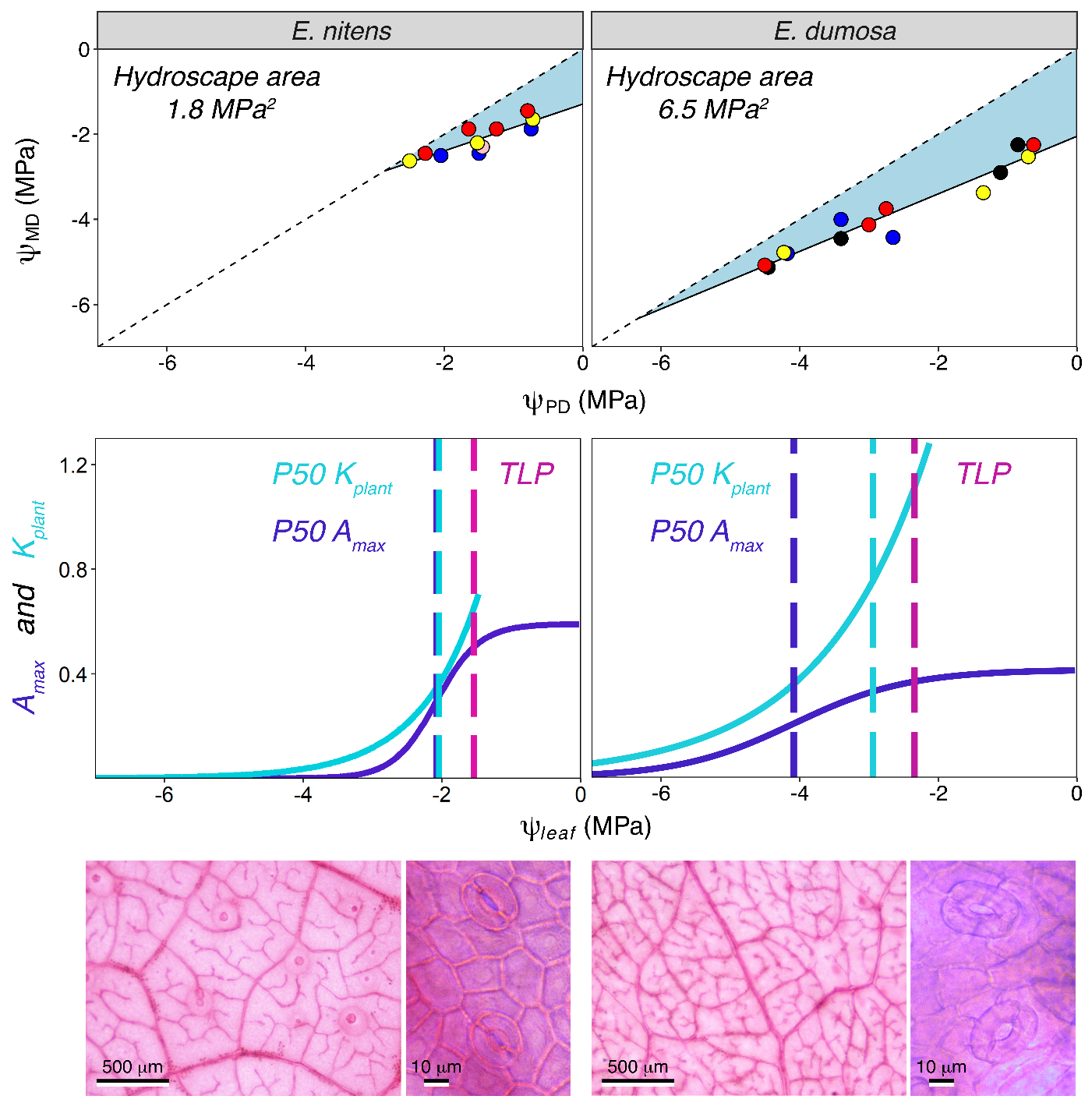
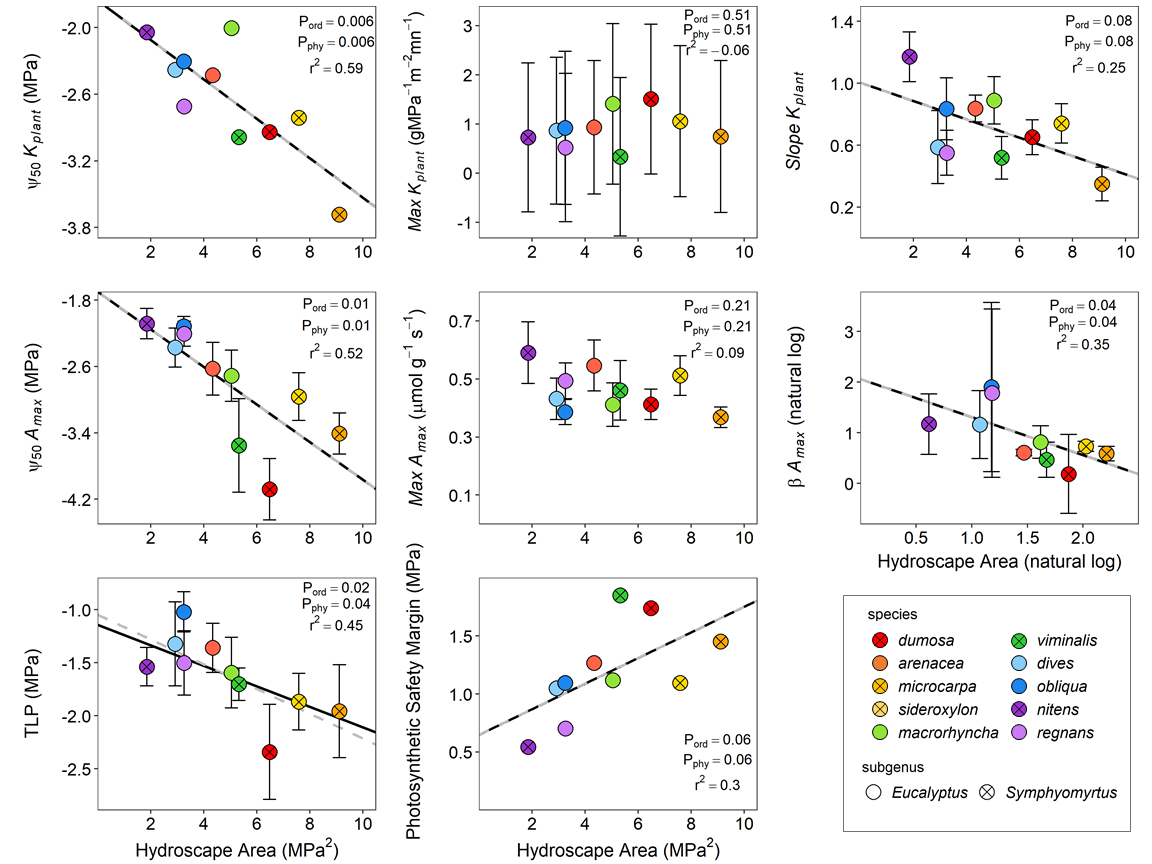
**Figures**

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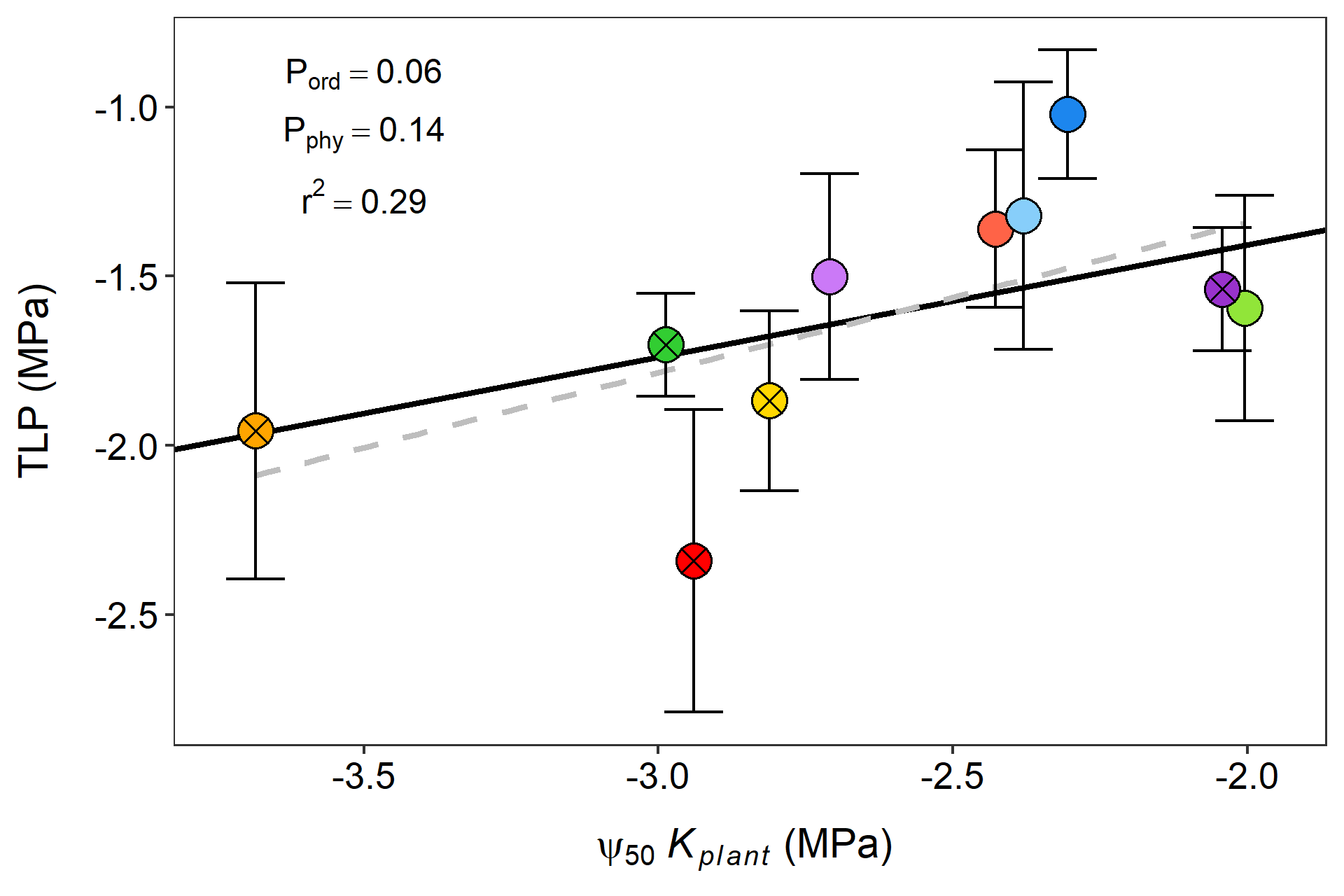
**Figure 1.** Comparisons of the most isohydric species (left column, *E. nitens*) to a more anisohydric species (right column, *E. dumosa*), with degree of anisohydry being classified by hydroscape area. **Top row** displays hydroscape (light blue triangle) across declines in midday leaf water potential (*MD*) and soil water potential (*PD*), with greater hydroscape area in the more anisohydric species by defini­tion. Different colored data points represent different individual plants. **Middle row** shows the response of whole plant hydraulic conductance (*Kplant,* g MPa-1 m-2 min-1) and mesophyll photosynthetic capacity (*Amax*, mol g-1 s-1) to declines in *leaf* (solid blue and purple lines, respectively). Vertical dashed lines display the *leaf* of leaf turgor loss (TLP), of 50% decline in *Amax* (*50Amax*), and of 50% decline in *Kplant* (*50 Kplant*). *Kplant* and *Amax* are less sensitive to **leaf and TLP is lower in the more anisohydric species. **Bottom row** displays vein and stomatal architecture. Vein length per area (VLA, mm mm-2) is greater in the more anisohydric species.

**Table 1.** Functional traits of 10 *Eucalyptus* species. Traits presented as means ± standard deviations. Species ordered by hydroscape area. Accurate standard deviations could not be easily estimated for *50 Kplant*, photosynthetic safety margin, and *dx/dy* given they are calculated from other estimated values. *50 Amax,  Amax*, and *Max Amax* taken from Salvi *et al.* (2021).

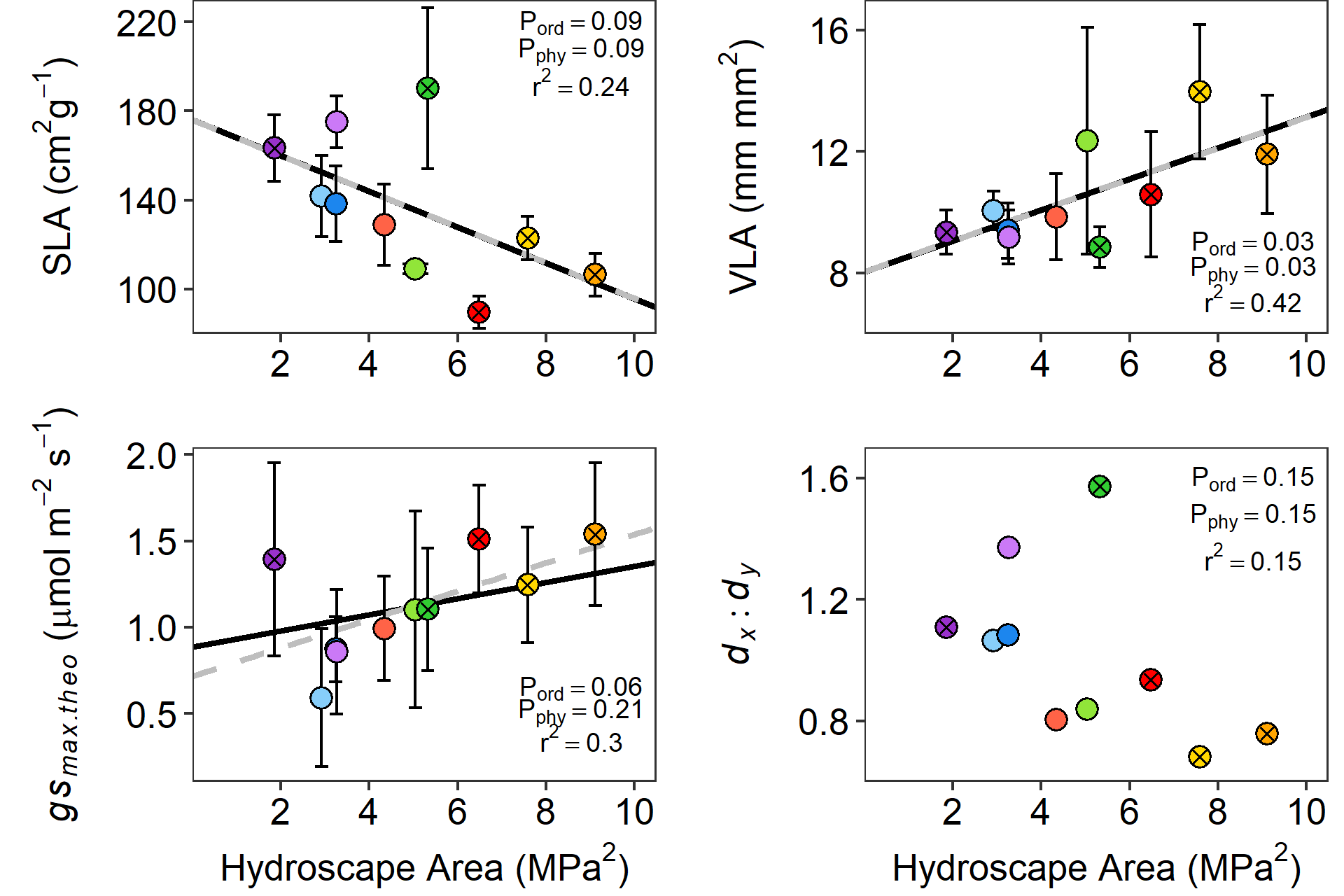
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Hydroscape area (MPa2)** | ***50 Amax* (MPa)** | *** Amax*** | ***Max Amax* (mol g-1 s-1)** | ***50*** ***Kplant* (MPa)** | ***Slope Kplant*** | ***Max Kplant* (g MPa-1 m-2 min-1)** | **TLP (MPa)** | **Photosynthetic Safety Margin (MPa)** | **SLA (cm2 g-1)** | **VLA (mm mm-2)** | ***gsmax.theo* (mol m-2 s-1)** | ***dx/dy* (μm μm-1)** |
| *nitens* | 1.8 ± 0.2 | -2.1 ± 0.2 | 3.2 ± 1.8 | 0.59 ± 0.11 | -2.0 | 1.2 ± 0.2 | 0.7 ± 1.5 | -1.5 ± 0.2 | 0.5 | 163.3 ± 14.9 | 9.3 ± 0.7 | 1.4 ± 0.6 | 1.1 |
| *dives* | 2.9 ± 0.2 | -2.4 ± 0.2 | 3.2 ± 2.0 | 0.43 ± 0.07 | -2.4 | 0.6 ± 0.2 | 0.9 ± 1.5 | -1.3 ± 0.4 | 1.1 | 141.9 ± 18.2 | 10.1 ± 0.6 | 0.6 ± 0.4 | 1.1 |
| *obliqua* | 3.2 ± 0.6 | -2.1 ± 0.1 | 6.7 ± 5.3 | 0.39 ± 0.04 | -2.3 | 0.8 ± 0.2 | 0.9 ± 1.6 | -1.0 ± 0.2 | 1.1 | 138.4 ± 17.0 | 9.4 ± 0.9 | 0.9 ± 0.2 | 1.1 |
| *regnans* | 3.3 ± 0.2 | -2.2 ± 0.2 | 5.9 ± 5.3 | 0.49 ± 0.06 | -2.7 | 0.6 ± 0.1 | 0.5 ± 1.5 | -1.5 ± 0.3 | 0.7 | 175.0 ± 11.6 | 9.2 ± 0.9 | 0.9 ± 0.4 | 1.4 |
| *arenacea* | 4.3 ± 0.5 | -2.6 ± 0.3 | 1.8 ± 0.9 | 0.55 ± 0.09 | -2.4 | 0.8 ± 0.1 | 0.9 ± 1.4 | -1.4 ± 0.2 | 1.3 | 129.0 ± 18.2 | 9.8 ± 1.4 | 1.0 ± 0.3 | 0.8 |
| *macrorhyncha* | 5.0 ± 0.5 | -2.7 ± 0.3 | 2.3 ± 1.4 | 0.41 ± 0.07 | -2.0 | 0.9 ± 0.2 | 1.4 ± 1.6 | -1.6 ± 0.3 | 1.1 | 109.1 ± 2.2 | 12.4 ± 3.7 | 1.1 ± 0.6 | 0.8 |
| *viminalis* | 5.3 ± 0.5 | -3.6 ± 0.6 | 1.6 ± 1.4 | 0.46 ± 0.10 | -3.0 | 0.5 ± 0.1 | 0.3 ±1.6 | -1.7 ± 0.2 | 1.8 | 190.2 ± 36.1 | 8.8 ± 0.7 | 1.1 ± 0.4 | 1.6 |
| *dumosa* | 6.5 ± 0.5 | -4.1 ± 0.4 | 1.2 ± 0.5 | 0.41 ± 0.05 | -2.9 | 0.7 ± 0.1 | 1.5 ± 1.5 | -2.3 ± 0.5 | 1.7 | 89.6 ± 7.3 | 10.6 ± 2.1 | 1.5 ± 0.3 | 0.9 |
| *sideroxylon* | 7.6 ± 2.1 | -3.0 0.3 | 2.1 ± 1.1 | 0.51 ± 0.07 | -2.8 | 0.7 ± 0.1 | 1.1 ± 1.5 | -1.9 ± 0.3 | 1.1 | 122.8 ± 9.7 | 14.0 ± 2.2 | 1.2 ± 0.3 | 0.7 |
| *microcarpa* | 9.1 ± 1.8 | -3.4 ± 0.3 | 1.8 ± 0.9 | 0.37 ± 0.04 | -3.7 | 0.3 ± 0.1 | 0.7 ± 1.5 | -2.0 ± 0.4 | 1.5 | 106.5 ± 9.6 | 11.9 ± 1.9 | 1.5 ± 0.4 | 0.8 |

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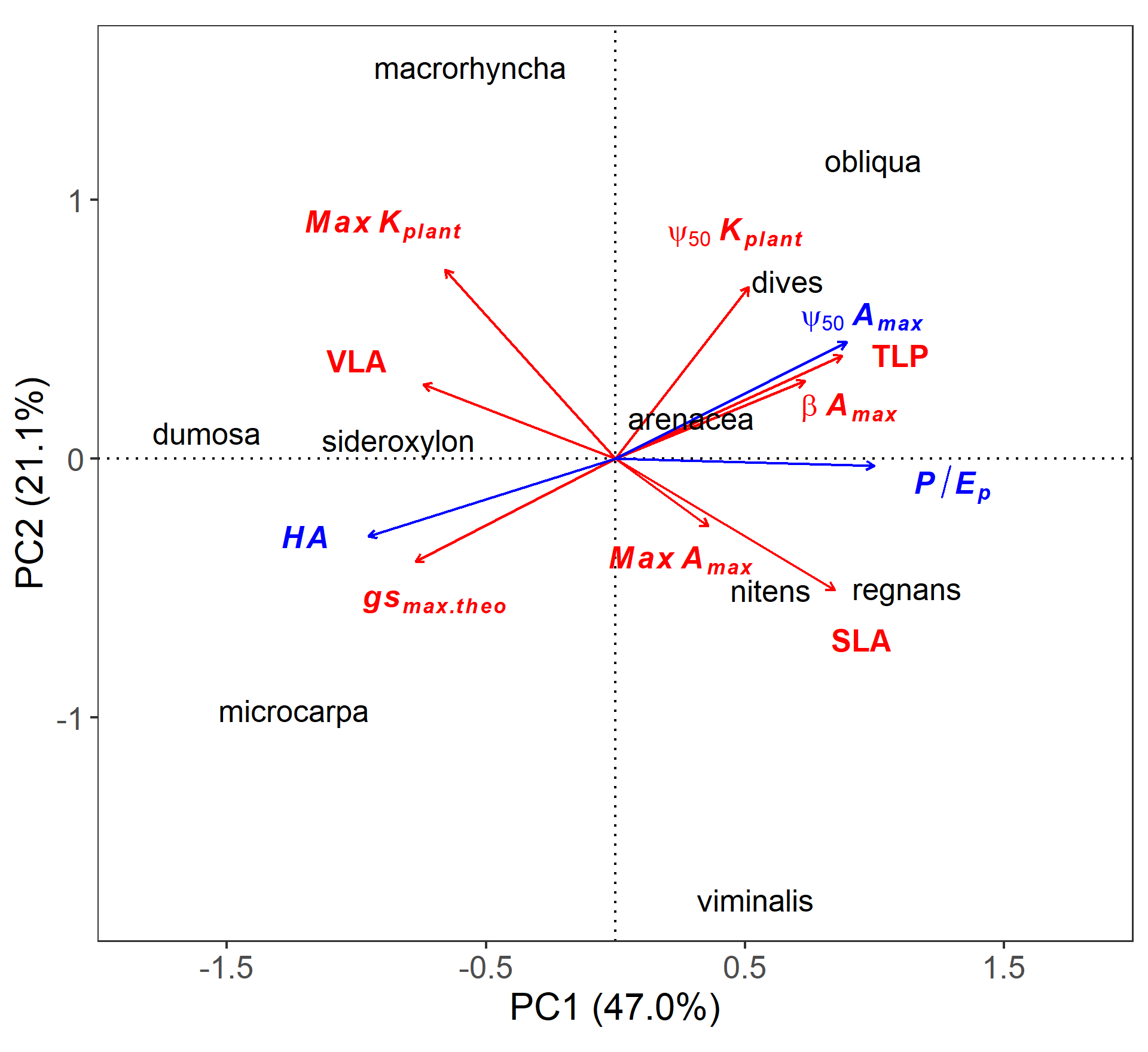
**Figure 2.** Relationships between hydroscape area and key hydraulic and photosynthetic traits. Traits include water potential inducting 50% loss of whole plant hydraulic conductance (*50 Kplant*), hydraulic conductance when *leaf* = 0 (*Max Kplant*), exponential slope of the decline of *Kplant* with decreasing*leaf*, *leaf* at 50% loss of mesophyll photosynthetic capacity (* Amax*), mesophyll photosynthetic capacity when *leaf* = 0 (*Max Amax*), sigmoidal slope of the decline of *Amax* with decreasing*leaf* (***Amax*), *leaf* at leaf turgor loss (TLP), and photosynthetic safety margin between *50 Amax* and TLP. Error lines indicate one standard deviation. Solid black lines are phylogenetically structured linear regressions; dashed gray lines are ordinary linear regressions; black and gray dashed lines indicated both types of linear regressions yield the same results.



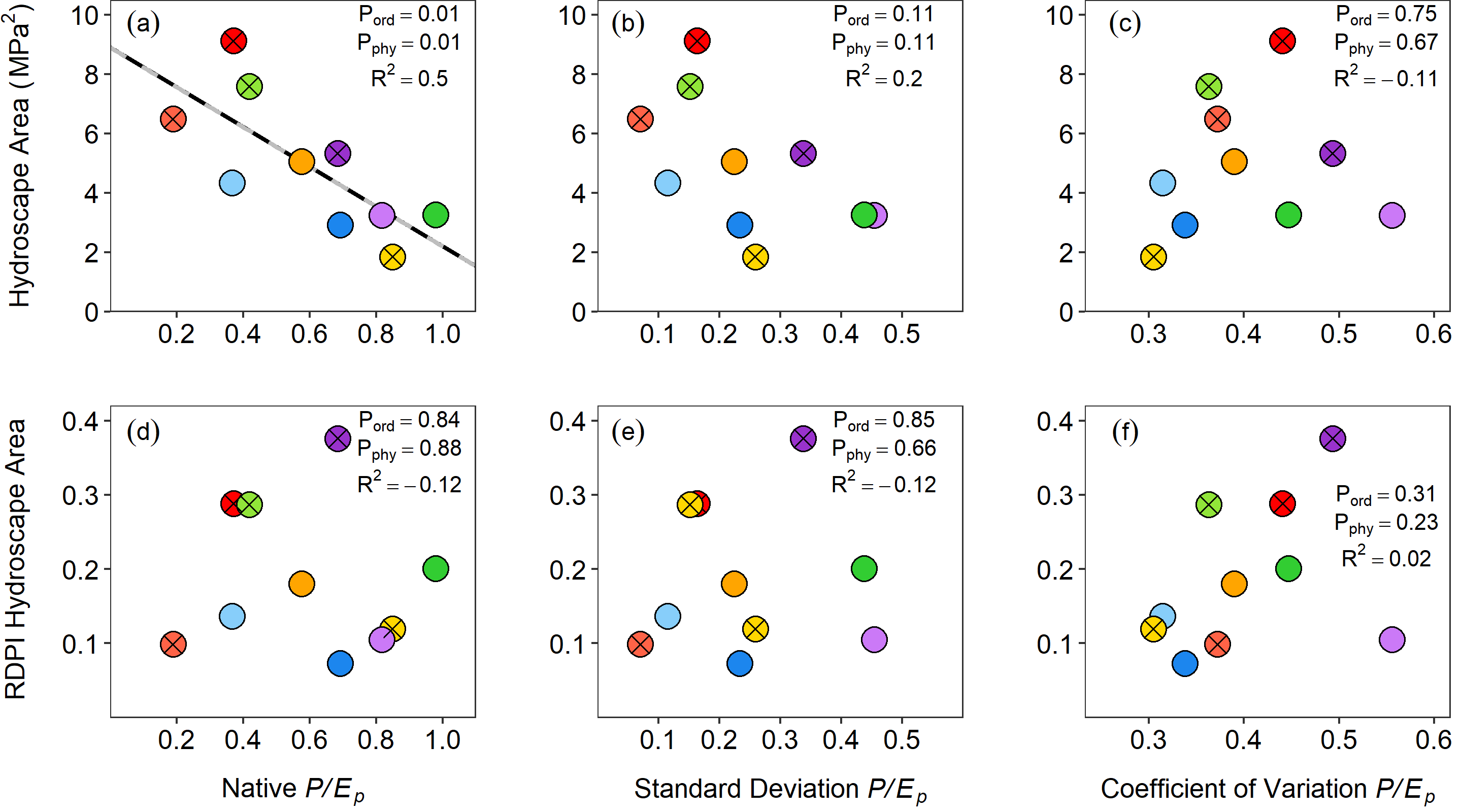
**Figure 3.** Correlation between vulnerability of whole plant hydraulic conductance (*50 Kplant*) and turgor loss point (TLP).Solid black line is a phylogenetically structured linear regression, and dashed gray line is the ordinary linear regressions



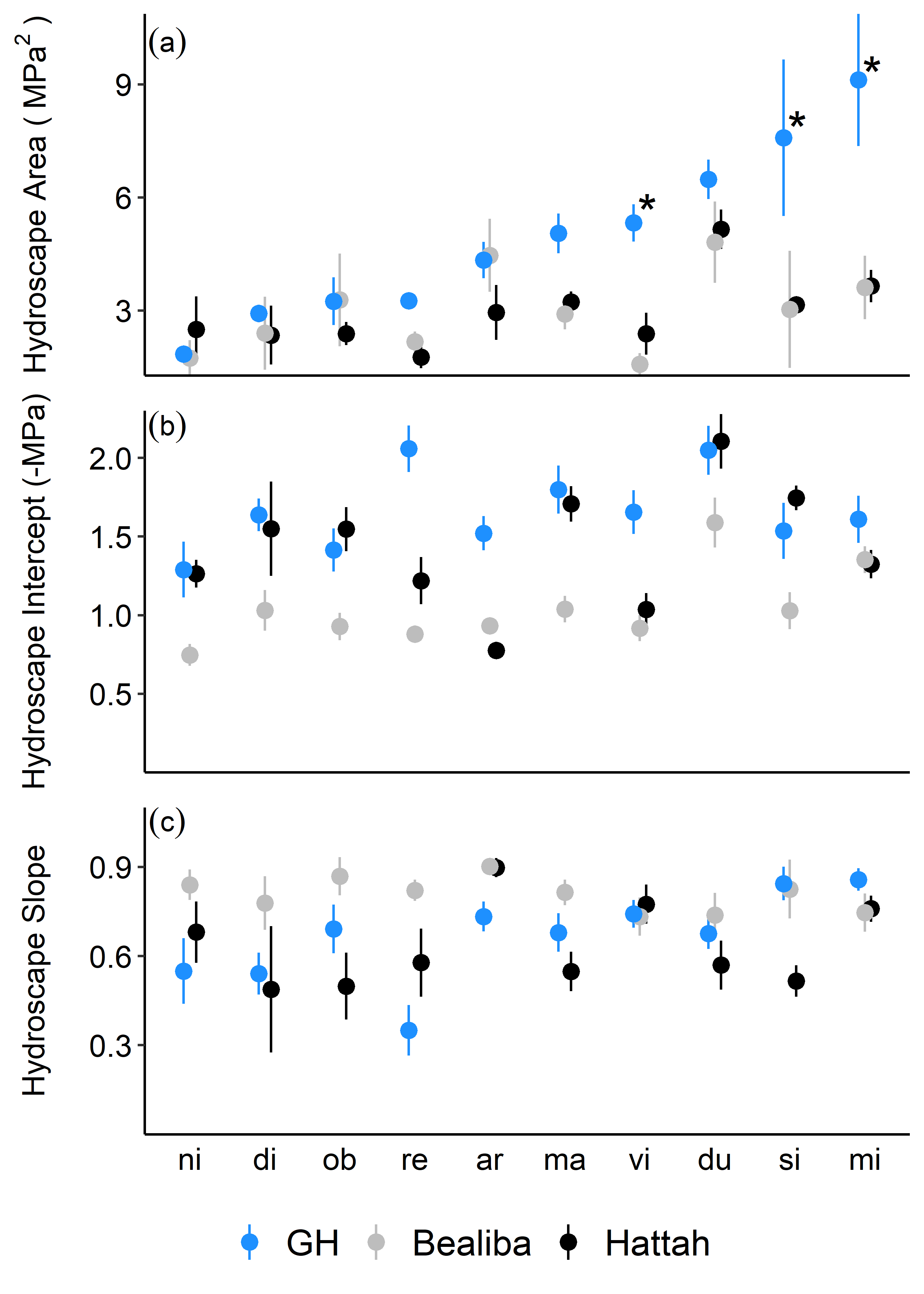
**Figure 4.** Relationships between hydroscape area and leaf anatomy. Traits include specific leaf area (SLA), vein length per area (VLA), max theoretical stomatal conductance (*gsmax.theo*), and the ratio of intervein distance to vein-epidermis distance (*dx:dy*). Error lines indicate one standard deviation. Solid black lines are phylogenetically structured linear regressions; dashed gray lines are ordinary linear regressions; black and gray dashed lines indicated both types of linear regressions yield the same results. Legend is the same as Fig. 2.



**Figure 5.** Results of phylogenetic principal component analysis (PCA) of functional traits. HA is hydroscape area, VLA is vein length per area, SLA is specific leaf area, *gsmax\_theo* is maximum theoretical stomatal conductance calculated using stomatal dimensions. Blue arrows represent traits of interest overlaid on the PCA for the purpose of analyzing correlation of these traits with the PCA axes and traits therein (red arrows).



**Figure 6.** Hydroscape areas and plasticity of 10 *Eucalyptus* species. **(a-c)** Hydroscape areas grown in glasshouse conditions and their relationship to **a)** moisture availability of native habitat (mean precipitation vs. mean pan evaporation, *P/Ep*), **b)** the standard deviation of *P/Ep*across the species’ native distribution, and **c)** the coefficient of variation (mean *P/Ep* / standard deviation *P/Ep*). **(d-f)** RDPI of hydroscape area, calculated from hydroscape areas of 10 *Eucalyptus* species across 3 sites of different moisture levels, and their relationship to **d)** *P/Ep*, **e)** the standard deviation of *P/Ep*, and **f)** the coefficient of variation *P/Ep*. Black and gray dashed lines indicated that both ordinary and phylogenetic linear regressions yield the same statistically significant results. Legend is the same as Fig. 2.



**Figure 7.** Hydroscape areas (a), intercepts (b), and slopes (c) across 3 sites in ten species of *Eucalyptus*. Glasshouse (GH) represents wettest conditions, Hattah is driest. Error bars represent one standard deviation, estimated using parametric bootstrapping. Species ordered left to right by most isohydric to most anisohydric according to GH hydroscape area. **a)** Asterisks denote the three species that displayed plasticity in hydroscape area (*HA*). In all three cases, *HA* was largest in the GH (P < 0.005). **b)** All ten species displayed differences in intercepts among sites (P < 0.05), but which site had the most negative intercept depended on the species (see Table S5). **c)** All ten species displayed differences in slopes among sites, and were steepest at intermediately dry site Bealiba for all ten species (P < 0.001). Thus, while slope and intercept were found to be plastic, *HA* itself in most cases was not.