**Output Protocol for EucFACE simulations**

Version 1, 20th September 2013.

Upload files to the dropbox folder EucFACE\_model\_outputs, link

**https://www.dropbox.com/sh/loidom9n60lc856/K\_GEOk-8OP**

Provide comma-delimited files.

Columns that you can’t provide data for should be filled with -9999.

Definitions:

NEP = GPP – Reco – Offsite Closses.

N uptake = N in new wood growth + (new leaf N – N from internal pools) + N for new root production + (N deposition – N in throughfall – i.e., canopy uptake of atmospheric N)

Daily Vapor Pressure Deficit in kPa hours = a summation of the hourly mean kPa VPD values for a 24 hour period intended to reflect the integrated daily VPD driving force for the day. A bit gimmicky perhaps but a fair way to contrast daily VPD across days, seasons, and years.

Wood and branch litterfall should include mortality of aboveground plants.

Betah and Betad (soil moisture stress) is a factor between 0 and 1 that represents how much soil moisture stress has reduced GPP below its unstressed value.

Model Abbreviations:

Please use a four letter abbreviation for your model, for example GDAY becomes GDAY, CABLE would be CABL.

**A. Hourly output -- Provide a 2 files containing the following 35 columns.**

Files for Stage 1 - Model ‘as is’ runs:

H1nameEUCAMBAVG.csv and H1nameEUCAMBVAR.csv

H1nameEUCELEAVG.csv and H1nameEUCELEVAR.csv

Data in each hourly file:

Col Variable Units Variable Name Variable Type

1 Year 19?? To 20?? YEAR Time

2 Hour of the year 1 to 8760 or 8784 HOY Time

3 CO2 Mean ppm CO2h Environ

4 Precipitation kgH2O m-2 h-1\*\* PPTh Environ

5 PAR µmol m-2 s-1 PARh Environ

6 Long wave radiation W m-2 LWh Environ

7 Air temp canopy Mean °C ATh Environ

8 Soil temp average Mean °C STh Environ

9 Vapor Pres Def Mean kPa VPDh Environ

10 Total plant available soil water content mm SWh Environ

11 Net Eco Prod gC m-2 h-1 NEPh Flux

12 Gross Prim Prod gC m-2 h-1 GPPh Flux

13 Net Prim Prod gC m-2 h-1 NPPh Flux

14 C exudation gC m-2 h-1 CEXh Flux

15 C VOC Flux gC m-2 h-1 CVOCh Flux

16 Resp ecosystem gC m-2 h-1 RECOh Flux

17 Resp autotroph gC m-2 h-1 RAUTOh Flux

18 Resp leaves (maint) gC m-2 h-1 RLEAFh Flux

19 Resp Wood (maint) gC m-2 h-1 RWOODh Flux

20 Resp Fine Root (maint) gC m-2 h-1 RROOTh Flux

21 Resp Growth gC m-2 h-1 RGROh Flux

22 Resp hetero gC m-2 h-1 RHETh Flux

23 Resp soil gC m-2 h-1 RSOILh Flux

24 Evapotranspiration kgH2O m-2 h-1 ETh Flux

25 Transpiration kgH2O m-2 h-1 Th Flux

26 Soil evaporation kgH2O m-2 h-1 ESh Flux

27 Canopy evaporation kgH2O m-2 h-1 ECh Flux

28 Soil surface runoff kgH2O m-2 h-1 ROh Flux

29 Drainage kgH2O m-2 h-1 DRAINh Flux

30 Latent Energy W m-2 LEh Flux

31 Sensible Heat W m-2 SHh Flux

32 Absorbed PAR umol m-2 s-1 APARh Flux

33 Canopy conductance mol H2O m-2 s-1 GCh Flux Flux

34 Aero. conductance mol H2O m-2 s-1 GAh Flux Flux

35 Leaf bound. conduct mol H2O m-2 s-1 GBh Flux Flux

36 Soil moisture stress 0 – 1 Betah Flux

Average daytime aerodynamic conductance

\*\* kgH2O m-2 h-1 = mm h-1

**B. Daily Output -- Provide 2 files containing the following 83 columns.**

Output files should be called:

D1nameEUCAMBAVG.csv and D1nameEUCAMBVAR.csv

D1nameEUCELEAVG.csv and D1nameEUCELEVAR.csv

Where AMB = ambient and ELE = elevated

And AVG = runs with average met data (met data from 1998 repeatedly) and VAR = runs with interannual variability (using met data from 1998 – 2011)

Data in each daily file:

Col Variable Units VariableName Variable Type

1 Year 19?? To 20?? YEAR Time

2 Day of the year 1 to 365 or 366 DOY Time

3 CO2 Mean ppm CO2 Environ

4 Precipitation PPT PPT Environ

5 PAR mol m-2 PAR Environ

6 Air temp canopy Mean °C AT Environ

7 Soil temp average Mean °C ST Environ

8 Vapor Pres Def kPa h VPD Environ

9 Total plant available soil water content mm SW Environ

10 N deposition gN m-2 d-1 NDEP Environ

11 Net Eco Prod gC m-2 d-1 NEP Flux

12 Gross Prim Prod gC m-2 d-1 GPP Flux

13 Net Prim Prod gC m-2 d-1 NPP Flux

14 C exudation gC m-2 d-1 CEX Flux

15 C VOC Flux gC m-2 d-1 CVOC Flux

16 Resp ecosystem gC m-2 d-1 RECO Flux

17 Resp autotrophic gC m-2 d-1 RAUTO Flux

18 Resp leaves (maint) gC m-2 d-1 RLEAF Flux

19 Resp Wood (maint) gC m-2 d-1 RWOOD Flux

20 Resp Fine Root (maint) gC m-2 d-1 RROOT Flux

21 Resp growth gC m-2 d-1 RGROW Flux

22 Resp heterotrophic gC m-2 d-1 RHET Flux

23 Resp from soil gC m-2 d-1 RSOIL Flux (aka FFCER)

24 Evapotranspiration kgH2O m-2 d-1\*\*\* ET Flux

25 Transpiration kgH2O m-2 d-1 T Flux

26 Soil Evaporation kgH2O m-2 d-1 ES Flux

27 Canopy evaporation kgH2O m-2 d-1 EC Flux

28 Runoff kgH2O m-2 d-1 RO Flux

29 Drainage kgH2O m-2 d-1 DRAIN Flux

30 Latent Energy MJ m-2 LE Flux

31 Sensible Heat MJ m-2 SH Flux

32 C Leaf Mass gC m-2 CL Pool

33 C Wood mass gC m-2 CW Pool

34 C Coarse Root mass gC m-2 CCR Pool

35 C Fine Root Mass gC m-2 CFR Pool

36 C Storage as TNC gC m-2 TNC Pool

37 C Fine Litter Total gC m-2 CFLIT Pool

38 C Fine Litter above gC m-2 CFLITA Pool

39 C Fine Litter below gC m-2 CFLITB Pool

40 C Coarse Litter gC m-2 CCLITB Pool

41 C Soil gC m-2 0 to 30 cm CSOIL Pool

42 C Leaf growth gC m-2 d-1 GL Flux

43 C Wood growth gC m-2 d-1 GW Flux

44 C Coarse Root growth gC m-2 d-1 GCR Flux

45 C Fine Root growth gC m-2 d-1 GR Flux

46 C Leaf Litterfall gC m-2 d-1 CLLFALL Flux

47 C Root litter inputs gC m-2 d-1 CRLIN Flux

48 C Wood/branch inputs gC m-2 d-1 CWIN Flux

49 LAI projected m2 m-2 LAI Characteristic

50 Leaf gC/leaf area gC m-2 LMA Characteristic

51 N Conc Leaves gN gd.m.-1 NCON Characteristic

52 N Mass Leaves gN m-2 NCAN Pool

53 N Mass Wood gN m-2 NWOOD Pool

54 N Mass Coarse Roots gN m-2 NCR Pool

55 N Mass Fine Roots gN m-2 NFR Pool

56 N Storage gN m-2 NSTOR Pool

57 N Litter aboveground gN m-2 NLIT Pool

58 N Litter belowground gN m-2 NRLIT Pool

59 N Dead wood gN m-2 NDW Pool

60 N Soil Total gN m-2 0 to 30cm NSOIL Pool

61 N in Mineral form gN m-2 0 to 30 cm NPOOLM Pool

62 N in Organic form gN m-2 0 to 30 cm NPOOLO Pool

63 N fixation gN m-2 d-1 NFIX Flux

64 N Leaf Litterfall gN m-2 d-1 NLITIN Flux

65 N Wood/brch litterfall gN m-2 d-1 NWLIN Flux

66 N Root litter input gN m-2 d-1 NRLIN Flux

67 N Biomass Uptake gN m-2 d-1 NUP Flux

68 N Gross Mineralization gN m-2 d-1 NGMIN Flux

69 N Net mineralization gN m-2 d-1 NMIN Flux

70 N Volatilization gN m-2 d-1 NVOL Flux

71 N Leaching gN m-2 d-1 NLEACH Flux

72 N Leaf growth gN m-2 d-1 NGL Flux

73 N Wood growth gN m-2 d-1 NGW Flux

74 N CR growth gN m-2 d-1 NGCR Flux

75 N Fine Root growth gN m-2 d-1 NGR Flux

76 Absorbed PAR MJ m-2 d-1 APARd

77 Average daytime canopy conductance mol H2O m-2 s-1 GCd

78 Average daytime aerodynamic conductance mol H2O m-2 s-1 GAd

79 Average daytime leaf boundary conductance mol H2O m-2 s-1 GBd

80 Soil moisture stress 0 – 1 Betad Flux

81 potential gC m-2 d-1 potGPP Flux

82      P Mass Leaves   gP m-2          PCAN  
83      P Mass Wood     gP m-2          PWOOD  
84      P Mass Coarse Roots     gP m-2          PCR  
85      P Mass Fine Roots       gP m-2          PFR  
86      P Storage       gP m-2          PSTOR  
87      P Litter aboveground    gP m-2          PLIT  
88      P Litter belowground    gP m-2          PRLIT  
89      P Dead wood     gP m-2          PDW  
90      P Soil Total    gP m-2 0 to 30cm        PSOIL  
91      P in Labile form        gP m-2          PLABILE  
92      P in Secondary form     gP m-2          PSECOND  
93      P in Occluded form      gP m-2          POCCLUD  
94      P in Parent material form       gP m-2          PPARENT  
95      P in Mineral form       gP m-2          PPOOLM  
96      P in Organic form       gP m-2          PPOOLO  
97      P Leaf Litterfall       gP m-2 d-1              PLITIN  
98      P Wood/brch litterfall  gP m-2 d-1              PWLIN  
99      P Root litter input     gP m-2 d-1              PRLIN  
100     P Biomass Uptake        gP m-2 d-1              PUP  
101     P Gross Mineralization  gP m-2 d-1              PGMIN  
102     P Net mineralization    gP m-2 d-1              PMIN  
103     P Leaching      gP m-2 d-1              PLEACH  
104     P Leaf growth   gP m-2 d-1              PGL  
105     P Wood growth   gP m-2 d-1              PGW  
106     P CR growth     gP m-2 d-1              PGCR  
107     P Fine Root growth      gP m-2 d-1              PGR

\*\* kgH2O m-2 d-1 = mm d-1