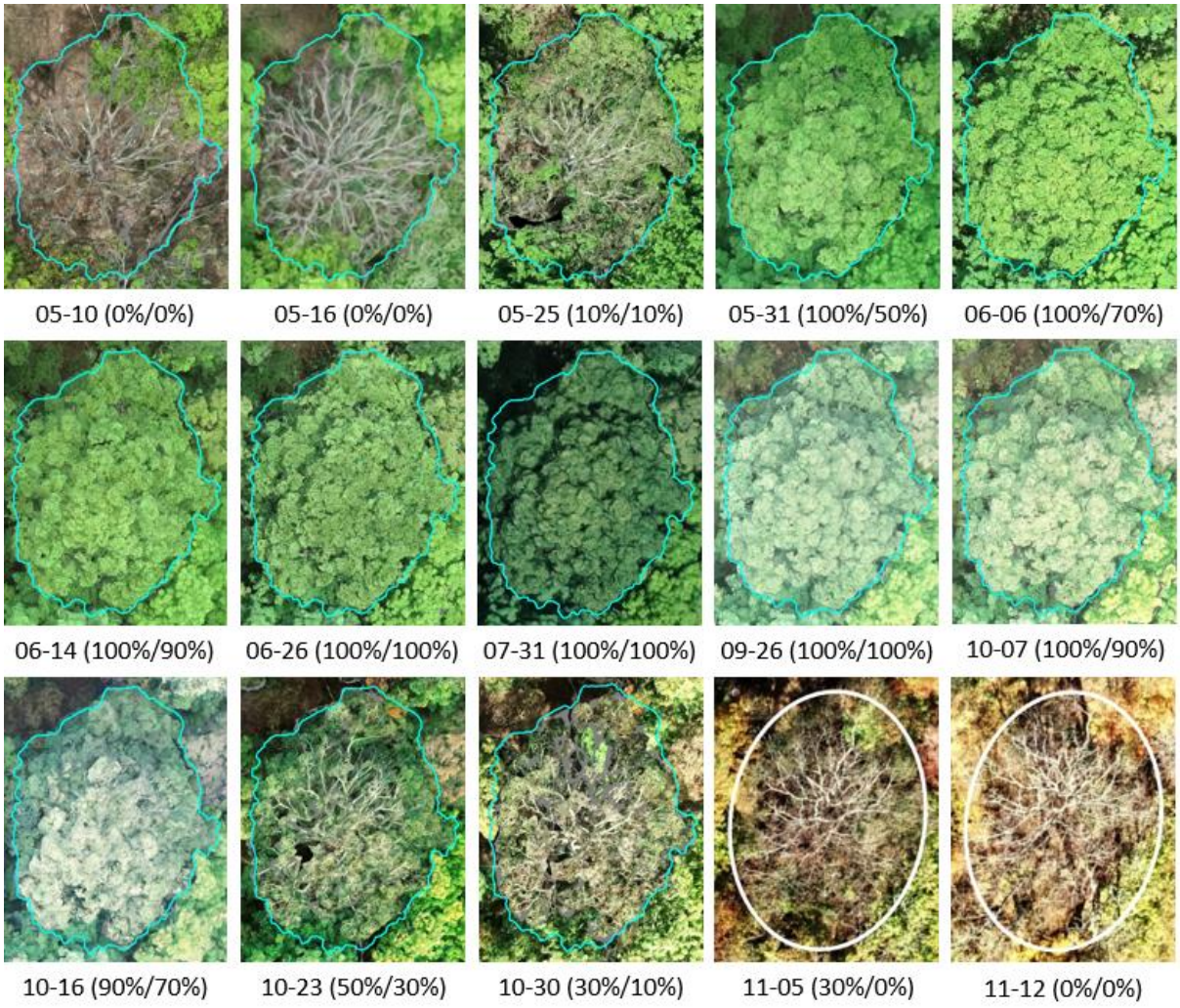

Figure S1 Example of a time-series of UAV images used for the visual interpretation of crown leaf cover for *Tilia japonica*. The text on the bottom of each image indicates the observation date and crown leaf cover determined by visual interpretation of the UAV image (CLC_{UAV}) and ground-based observations (CLC_{ground}) (date followed by CLC_{UAV}/CLC_{ground}). 15 out of 21 dates are shown. CLC_{UAV} values in November were determined based on the raw aerial photographs which had a similar viewing angle as the orthophoto due to the failure of orthophoto development.

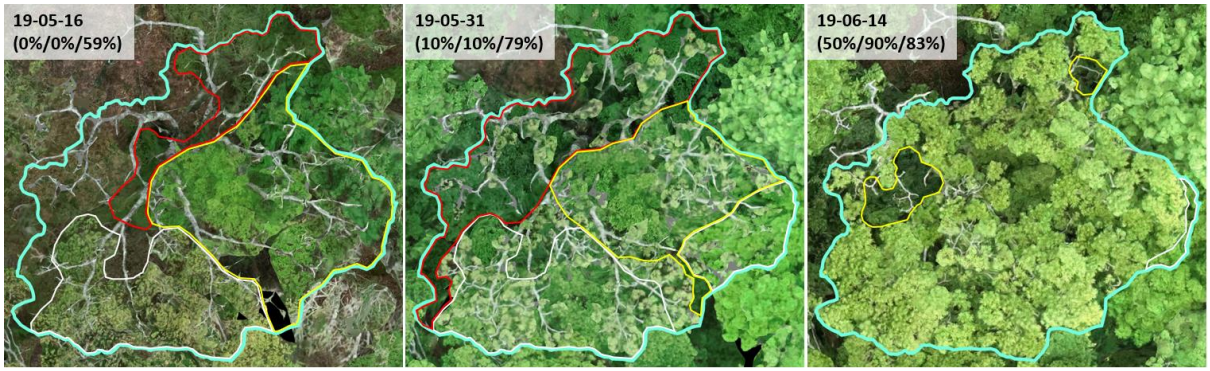

Figure S2. Images demonstrating the influence of below-crown vegetation, such as neighboring trees (white line), subcanopy trees (yellow line) and understory vegetation (red line), on *Phellodendron amurense* crown leaf phenology (light blue line) during spring leaf expansion. The below-crown vegetation had a strong influence on estimated green chromatic coordinate since leaf emergence in the below-crown vegetation preceded the *P. amurense* crown by about three weeks (Figure 5). The text box in each image gives the date, (YY-MM-DD) and crown leaf cover based on ground observations (CLC_{ground}), crown leaf cover determined by visual interpretation of UAV images (CLC_{UAV}), and relative mean crown-level green chromatic coordinate (GCC_{crown}) (YY-MM-DD followed by CLC_{ground}/CLC_{UAV}/relative GCC_{crown}).

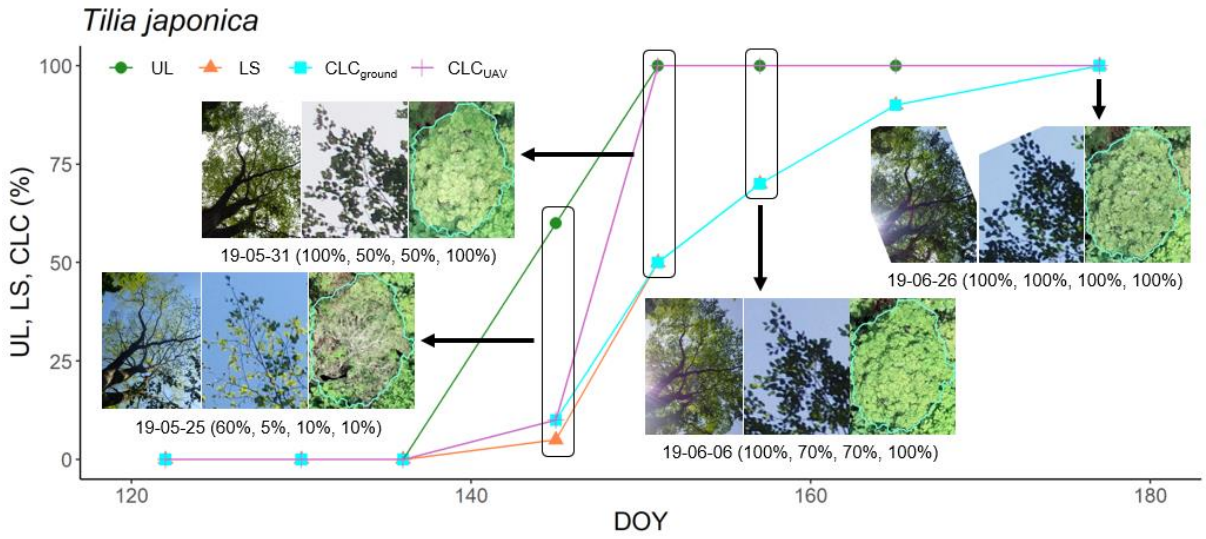

Figure S3. Comparison of spring trajectories for mean crown leaf size (LS), frequency of unfolding leaves (UL), ground-based crown leaf cover (CLC_{ground}) and UAV-derived crown leaf cover (CLC_{UAV}) in *Tilia japonica*. Crown images from the UAV dataset and photographs of the crown and branches taken from ground with a digital camera are given as examples. CLC_{ground} was calculated as a product of UL and LS. In this example, the timing of peak UL was much earlier than that of LS in most of the species, and consequently CLC_{ground} showed a similar trajectory as LS, whereas CLC_{UAV} followed the sharp increase in the UL trajectory. The values below the images and photographs are the observation date (YY-MM-DD) and UL/ LS/ CLC_{ground}/ CLC_{UAV}.

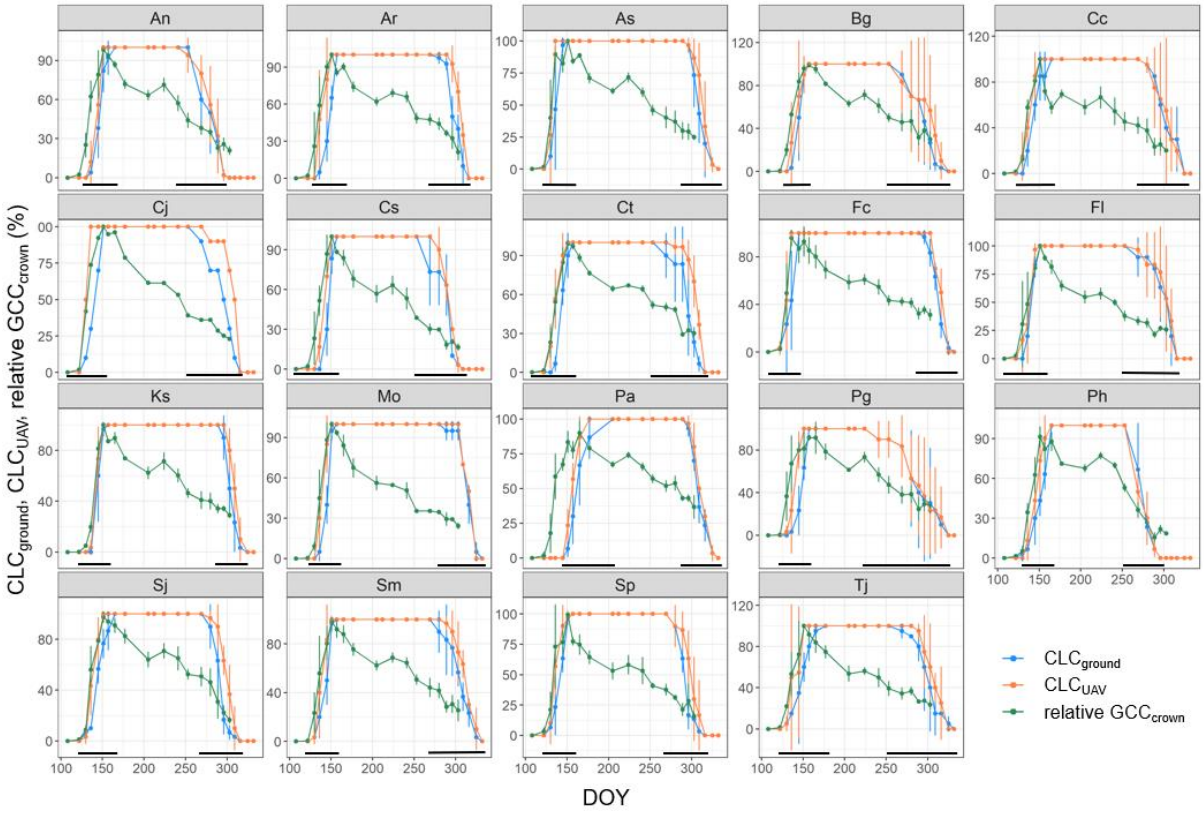

Figure S4. Time series of crown leaf cover based on ground observation (CLC_{ground}), crown leaf cover determined by visual interpretation of UAV images (CLC_{UAV}), and mean crown green chromatic coordinate (GCC_{crown}) during the 2019 growing season. GCC_{crown} was converted to the same scale of crown leaf cover to enable direct comparisons (i.e., relative GCC_{crown}), by setting the minimum GCC_{crown} before bud break and the spring GCC_{crown} peak to 0 % and 100 %, respectively. Each data point represents the mean value calculated from two to five individuals, with the exception of *Carpinus japonica* (only one sample; Table 1), for which the ±SD (vertical black line) is shown. Species abbreviations are clarified in Table 1. The black bars in each panel indicate the period for the data used for Figure 4 and Bayesian analysis.

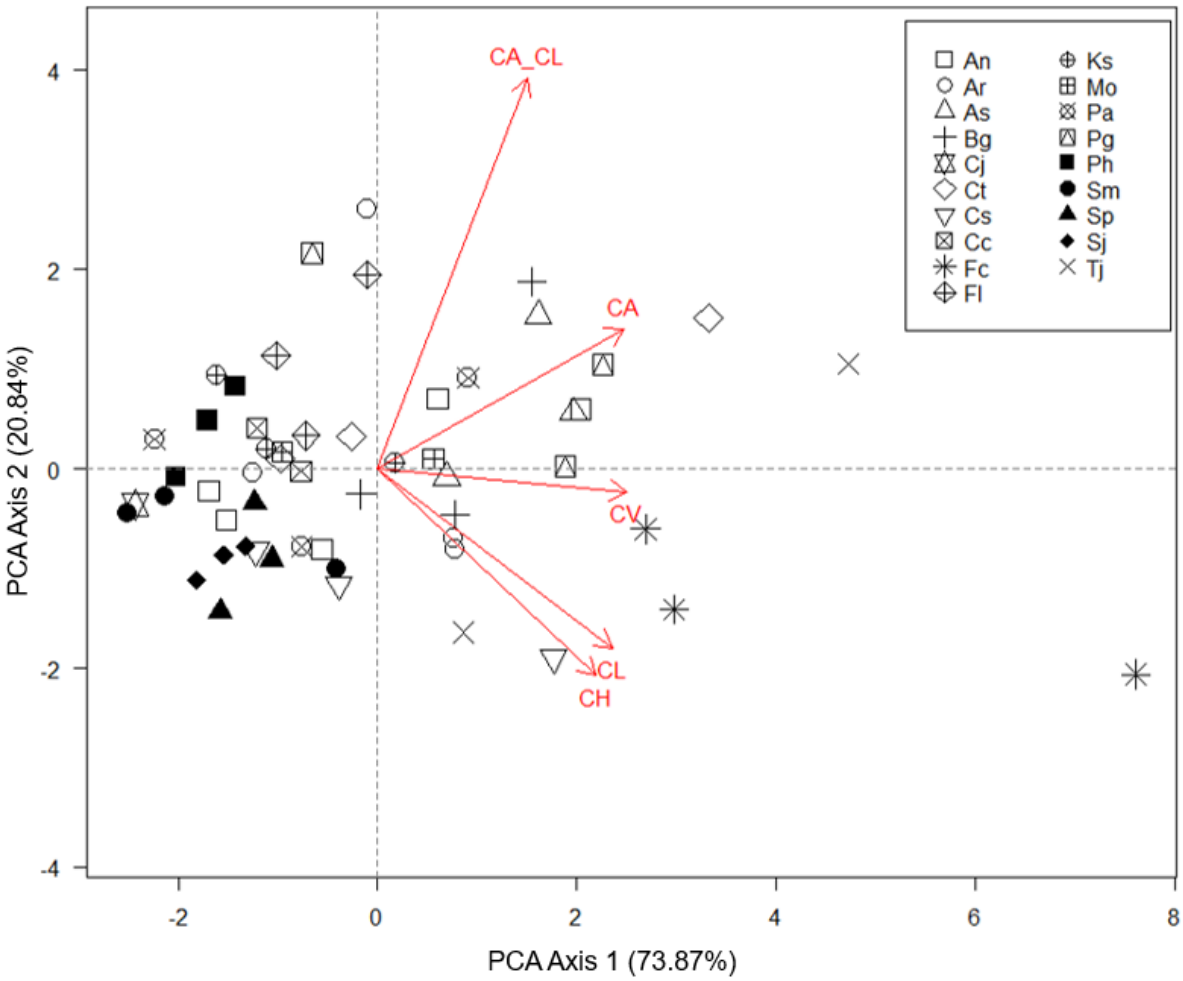

Figure S5. Principal component analysis (PCA) for the crown structural parameters of 55 individuals representing 19 species. Each data point represents one tree, and each symbol represents a distinct species. Abbreviations: CH - crown height; CA - crown projection area; CL - crown length; CV - crown volume; and CA/CL - ratio of CA to CL. Species abbreviations are shown in Table 1.