



Figures and figure supplements

The African ape-like foot of *Ardipithecus ramidus* and its implications for the origin of bipedalism

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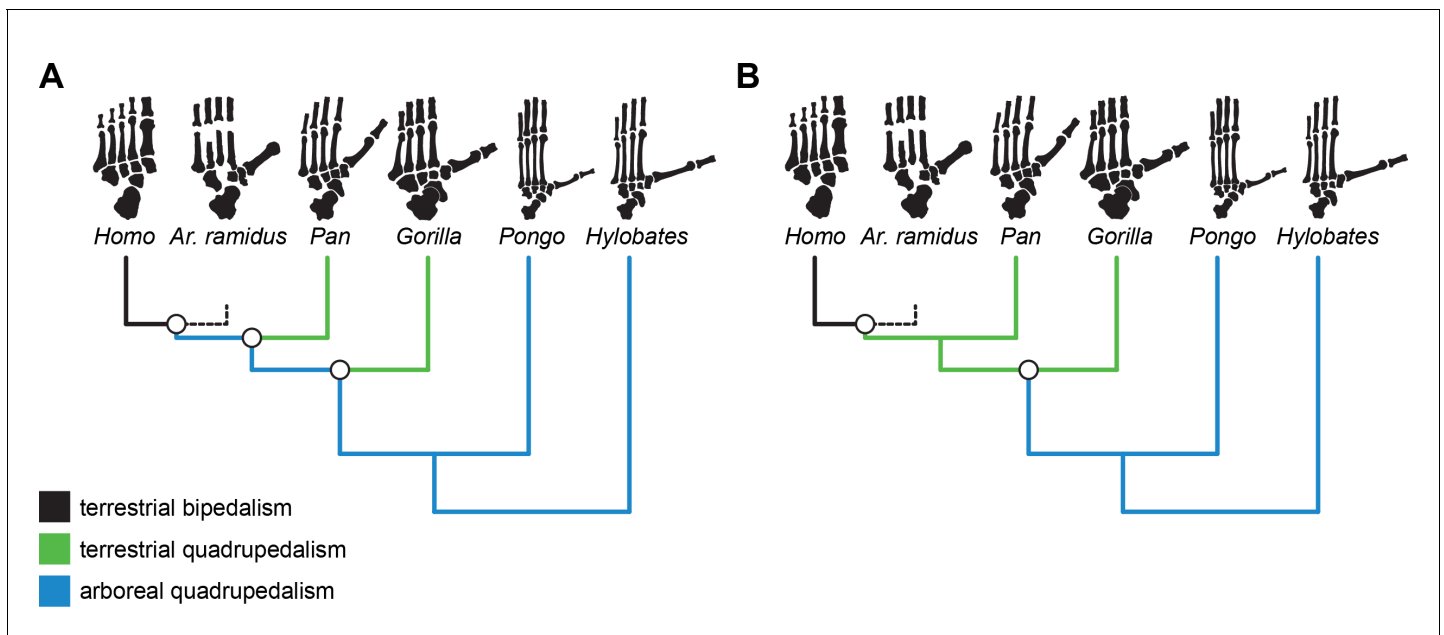


Figure 1. Alternative evolutionary scenarios for the origin of hominin bipedalism. Black = terrestrial bipedalism, green = terrestrial quadrupedalism, blue = arboreal quadrupedalism. (A) Bipedalism is principally a terrestrial adaptation derived from a more exclusively arboreal ancestor, which is consistent with the original interpretation of the *Ar. ramidus* foot. (B) Alternative scenario in which bipedalism originates from an ancestor with terrestrial quadrupedal adaptations, which would be predicted based on the comparative anatomy of living apes and humans. Here, whether a taxon is considered arboreal or terrestrial is based on their reported frequency of arboreality in the wild.

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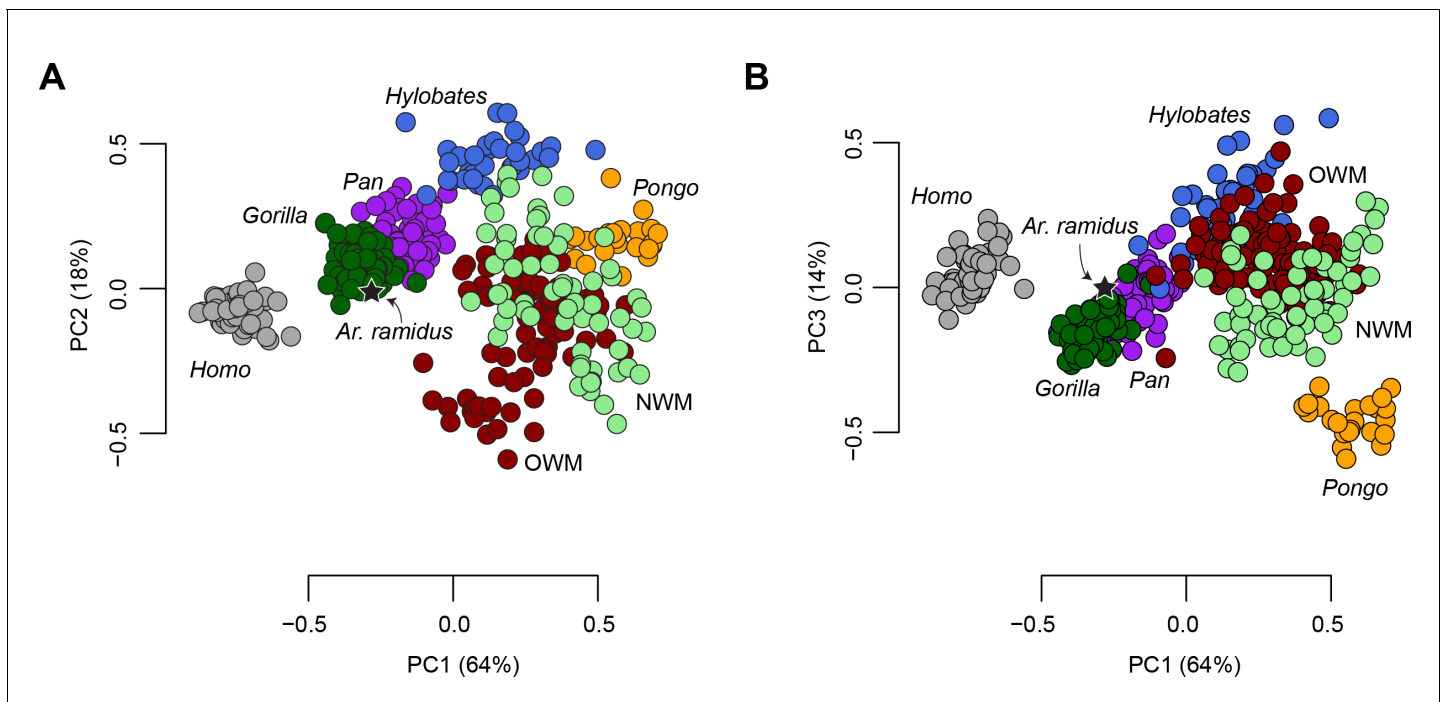


Figure 2. Principal Components Analysis (PCA) on six geometric mean-standardized variables. (A) The first two principal components representing 82% of the variance. (B) The first and third principal components representing 76% of the variance. Star = *Ar. ramidus*, Grey = *Homo*, green = *Gorilla*, purple = *Pan*, orange = *Pongo*, blue = *Hylobates*, red = Old World monkeys, light green = New World monkeys. Note the placement of *Ar. ramidus* with the African apes.

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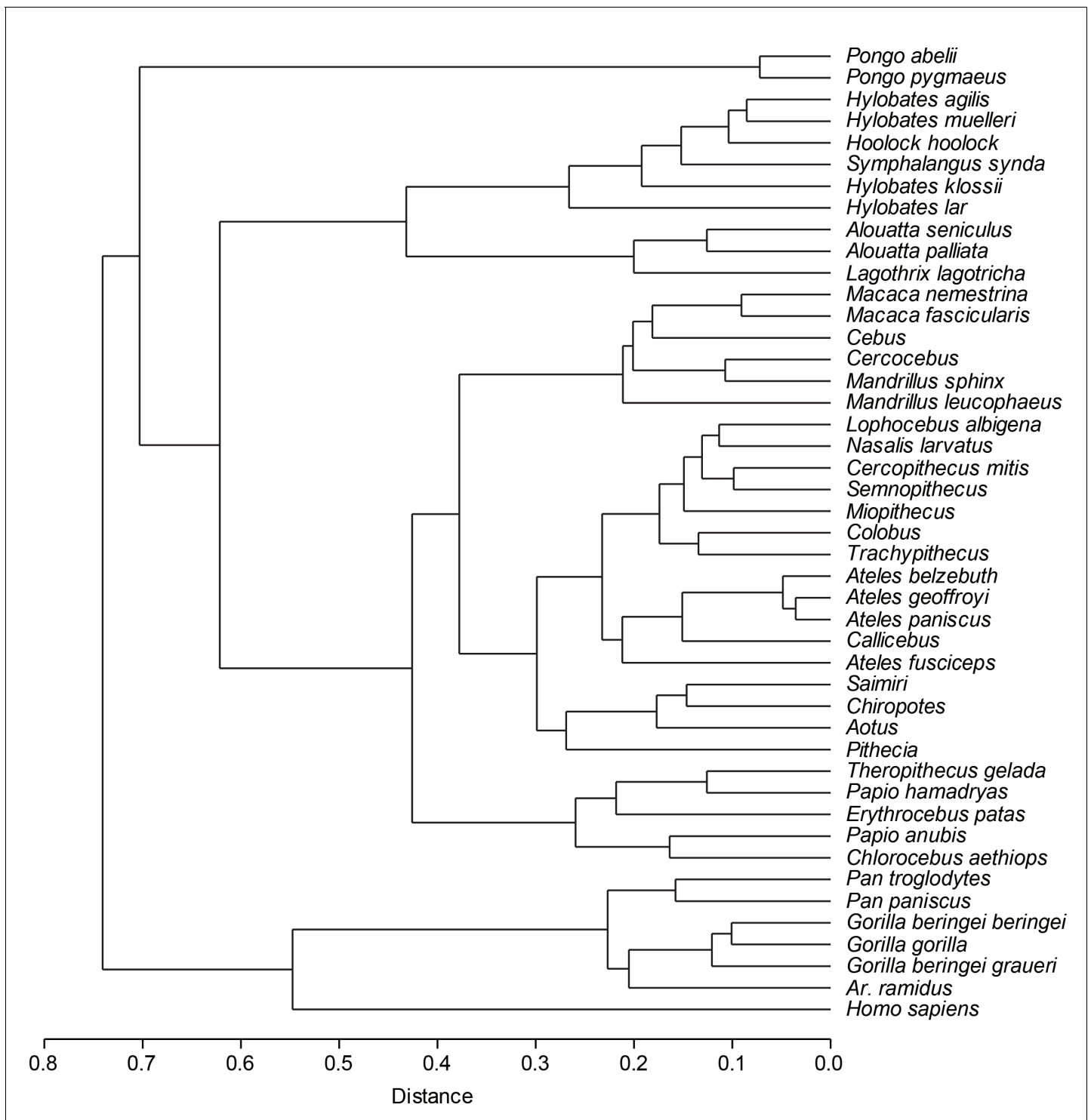


Figure 2—figure supplement 1. UPGMA dendrogram on Euclidean distances in anthropoid primates and *Ardipithecus ramidus*. The cluster analysis was conducted using the first three principal components. African apes and *Ar. ramidus* cluster together, followed by *Homo sapiens*. Note that hylobatids cluster with *Alouatta* and *Lagothrix*.

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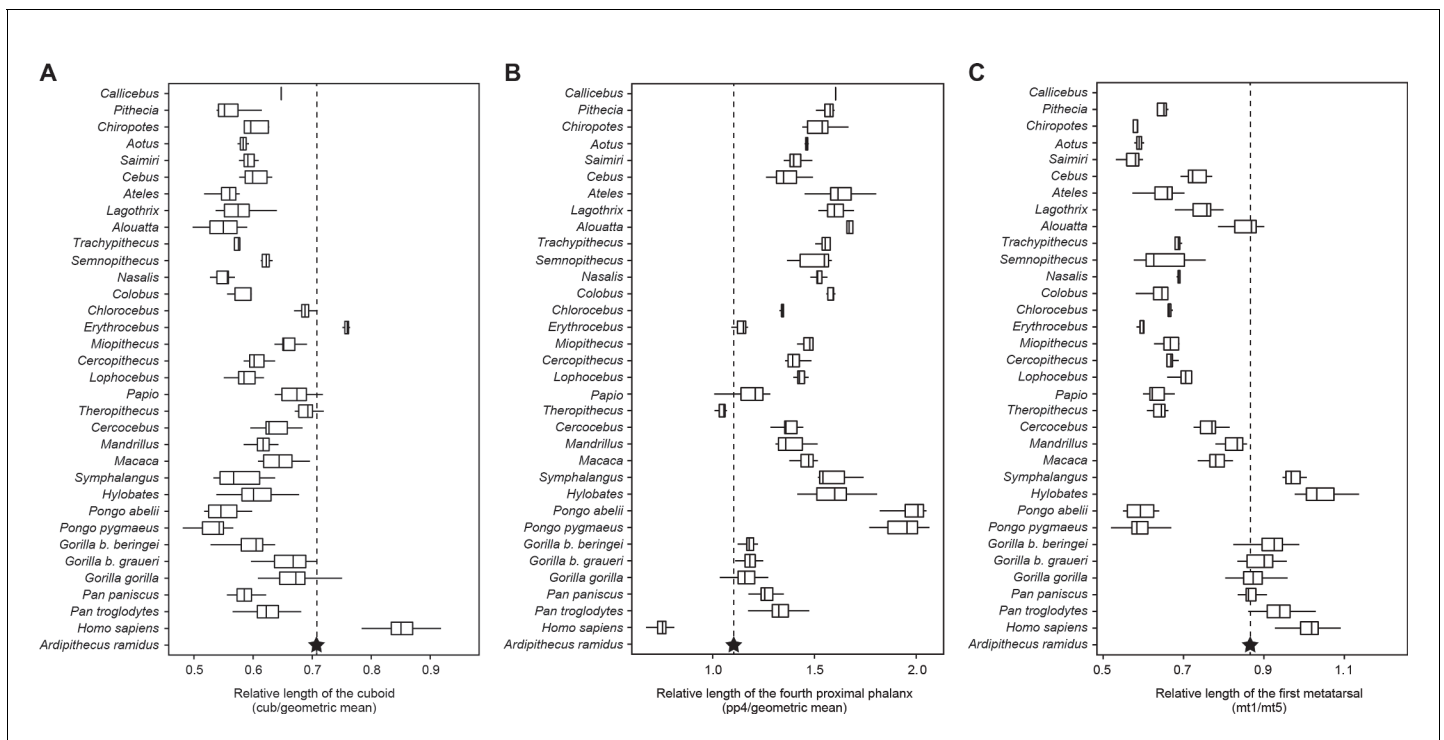


Figure 2—figure supplement 2. Univariate comparisons of *Ar. ramidus* foot proportions to extant anthropoids. (A) Humans have the longest cuboids among living anthropoids. Note that *Ar. ramidus* has a cuboid that is relatively longer than most taxa, but falls within the range of variation for *G. gorilla*, *Papio*, and *Theropithecus*. (B) Humans have the shortest phalanges among living anthropoids. Note the convergence between terrestrial apes and monkeys. *Ar. ramidus* falls within the range of variation for *G. gorilla*, *Papio*, and *Erythrocebus*. (C) Hominoids and select anthropoids have relatively long first metatarsals. Note the long MT1 of *Alouatta*, *Lagothrix*, *Cebus*, and the arboreally adapted papionins. *Ar. ramidus* falls within the ranges of variation for African apes and *Alouatta*.

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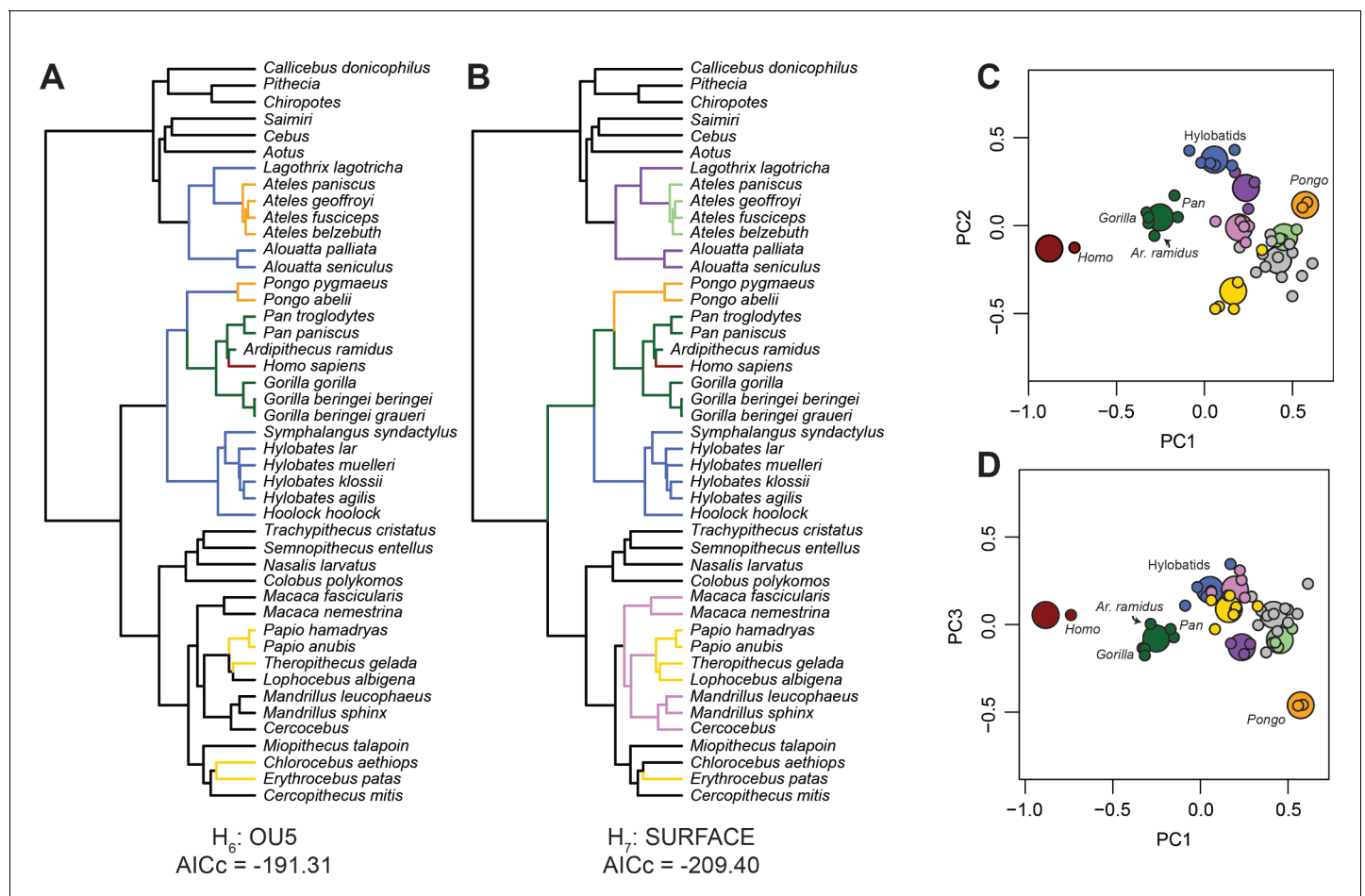


Figure 3. Evolutionary modeling. Best fitting evolutionary models. (A) Best fitting a priori evolutionary hypothesis according to OUCH. (B) Arrangement of selective regimes fit by SURFACE. (C) The first two principal components with phenotypic optima estimated by SURFACE. (D) The first and third principal components with phenotypic optima estimated by SURFACE. Note the tight fit of species means (small dots) around their optima (large dots) as well as the placement of *Ar. ramidus* near the African ape phenotypic optimum. The colors in C and D correspond to the selective regimes painted onto the phylogeny in B.

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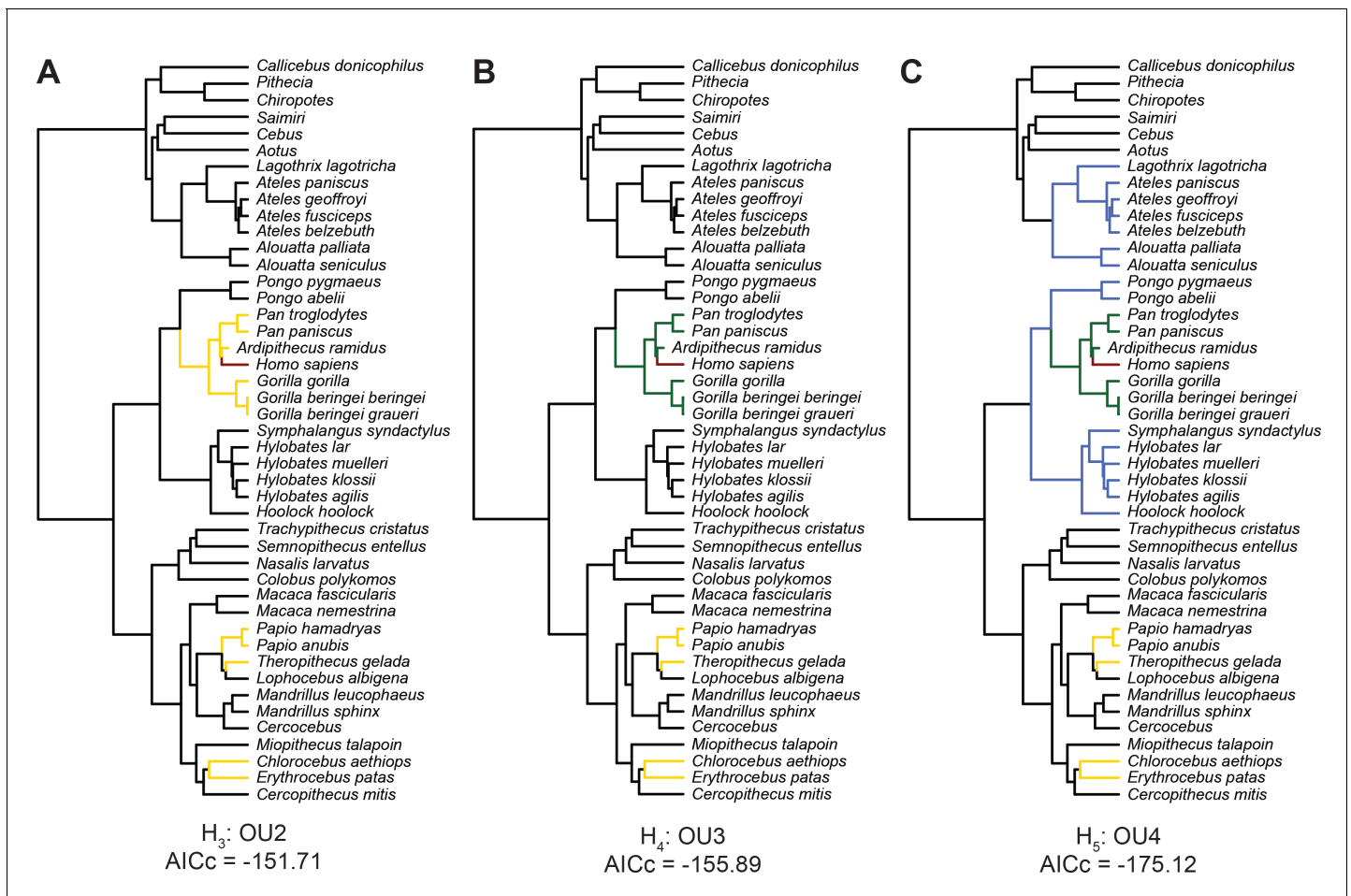


Figure 3—figure supplement 1. Alternative evolutionary hypotheses represented by painting branches of the phylogeny according to selective regimes. (A) Regimes correspond to bipedality in humans and terrestrial quadrupedalism in African apes and several cercopithecine taxa. (B) The terrestrial regime is split into terrestrial plantigrady in the African apes and terrestrial semiplantigrady in the cercopithecines. (C) An additional climbing regime is added for gibbons, orangutans, and atelids.

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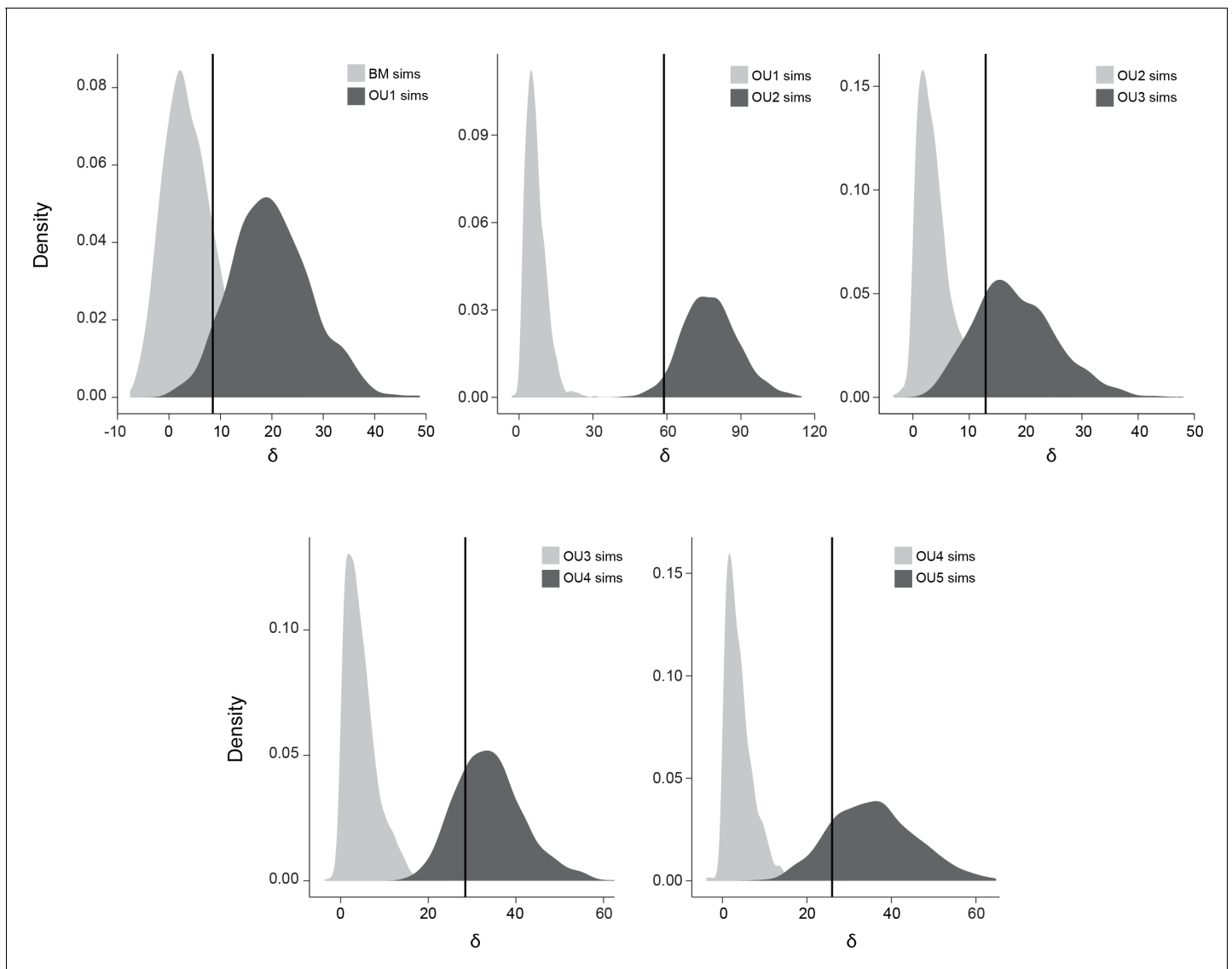


Figure 3—figure supplement 2. Simulation results for *a priori* evolutionary model comparisons. The light grey distributions represent the simpler of the two models whereas the dark grey distributions represent likelihood ratio statistics for more complex models. The vertical line represents the actual likelihood ratio statistic measured between the two models. There is statistical power to distinguish between all *a priori* models, with weakest power for Brownian motion versus OU1.

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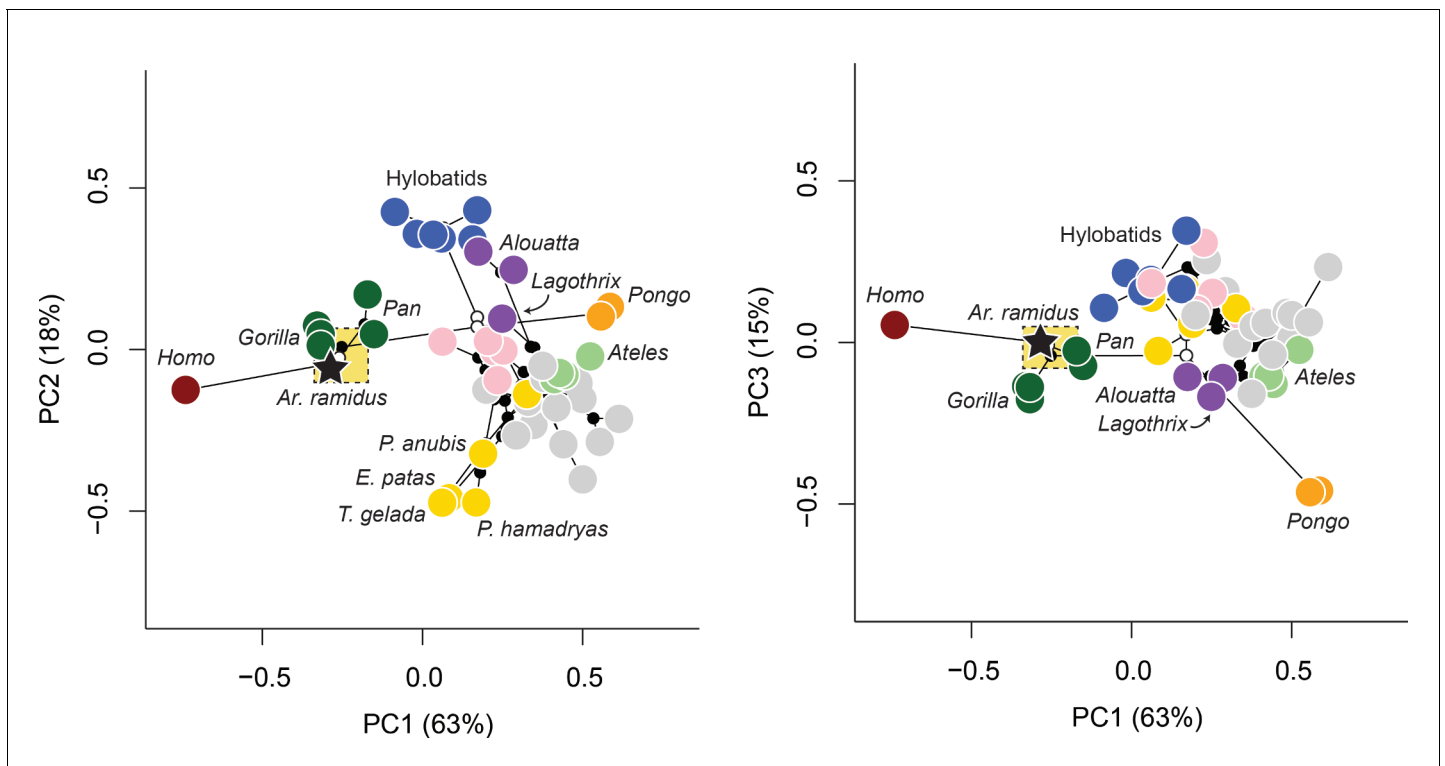


Figure 4. Phylomorphospace. Phylomorphospace plots describing the evolution of the anthropoid foot. Internal nodes are represented by black dots with exception for the nodes corresponding to the ancestral values for hominins, hominids, and hominoids which are white. The stitched gold box refers to the 95% credibility intervals for the *Homo-Pan* ancestral state. Note the placement of *Ar. ramidus* with the African apes as well as the separation of taxa according to known differences in locomotion (e.g., more terrestrial taxa are represented by lower values of PC1 whereas more arboreal taxa are represented by higher values of PC1, taxa that engage in active climbing are represented by higher values of PC2). The estimated ancestral morphology for hominins is African ape-like and for both hominids and hominoids it is nearest to *Alouatta* and *Lagothrix*.

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