

1 SUPPLEMENTARY FIGURES

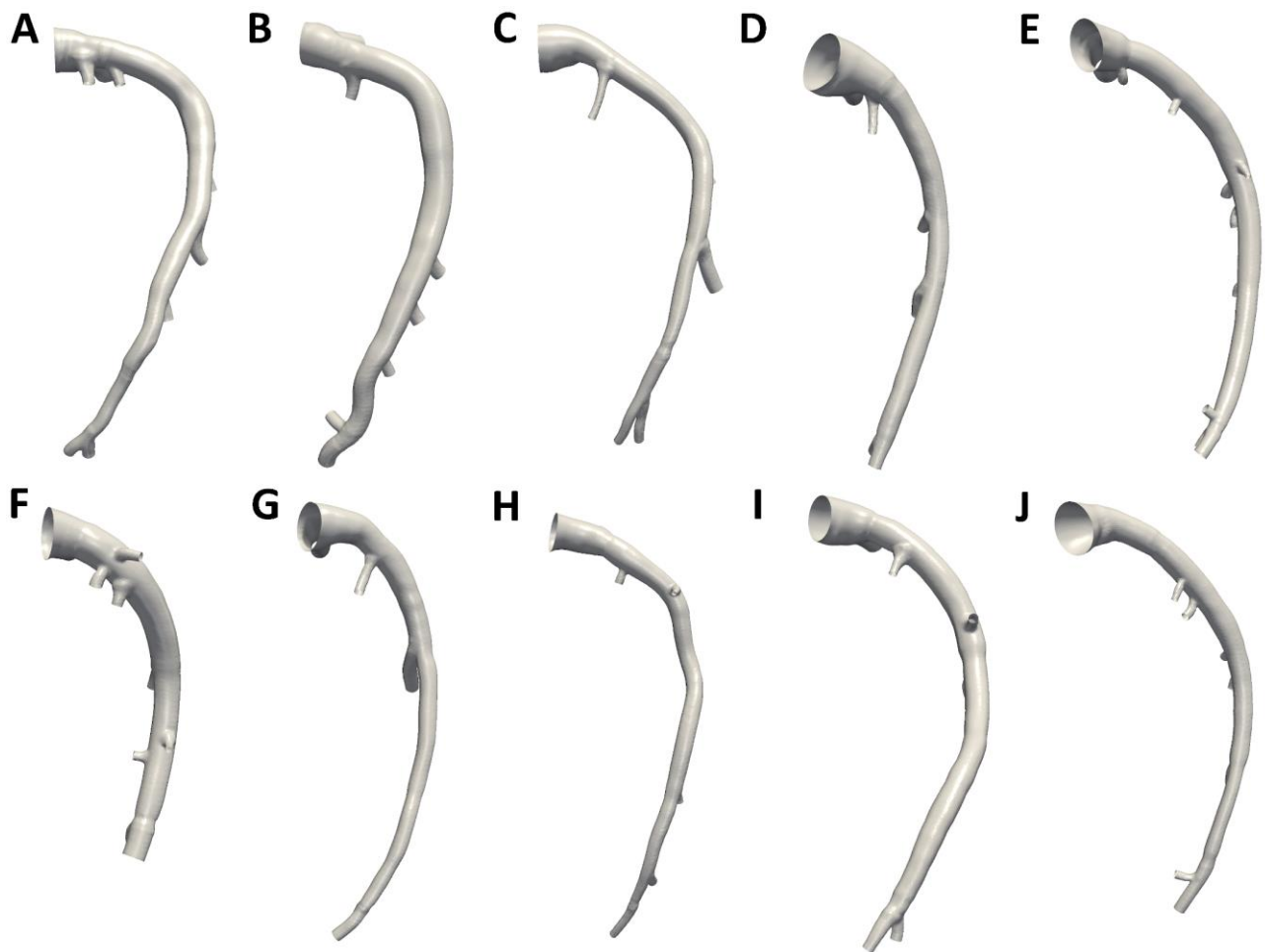


Figure S1 – Reconstructed geometries of the 10 pig left anterior descending (LAD) coronary artery models. Labels from A to J identify a single pig.

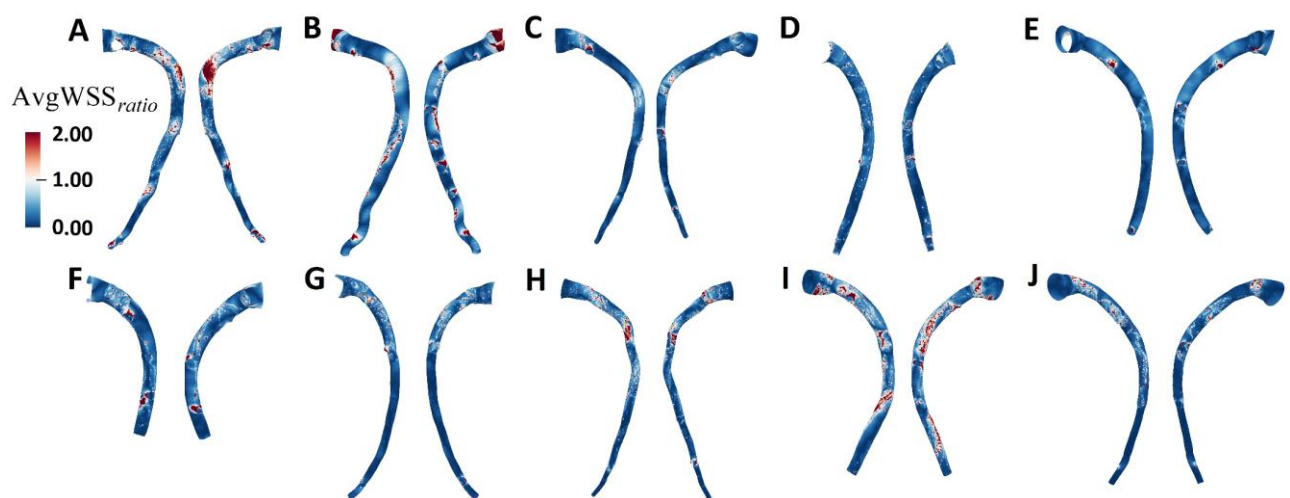


Figure S2 – Luminal surface distributions of cardiac cycle-average WSS_{ratio} ($AvgWSS_{ratio}$), for all the investigated LAD models.

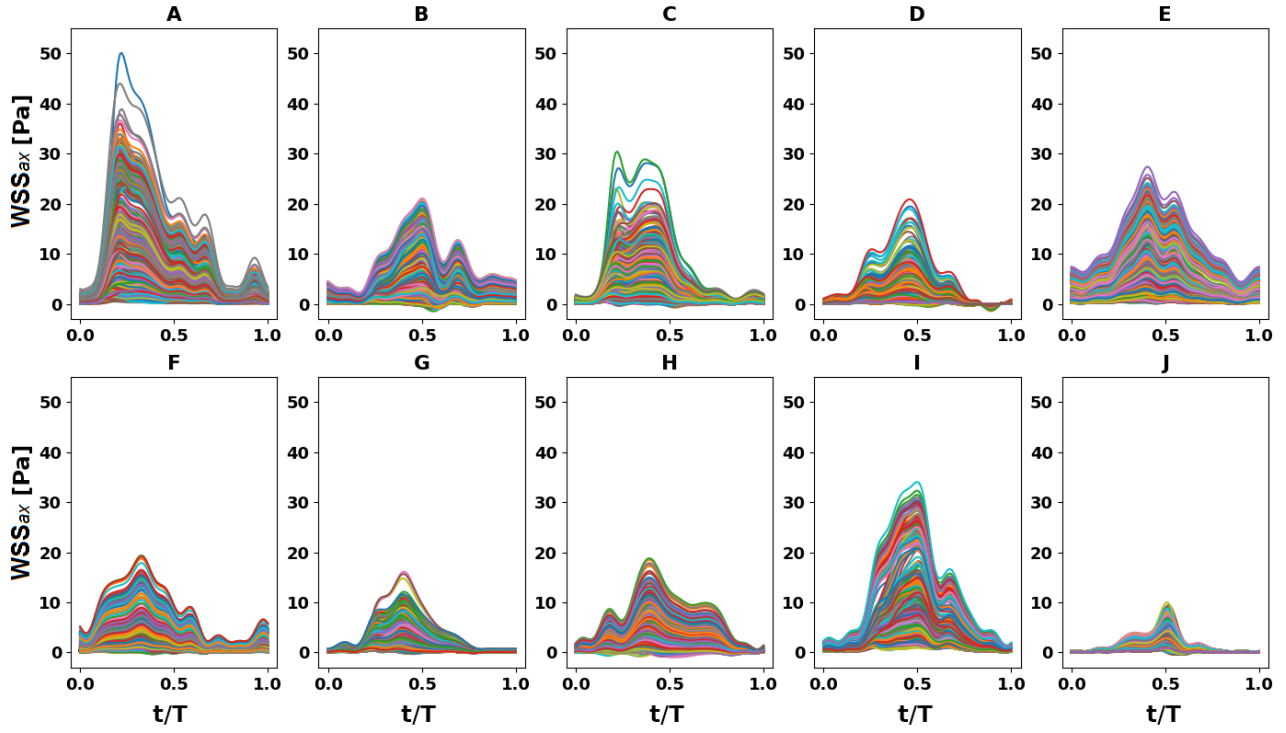


Figure S3 - Time-histories of $\mathbf{WSS}_{ax}$ in all nodes of the mesh for every investigated LAD model. It can be noted that the amount of flow reversal (as highlighted by negative $\mathbf{WSS}_{ax}$ components) is negligible, and that $\mathbf{WSS}$ is predominantly aligned with the positive axial direction in each LAD model.

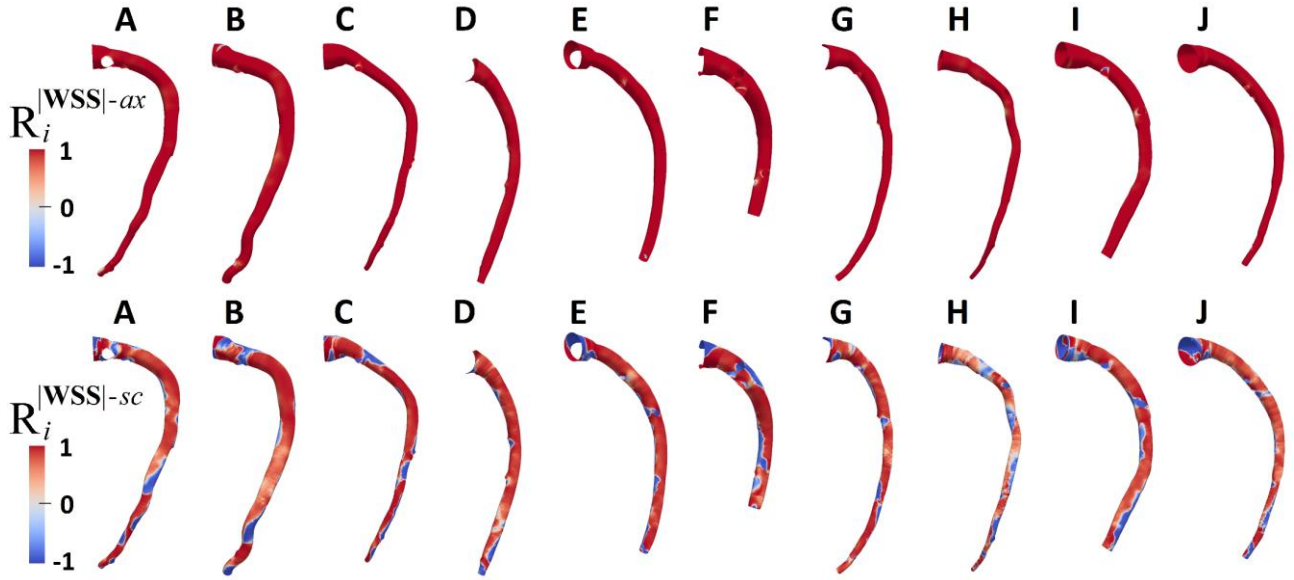


Figure S4 – Luminal surface contour maps of “layered” correlation R_i between $\mathbf{WSS}$ magnitude ($|\mathbf{WSS}|$) and each one of $\mathbf{WSS}_{ax}$ ($R_i^{|\mathbf{WSS}|-ax}$, top panel) and $\mathbf{WSS}_{sc}$ ($R_i^{|\mathbf{WSS}|-sc}$, bottom panel) at the same node i of the surface mesh, for all the investigated LAD models. The quantitative “layered” analysis confirms that the dynamics of $|\mathbf{WSS}|$ and $\mathbf{WSS}_{ax}$ time-histories in each node are strongly correlated ($R_i^{|\mathbf{WSS}|-ax} > 0.90$, in each LAD model). For $|\mathbf{WSS}|$ vs. $\mathbf{WSS}_{sc}$, correlation patterns at the luminal surface are markedly affected by $\mathbf{WSS}_{sc}$ directionality ($R_i^{|\mathbf{WSS}|-sc}$ maps recall the patterns of $\text{Avg}\mathbf{WSS}_{sc}$, see bottom panel of Figure 3 of the main text).

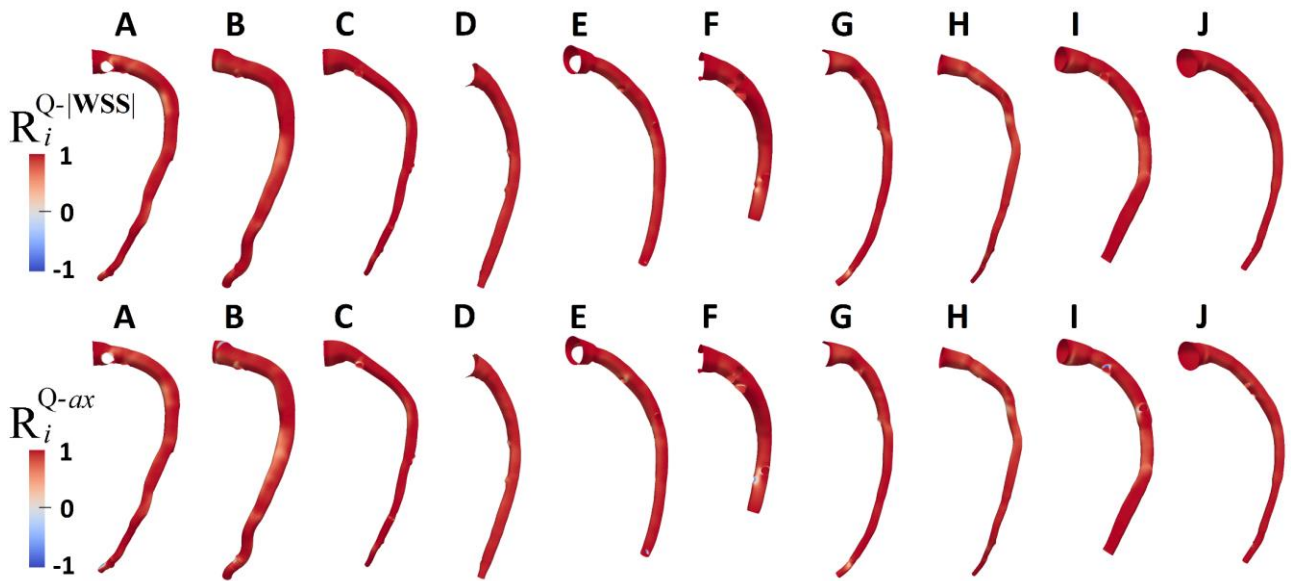


Figure S5 – Luminal surface contour maps of “one-to-all” correlation R_i between pig-specific LAD inlet flow-rate (Q) waveform and each one of WSS magnitude ($R_i^{Q-|WSS|}$, top panel) and WSS_{ax} (R_i^{Q-ax} , bottom panel) at the generic node i of the surface mesh, for all the investigated LAD models. The “one-to-all” correlation maps highlight a uniform distribution of strong positive correlation values both for Q vs. $|WSS|$ and Q vs. WSS_{ax} time-histories, in all LAD models. This result indicates that the shape of the inlet flow-rate waveform “propagates” along the vessel strongly conditioning both $|WSS|$ and WSS_{ax} time-histories.

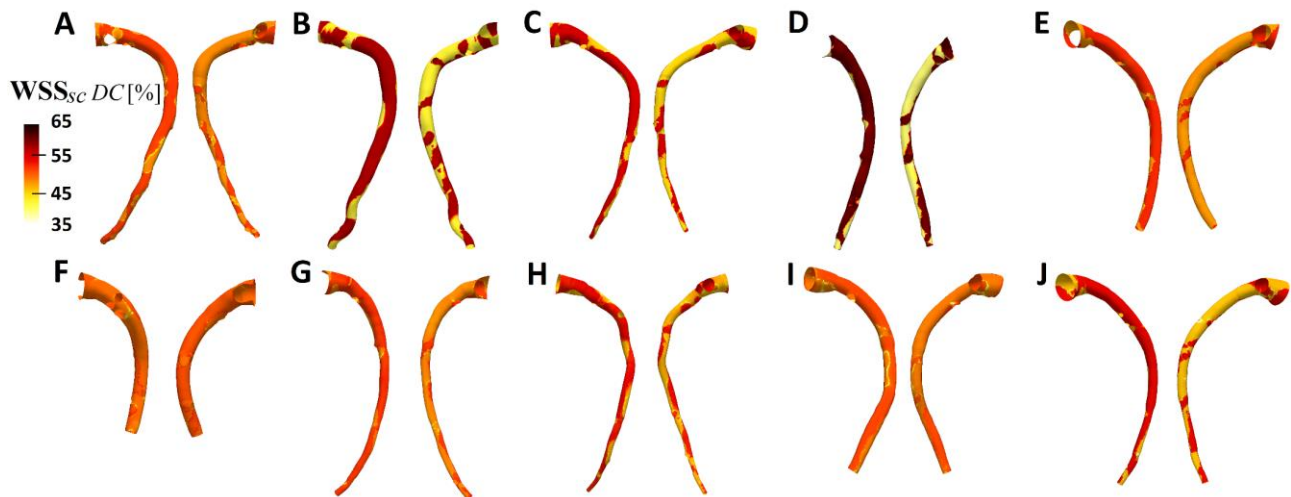


Figure S6 – Luminal surface contour maps of normalized degree centrality (DC) for the ten WSS_{sc} CNs. Narrowing the visualization range between 35 and 65%, two separated DC regions at the wall of each LAD model, where the secondary WSS exhibits very similar time-dependent behaviors, can be clearly identified.

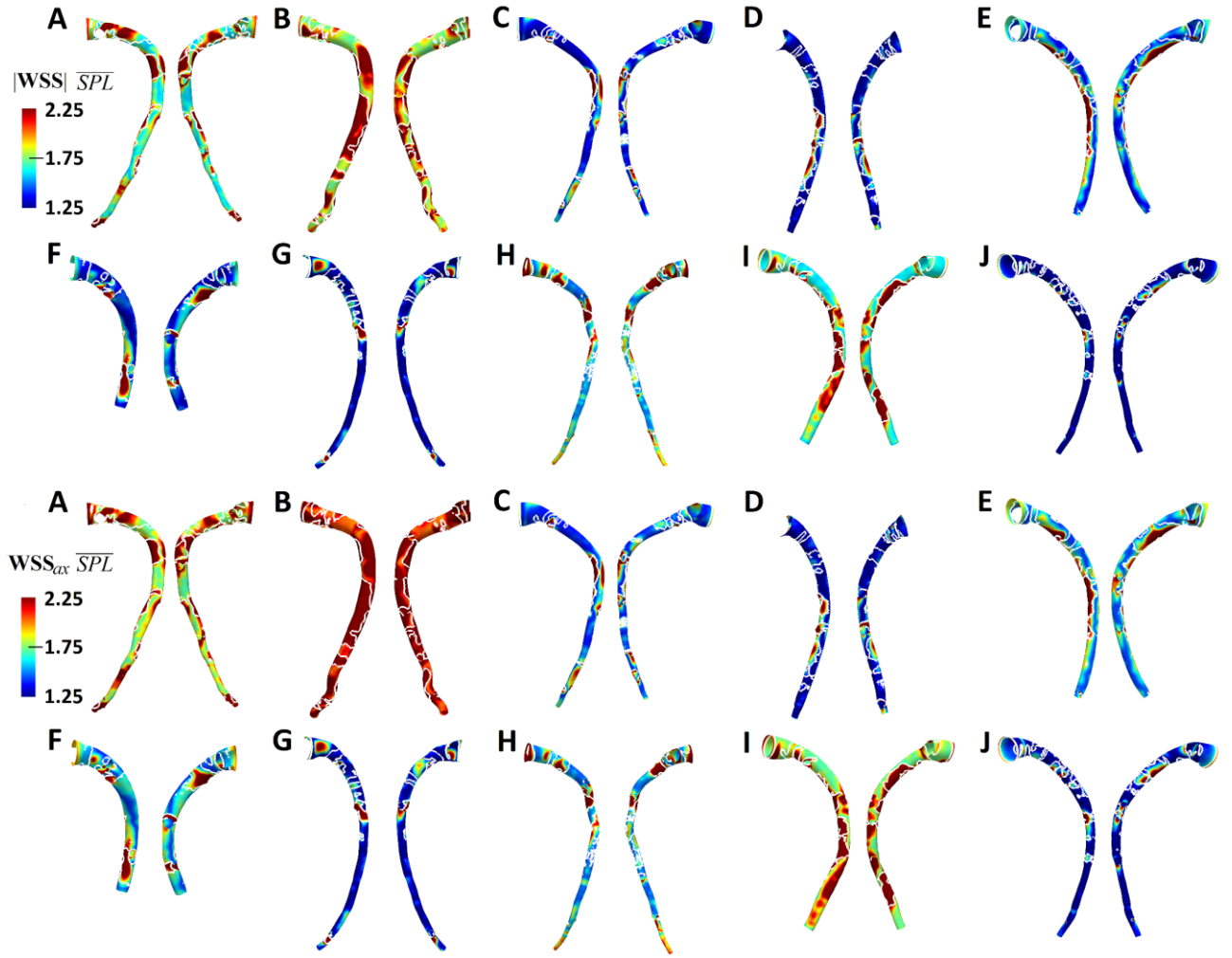


Figure S7 – Luminal distributions of *average shortest path length* ($\overline{SPL}$) of $|WSS|$ (top panel) and WSS_{ax} (bottom panel) CNs, for the ten LAD models. The $\overline{SPL}$ is a measure of the topological “persistence length” of correlations: lower (higher) $\overline{SPL}$ values indicate longer (shorter) correlation persistence length. $|WSS|$ - and WSS_{ax} -based networks present similar $\overline{SPL}$ distributions at the luminal surface of all the LAD models, although some of the WSS_{ax} CNs are more disperse than the corresponding $|WSS|$ ones (case A, B, F and I). In each LAD model, nodes with a markedly different $|WSS|$ and WSS_{ax} dynamic behavior are topologically separated from the rest of the nodes on the luminal surface by at least 2.25 links. These regions co-localize with areas at the luminal surface exposed to low cycle-average $|WSS|$, here displayed by the white contour lines representing the artery-specific lower cycle-average $|WSS|$ tertile.

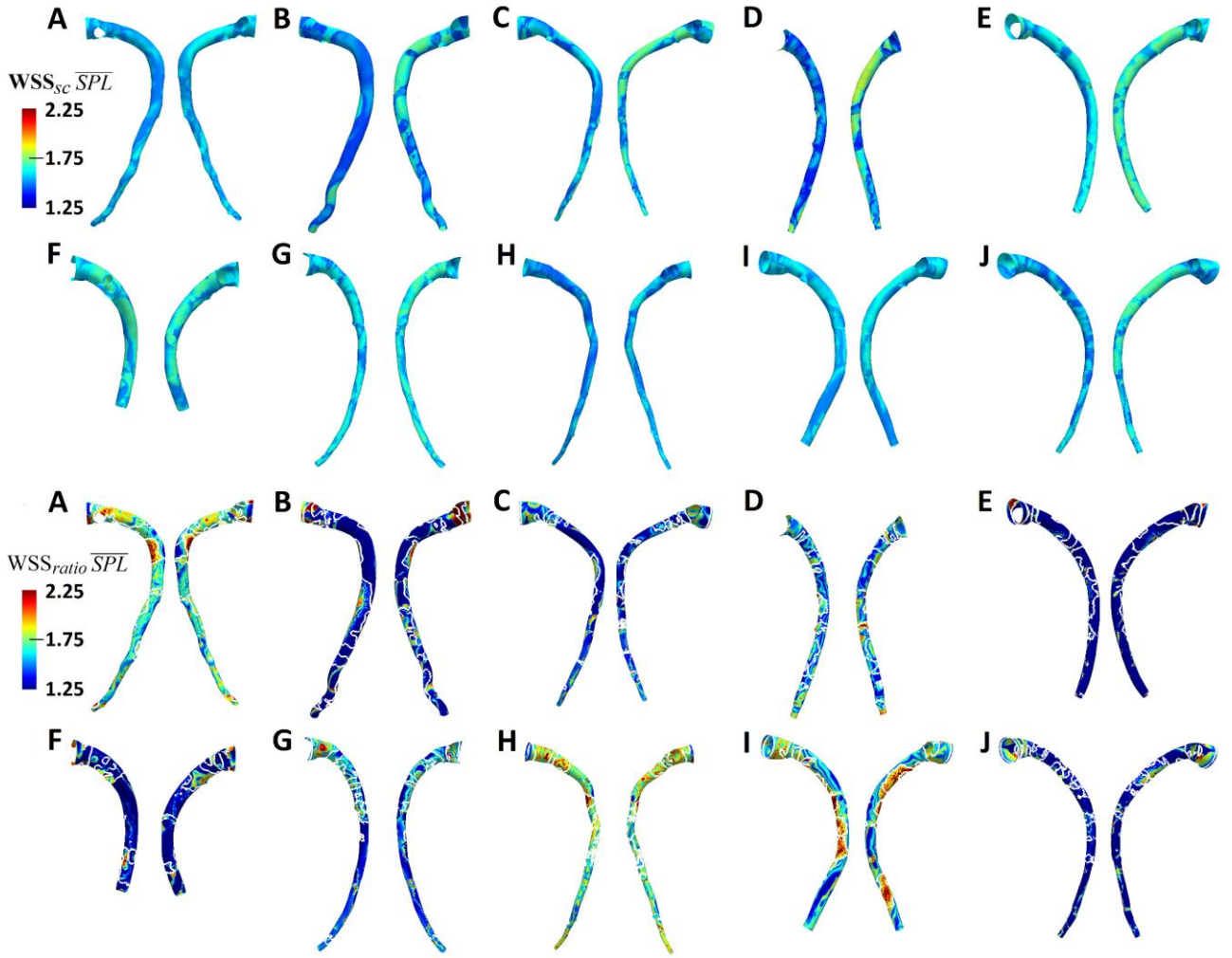


Figure S8 – Luminal distributions of average shortest path length ($\overline{SPL}$) of $\mathbf{WSS}_{sc}$ (top panel) and $\mathbf{WSS}_{ratio}$ (bottom panel) CNs, for the ten LAD models. The $\overline{SPL}$ is a measure of the topological “persistence length” of correlations: lower (higher) $\overline{SPL}$ values indicate longer (shorter) correlation persistence length. The $\overline{SPL}$ maps of the $\mathbf{WSS}_{sc}$ networks are characterized by a low inter-variability, with short topological paths (around 1.5 links-long on average) separating nodal time-histories and, subsequently, a strong persistence of the spatiotemporal correlations. The $\overline{SPL}$ maps of the $\mathbf{WSS}_{ratio}$ networks present topologically isolated regions (identified by higher $\overline{SPL}$ values) co-localized with luminal surface areas exposed to low cycle-average $|\mathbf{WSS}|$, here displayed by the white contour lines representing the artery-specific lower cycle-average $|\mathbf{WSS}|$ tertile.