Appendix 5: Plots of yx'y'' axial orientation for individual subjects

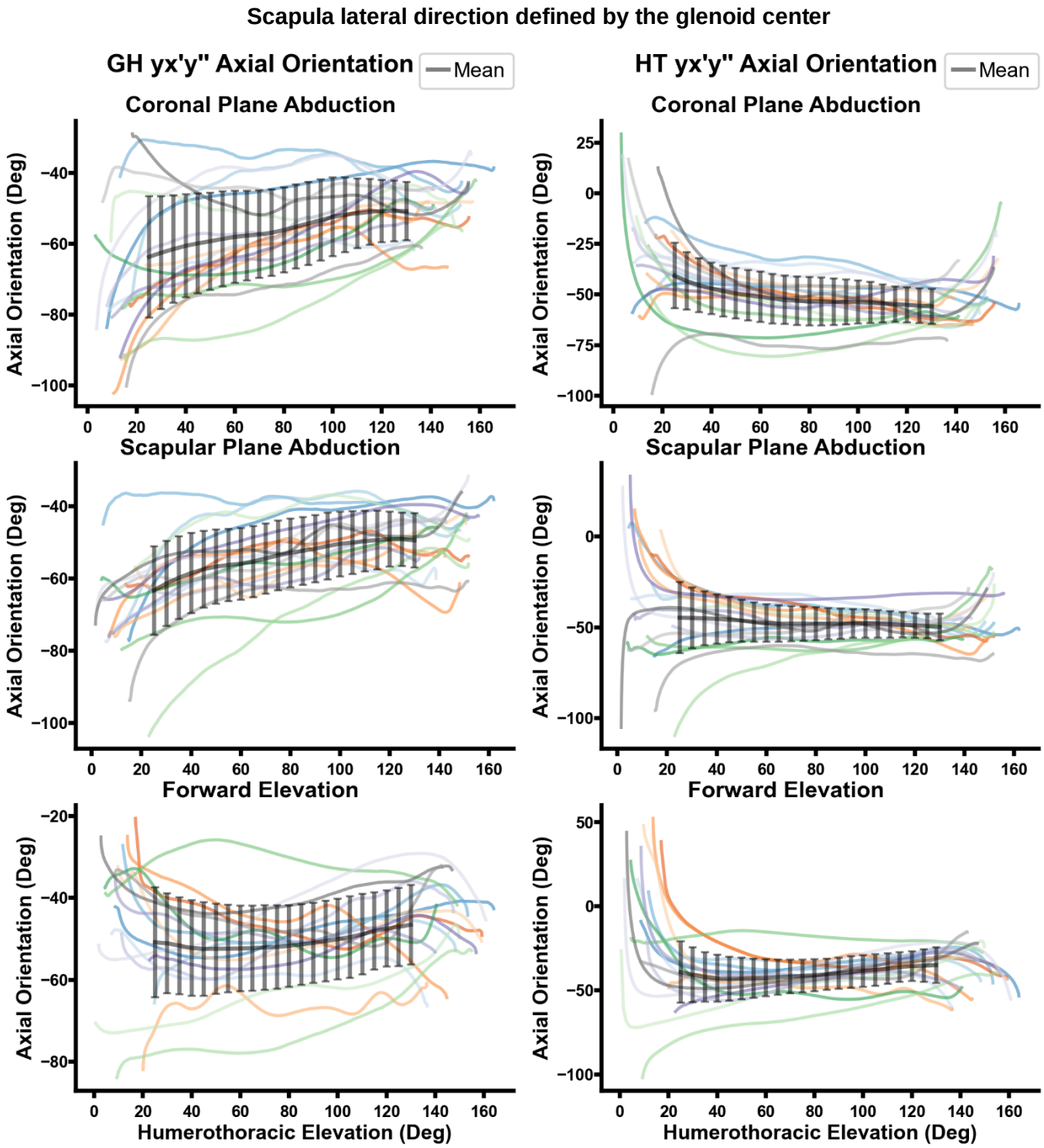

Fig A5a: GH (left) and HT (right) yx'y'' axial orientation for each individual subject with means±SD computed from 25° to 130° of HT elevation for CA (top), SA (middle), and FE (bottom). The scapula lateral direction was defined by the glenoid center. Note the sharp changes in axial orientation that occur up to ~30° of HT elevation, which arise from changes in PoE associated with numerical instability and/or body habitus. Although these large changes in axial orientation do not embody a rotation around the humerus' longitudinal axis, they have led prior investigations to conclude the presence of up to 80° of (apparent) external axial rotation during arm elevation. As shown below in Fig A5b, the magnitude and direction (internal/external rotation) of these changes depends on the definition of the anatomical coordinate system of the scapula.

Appendix 5: Plots of yx'y'' axial orientation for individual subjects

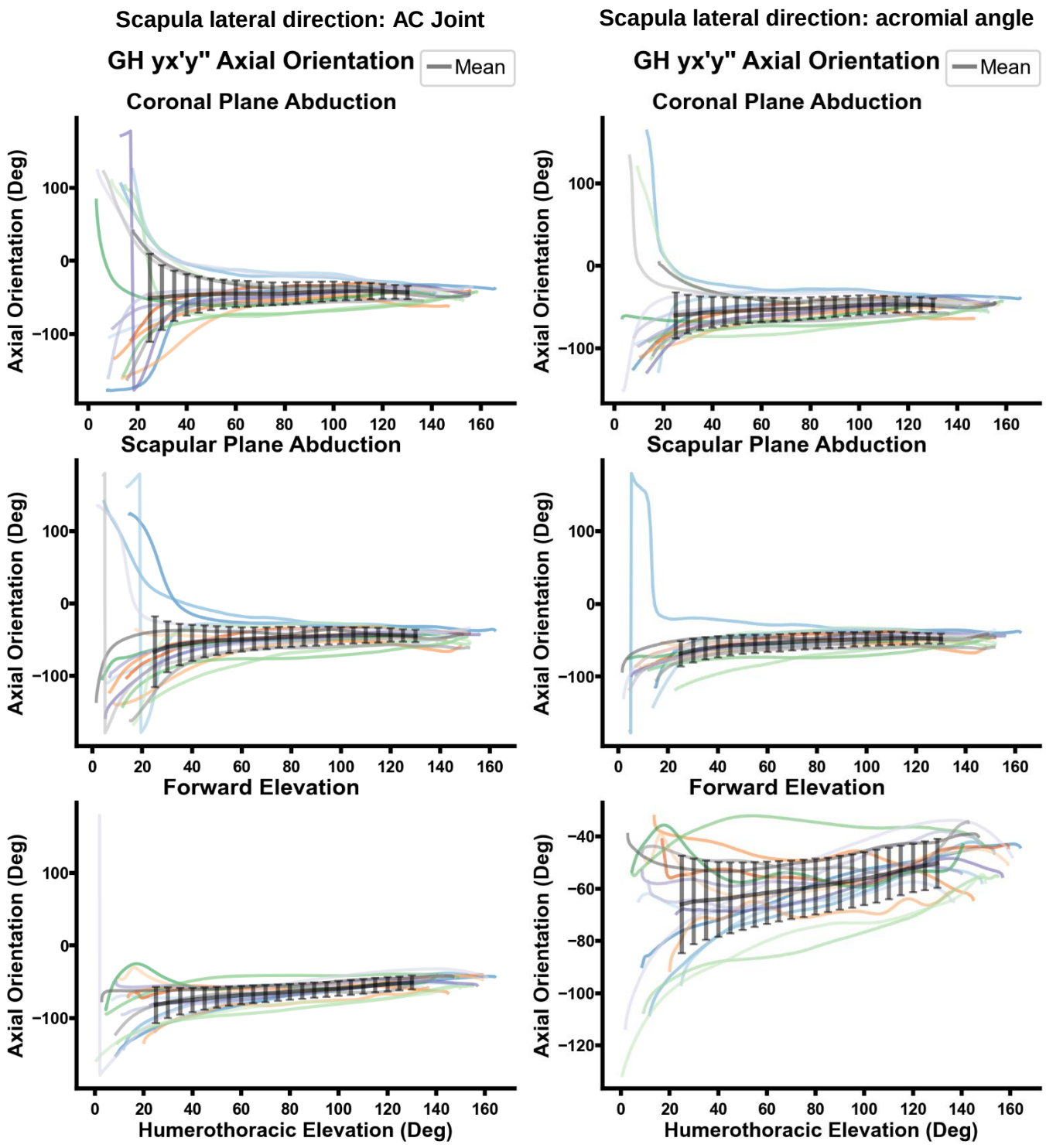

Fig A5b: GH axial orientation with the scapula lateral direction defined by the AC joint (left), and acromial angle (right). Several trajectories underwent discontinuities caused by crossing a singularity (pole of globe). For FE (bottom), when the scapula lateral direction is defined by either the AC joint or the acromial angle there is large increases in internal rotation in the first ~30° of HT elevation. In contrast, when the scapula lateral direction is defined by the glenoid center (Fig A5a), there is large increases in external rotation in the first ~30° of HT elevation. This highlights the sensitivity of apparent axial rotation, in contrast to true axial rotation, to the scapula's coordinate system definition (see Appendix 6).