Supplementary Information

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Appendix S1. Methods for reconstruction of DBH

For each core, DBH can be reconstructed outside-in (based on recent DBH, subtracting growth recorded in tree rings) or inside-out (summing Δr from the inside out). We generally gave precedence to the outside-in approach. Specifically, when DBH was taken at the time of coring,
At some of our sites where DBH was not taken at the time of coring (*SCBI*,), DBH measurements taken before or slightly after the time of coring could be used. (see issue #19 in ForestGEO_dendro) If before, ... If after... For all outside-in reconstructions, if a negative DBH was predicted...

When there were more than one cores for a tree, the DBH reconstructions from each core were averaged to produce a single estimate of the tree's DBH through time. When the start or end dates of the records from the cores differed, we extrapolated growth of the shorter core to match the years covered by the longer core. Specifically, to fill in years at the more recent end, we assumed that the average growth rate of the ten years prior to the missing records applied to the missing years. To fill in years at the beginning of the tree's lifespan, we likewise assumed that the ten years adjacent to the missing record applied to the missing years; however, if this yielded a negative DBH estimate for the earliest year in the reconstruction, we divided the existing minimum DBH by number of years missing and applied that value to each year. We note that these reconstructed growth records were used only for the reconstruction of DBH and were not included as response variables in any of our analyses.

In either case we need bark thickness–ideally allometries describing the relationship between DBH and bark thickness. This is especially critical for thick-barked species When bark thickness data were available, we generated allometries ... lognormal model with intercept forced to zero: lm(bark_depth.mm ~ -1 + log(dbh_no_bark.cm+1):bark_species, data = bark) (issue #8 in ForestGEO_dendro)

Appendix S2. Methods for comparing climwin results with traditional methods

(**ISSUE #35 in ForestGEO-climate-sensitivity

Appendix S3. Dealing with rapidly changing climate and tree growth

ISSUE #25 in ForestGEO-climate-sensitivity

Our analysis included two sites where climate change has had pronounced effects on tree growth: Scotty Creek, NW Territories, Canada (SC) and Little Tesque, New Mexico, USA (LT). At SC, [temperatures have increased by X ° over X years]…, resulting in negative growth trends in basal area index (BAI) starting around 1950 and significant growth declines since 1970 in 56% of trees [@sniderhan_growth_2016].

Table S1. Site details

site code	site name	latitude	longitude	cores within ForestGEO plot?	date range	dormant season	months in climwin
SC	Scotty Creek	61.30000	-121.3000	n	NA	NA	NA
Zofin	Zofin Forest Dynamics Plot	48.66380	14.7073	y	NA	NA	NA
NB	Niobrara/Hansley	42.78000	-100.0210		NA	NA	NA
Harvard	Harvard Forest	42.53880	-72.1755	y	NA	NA	NA
LDW	Lilly Dickey Woods	39.23590	-86.2181		NA	NA	NA
SCBI	Smithsonian Conservation Biology Institute	38.89350	-78.1454	y	NA	NA	NA
Utah	Utah Forest Dynamics Plot	37.66150	-112.8525		NA	NA	NA
LT	Little Tesque	35.73838	-105.8382	NA	NA	NA	NA
HKK	Huai Kha Khaeng	15.63240	99.2170	n	NA	NA	NA
BCI	Barro Colorado Island	9.15430	-79.8461	n	NA	NA	NA

Table S2. List of species analyzed

Site	Code	Species	leaf type	n trees	n cores	bark
SCBI	LITU	Liriodendron tulipifera	BD	NA	NA	NA

** Table S3- allometric equations for bark thickness **

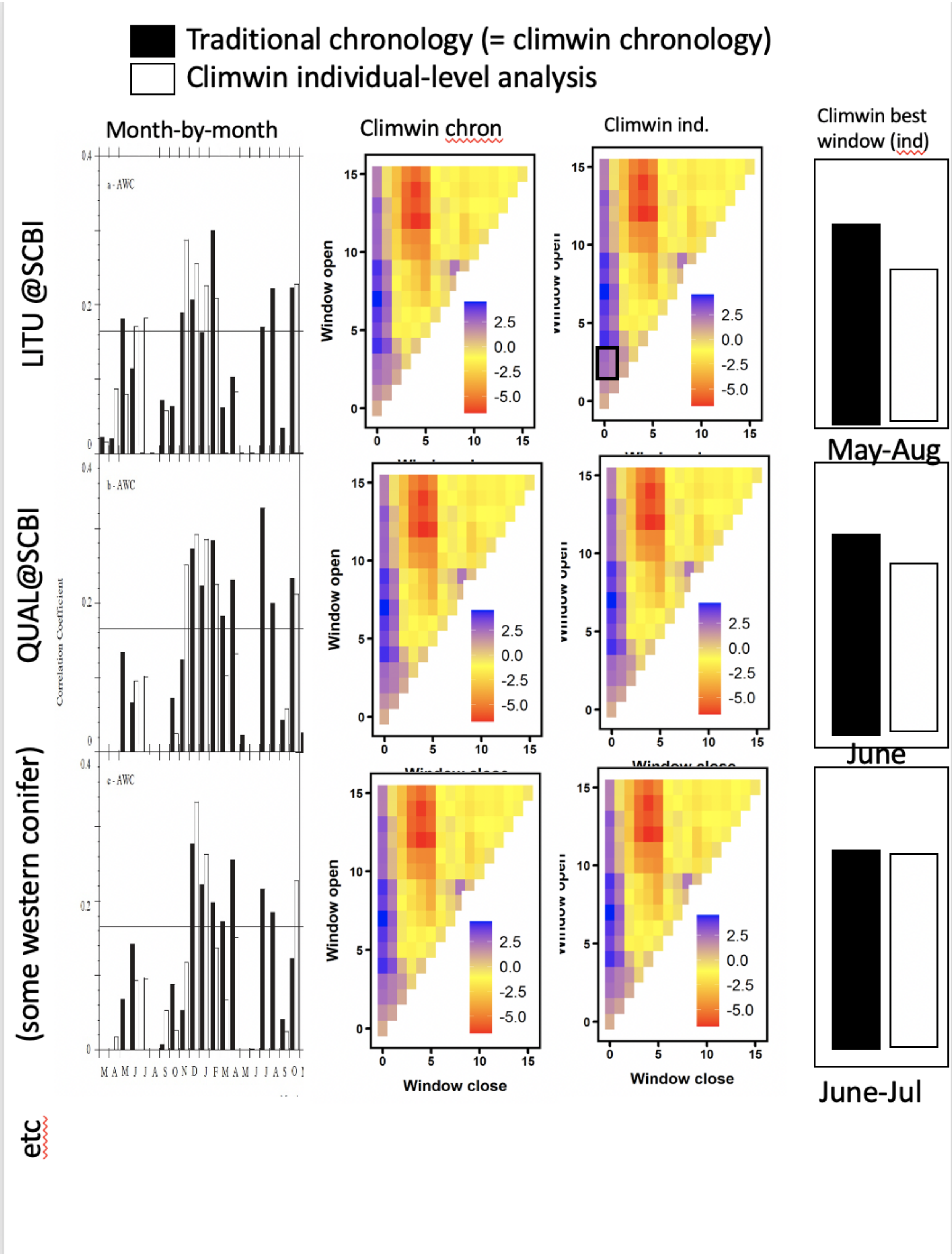

Figure S1 | (Comparison of traditional approaches with ours). (THIS FIGURE IS JUST A MOCK-UP TO SHOW VALENTINE WHAT I HAVE IN MIND.)

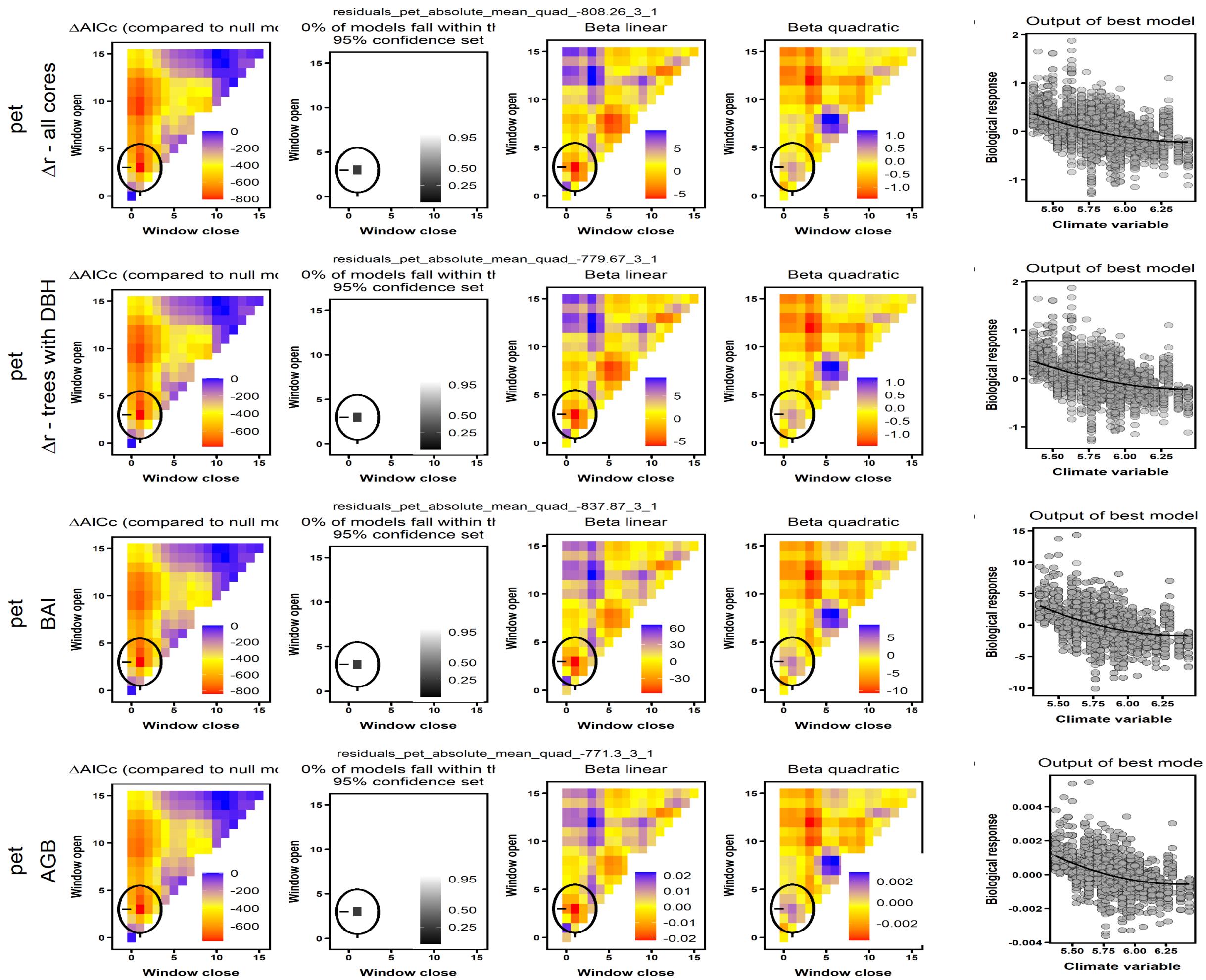

Figure S2 | Example comparison of climwin output when the optimal climate variable and time window were identical across growth metrics. Example is temperature variable group at Little Tesque, NM. Here, *climwin* identified potential evapotranspiration (PET) as the strongest climate variable across all three metrics of growth (Δr, BAI, ΔAGB) and regardless of whether all cores were included in the analysis, or only those for which DBH could be reconstructed (Δr-trees with DBH, BAI, ΔAGB).)

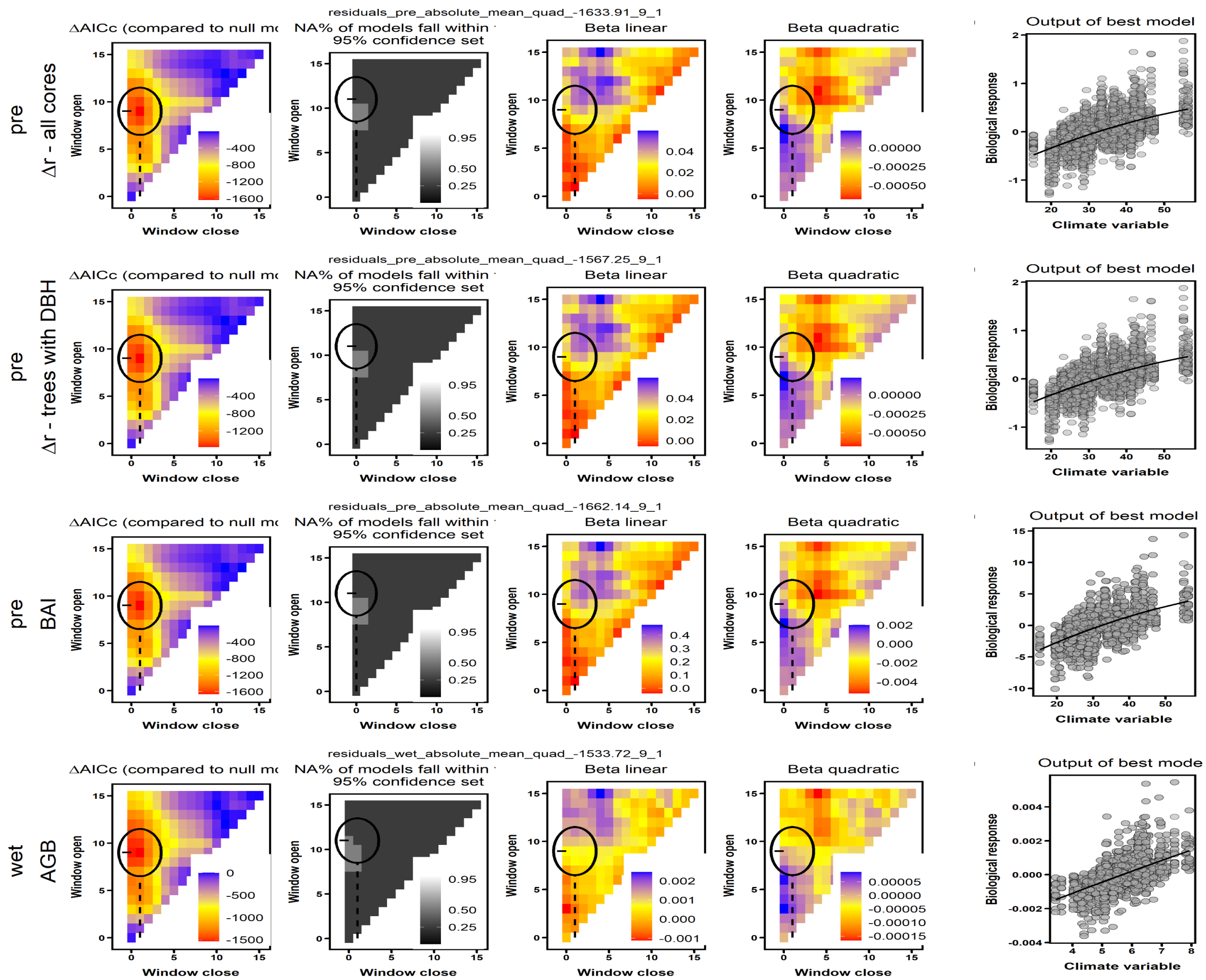

Figure S3 | Example comparison of climwin output when the optimal climate variable differed across growth metrics, but the selected time window was similar. Example is precipitation variable group at Little Tesque, NM. Here, *climwin* identified precipitation (PRE) as the strongest climate variable for Δr and BAI, but precipitation day frequency (WET) as the strongest climate variable for ΔAGB.

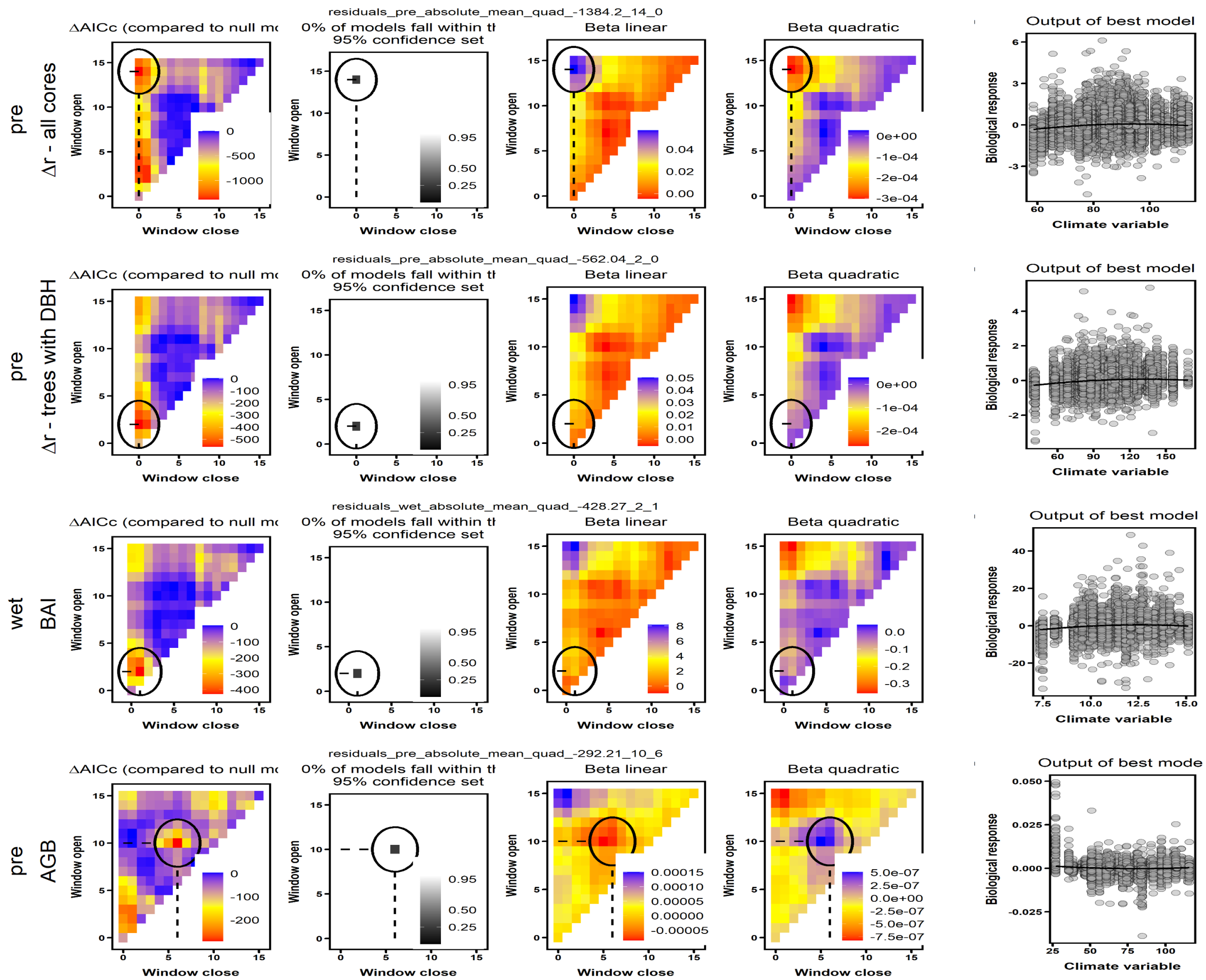

Figure S4 | Example comparison of climwin output when both the optimal climate variable and selected time window differed across growth metrics. Example is precipitation variable group at SCBI, VA, USA. Here, *climwin* identified precipitation (PRE) as the strongest climate variable for Δr and BAI, but precipitation day frequency (WET) as the strongest climate variable for ΔAGB. The optimal time window (circled) also differed across growth metrics and depending on whether or not trees without DBH were included in the analysis (Δr-all trees and Δr-trees with DBH, respectively).