Supplementary Material

**Species-specific shifts in diurnal sap velocity dynamics and hysteretic behavior of ecophysiological variables during the 2015-2016 El Niño event in the Amazon forest**

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**Supplementary Figure S1** Map of the study areas developed using Landsat 8 satellite images (available in <https://earthexplorer.usgs.gov/>) where the K-34 tower and K-67 tower are located. The K-34 tower is in the central Amazon, near the city of Manaus, Brazil. The K-67 tower is in the north side of Tapajós National Forest (eastern Amazon) near the city of Santarém, Brazil.

**Supplementary Figure S2** Images of the sensor network used to study the dependencies of tree physiology on environmental conditions in Manaus and Santarém, Brazil. (**a**) Tleaf measurements using infrared radiometer sensors, Apogee®; (**b**) direct solar radiation equipment - SPN1 sunshine pyranometer, Delta-T Devices®; (**c**) leaf gas exchange system – LiCor 6400XT, Lincoln®, NE, USA; (**d**) leaf stomatal conductance measurements (porometer) - Decagon Devices®, WA, USA;(**e**) Tleaf thermocouples measurements - OM-CP-OCTTEMP-A Nomad®, Omega Engineering; (**f**) sap velocity system - SFM1, ICT international®.

**Supplementary Figure S3** Intercomparisons between Tleaf measurements using infrared and leaf thermocouples. In Manaus, the results show good agreement between the two methods for Tleaf estimation with values generally falling within the range of the four different leaf thermocouples. In Manaus both methods were tested using the same tree species (*P. anomala*), in which was possible because the proximity of the crown to the K-34 walkup tower. In Santarém, the Tleaf observations using the infrared radiometers were underestimated due to the larger distance between the sensors mounted on the K-67 triangle tower and the crowns of the trees. While in Manaus the target areas were up to 2.4 m2, which consisted mainly of sun-exposed leaves, the target areas in Santarém were up to 65.4 m2 which consisted of both shade and sun-exposed leaves, and branches. An underestimate values of Tleaf in Santarém was suggested using leaf thermocouples installed in upper canopy leaves of *Manilkara* sp. (~30 m height) accessible next to a nearby walkup tower. The values of diurnal thermocouple data of *Manilkara* sp. were compared with the infrared radiometers mounted on the K-67 triangle tower with the field of view to the tree *Chamaecrista xinguensis* (~30 m height). On 09 November 2016 maximum afternoon Tleaf determined by infrared radiometers on the K-67 triangle tower were 33-35°C for *Chamaecrista xinguensis* whereas maximum afternoon Tleaf determined by leaf thermocouples on the nearby walkup tower were 40-42°C for *Manilkara* sp. Thus, the Tleaf data in Manaus is considered quantitative whereas the Tleaf data in Santarém is considered more qualitative but expected to follow the temporal patterns of the actual Tleaf.

**Supplementary Figure S4** Normalized long time series (2 months) of Vs and Tleaf of six trees (*E. cyathiformis*, *P. anomala*, and *P. erythrochysa* in Manaus, and *C. xinguensis*, *Lecythis* sp., and *E. uncinatum* in Santarém), with the peaks and valleys of these two variables coinciding temporally.

**Supplementary Figure S5** One-week scatter plot data with 15-minute observation intervals during the 2015-2016 ENSO for *E. cyathiformis*, *P. anomala*, and *P. erythrochysa* in Manaus, and *C. xinguensis,* *Lecythis* sp. and *E. uncinatum* in Santarém. The sigmoid function presented the best fit for one-week data of sap velocity as function of Tleaf. Four parameter logistic regressions (4PL) were fitted for each species using the following equation: $y=base+ \left\{\frac{max}{\left(1+exp\left(\frac{xhalf-x}{rate}\right)\right)}\right\} $

**Supplementary Figure S6** Diurnal patterns of gs for *E. cyathiformis* in Manaus (**a, c**) and for *Manilkara* sp. in Santarém (**b, d**). The gs peak for *E. cyathiformis* in Manaus was 31 ºC (~ 10:20 Local Time) and the gs peak for *Manilkara* sp. In Santarém was 32.6 ºC (~ 11:30 Local Time), both in the morning period. Additionally, clockwise hysteresis patterns of the variables gs and Tleaf was observed in the two sites(**c, d**).