Influence of an optimal stomatal conductance scheme in Australian Community Climate and Earth System Simulator (ACCESSv1.3)

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Abstract: Stomatal conductance (g_s) controls the fluxes of carbon and water between vegetation and the atmosphere and hence plays an important role in the carbon, energy, and water cycles. g_s has traditionally been parameterized using empirical models (Jarvis, 1986) within land surface models. The Community Atmosphere Biosphere Land Exchange (CABLE) model (Wang et al. 2011), the land surface model within the Australian Community Climate and Earth Systems Simulator (ACCESS, see http://www.accessimulator.org.au; Kowalczyk et al. 2013)), parameterizes g_s following Leuning et al. (1995). This scheme, like most traditional models of g_s, does not differentiate between model parameters as a function of plant function types (PFTs), but only in relation to photosynthetic pathway. Recently, a new g_s scheme has been proposed by Medlyn et al. (2011), which is based upon the optimization approach, i.e., that stomata adapt to maximize carbon gain whilst minimizing water loss. The g_s model parameters for this scheme vary per PFT and are derived from observational studies, and hence provide a more physically based approach to parameterize g_s. This scheme was recently implemented with CABLEv2.0.1 and tested globally in offline simulations (De Kauwe et al. 2014). This paper will present preliminary results from simulations with CABLE fully coupled to ACCESS, in atmosphere-only AMIP-style simulations with prescribed sea-surface temperature fields. The paper will focus on the influence of the scheme on both the mean climate and extreme indices.

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