contemp_biome2.v6	
			cent_npp.355contemp_biome2.v6	
			cent_soilc.355contemp_biome2.v6	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			cent_vegc.355contemp_biome2.v6	
		gf3		
			cent_et.710gf3_biome2.v6	
			cent_nmin.710gf3_biome2.v6	
			cent_npp.710gf3_biome2.v7	
			cent_soilc.710gf3_biome2.v7	
			cent_vegc.710gf3_biome2.v7	
		osu		
			cent_et.710osu_biome2.v6	
			cent_nmin.710osu_biome2.v6	
			cent_npp.710osu_biome2.v7	
			cent_soilc.710osu_biome2.v7	
			cent_vegc.710osu_biome2.v7	
		README.qc		
		sum_tables		
			cent_et.355contemp_biome2.sum	
			cent_et.710gf3_biome2.sum	
			cent_et.710osu_biome2.sum	
			cent_et.710ukm_biome2.sum	
			cent_nmin.355contemp_biome2.sum	
			cent_nmin.710gf3_biome2.sum	
			cent_nmin.710osu_biome2.sum	
			cent_nmin.710ukm_biome2.sum	
			cent_npp.355contemp_biome2.sum	
			cent_npp.710gf3_biome2.sum	
			cent_npp.710osu_biome2.sum	
			cent_npp.710ukm_biome2.sum	
			cent_soilc.355contemp_biome2.sum	
			cent_soilc.710gf3_biome2.sum	
			cent_soilc.710osu_biome2.sum	
			cent_soilc.710ukm_biome2.sum	
			cent_vegc.355contemp_biome2.sum	
			cent_vegc.710gf3_biome2.sum	
			cent_vegc.710osu_biome2.sum	
			cent_vegc.710ukm_biome2.sum	
		ukm		
			cent_et.710ukm_biome2.v6	
			cent_nmin.710ukm_biome2.v6	
			cent_npp.710ukm_biome2.v7	
			cent_soilc.710ukm_biome2.v7	
			cent_vegc.710ukm_biome2.v7	
century_README.contemp	contemp_vveg			
		contemp		
			cent_et.355contemp100.v4	
			cent_et.710contemp100.v4	
			cent_folc.355contemp100.v4	
			cent_folc.710contemp100.v4	
			cent_nmin.355contemp100.v4	
			cent_nmin.710contemp100.v4	
			cent_npp.355contemp100.v4	
			cent_npp.710contemp100.v4	
			cent_soilc.355contemp100.v4	
			cent_soilc.710contemp100.v4	
			cent_soiln.355contemp100.v4	
			cent_soiln.710contemp100.v4	
			cent_vegc.355contemp100.v4	
			cent_vegc.710contemp100.v4	
			cent_vegn.355contemp100.v4_1	
			cent_vegn.710contemp100.v4_1	
			sum_tables	
				cent_et.355contemp100.sum
				cent_et.710contemp100.sum

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
				cent_folc.355contemp100.sum
				cent_folc.710contemp100.sum
				cent_nmin.355contemp100.sum
				cent_nmin.710contemp100.sum
				cent_npp.355contemp100.sum
				cent_npp.710contemp100.sum
				cent_soilc.355contemp100.sum
				cent_soilc.710contemp100.sum
				cent_soiln.355contemp100.sum
				cent_soiln.710contemp100.sum
				cent_vegc.355contemp100.sum
				cent_vegc.710contemp100.sum
				cent_vegn.355contemp100.sum_1
				cent_vegn.710contemp100.sum_1
		GFDLR30gcm		
			cent_et.355gf3100.v4	
			cent_et.710gf3100.v4	
			cent_folc.355gf3100.v4	
			cent_folc.710gf3100.v4	
			cent_nmin.355gf3100.v4	
			cent_nmin.710gf3100.v4	
			cent_npp.355gf3100.v4	
			cent_npp.710gf3100.v4	
			cent_soilc.355gf3100.v4	
			cent_soilc.710gf3100.v4	
			cent_soiln.355gf3100.v4	
			cent_soiln.710gf3100.v4	
			cent_vegc.355gf3100.v4	
			cent_vegc.710gf3100.v4	
			cent_vegn.355gf3100.v4_1	
			cent_vegn.710gf3100.v4_1	
			sum_tables	
				cent_et.355gf3100.sum
				cent_et.710gf3100.sum
				cent_folc.355gf3100.sum
				cent_folc.710gf3100.sum
				cent_nmin.355gf3100.sum
				cent_nmin.710gf3100.sum
				cent_npp.355gf3100.sum
				cent_npp.710gf3100.sum
				cent_soilc.355gf3100.sum
				cent_soilc.710gf3100.sum
				cent_soiln.355gf3100.sum
				cent_soiln.710gf3100.sum
				cent_vegc.355gf3100.sum
				cent_vegc.710gf3100.sum
				cent_vegn.355gf3100.sum_1
				cent_vegn.710gf3100.sum_1
		OSUgcm		

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			cent_et.355osu100.v4	
			cent_et.710osu100.v4	
			cent_folc.355osu100.v4	
			cent_folc.710osu100.v4	
			cent_nmin.355osu100.v4	
			cent_nmin.710osu100.v4	
			cent_npp.355osu100.v4	
			cent_npp.710osu100.v4	
			cent_soilc.355osu100.v4	
			cent_soilc.710osu100.v4	
			cent_soiln.355osu100.v4	
			cent_soiln.710osu100.v4	
			cent_vegc.355osu100.v4	
			cent_vegc.710osu100.v4	
			cent_vegn.355osu100.v4_1	
			cent_vegn.710osu100.v4_1	
			sum_tables	
				cent_et.355osu100.sum
				cent_et.710osu100.sum
				cent_folc.355osu100.sum
				cent_folc.710osu100.sum
				cent_nmin.355osu100.sum
				cent_nmin.710osu100.sum
				cent_npp.355osu100.sum
				cent_npp.710osu100.sum
				cent_soilc.355osu100.sum
				cent_soilc.710osu100.sum
				cent_soiln.355osu100.sum
				cent_soiln.710osu100.sum
				cent_vegc.355osu100.sum
				cent_vegc.710osu100.sum
				cent_vegn.355osu100.sum_1
				cent_vegn.710osu100.sum_1
		README.cent		
		README.qc		
		UKMOgcm		
			cent_et.355ukm100.v4	
			cent_et.710ukm100.v4	
			cent_folc.355ukm100.v4	
			cent_folc.710ukm100.v4	
			cent_nmin.355ukm100.v4	
			cent_nmin.710ukm100.v4	
			cent_npp.355ukm100.v4	
			cent_npp.710ukm100.v4	
			cent_soilc.355ukm100.v4	
			cent_soilc.710ukm100.v4	
			cent_soiln.355ukm100.v4	
			cent_soiln.710ukm100.v4	
			cent_vegc.355ukm100.v4	
			cent_vegc.710ukm100.v4	
			cent_vegn.355ukm100.v4_1	
			cent_vegn.710ukm100.v4_1	
			sum_tables	
				cent_et.355ukm100.sum
				cent_et.710ukm100.sum
				cent_folc.355ukm100.sum
				cent_folc.710ukm100.sum
				cent_nmin.355ukm100.sum
				cent_nmin.710ukm100.sum
				cent_npp.355ukm100.sum

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
				cent_npp.710ukm100.sum
				cent_soilc.355ukm100.sum
				cent_soilc.710ukm100.sum
				cent_soiln.355ukm100.sum
				cent_soiln.710ukm100.sum
				cent_vegc.355ukm100.sum
				cent_vegc.710ukm100.sum
				cent_vegn.355ukm100.sum_1
				cent_vegn.710ukm100.sum_1
century_README.doly	doly_vveg			
		contemp		
			cent_et.355contemp_doly.v6	
			cent_folc.355contemp_doly.v6	
			cent_nmin.355contemp_doly.v6	
			cent_npp.355contemp_doly.v6	
			cent_soilc.355contemp_doly.v6	
			cent_soiln.355contemp_doly.v6	
			cent_vegc.355contemp_doly.v6	
			cent_vegn.355contemp_doly.v6	
		gf3		
			cent_et.710gf3_doly.v6	
			cent_folc.710gf3_doly.v6	
			cent_nmin.710gf3_doly.v6	
			cent_npp.710gf3_doly.v6	
			cent_soilc.710gf3_doly.v6	
			cent_soiln.710gf3_doly.v6	
			cent_vegc.710gf3_doly.v6	
			cent_vegn.710gf3_doly.v6	
		osu		
			cent_et.710osu_doly.v6	
			cent_folc.710osu_doly.v6	
			cent_nmin.710osu_doly.v6	
			cent_npp.710osu_doly.v6	
			cent_soilc.710osu_doly.v6	
			cent_soiln.710osu_doly.v6	
			cent_vegc.710osu_doly.v6	
			cent_vegn.710osu_doly.v6	
		README.qc		
		sum_tables		
			cent_et.355contemp_doly.sum	
			cent_et.710gf3_doly.sum	
			cent_et.710osu_doly.sum	
			cent_et.710ukm_doly.sum	
			cent_folc.355contemp_doly.sum	
			cent_folc.710gf3_doly.sum	
			cent_folc.710osu_doly.sum	
			cent_folc.710ukm_doly.sum	
			cent_nmin.355contemp_doly.sum	
			cent_nmin.710gf3_doly.sum	
			cent_nmin.710osu_doly.sum	
			cent_nmin.710ukm_doly.sum	
			cent_npp.355contemp_doly.sum	
			cent_npp.710gf3_doly.sum	
			cent_npp.710osu_doly.sum	
			cent_npp.710ukm_doly.sum	
			cent_soilc.355contemp_doly.sum	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			cent_soilc.710gf3_doly.sum	
			cent_soilc.710osu_doly.sum	
			cent_soilc.710ukm_doly.sum	
			cent_soiln.355contemp_doly.sum	
			cent_soiln.710gf3_doly.sum	
			cent_soiln.710osu_doly.sum	
			cent_soiln.710ukm_doly.sum	
			cent_vegc.355contemp_doly.sum	
			cent_vegc.710gf3_doly.sum	
			cent_vegc.710osu_doly.sum	
			cent_vegc.710ukm_doly.sum	
			cent_vegn.355contemp_doly.sum	
			cent_vegn.710gf3_doly.sum	
			cent_vegn.710osu_doly.sum	
			cent_vegn.710ukm_doly.sum	
		ukm		
			cent_et.710ukm_doly.v6	
			cent_folc.710ukm_doly.v6	
			cent_nmin.710ukm_doly.v6	
			cent_npp.710ukm_doly.v6	
			cent_soilc.710ukm_doly.v6	
			cent_soiln.710ukm_doly.v6	
			cent_vegc.710ukm_doly.v6	
			cent_vegn.710ukm_doly.v6	
century_README.mapss.v6_1	mapss_vveg			
		contemp		
			cent_et.355contemp_mapss.v6_1	
			cent_folc.355contemp_mapss.v6_1	
			cent_nmin.355contemp_mapss.v6_1	
			cent_npp.355contemp_mapss.v6_1	
			cent_soilc.355contemp_mapss.v6_1	
			cent_soiln.355contemp_mapss.v6_1	
			cent_vegc.355contemp_mapss.v6_1	
			cent_vegn.355contemp_mapss.v6_1	
		GFDLR30		
			cent_et.710gf3_mapss.v6_1	
			cent_folc.710gf3_mapss.v6_1	
			cent_nmin.710gf3_mapss.v6_1	
			cent_npp.710gf3_mapss.v6_1	
			cent_soilc.710gf3_mapss.v6_1	
			cent_soiln.710gf3_mapss.v6_1	
			cent_vegc.710gf3_mapss.v6_1	
			cent_vegn.710gf3_mapss.v6_1	
		OSU		
			cent_et.710osu_mapss.v6_1	
			cent_folc.710osu_mapss.v6_1	
			cent_nmin.710osu_mapss.v6_1	
			cent_npp.710osu_mapss.v6_1	
			cent_soilc.710osu_mapss.v6_1	
			cent_soiln.710osu_mapss.v6_1	
			cent_vegc.710osu_mapss.v6_1	
			cent_vegn.710osu_mapss.v6_1	
		README.mapss.v6_1		
		README.qc		
		sum_tables		
			cent_et.355contemp_mapss.sumv6_1	
			cent_et.710gf3_mapss.sumv6_1	
			cent_et.710osu_mapss.sumv6_1	
			cent_et.710ukm_mapss.sumv6_1	
			cent_folc.355contemp_mapss.sumv6_1	
			cent_folc.710gf3_mapss.sumv6_1	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			cent_folc.710osu_mapss.sumv6_1	
			cent_folc.710ukm_mapss.sumv6_1	
			cent_nmin.355contemp_mapss.sumv6_1	
			cent_nmin.710gf3_mapss.sumv6_1	
			cent_nmin.710osu_mapss.sumv6_1	
			cent_nmin.710ukm_mapss.sumv6_1	
			cent_npp.355contemp_mapss.sumv6_1	
			cent_npp.710gf3_mapss.sumv6_1	
			cent_npp.710osu_mapss.sumv6_1	
			cent_npp.710ukm_mapss.sumv6_1	
			cent_soilc.355contemp_mapss.sumv6_1	
			cent_soilc.710gf3_mapss.sumv6_1	
			cent_soilc.710osu_mapss.sumv6_1	
			cent_soilc.710ukm_mapss.sumv6_1	
			cent_soiln.355contemp_mapss.sumv6_1	
			cent_soiln.710gf3_mapss.sumv6_1	
			cent_soiln.710osu_mapss.sumv6_1	
			cent_soiln.710ukm_mapss.sumv6_1	
			cent_vegc.355contemp_mapss.sumv6_1	
			cent_vegc.710gf3_mapss.sumv6_1	
			cent_vegc.710osu_mapss.sumv6_1	
			cent_vegc.710ukm_mapss.sumv6_1	
			cent_vegn.355contemp_mapss.sumv6_1	
			cent_vegn.710gf3_mapss.sumv6_1	
			cent_vegn.710osu_mapss.sumv6_1	
			cent_vegn.710ukm_mapss.sumv6_1	
		UKMO		
			cent_et.710ukm_mapss.v6_1	
			cent_folc.710ukm_mapss.v6_1	
			cent_nmin.710ukm_mapss.v6_1	
			cent_npp.710ukm_mapss.v6_1	
			cent_soilc.710ukm_mapss.v6_1	
			cent_soiln.710ukm_mapss.v6_1	
			cent_vegc.710ukm_mapss.v6_1	
			cent_vegn.710ukm_mapss.v6_1	
doly				
README.doly	doly_cur_veg355.v4			
	doly_cur_veg710.v4			
	doly_gf3_veg355.v4			
	doly_gf3_veg710.v4			
	doly_osu_veg355.v4			
	doly_osu_veg710.v4			
	doly_ukm_veg355.v4			
	doly_ukm_veg710.v4			
	README.doly			
	README.qc			
mapss				
README.aet	p.peninsula			
README.class		control.aet_v5		
		control.class_v5		

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
		control_Wue.aet_v5		
		gfdl_r30_cw.aet_v5		
		gfdl_r30_cw_Wue.aet_v5		
		gfdl_r30_cw_Wue.class_v5		
		osu_cw.aet_v5		
		osu_cw_Wue.aet_v5		
		osu_cw_Wue.class_v5		
		ukmo_cw.aet_v5		
		ukmo_cw_Wue.aet_v5		
		ukmo_cw_Wue.class_v5		
	README.aet			
	README.class			
	README.qc			
tem				
README.temxbiome2	biome2_vveg			
		contemp		
			temxbiome2_aet355.annv2	
			temxbiome2_nmin355.annv2	
			temxbiome2_npp355.annv2	
			temxbiome2_solc355.avev2	
			temxbiome2_vegc355.avev2	
		GFDLR30		
			temxbiome2_aet710_gf3.annv3	
			temxbiome2_nmin710_gf3.annv3	
			temxbiome2_npp710_gf3.annv3	
			temxbiome2_solc710_gf3.avev3	
			temxbiome2_vegc710_gf3.avev3	
		OSU		
			temxbiome2_aet710_osu.annv3	
			temxbiome2_nmin710_osu.annv3	
			temxbiome2_npp710_osu.annv3	
			temxbiome2_solc710_osu.avev3	
			temxbiome2_vegc710_osu.avev3	
		README.qc		
		sum_tables		
			temxbiome2_aet355.sumv2_1	
			temxbiome2_aet710_gf3.sumv3	
			temxbiome2_aet710_osu.sumv3	
			temxbiome2_aet710_ukm.sumv3	
			temxbiome2_nmin355.sumv2_1	
			temxbiome2_nmin710_gf3.sumv3	
			temxbiome2_nmin710_osu.sumv3	
			temxbiome2_nmin710_ukm.sumv3	
			temxbiome2_npp355.sumv2_1	
			temxbiome2_npp710_gf3.sumv3	
			temxbiome2_npp710_osu.sumv3	
			temxbiome2_npp710_ukm.sumv3	
			temxbiome2_solc355.sumv2_1	
			temxbiome2_solc710_gf3.sumv3	
			temxbiome2_solc710_osu.sumv3	
			temxbiome2_solc710_ukm.sumv3	
			temxbiome2_vegc355.sumv2_1	
			temxbiome2_vegc710_gf3.sumv3	
			temxbiome2_vegc710_osu.sumv3	
			temxbiome2_vegc710_ukm.sumv3	
		UKMO		
			temxbiome2_aet710_ukm.annv3	
			temxbiome2_nmin710_ukm.annv3	
			temxbiome2_npp710_ukm.annv3	
			temxbiome2_solc710_ukm.avev3	
			temxbiome2_vegc710_ukm.avev3	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
README_v2.tem	contemp_vveg			
		contemp		
			aet355.annv2	
			aet710.annv2	
			nmin355.annv2	
			nmin710.annv2	
			npp355.annv2	
			npp710.annv2	
			solc355.avev2	
			solc710.avev2	
			vegc355.avev2	
			vegc710.avev2	
		GFDLR30gcm		
			aet355_gf3.annv2	
			aet710_gf3.annv2	
			nmin355_gf3.annv2	
			nmin710_gf3.annv2	
			npp355_gf3.annv2	
			npp710_gf3.annv2	
			solc355_gf3.avev2	
			solc710_gf3.avev2	
			vegc355_gf3.avev2	
			vegc710_gf3.avev2	
		OSUgcm		
			aet355_osu.annv2	
			aet710_osu.annv2	
			nmin355_osu.annv2	
			nmin710_osu.annv2	
			npp355_osu.annv2	
			npp710_osu.annv2	
			solc355_osu.avev2	
			solc710_osu.avev2	
			vegc355_osu.avev2	
			vegc710_osu.avev2	
		README.new_summaries		
		README.qc		
		README_v2.tem		
		sum_tables		
			tem_aet355.sumv2_1	
			tem_aet355_gf3.sumv2_1	
			tem_aet355_osu.sumv2_1	
			tem_aet355_ukm.sumv2_1	
			tem_aet710.sumv2_1	
			tem_aet710_gf3.sumv2_1	
			tem_aet710_osu.sumv2_1	
			tem_aet710_ukm.sumv2_1	
			tem_nmin355.sumv2_1	
			tem_nmin355_gf3.sumv2_1	
			tem_nmin355_osu.sumv2_1	
			tem_nmin355_ukm.sumv2_1	
			tem_nmin710.sumv2_1	
			tem_nmin710_gf3.sumv2_1	
			tem_nmin710_osu.sumv2_1	
			tem_nmin710_ukm.sumv2_1	
			tem_npp355.sumv2_1	
			tem_npp355_gf3.sumv2_1	
			tem_npp355_osu.sumv2_1	
			tem_npp355_ukm.sumv2_1	
			tem_npp710.sumv2_1	
			tem_npp710_gf3.sumv2_1	
			tem_npp710_osu.sumv2_1	
			tem_npp710_ukm.sumv2_1	
			tem_solc355.sumv2_1	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			tem_solc355_gf3.sumv2_1	
			tem_solc355_osu.sumv2_1	
			tem_solc355_ukm.sumv2_1	
			tem_solc710.sumv2_1	
			tem_solc710_gf3.sumv2_1	
			tem_solc710_osu.sumv2_1	
			tem_solc710_ukm.sumv2_1	
			tem_vegc355.sumv2_1	
			tem_vegc355_gf3.sumv2_1	
			tem_vegc355_osu.sumv2_1	
			tem_vegc355_ukm.sumv2_1	
			tem_vegc710.sumv2_1	
			tem_vegc710_gf3.sumv2_1	
			tem_vegc710_osu.sumv2_1	
			tem_vegc710_ukm.sumv2_1	
		UKMOgcm		
			aet355_ukm.annv2	
			aet710_ukm.annv2	
			nmin355_ukm.annv2	
			nmin710_ukm.annv2	
			npp355_ukm.annv2	
			npp710_ukm.annv2	
			solc355_ukm.avev2	
			solc710_ukm.avev2	
			vegc355_ukm.avev2	
			vegc710_ukm.avev2	
README.temxdoly	doly_vveg			
		contemp		
			temxdoly_aet355.annv2	
			temxdoly_nmin355.annv2	
			temxdoly_npp355.annv2	
			temxdoly_solc355.avev2	
			temxdoly_vegc355.avev2	
		GFDLR30		
			temxdoly_aet710_gf3.annv2	
			temxdoly_nmin710_gf3.annv2	
			temxdoly_npp710_gf3.annv2	
			temxdoly_solc710_gf3.avev2	
			temxdoly_vegc710_gf3.avev2	
		OSU		
			temxdoly_aet710_osu.annv2	
			temxdoly_nmin710_osu.annv2	
			temxdoly_npp710_osu.annv2	
			temxdoly_solc710_osu.avev2	
			temxdoly_vegc710_osu.avev2	
		README.new_summaries		
		README.qc		
		README.temxdoly		
		sum_tables.v2_1		
			temxdoly_aet355.sumv2_1	
			temxdoly_aet710_gf3.sumv2_1	
			temxdoly_aet710_osu.sumv2_1	
			temxdoly_aet710_ukm.sumv2_1	
			temxdoly_nmin355.sumv2_1	
			temxdoly_nmin710_gf3.sumv2_1	
			temxdoly_nmin710_osu.sumv2_1	
			temxdoly_nmin710_ukm.sumv2_1	
			temxdoly_npp355.sumv2_1	
			temxdoly_npp710_gf3.sumv2_1	
			temxdoly_npp710_osu.sumv2_1	
			temxdoly_npp710_ukm.sumv2_1	
			temxdoly_solc355.sumv2_1	
			temxdoly_solc710_gf3.sumv2_1	

Model	Vegetation Distribution	Climate Change Scenario	Variable Results Output File Names	Summary Table Output File Names
			temxdoly_solc710_osu.sumv2_1	
			temxdoly_solc710_ukm.sumv2_1	
			temxdoly_vegc355.sumv2_1	
			temxdoly_vegc710_gf3.sumv2_1	
			temxdoly_vegc710_osu.sumv2_1	
			temxdoly_vegc710_ukm.sumv2_1	
		UKMO		
			temxdoly_aet710_ukm.annv2	
			temxdoly_nmin710_ukm.annv2	
			temxdoly_npp710_ukm.annv2	
			temxdoly_solc710_ukm.avev2	
			temxdoly_vegc710_ukm.avev2	
README.temxmapss______	mapss_vveg			
		contemp		
			temxmapss_aet355.annv2	
			temxmapss_nmin355.annv2	
			temxmapss_npp355.annv2	
			temxmapss_solc355.avev2	
			temxmapss_vegc355.avev2	
		GFDLR30gcm		
			temxmapss_aet710_gf3.annv2	
			temxmapss_nmin710_gf3.annv2	
			temxmapss_npp710_gf3.annv2	
			temxmapss_solc710_gf3.avev2	
			temxmapss_vegc710_gf3.avev2	
		OSUgcm		
			temxmapss_aet710_osu.annv2	
			temxmapss_nmin710_osu.annv2	
			temxmapss_npp710_osu.annv2	
			temxmapss_solc710_osu.avev2	
			temxmapss_vegc710_osu.avev2	
		README.new_summaries		
		README.qc		
		README.temxmapss		
		sum_tables.v2_1		
			temxmapss_aet355.sumv2_1	
			temxmapss_aet710_gf3.sumv2_1	
			temxmapss_aet710_osu.sumv2_1	
			temxmapss_aet710_ukm.sumv2_1	
			temxmapss_nmin355.sumv2_1	
			temxmapss_nmin710_gf3.sumv2_1	
			temxmapss_nmin710_osu.sumv2_1	
			temxmapss_nmin710_ukm.sumv2_1	
			temxmapss_npp355.sumv2_1	
			temxmapss_npp710_gf3.sumv2_1	
			temxmapss_npp710_osu.sumv2_1	
			temxmapss_npp710_ukm.sumv2_1	
			temxmapss_solc355.sumv2_1	
			temxmapss_solc710_gf3.sumv2_1	
			temxmapss_solc710_osu.sumv2_1	
			temxmapss_solc710_ukm.sumv2_1	
			temxmapss_vegc355.sumv2_1	
			temxmapss_vegc710_gf3.sumv2_1	
			temxmapss_vegc710_osu.sumv2_1	
			temxmapss_vegc710_ukm.sumv2_1	
		UKMOgcm		
			temxmapss_aet710_ukm.annv2	
			temxmapss_nmin710_ukm.annv2	
			temxmapss_npp710_ukm.annv2	
			temxmapss_solc710_ukm.avev2	
			temxmapss_vegc710_ukm.avev2	

bgc_README.biome2 **back**

BGC-GESSys - Version 2.4 - 28 July 1994

This tar file contains the output files for the BGC round 3 VEMAP simulations for the contemporary climate @ 355 ppmv CO2, GFDL_R30 climate @ 710 ppmv CO2, OSU climate @ 710 ppmv CO2, and the UKMO climate@ 710 ppmv CO2 using the MAPSS and BIOME2 vegetation distributions.

The file naming convention is as follows:

MMM_BB_AAACCC.VVVr3

where - MMM = bgc model (bgc)

BB = vegetation distribution model -
- ma = MAPSS
- b2 = BIOME2

AAA = atmospheric CO2 (355 or 710 ppmv)

CCC = climate scenario -
- con = contemporary climate
- gf3 = GFDL_R30
- osu = OSU
- ukm = UKMO

VVV = output variable -
- et = evapotranspiration
- npp = net primary productivity
- nmin = nitrogen mineralization
- soilc = soil carbon
- vegc = vegetation carbon
- sum = summary tables

r3 = round 3

All summary tables have been included in a single file with the *.sumr3 extension.

bgc_README.con **back**

BGC-GESSys - Version 2.4 - 15 July 1994

This dir contains the output files for the BGC round 3 VEMAP simulations for the contemporary climate at 355 and 710 ppmv CO2 using the original VEMAP VVEG layer (vveg.v1).

The file naming convention is as follows:

```
       MMMAAACCC.VVVr3

where - MMM = model (BGC)

        AAA = atmospheric CO2 (355 or 710 ppmv)

        CCC = climate scenario -
                         con = contemporary climate
                         gf3 = GFDL_R30
                         osu = OSU
                         ukm = UKMO

        VVV = output variable -
                        et = evapotranspiration
                        npp = net primary productivity
                        nmin = nitrogen mineralization
                        soilc = soil carbon
                        vegc = vegetation carbon
                        sum = summary tables

        r3 = round 3
```

This third round of simulations contains the following "fixes":

1. The addition of a monthly soil water balance model to predict the maximum equilibrium LAI for each cell. The model uses a reduction in AET of 30% to simulate CO2 effects on LAI.

2. Photosynthesis was downregulated within BGC by reducing leaf N by 20%. The vegetation and soil C:N ratios were allowed to increase with a reduction in leaf N.

3. For potential vegetation in equilibrium with climate, we assumed that npp = autotrophic respiration = heterotrophic respiration. We added a module to BGC which, based on this assumption, adjusts the soil and vegetation C and N pools until heterotrophic and autotrophic respiration come into line with npp. We feel that this gets us at least a step closer to a better estimation of the C and N pools; however, give the Veg and Soil C,N variables the twice over - no matter what assumptions one makes, these are still difficult to predict with a single year simulation.

All summary tables have been included in a single file with the *.sumr3 extension.

bgc_README.gfdlr30

back

BGC-GESSys - Version 2.4 - 15 July 1994

This dir contains the output files for the BGC round 3 VEMAP simulations for the GFDL_R30 climate at 355 and 710 ppmv CO2 using the original VEMAP VVEG layer (vveg.v1).

The file naming convention is as follows:

MMMAAACCC.VVVr3

where - MMM = model (BGC)

AAA = atmospheric CO2 (355 or 710 ppmv)

CCC = climate scenario -
- con = contemporary climate
- gf3 = GFDL_R30
- osu = OSU
- ukm = UKMO

VVV = output variable -
- et = evapotranspiration
- npp = net primary productivity
- nmin = nitrogen mineralization
- soilc = soil carbon
- vegc = vegetation carbon
- sum = summary tables

r3 = round 3

This third round of simulations contains the following "fixes":

1. The addition of a monthly soil water balance model to predict the maximum equilibrium LAI for each cell. The model uses a reduction in AET of 30% to simulate CO2 effects on LAI.

2. Photosynthesis was downregulated within BGC by reducing leaf N by 20%. The vegetation and soil C:N ratios were allowed to increase with a reduction in leaf N.

3. For potential vegetation in equilibrium with climate, we assumed that npp = autotrophic respiration = heterotrophic respiration. We added a module to BGC which, based on this assumption, adjusts the soil and vegetation C and N pools until heterotrophic and autotrophic respiration come into line with npp. We feel that this gets us at least a step closer to a better estimation of the C and N pools; however, give the Veg and Soil C,N variables the twice over - no matter what assumptions one makes, these are still difficult to predict with a single year simulation.

All summary tables have been included in a single file with the *.sumr3 extension.

bgc_README.osu **back**

BGC-GESSys - Version 2.4 - 15 July 1994

This dir contains the output files for the BGC round 3 VEMAP simulations for the OSU climate scenario at 355 and 710 ppmv CO2 using the original VEMAP VVEG layer (vveg.v1).

The file naming convention is as follows:

MMMAAACCC.VVVr3

where - MMM = model (BGC)

AAA = atmospheric CO2 (355 or 710 ppmv)

CCC = climate scenario -
- con = contemporary climate
- gf3 = GFDL_R30
- osu = OSU
- ukm = UKMO

VVV = output variable -
- et = evapotranspiration
- npp = net primary productivity
- nmin = nitrogen mineralization
- soilc = soil carbon
- vegc = vegetation carbon
- sum = summary tables

r3 = round 3

This third round of simulations contains the following "fixes":

1. The addition of a monthly soil water balance model to predict the maximum equilibrium LAI for each cell. The model uses a reduction in AET of 30% to simulate CO2 effects on LAI.

2. Photosynthesis was downregulated within BGC by reducing leaf N by 20%. The vegetation and soil C:N ratios were allowed to increase with a reduction in leaf N.

3. For potential vegetation in equilibrium with climate, we assumed that npp = autotrophic respiration = heterotrophic respiration. We added a module to BGC which, based on this assumption, adjusts the soil and vegetation C and N pools until heterotrophic and autotrophic respiration come into line with npp. We feel that this gets us at least a step closer to a better estimation of the C and N pools; however, give the Veg and Soil C,N variables the twice over - no matter what assumptions one makes, these are still difficult to predict with a single year simulation.

All summary tables have been included in a single file with the *.sumr3 extension.

bgc_README.ukmo **back**

BGC-GESSys - Version 2.4 - 15 July 1994

This dir contains the output files for the BGC round 3 VEMAP simulations for the UKMO climate at 355 and 710 ppmv CO2 using the original VEMAP VVEG layer (vveg.v1).

The file naming convention is as follows:

```
       MMMAAACCC.VVVr3

where - MMM = model (BGC)

        AAA = atmospheric CO2 (355 or 710 ppmv)

        CCC = climate scenario -
                         con = contemporary climate
                         gf3 = GFDL_R30
                         osu = OSU
                         ukm = UKMO

        VVV = output variable -
                        et = evapotranspiration
                        npp = net primary productivity
                        nmin = nitrogen mineralization
                        soilc = soil carbon
                        vegc = vegetation carbon
                        sum = summary tables

        r3 = round 3
```

This third round of simulations contains the following "fixes":

1. The addition of a monthly soil water balance model to predict the maximum equilibrium LAI for each cell. The model uses a reduction in AET of 30% to simulate CO2 effects on LAI.

2. Photosynthesis was downregulated within BGC by reducing leaf N by 20%. The vegetation and soil C:N ratios were allowed to increase with a reduction in leaf N.

3. For potential vegetation in equilibrium with climate, we assumed that npp = autotrophic respiration = heterotrophic respiration. We added a module to BGC which, based on this assumption, adjusts the soil and vegetation C and N pools until heterotrophic and autotrophic respiration come into line with npp. We feel that this gets us at least a step closer to a better estimation of the C and N pools; however, give the Veg and Soil C,N variables the twice over - no matter what assumptions one makes, these are still difficult to predict with a single year simulation.

All summary tables have been included in a single file with the *.sumr3 extension.

bgc_README.bgc_doly

back

BGC-GESSys - Version 2.4 - 28 August 1994

This tar file contains the output files for the BGC round 3 VEMAP simulations for the contemporary climate @ 355 ppmv CO2, GFDL_R30 climate @ 710 ppmv CO2, OSU climate @ 710 ppmv CO2, and the UKMO climate@ 710 ppmv CO2 using the DOLY vegetation distributions.

The file naming convention is as follows:

```
       MMM_BB_AAACCC.VVVr3

where - MMM = bgc model (bgc)

         BB = vegetation distribution model, ma = MAPSS
                                             b2 = BIOME2
                                   do = DOLY

        AAA = atmospheric CO2 (355 or 710 ppmv)

        CCC = climate scenario - con = contemporary climate
                         gf3 = GFDL_R30
                         osu = OSU
                         ukm = UKMO

        VVV = output variable - et = evapotranspiration
                        npp = net primary productivity
                        nmin = nitrogen mineralization
                        soilc = soil carbon
                        vegc = vegetation carbon
                        sum = summary tables

        r3 = round 3
```

All summary tables have been included in a single file with the *.sumr3 extension.

bgc_README.mapss

back

BGC-GESSys - Version 2.4 - 28 July 1994

This tar file contains the output files for the BGC round 3 VEMAP simulations for the contemporary climate @ 355 ppmv CO2, GFDL_R30 climate @ 710 ppmv CO2, OSU climate @ 710 ppmv CO2, and the UKMO climate@ 710 ppmv CO2 using the MAPSS and BIOME2 vegetation distributions.

The file naming convention is as follows:

MMM_BB_AAACCC.VVVr3

where - MMM = bgc model (bgc)

BB = vegetation distribution model -
- ma = MAPSS
- b2 = BIOME2

AAA = atmospheric CO2 (355 or 710 ppmv)

CCC = climate scenario -
- con = contemporary climate
- gf3 = GFDL_R30
- osu = OSU
- ukm = UKMO

VVV = output variable -
- et = evapotranspiration
- npp = net primary productivity
- nmin = nitrogen mineralization
- soilc = soil carbon
- vegc = vegetation carbon
- sum = summary tables

r3 = round 3

All summary tables have been included in a single file with the *.sumr3 extension.

biome2_readme.new

back

```
biome2 outputs for climate change scenarios

      gfdl r30 climate 1xco2  file= gf3_355.v4
      gfdl r30 climate 2xco2  file= gf3_710.v4

      ukmo climate 1xco2  file= ukm_355.v4
      ukmo climate 2xco2  file= ukm_710.v4

      osu  climate 1xco2  file= osu_355.v4
      osu  climate 2xco2  file= osu_710.v4
```

century_README.biome2 **back**

century_README.mapss.v6_1 **back**

century_README.doly **back**

README:
VEMAP CENTURY RESULTS

The units and scaling factors are described in the header of each output file.

The naming convention for the files is:

    cent_{variable}.{co2 level}{gcm/weather}{_biome model}.{version #}

The 'biome model' is the model which produced the redistributed biome map.

Where:

cent = Century

output variable -
    et = evapotranspiration
    npp = net primary productivity
    nmin = nitrogen mineralization
    soilc = soil carbon
    vegc = vegetation carbon

atmospheric CO2 (355 or 710 ppmv)

gcm/weather, climate scenario -
    con = contemporary climate
    gf3 = GFDL_R30
    osu = OSU
    ukm = UKMO

biome model / vegetation distribution model -
    ma = MAPSS
    b2 = BIOME2
    do = DOLY

version # = v6._1

Each file has an associated summary table which adheres to the format outlined by the TEM group.

century_README.contemp

back

README:
VEMAP CENTURY RESULTS

The naming convention for the files is:

```
      cent_{variable}.{co2 level}{gcm/weather}{years simulated}.{version #}
```

the 'years simulated' is the number of years we ran beyond our equilibrium / stand-age simulation.

Where:

cent = Century

output variable -
- et = evapotranspiration
- npp = net primary productivity
- nmin = nitrogen mineralization
- soilc = soil carbon
- vegc = vegetation carbon

atmospheric CO2 (355 or 710 ppmv)

gcm/weather, climate scenario -
- contemp = contemporary climate
- gf3 = GFDL_R30
- osu = OSU
- ukm = UKMO

years simulated = number of years we ran beyond our equilibrium / stand-age simulation.

version # = v4 or v4_1

Each file has an associated summary table which adheres to the format outlined by the TEM group.

README.doly **back**

8/18/94 Brian Rizzo

The new DOLY runs have been completed. All svf files are or should be revision 4.

** Files with 710 in their titles implies a 2x climate and fertilization effect. [Control or Altered Climate 710ppm CO2 H. Fisher 8/24/94]

** Files with 355 imply only a 2x climate effect (except the current run which is at current climate). [Control or Altered Climate 355ppm CO2 H. Fisher 8/24/94]

README.aet

back

MAPSS output for vemap project
from the laboratory of Ronald P. Neilson
contact (USA) (503) 750-7250, neilsonr@fsl.orst.edu

MAPSS predicted AET (mm).

List of files:

control.aet_v5
control_NP.aet_v5
control_NP_Wue.aet_v5
control_Wue.aet_v5
gfdl_r30_cw.aet_v5
gfdl_r30_cw_NP.aet_v5
gfdl_r30_cw_NP_Wue.aet_v5
gfdl_r30_cw_Wue.aet_v5
osu_cw.aet_v5
osu_cw_NP.aet_v5
osu_cw_NP_Wue.aet_v5
osu_cw_Wue.aet_v5
ukmo_cw.aet_v5
ukmo_cw_NP.aet_v5
ukmo_cw_NP_Wue.aet_v5
ukmo_cw_Wue.aet_v5

Naming convention:

control -> current climate from the vemap data files
gfdl_r30 -> GFDL R 30 doubled CO2 climate
osu -> OSU doubled CO2 climate
ukmo -> UKMO doubled CO2 climate

A suffix of _cw means that future winds were not used in the MAPSS run, only control (current) winds were used.

A suffix of Wue means that MAPSS was run with an increased water use efficiency factor.

A suffix of NP means that MAPSS did not include the Prairie Peninsula in the calucuation of veg classes.

README.class **back**

MAPSS output for vemap project
from the laboratory of Ronald P. Neilson
contact (USA) (503) 750-7250, neilsonr@fsl.orst.edu

MAPSS vegetation classes

List of files:

control.class_v5
control_NP.class_v5
control_NP_Wue.class_v5
control_Wue.class_v5
gfdl_r30_cw.class_v5
gfdl_r30_cw_NP.class_v5
gfdl_r30_cw_NP_Wue.class_v5
gfdl_r30_cw_Wue.class_v5
osu_cw.class_v5
osu_cw_NP.class_v5
osu_cw_NP_Wue.class_v5
osu_cw_Wue.class_v5
ukmo_cw.class_v5
ukmo_cw_NP.class_v5
ukmo_cw_NP_Wue.class_v5
ukmo_cw_Wue.class_v5

Naming convention:

control -> current climate from the vemap data files
gfdl_r30 -> GFDL R 30 doubled CO2 climate
osu -> OSU doubled CO2 climate
ukmo -> UKMO doubled CO2 climate

A suffix of _cw means that future winds were not used in the MAPSS run, only control (current) winds were used.

A suffix of Wue means that MAPSS was run with an increased water use efficiency factor (WUE+).

A suffix of NP means that MAPSS did not include the Prairie Peninsula in the calucuation of veg classes.

README.temxbiome2

back

README: TEM-VEMAP outputs using BIOME2 output, version 2

We are happy to provide you our new results (version 2) of TEM runs using the BIOME2 vegetation distribution. The new results contain 7 output variables (npp, vegc, solc, nmin, aet, strn, soln) from the TEM (version 4.0) runs under contemporary climate (version 1), and 3 revised GCM climates (OSU - version 1; UKMO,GFDL R30 - version 3), respectively.

Filename format: temxbiome2_vvvccc_ggg.dddvx

where:

vvv = output variables (missing data values after scaling)

aet = actual evapotranspiration (-99.0)
npp = net primary production (-99.0)
nmin = net nitrogen mineralization (-9.9)
solc = soil organic carbon storage (-99.0)
vegc = vegetation carbon storage (-99.0)
strn = vegetation structural nitrogen storage (-99.0)
soln = soil organic nitrogen storage (-99.0)

ccc = atmospheric CO2 (ppm) concentration

355 = 355 ppm
710 = 710 ppm

For GCMs: ggg = climate scenarios

gf3 = GFDL-R30 GCM scenario
osu = OSU GCM scenario
ukm = UKMO GCM scenario

ddd = data characteristics

ann = annual values
ave = average values for 12 months
sum = summary tables

vx = data version

Note:

1. Background values by variables (except nmin) are all set to fit the standard format Tim pooled in Table 1 in his June 14th memo, as agreed upon at the VEMAP meeting in Woods Hole (May 20-21). Background values include wetland and inland water. For nmin, we assigned a background value of -9.9 as described in Tim and Nan's June 22nd memo.

2. Although TEM did solve for all non-wetland grid cells for the contemporary climate scenario, the model did not solve ("bombed") all the non-wetland grid cells in the GCM scenarios:

Scenario	"Bombs"	Number of "Good" Values

See README.qc for more information on “bombed” grid cells

More information about these "bomb-outs" (including location) is given in the summary tables. As agreed upon at the VEMAP meeting in Woods Hole, we assigned a value of -98 to these grid cells with the exception of nmin, which we assigned a value of -9.8 (see 1. above).

3. The unit of each variable is described in each svf file and matches those described in Table 1 of the June 14th memo from Nan Rosenbloom and Tim Kittel.

4. As the use of C/N ratios was discussed at the VEMAP meeting in Woods Hole as a possible diagnostic variable, we have included data on vegetation structural nitrogen (strn) and soil organic nitrogen (soln) with this release to allow such calculations (i.e. vegc/strn and solc/soln) and comparisons to the other models.

5. Each of the 7 output variables has a summary table associated with it (see all *.sumv2 files). The summary data are based on information from the original TEM data structure and not the svf files. As the svf format has truncated the values of many of the output variables, summaries based on the svf files might not exactly match the summary tables provided. In addition, the US totals at the bottom of the summary tables may not exactly match the sum of the vegetation types, again due to truncation of values in developing a "pretty" summary table.

In addition to summarizing the results for grid cells that were solved by TEM, we include summary information for the "bomb-outs" or "grid cells rejected for analysis" by vegetation type (column 1). By including the grid cell area (column 3) and the unit-area mean of each variable (by vegetation type - column 4), we can develop a regional estimate of each variable for the rejected grid cells (column 5). Adding the regional estimate for the rejected grid cells (column 5) to the appropriate regional estimate of "solved" grid cells, we can develop a regional estimate for vegetation types that includes both "solved" and "rejected" grid cells (column 6). The total at the bottom of column 6 would then be our final estimate for the conterminous United States.

Finally, we provide the longitude and latitude of each grid cell that "bombed".

If there are any questions, please contact us at MBL.

Yude	508 548-3705 x498	yudepan@lupine.mbl.edu
Kick	508 548-3705 x490	dkick@lupine.mbl.edu
Dave	303 872-3387	amcguire@lupine.mbl.edu

README_v2.tem back

README: TEM-VEMAP outputs, version 2

We are happy to provide you our new results (version 2) of TEM runs using the VVEG vegetation distribution. The new results contain 7 output variables (npp, vegc, solc, nmin, aet, strn, soln) from the TEM (version 4.0) runs under contemporary climate, and 3 revised GCM climates (version 3), respectively.

Filename format: vvvccc_ggg.dddvx

where:

- vvv = output variables (missing data values after scaling)
  - aet = actual evapotranspiration (-99.0)
  - npp = net primary production (-99.0)
  - nmin = net nitrogen mineralization (-9.9)
  - solc = soil organic carbon storage (-99.0)
  - vegc = vegetation carbon storage (-99.0)
  - strn = vegetation structural nitrogen storage (-99.0)
  - soln = soil organic nitrogen storage (-99.0)

- ccc = atmospheric CO2 (ppm) concentration
  - 355 = 355 ppm
  - 710 = 710 ppm

- ddd = data characteristics
  - ann = annual values
  - ave = average values for 12 months
  - sum = summary tables

- vx = data version

For GCMs:

- ggg = climate scenarios
  - gf3 = GFDL-R30 GCM scenario
  - osu = OSU GCM scenario
  - ukm = UKMO GCM scenario

The SVF format image files and summary files are as follows:

/Contemp :

- aet355.annv2
- aet355.sumv2
- npp355.annv2
- npp355.sumv2
- vegc355.avev2
- vegc355.sumv2
- solc355.avev2
- solc355.sumv2
- strn355.avev2
- strn355.sumv2
- soln355.avev2
- soln355.sumv2
- nmin355.annv2
- nmin355.sumv2
- aet710.annv2
- aet710.sumv2
- npp710.annv2
- npp710.sumv2
- vegc710.avev2
- vegc710.sumv2
- solc710.avev2
- solc710.sumv2
- strn710.avev2
- strn710.sumv2
- soln710.avev2
- soln710.sumv2
- nmin710.annv2
- nmin710.sumv2

/GFDLR30gcm :

aet355_gf3.annv2
aet355_gf3.sumv2
npp355_gf3.annv2
npp355_gf3.sumv2
vegc355_gf3.avev2
vegc355_gf3.sumv2
solc355_gf3.avev2
solc355_gf3.sumv2
strn355_gf3.avev2
strn355_gf3.sumv2
soln355_gf3.avev2
soln355_gf3.sumv2
nmin355_gf3.annv2
nmin355_gf3.sumv2
aet710_gf3.annv2
aet710_gf3.sumv2
npp710_gf3.annv2
npp710_gf3.sumv2
vegc710_gf3.avev2
vegc710_gf3.sumv2
solc710_gf3.avev2
solc710_gf3.sumv2
strn710_gf3.avev2
strn710_gf3.sumv2
soln710_gf3.avev2
soln710_gf3.sumv2
nmin710_gf3.annv2
nmin710_gf3.sumv2

/OSUgcm :

aet355_osu.annv2
aet355_osu.sumv2
npp355_osu.annv2
npp355_osu.sumv2
vegc355_osu.avev2
vegc355_osu.sumv2
solc355_osu.avev2
solc355_osu.sumv2
strn355_osu.avev2
strn355_osu.sumv2
soln355_osu.avev2
soln355_osu.sumv2
nmin355_osu.annv2
nmin355_osu.sumv2
aet710_osu.annv2
aet710_osu.sumv2
npp710_osu.annv2
npp710_osu.sumv2
vegc710_osu.avev2
vegc710_osu.sumv2
solc710_osu.avev2
solc710_osu.sumv2
strn710_osu.avev2
strn710_osu.sumv2
soln710_osu.avev2
soln710_osu.sumv2
nmin710_osu.annv2
nmin710_osu.sumv2

/UKMOgcm :

aet355_ukm.annv2
aet355_ukm.sumv2
npp355_ukm.annv2
npp355_ukm.sumv2
vegc355_ukm.avev2
vegc355_ukm.sumv2
solc355_ukm.avev2
solc355_ukm.sumv2
strn355_ukm.avev2
strn355_ukm.sumv2
soln355_ukm.avev2
soln355_ukm.sumv2
nmin355_ukm.annv2
nmin355_ukm.sumv2
aet710_ukm.annv2
aet710_ukm.sumv2
npp710_ukm.annv2
npp710_ukm.sumv2
vegc710_ukm.avev2
vegc710_ukm.sumv2
solc710_ukm.avev2
solc710_ukm.sumv2
strn710_ukm.avev2
strn710_ukm.sumv2
soln710_ukm.avev2
soln710_ukm.sumv2
nmin710_ukm.annv2
nmin710_ukm.sumv2

Note:

1. Background values by variables (except nmin) are all set to fit the standard format Tim pooled in Table 1 in his June 14th memo, as agreed upon at the VEMAP meeting in Woods Hole (May 20-21). Background values include wetland and inland water. For nmin, we assigned a background value of -9.9 to maintain a space and a 5-digit integer for each missing value in the svf file (which is comparable to the svf files of the GCM "change ratios" made available by UCAR/NCAR).

2. We fixed a very minor problem in TEM version 4.0 so that TEM solves for all the non-wetland grid cells (N=3168) of all the files in this release.

3. In version 1, we read the results of the water balance model (WBM) from input files into TEM to calculate TEM output variables. In these new runs (version 2), the WBM

variables were calculated concurrently with the TEM output variables. This process allowed us to estimate TEM output variables more accurately so that our results are slightly different from those obtained in version 1.

4. Our AET estimates do not depend upon CO2 concentration. As a convenience, we made two copies of our AET estimates for each climate scenario. We placed one copy with the TEM results at 355 ppmv and the other copy with the TEM results at 710 ppmv.

5. The unit of each variable is described in each svf file and matches those described in Table 1 of the June 14th memo from Nan Rosenbloom and Tim Kittel.

6. As the use of C/N ratios was discussed at the VEMAP meeting in Woods Hole as a possible diagnostic variable, we have included data on vegetation structural nitrogen (strn) and soil organic nitrogen (soln) with this release to allow such calculations (i.e. vegc/strn and solc/soln) and comparisons to the other models.

7. Each of the 7 output variables has a summary table associated with it (see all *.sumv2 files). The summary data are based on information from the original TEM data structure and not the svf files. As the svf format has truncated the values of many of the output variables, summaries based on the svf files might not exactly match the summary tables provided. In addition, the US totals at the bottom of the summary tables may not exactly match the sum of the vegetation types, again due to truncation of values in developing a "pretty" summary table.

If there are any questions, please contact us at MBL.

Yude	508 548-3705 x498	yudepan@lupine.mbl.edu
Kick	508 548-3705 x490	dkick@lupine.mbl.edu
Dave	303 872-3387	amcguire@lupine.mbl.edu

README.temxdoly

back

README: TEM-VEMAP outputs using DOLY output, version 2

Hi, VEMAPers:

We are happy to provide you our new results (version 2) of TEM runs using the DOLY vegetation distribution. The new results contain 7 output variables (npp, vegc, solc, nmin, aet, strn, soln) from the TEM (version 4.0) runs under contemporary climate (version 1), and 3 revised GCM climates (OSU - version 1; UKMO,GFDL R30 - version 3), respectively.

Filename format: temxdoly_vvvccc_ggg.dddvx

where:

vvv = output variables (missing data values after scaling)

aet = actual evapotranspiration (-99.0)
npp = net primary production (-99.0)
nmin = net nitrogen mineralization (-9.9)
solc = soil organic carbon storage (-99.0)
vegc = vegetation carbon storage (-99.0)
strn = vegetation structural nitrogen storage (-99.0)
soln = soil organic nitrogen storage (-99.0)

ccc = atmospheric CO2 (ppm) concentration

355 = 355 ppm
710 = 710 ppm

For GCMs: ggg = climate scenarios

gf3 = GFDL-R30 GCM scenario
osu = OSU GCM scenario
ukm = UKMO GCM scenario

ddd = data characteristics

ann = annual values
ave = average values for 12 months
sum = summary tables

vx = data version

The SVF format image files and summary files are as follows:

/Contemp:

temxdoly_aet355.annv2
temxdoly_aet355.sumv2
temxdoly_npp355.annv2
temxdoly_strn355.avev2
temxdoly_strn355.sumv2
temxdoly_soln355.avev2

temxdoly_npp355.sumv2
temxdoly_vegc355.avev2
temxdoly_vegc355.sumv2
temxdoly_solc355.avev2
temxdoly_solc355.sumv2
temxdoly_soln355.sumv2
temxdoly_nmin355.annv2
temxdoly_nmin355.sumv2

/GFDLR30gcm:

temxdoly_aet710_gf3.annv2
temxdoly_aet710_gf3.sumv2
temxdoly_npp710_gf3.annv2
temxdoly_npp710_gf3.sumv2
temxdoly_vegc710_gf3.avev2
temxdoly_vegc710_gf3.sumv2
temxdoly_solc710_gf3.avev2
temxdoly_solc710_gf3.sumv2
temxdoly_strn710_gf3.avev2
temxdoly_strn710_gf3.sumv2
temxdoly_soln710_gf3.avev2
temxdoly_soln710_gf3.sumv2
temxdoly_nmin710_gf3.annv2
temxdoly_nmin710_gf3.sumv2

/OSUgcm:

temxdoly_aet710_osu.annv2
temxdoly_aet710_osu.sumv2
temxdoly_npp710_osu.annv2
temxdoly_npp710_osu.sumv2
temxdoly_vegc710_osu.avev2
temxdoly_vegc710_osu.sumv2
temxdoly_solc710_osu.avev2
temxdoly_solc710_osu.sumv2
temxdoly_strn710_osu.avev2
temxdoly_strn710_osu.sumv2
temxdoly_soln710_osu.avev2
temxdoly_soln710_osu.sumv2
temxdoly_nmin710_osu.annv2
temxdoly_nmin710_osu.sumv2

/UKMOgcm:

temxdoly_aet710_ukm.annv2
temxdoly_aet710_ukm.sumv2
temxdoly_npp710_ukm.annv2
temxdoly_npp710_ukm.sumv2
temxdoly_vegc710_ukm.avev2
temxdoly_vegc710_ukm.sumv2
temxdoly_solc710_ukm.avev2
temxdoly_solc710_ukm.sumv2
temxdoly_strn710_ukm.avev2
temxdoly_strn710_ukm.sumv2
temxdoly_soln710_ukm.avev2
temxdoly_soln710_ukm.sumv2
temxdoly_nmin710_ukm.annv2
temxdoly_nmin710_ukm.sumv2

Note:

1. Background values by variables (except nmin) are all set to fit the standard format Tim pooled in Table 1 in his June 14th memo, as agreed upon at the VEMAP meeting in Woods Hole (May 20-21). Background values include wetland and inland water. For nmin, we assigned a background value of -9.9 as described in Tim and Nan's June 22nd memo.

2. Although TEM did solve for all non-wetland grid cells for the contemporary climate scenario, the model did not solve ("bombed") all the non-wetland grid cells in the GCM scenarios:

Scenario	"Bombs"	Number of "Good" Values
Contemporary Climate @ 355 ppmv	0	3168

UKMO Climate @ 710 ppmv	5	3163
OSU Climate @ 710 ppmv	14	3154
GFDL R30 Climate @ 710 ppmv	5	3163

More information about these "bomb-outs" (including location) is given in the summary tables. As agreed upon at the VEMAP meeting in Woods Hole, we assigned a value of -98 to these grid cells with the exception of nmin, which we assigned a value of -9.8 (see 1. above).

3. The unit of each variable is described in each svf file and matches those described in Table 1 of the June 14th memo from Nan Rosenbloom and Tim Kittel.

4. As the use of C/N ratios was discussed at the VEMAP meeting in Woods Hole as a possible diagnostic variable, we have included data on vegetation structural nitrogen (strn) and soil organic nitrogen (soln) with this release to allow such calculations (i.e. vegc/strn and solc/soln) and comparisons to the other models.

5. Each of the 7 output variables has a summary table associated with it (see all *.sumv2 files). The summary data are based on information from the original TEM data structure and not the svf files. As the svf format has truncated the values of many of the output variables, summaries based on the svf files might not exactly match the summary tables provided. In addition, the US totals at the bottom of the summary tables may not exactly match the sum of the vegetation types, again due to truncation of values in developing a "pretty" summary table.

In addition to summarizing the results for grid cells that were solved by TEM, we include summary information for the "bomb-outs" or "grid cells rejected for analysis" by vegetation type (column 1). By including the grid cell area (column 3) and the unit-area mean of each variable (by vegetation type - column 4), we can develop a regional estimate of each variable for the rejected grid cells (column 5). Adding the regional estimate for the rejected grid cells (column 5) to the appropriate regional estimate of "solved" grid cells, we can develop a regional estimate for vegetation types that includes both "solved" and "rejected" grid cells (column 6). The total at the bottom of column 6 would then be our final estimate for the conterminous United States.

Finally, we provide the longitude and latitude of each grid cell that "bombed".

If there are any questions, please contact us at MBL.

Yude	508 548-3705 x498	yudepan@lupine.mbl.edu
Kick	508 548-3705 x490	dkick@lupine.mbl.edu
Dave	303 872-3387	amcguire@lupine.mbl.edu

README.temxmapss

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README: TEM-VEMAP outputs using MAPSS output, version 2

We are happy to provide you our new results (version 2) of TEM runs using the MAPSS vegetation distribution (w/prairie peninsula, current winds, and WUE for CO2 = 710 ppmv). The new results contain 7 output variables (npp, vegc, solc, nmin, aet, strn, soln) from the TEM (version 4.0) runs under contemporary climate, and 3 revised GCM climates (version 3), respectively.

Filename format: temxmapss_vvvccc_ggg.dddvx

where:

vvv = output variables (missing data values after scaling)

aet = actual evapotranspiration (-99.0)
npp = net primary production (-99.0)
nmin = net nitrogen mineralization (-9.9)
solc = soil organic carbon storage (-99.0)
vegc = vegetation carbon storage (-99.0)
strn = vegetation structural nitrogen storage (-99.0)
soln = soil organic nitrogen storage (-99.0)

ccc = atmospheric CO2 (ppm) concentration

355 = 355 ppm
710 = 710 ppm

For GCMs: ggg = climate scenarios

gf3 = GFDL-R30 GCM scenario
osu = OSU GCM scenario
ukm = UKMO GCM scenario

ddd = data characteristics

ann = annual values
ave = average values for 12 months
sum = summary tables

vx = data version

The SVF format image files and summary files are as follows:

/Contemp (or temdata_v2_mapss_contemp.tar):

temxmapss_aet355.annv2
temxmapss_aet355.sumv2
temxmapss_npp355.annv2
temxmapss_npp355.sumv2
temxmapss_vegc355.avev2
temxmapss_vegc355.sumv2
temxmapss_solc355.avev2
temxmapss_solc355.sumv2
temxmapss_strn355.avev2
temxmapss_strn355.sumv2
temxmapss_soln355.avev2
temxmapss_soln355.sumv2
temxmapss_nmin355.annv2
temxmapss_nmin355.sumv2

/GFDLR30gcm (or temdata_v2_mapss_gf3.tar):

temxmapss_aet710_gf3.annv2
temxmapss_aet710_gf3.sumv2
temxmapss_npp710_gf3.annv2
temxmapss_npp710_gf3.sumv2
temxmapss_vegc710_gf3.avev2
temxmapss_vegc710_gf3.sumv2
temxmapss_solc710_gf3.avev2
temxmapss_solc710_gf3.sumv2
temxmapss_strn710_gf3.avev2
temxmapss_strn710_gf3.sumv2
temxmapss_soln710_gf3.avev2
temxmapss_soln710_gf3.sumv2
temxmapss_nmin710_gf3.annv2
temxmapss_nmin710_gf3.sumv2

/OSUgcm (or temdata_v2_mapss_osu.tar):

temxmapss_aet710_osu.annv2
temxmapss_aet710_osu.sumv2
temxmapss_npp710_osu.annv2
temxmapss_npp710_osu.sumv2
temxmapss_vegc710_osu.avev2
temxmapss_vegc710_osu.sumv2
temxmapss_solc710_osu.avev2
temxmapss_solc710_osu.sumv2
temxmapss_strn710_osu.avev2
temxmapss_strn710_osu.sumv2
temxmapss_soln710_osu.avev2
temxmapss_soln710_osu.sumv2
temxmapss_nmin710_osu.annv2
temxmapss_nmin710_osu.sumv2

/UKMOgcm (or temdata_v2_mapss_ukm.tar):

temxmapss_aet710_ukm.annv2
temxmapss_aet710_ukm.sumv2
temxmapss_npp710_ukm.annv2
temxmapss_npp710_ukm.sumv2
temxmapss_vegc710_ukm.avev2
temxmapss_vegc710_ukm.sumv2
temxmapss_solc710_ukm.avev2
temxmapss_solc710_ukm.sumv2
temxmapss_strn710_ukm.avev2
temxmapss_strn710_ukm.sumv2
temxmapss_soln710_ukm.avev2
temxmapss_soln710_ukm.sumv2
temxmapss_nmin710_ukm.annv2
temxmapss_nmin710_ukm.sumv2

Note:

1. Background values by variables (except nmin) are all set to fit the standard format Tim pooled in Table 1 in his June 14th memo, as agreed upon at the VEMAP meeting in Woods Hole (May 20-21). Background values include wetland and inland water. For nmin, we assigned a background value of -9.9 as described in Tim and Nan's June 22nd memo.

2. Although TEM did solve for all non-wetland grid cells for the contemporary climate scenario, the model did not solve ("bombed") all the non-wetland grid cells in the GCM scenarios:

Scenario	"Bombs"	Number of "Good" Values
Contemporary Climate @ 355 ppmv	0	3168
UKMO Climate @ 710 ppmv	5	3163
OSU Climate @ 710 ppmv	14	3154
GFDL R30 Climate @ 710 ppmv	6	3162

More information about these "bomb-outs" (including location) is given in the summary tables. As agreed upon at the VEMAP meeting in Woods Hole, we assigned a value of -98 to these grid cells with the exception of nmin, which we assigned a value of -9.8 (see 1. above).

3. The unit of each variable is described in each svf file and matches those described in Table 1 of the June 14th memo from Nan Rosenbloom and Tim Kittel.

4. As the use of C/N ratios was discussed at the VEMAP meeting in Woods Hole as a possible diagnostic variable, we have included data on vegetation structural nitrogen (strn) and soil organic nitrogen (soln) with this release to allow such calculations (i.e. vegc/strn and solc/soln) and comparisons to the other models.

5. Each of the 7 output variables has a summary table associated with it (see all *.sumv2 files). The summary data are based on information from the original TEM data structure and not the svf files. As the svf format has truncated the values of many of the output variables, summaries based on the svf files might not exactly match the summary tables provided. In addition, the US totals at the bottom of the summary tables may not exactly match the sum of the vegetation types, again due to truncation of values in developing a "pretty" summary table.

In addition to summarizing the results for grid cells that were solved by TEM, we include summary information for the "bomb-outs" or "grid cells rejected for analysis" by vegetation type (column 1). By including the grid cell area (column 3) and the unit-area mean of each variable (by vegetation type - column 4), we can develop a regional estimate of each variable for the rejected grid cells (column 5). Adding the regional estimate for the rejected grid cells (column 5) to the appropriate regional estimate of "solved" grid cells, we can develop a regional estimate for vegetation types that includes both "solved" and "rejected" grid cells (column 6). The total at the bottom of column 6 would then be our final estimate for the conterminous United States.

Finally, we provide the longitude and latitude of each grid cell that "bombed".

If there are any questions, please contact us at MBL.

Yude	508 548-3705 x498	yudepan@lupine.mbl.edu
Kick	508 548-3705 x490	dkick@lupine.mbl.edu
Dave	303 872-3387	amcguire@lupine.mbl.edu

Appendix B

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Individual Model Descriptions (linked from above)

BIOME2

BIOME2 uses a coupled carbon and water flux simulation model to capture the broadscale environmental controls on the distribution of vegetation structural and functional types (Haxeltine et al. 1996, Haxeltine and Prentice 1996a, Haxeltine and Prentice 1996b). Model input consists of latitude, soil texture, and mean monthly climate data (temperature, precipitation, and sunshine hours).

A rule-based biogeography module based largely on the biome model of Prentice et al. (1992) is first used to select which plant types may potentially be present at a particular site. This rule-base captures the effects of minimum temperature tolerances and chilling requirements on determining the distributions of different plant types. Starting from the set of plant types that may potentially be present at a certain site the model then finds the combination of plant types which maximizes the whole ecosystem NPP. Gross primary production (GPP) is calculated as a linear function of absorbed photosynthetically active radiation based on a optimized version of the Farquhar photosynthesis equation (Haxeltine and Prentice 1996a). GPP is reduced by drought stress and low temperatures. Respiration costs are currently estimateed simply as being 50% of the non-water-limited GPP. Through the effects of drought stress on NPP, the model correctly reproduces changes in FPC along moisture gradients. A simple two-layer hydrology model allows a realistic simulation of the competitive balance between grass and woody vegetation, including the effects of soil texture. The prescribed CO2 concentration has a direct effect on GPP through the photosynthesis algorithm and greatly effects the competitive balance between C3 and C4 plants. The water balance calculation is based upon equilibrium evapotranspiration theory (Jarvis and McNaughton 1986) which suggests that the large-scale potential evapotranspiration rate is determined by the energy supply for evaporation. Stomatal conductance is not explicitly included in the water balance calculation and there is no direct effect of CO2 on the water balance in the model.

Model output consists of net primary production (NPP) and leaf area (as foliar projective cover, FPC) for the combination of major plant types (e.g., evergreen and cold deciduous woody plants and C3 and C4 grasses) that maximizes whole ecosystem

NPP. A rule-base is then used to translate the model output into vegetation structural categories which can be directly compared with those of the VEMAP vegetation data set.

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BIOME2 Contacts:

Colin Prentice	colin@planteco.lu.se
Stephen Sitch	stephen@planteco.lu.se
Jed Kaplan	Jed_O.Kaplan@planteco.lu.se

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A global primary productivity and phytogeography model represents the biochemical processes of photosynthesis and the dependence of gas exchange on stomatal conductance, which in turn depends on temperature and soil moisture. Canopy conductance controls soil water loss by evapotranspiration. The assignment of nitrogen uptake to leaf layers is proportional to irradiance, and respiration and maximum assimilation rates depend on nitrogen uptake and temperature. Total nitrogen uptake is derived from soil carbon and nitrogen and depends on temperature. The long-term average annual carbon and hydrological budgets dictate canopy leaf area. Although observations constrain soil carbon and nitrogen, the distribution of vegetation types is not specified by an underlying map. Variables simulated by the model are compared favorably to experimental results. These comparisons extend from biochemical processes to the whole canopy, and the comparisons are favorable for both current and elevated CO_2 atmospheres. The model is used to simulate the global distributions of leaf area index and annual net primary productivity. These distributions are sufficiently realistic to demonstrate that the model is useful for analyzing vegetation responses to global environmental change. A statistical procedure is used to derive global distributions of ecosystem complexes from variables simulated by the primary productivity model. A multiple discriminant function analysis of variables including net primary productivity, leaf area index, evapotranspiration, and potential evapotranspiration accounts for both ecophysiological constraints as well as the effects of resource limitations to produce biogeographical ecosystem distributions.

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The MAPSS Model back to top

MAPSS (Mapped Atmosphere-Plant-Soil System) is a global biogeography model which simulates the potential natural vegetation that can be supported at any upland site in the world under a long-term steady-state climate. MAPSS operates on the fundamental principle that ecosystems will tend to maximize the leaf area that can be supported at a site by available soil moisture or energy (Woodward 1987; Neilson et al. 1989; Neilson 1993a; Neilson 1995).

Conceptual Framework

The conceptual framework for this approach is that vegetation distributions are, in general, constrained by either the availability of water in relation to transpirational demands or the availability of energy for growth (Neilson and Wullstein 1983, Neilson et al. 1989, Stephenson 1990, Woodward 1987). In temperate latitudes, water is the primary constraint, while at high latitudes energy is the primary constraint (exceptions occur, of course, particularly in some areas that may be nutrient limited). The energy constraints on vegetation type and leaf area index (LAI) are currently modeled in MAPSS using a growing degree day algorithm as a surrogate for net radiation (e.g. Botkin et al. 1972; Shugart 1984).

The model calculates the leaf area index of both woody and grass life forms (trees or shrubs, but not both) in competition for both light and water, while maintaining a site water balance consistent with observed runoff (Neilson 1995). Water in the surface layer is apportioned to the two life forms in relation to their relative LAIs and stomatal conductances, i.e., canopy conductance, while woody vegetation alone has access to deeper soil water.

Biomes are not explicitly simulated in MAPSS; rather, the model simulates the distribution of vegetation lifeforms (tree, shrub, grass), the dominant leaf form (broadleaf, needleleaf), leaf phenology (evergreen, deciduous), thermal tolerances and vegetation density (LAI). These characteristics are then combined into a vegetation classification consistent with the biome level (Neilson 1995).

Model Workings

The principal features of the MAPSS model include algorithms for:

1) formation and melt of snow,
2) interception and evaporation of rainfall,
3) infiltration and percolation of rainfall and snowmelt through three soil layers,
4) runoff,

5) transpiration based on LAI and stomatal conductance,
6) biophysical 'rules' for leaf form and phenology,
7) iterative calculation of LAI, and
8) assembly rules for vegetation classification.

Infiltration, and saturated and unsaturated percolation, are represented by an analog of Darcy's Law specifically calibrated to a monthly time step. Water holding capacities at saturation, field potential, and wilting point are calculated from soil texture, as are soil water retention curves (Saxton et al., 1986). Transpiration is driven by potential evapotranspiration (PET) as calculated by an aerodynamic turbulent transfer model based upon Brutsaert's (1982) ABL model (Marks and Dozier, 1992; Marks 1990), with actual transpiration being constrained by soil water, leaf area and stomatal conductance. Stomatal conductance is modulated as a function of PET (a surrogate for vapor pressure deficit) and soil water content (Denmead and Shaw 1962). Canopy conductance (i.e., actual transpiration) is an exponential function of LAI, modulated by stomatal conductance.

Elevated CO2 can affect vegetation responses to climate change through changes in carbon fixation and water-use-efficiency (WUE, carbon atoms fixed per water molecule transpired). The WUE effect is often noted as a reduction in stomatal conductance (Eamus 1991). Since MAPSS simulates carbon indirectly (through LAI), a WUE effect can be imparted directly as a change in stomatal conductance, which results in increased LAI (carbon stocks) and usually a small decrease in transpiration per unit land area.

MAPSS has been implemented at a 10 km resolution over the continental U.S. and at a 0.5o resolution globally (Neilson 1995, Neilson 1993a, Neilson and Marks 1994). The model has been partially validated within the U.S. and globally with respect to simulated vegetation distribution, LAI, and runoff (Neilson 1993a; Neilson 1995; Neilson and Marks 1994). MAPSS has also been implemented at the watershed scale (MAPSS-W, 200 m resolution) via a partial hybridization with a distributed catchment hydrology model (Daly 1994, Wigmosta 1994).

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BIOME-BGC back to top

The BIOME-BGC (BioGeochemical Cycles) model is a multi-biome generalization of FOREST-BGC, a model originally developed to simulate a forest stand development through a life cycle [Running and Coughlan, 1988; Running and Gower, 1991] . The model requires daily climate data and the definition of several key climate, vegetation, and site conditions to estimate fluxes of carbon, nitrogen, and water through ecosystems. Allometric relationships are used to initialize plant and soil carbon (C) and nitrogen (N) pools based on the leaf pools of these elements. [Vitousek et al, 1988] . Components of BIOME-BGC have previously undergone testing and validation, including the carbon dynamics [McLeod and Running, 1988; Korol et al, 1991; Hunt et al, 1991; Pierce, 1993; Running, 1994] and the hydrology [Knight et al, 1985; Nemani and Running, 1989; White and Running, 1994].

BIOME-BGC estimated NPP (3.8 PgC yr-1) and total carbon storage (118 PgC) for the conterminous United States from derived Küchler potential vegetation for contemporary climate and CO2 concentrations. Of total carbon, soil and vegetation carbon were estimated at 70 and 48 PgC, respectively. In response to climate change, BIOME-BGC estimated NPP from 3527-4119 PgC yr-1 and total carbon storage from 74-98 PgC for the three climate scenarios (OSU, GFDL, and UKMO). Estimates of total carbon storage to changes in climate were caused by decreased NPP as a result of decreased water availability, and increased plant and soil respiration response to increased temperatures. Soil C losses accounted for 72-85% of the total C loss across the three climate scenarios. Doubled atmospheric CO2 caused continental-scale increased NPP by 11% (4.2 PgC yr-1) and total carbon storage by 7% (126 PgC) in BIOME-BGC. The NPP and total carbon responses of BIOME-BGC to changes in both climate and CO2 were essentially additive, with NPP ranging from 3.8-4.5 PgC yr-1 and total carbon storage from 79-107 PgC.

The coupled-BIOME-BGC and Biogeography model experimental results ranged from 3.8-3.9 PgC yr-1 for NPP and 120-122 PgC total carbon storage for contemporary climate. There were relative increases in NPP when BIOME-BGC is run with either the DOLY or MAPSS vegetation distributions for the UKMO climate. Estimates of NPP from coupled BIOME-BGC to the biogeography vegetation distributions and climate scenarios ranged from 3.8-5.0 PgC yr-1 for changed climate and doubled CO2 concentrations. Similarly, total carbon storage ranged from 73-120 PgC, with the MAPSS vegetation and UKMO climate scenario exhibiting the largest total carbon storage reduction (39%). This was an absolute loss of 47 PgC of which 33 Pg was from soil, and 14 Pg from vegetation. Increased water use efficiency produced by higher CO2 concentrations was insufficient to overcome the negative effects of increased water stress on NPP resulting from warmer climates. The decrease in forested area from 44% to 38% under the MAPSS vegetation is responsible for the structural response. The functional response indicates a large reduction in carbon density within the forests. The reduction is caused by a combination of lower NPP due to water stress and higher plant respiration and decomposition caused by elevated temperature. In BIOME-BGC, the Q10 for the decomposition relationship is 2.4 as compared for 2.0 in the other biogeochemistry models. Of the three biogeochemistry models (BIOME-BGC, CENTURY, and TEM), BIOME-BGC predicted the highest losses of total carbon as a result of changed climate and doubled atmospheric CO2 concentrations.

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The CENTURY Model back to top

Natural Resource Ecology Laboratory
Colorado State University

The CENTURY model is a general model of plant-soil nutrient cycling which has been used to simulate carbon and nutrient dynamics for different types of ecosystems including grasslands, agricultural lands, forests and savannas. CENTURY is composed of a soil organic matter/decomposition submodel, a water budget model, a grassland/crop submodel, a forest production submodel, and management and events scheduling functions. It computes the flow of carbon, nitrogen, phosphorus, and sulfur through the model's compartments. The minimum configuration of elements is C and N for all the model compartments. The organic matter structure for C, N, P and S are identical, the inorganic components are computed for the specific inorganic compound. The timestep is or monthly and the model requires the following driving variables as input:

- Monthly average maximum and minimum air temperature
- Monthly precipitation
- Soil texture
- Plant nitrogen, phosphorus, and sulfur content
- Lignin content of plant material
- Atmospheric and soil nitrogen inputs
- Initial soil carbon, nitrogen (phosphorus and sulfur optional)

These variables are available for most natural and agricultural ecosystems.

The soil organic matter submodel includes three soil organic matter pools (active, slow, and passive) with different potential decomposition rates, above and below ground litter pools and a surface microbial pool which is associated with decomposing surface litter. The simplified water budget model calculates monthly evaporation, transpiration, the water content of the soil layers, snow water content, and saturated flow of water between soil layers. As mentioned above, CENTURY contains two plant production submodels; a grassland/crop submodel and a forest production submodel. Both plant production models assume that the monthly maximum plant production is controlled by moisture and temperature, and that maximum plant production rates are decreased if there are insufficient nutrient supplies. The grassland/crop production model simulates plant production for different herbaceous crops and plant communities (e.g. warm or cool season grasslands, wheat, and corn). The forest model simulates the growth of deciduous or evergreen forests in juvenile and mature phases. To simulate a savanna or shrubland, CENTURY uses both of these submodels with some additional code to simulate nutrient competition and shading effects.

Disturbances such as fire, havest, grazing and cultivation can be simulated via the management and events scheduling functions.

CENTURY was originally developed as a project of the U.S. National Science Foundation Ecosystem Studies Research Projects. Additional support for model enhancement has been provided by

Tallgrass Ecosystem Fire Project
Central Plains Experimental Range - LTER
NASA-EOS Project
Agricultural Research Service USDA

Link to the CENTURY webpage.

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CENTURY Contacts:

Dr. William Parton
Natural Resource Ecology Laboratory
Colorado State University
Fort Collins, CO 80523

FAX: (303) 491-1965
E-mail: century@nrel.colostate.edu

Terrestrial Ecosystem Model (TEM) top

The Terrestrial Ecosystem Model (TEM version 4) is a process-based ecosystem model (Raich et al., 1989; McGuire et al. 1992, 1993, 1996a, 1996b; Melillo et al., 1993, 1995) that describes carbon and nitrogen dynamics of plant and soils for non-wetland ecosystems of the globe. The TEM uses spatially referenced information on climate, elevation, soils, vegetation and water availability as well as soil- and vegetation-specific parameters to make monthly estimates of important carbon and nitrogen fluxes and pool sizes. Hydrological inputs for TEM are determined by a water balance model (Vorosmarty et al. 1989) that use the same climatic data and soil-specific parameters as used in TEM. The TEM operates on a monthly time step and at a 0.5 degrees latitude/longitude spatial resolution.

In TEM, annual primary production (NPP) is the difference between carbon captured from the atmosphere as gross primary production (GPP) and carbon respired to the atmosphere by the vegetation. Gross primary production is calculated as a function of light availability, air temperature, atmospheric CO2 concentration, moisture availability and nitrogen supply. The nitrogen uptake in the model is controlled by the stoichiometric C:N ratio of biomass production. The carbon-nitrogen status of the vegetation cause the model to allocate more effort towards either carbon or nitrogen uptake. Plant respiration is a function of vegetation carbon(i.e. biomass) and air temperature. In TEM, decomposition is a function of the one soil organic carbon compartment, temperature and soil moisture. The carbon and nitrogen pool sizes of vegetation and soil are affected by dynamic carbon and nitrogen fluxes (NPP, litterfall C, decomposition, litterfall N, net N mineralization, N uptake, etc.). Elevated CO2 may have either a direct or indirect effect on GPP. A direct consequence of elevated atmospheric CO2 is to increase GPP via a Michaelis -Menton (hyperbolic) relationship. Elevated CO2 may indirectly affect GPP by altering the carbon-nitrogen status of the vegetation to increase effort towards nitrogen uptake.

For simulating mature ecosystems at "equilibrium" as required by the VEMAP activity (VEMAP Members, 1995), TEM assumes equilibrium conditions are reached when: 1) annual fluxes of NPP, litterfall carbon, and decomposition are balanced; 2) the annual fluxes of net nitrogen mineralization, litterfall nitrogen, and nitrogen uptake by vegetation are balanced; and 3) nitrogen inputs are equal to nitrogen losses from the ecosystem.

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TEM Contacts:

Dave Kicklighter	dkick@lupine.mbl.edu
Dave McGuire	ffadm@aurora.alaska.edu
Jerry Melillo	jmelillo@lupine.mbl.edu
Yude Pan	yudepan@lupine.mbl.edu
Hanqin Tian	htian@lupine.mbl.edu