1) Update to constrain photosynthesis flux under restricted availability of soil moisture (reported by Vanessa Haverd).

Offline tests using forcing data from PALS selected sites revealed that CABLE produced an excessive photosynthesis flux in two arid sites in South Africa; Mopane and Kruger. Both sites are covered with savannah which in CABLE is represented as C4 grass and deciduous broadleaf trees tiles. The observed daytime Net Ecosystem Exchange (NEE) in JJA and SON seasons was close to zero due to severe water restriction while CABLE produced large photosynthesis flux resulting in the negative NEE of up to 6 µmol/m2/s. To correct this the minimum stomatal conductance was modified with soil water availability factor 'fwsoil' which scaled down the photosynthesis flux. In the new results the modelled diurnal net ecosystem exchange become comparable with the observations in all four season as illustrated below in Fig 1 (first column). The diurnal fluxes of the net radiation and sensible heat were not affected while canopy transpiration was only slightly lower.

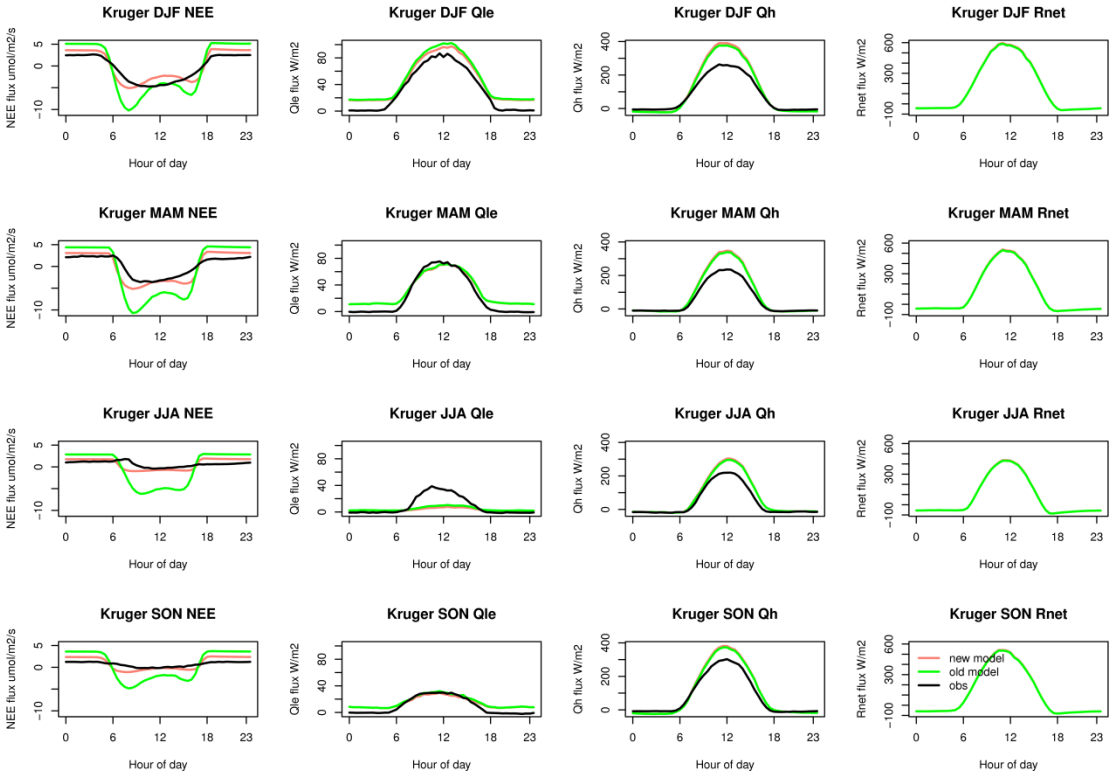

Figure 1: Diurnal cycles of NEE, Qle, Qh and Rnet during DJF, MAM, JJA and SON season at the Kruger station. The new results are in red, old in green and the observations in black.

Mean monthly fluxes of NEE were also improved for Kruger site with the mean NEE being a source rather than a sink throughout the dry season, see Fig. 2. zero.

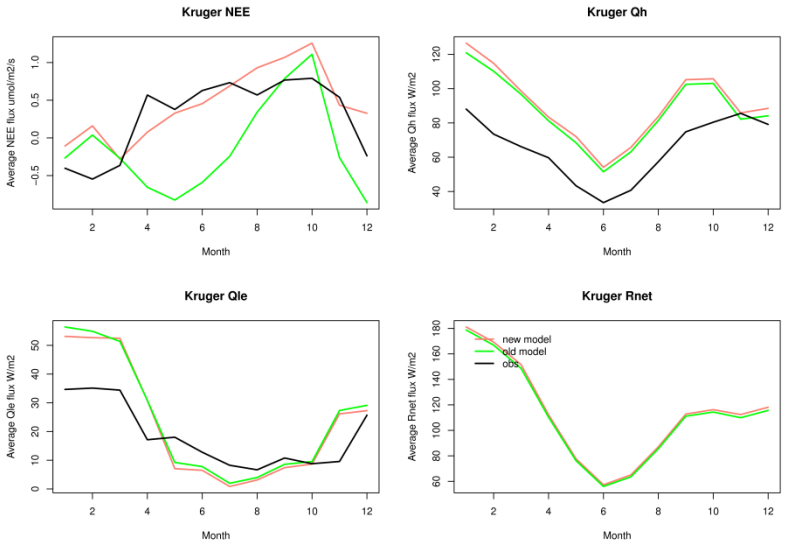

Figure 2. Mean monthly fluxes of NEE, Qle, Qh and Rnet at the Kruger station. The new results are in red, old in green and the observations in black.

Similar changes were observed in the model results for diurnal cycles in Mopane site which is slightly wetter, see Fig. 3. The new monthly means of NEE were only slightly more positive reflecting the lower photosynthesis flux, Fig 4.

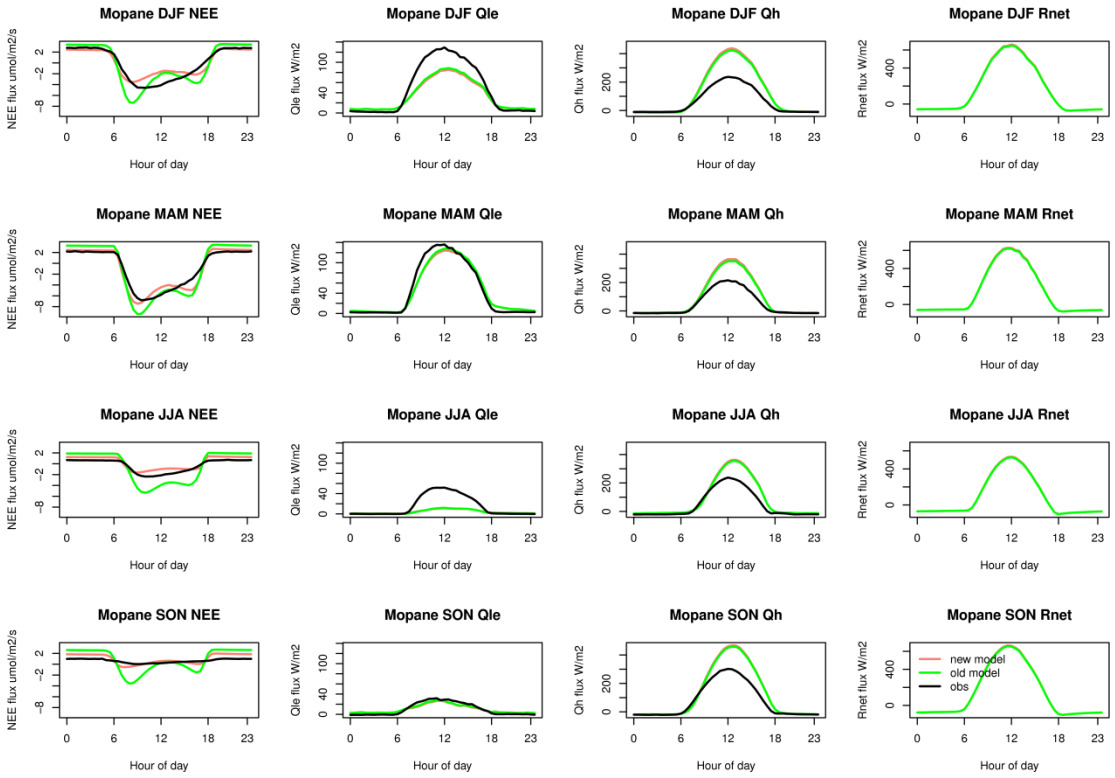

Figure 3: Diurnal cycles of NEE, Qle, Qh and Rnet during DJF, MAM, JJA and SON season at the Mopane station. The new results are in red, old in green and the observations in black.

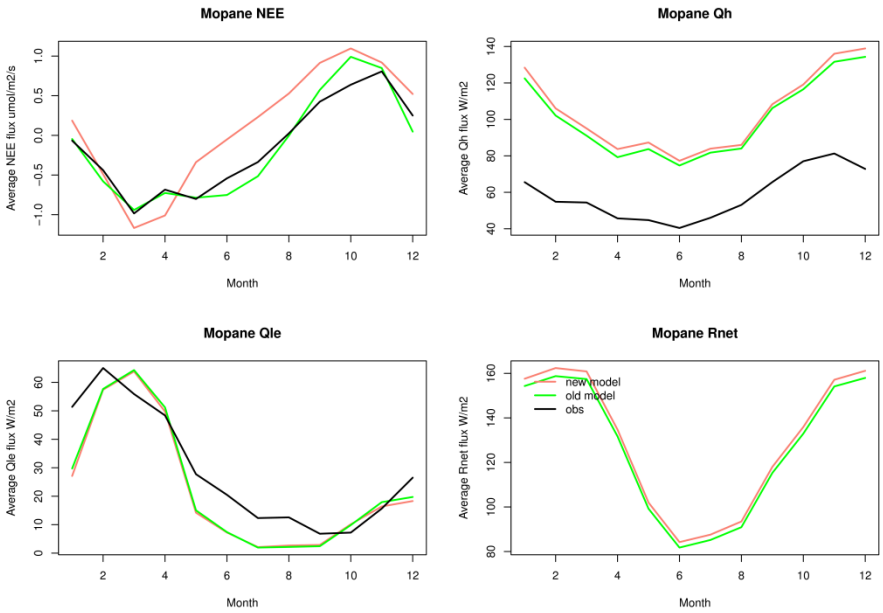

Figure 4. Mean monthly fluxes of NEE, Qle, Qh and Rnet at the Mopane station. The new results are in red, old in green and the observations in black.

Out of 20 sites tested on PALS this update affected in a significant way only those two arid sites; Mopane and Kruger.

The online AMIP test of 10 years has not shown any significant differences in the temperature or precipitation biases.