

Supplement S6

May 11, 2021

1 Model Details

Table S6.1. Time periods for the different models per site that overlap with the flux tower observations, and that are used for model evaluation.

	Howard Springs	Adelaide River	Daly Uncleared	Dry River	Sturt Plains
BESS	7-8-2001–27-12-2012	1-1-2007–24-5-2009	19-2-2007–27-12-2012	31-8-2008–27-12-2012	28-8-2008–27-12-2012
BIOS2	7-8-2001–31-12-2013	1-1-2007–24-5-2009	19-2-2007–31-12-2013	31-8-2008–31-12-2013	28-8-2008–31-12-2013
LPJ-GUESS	7-8-2001–26-6-2013	1-1-2007–23-5-2009	19-2-2007–21-7-2013	31-8-2008–10-6-2013	28-8-2008–11-6-2013
MAESPA	7-8-2001–27-6-2013	1-1-2007–24-5-2009	19-2-2007–22-7-2013	31-8-2008–11-6-2013	28-8-2008–12-6-2013
SPA	7-8-2001–25-6-2013	1-1-2007–23-5-2009	1-1-2008–31-12-2013	31-8-2008–31-12-2012	28-8-2008–31-12-2012
CABLE	7-8-2001–29-12-2012	1-1-2007–31-12-2008	19-2-2007–30-12-2012	31-8-2008–30-12-2012	28-8-2008–30-12-2012
VOM	7-8-2001–21-12-2016	1-1-2007–24-5-2009	19-2-2007–21-12-2016	31-8-2008–21-12-2016	28-8-2008–21-12-2016

Table S6.2. Vegetation properties in the Vegetation Optimality Model optimized for maximizing the Net Carbon Profit.

Parameter	Description	Initial range	Timescale	Unit
$c_{\lambda f,p}$	water use parameter perennial vegetation	0.0 - 10000.0	Long-term	$\text{mol mol}^{-1} \text{m}^{-1}$
$c_{\lambda e,p}$	water use parameter perennial vegetation	-3.0 - 0.0	Long-term	-
$c_{\lambda f,s}$	water use parameter seasonal vegetation	0.0 - 10000.0	Long-term	$\text{mol mol}^{-1} \text{m}^{-1}$
$c_{\lambda e,s}$	water use parameter seasonal vegetation	-3.0 - 0.0	Long-term	-
$M_{A,p}$	fractional cover perennial vegetation	0 - 1	Long-term	-
$y_{r,p}$	rooting depth perennial vegetation	1.0 - 9.0	Long-term	m
$y_{r,s}$	rooting depth seasonal vegetation	0.05 - 2	Long-term	m
$M_{A,s}$	fractional cover seasonal vegetation	0.00 - (1.0-pct)	Daily	-
$J_{\max 25,p}$	electron transport capacity perennial vegetation	-	Daily	$\text{mol s}^{-1} \text{m}^{-2}$
$J_{\max 25,s}$	electron transport capacity annual vegetation	-	Daily	$\text{mol s}^{-1} \text{m}^{-2}$
$G_{s,p}$	stomatal conductance perennial vegetation	-	Daily	$\text{mol s}^{-1} \text{m}^{-2}$
$G_{s,s}$	stomatal conductance seasonal vegetation	-	Daily	$\text{mol s}^{-1} \text{m}^{-2}$
$S_{\text{Adr},i,s}$	root surface area distribution of perennial vegetation	-	Daily	$\text{m}^2 \text{m}^{-3}$
$S_{\text{Adr},i,s}$	root surface area distribution of annual vegetation	-	Daily	$\text{m}^2 \text{m}^{-3}$