

Supplementary material

Analysis of geometric primitives in quantitative structure models of tree stems

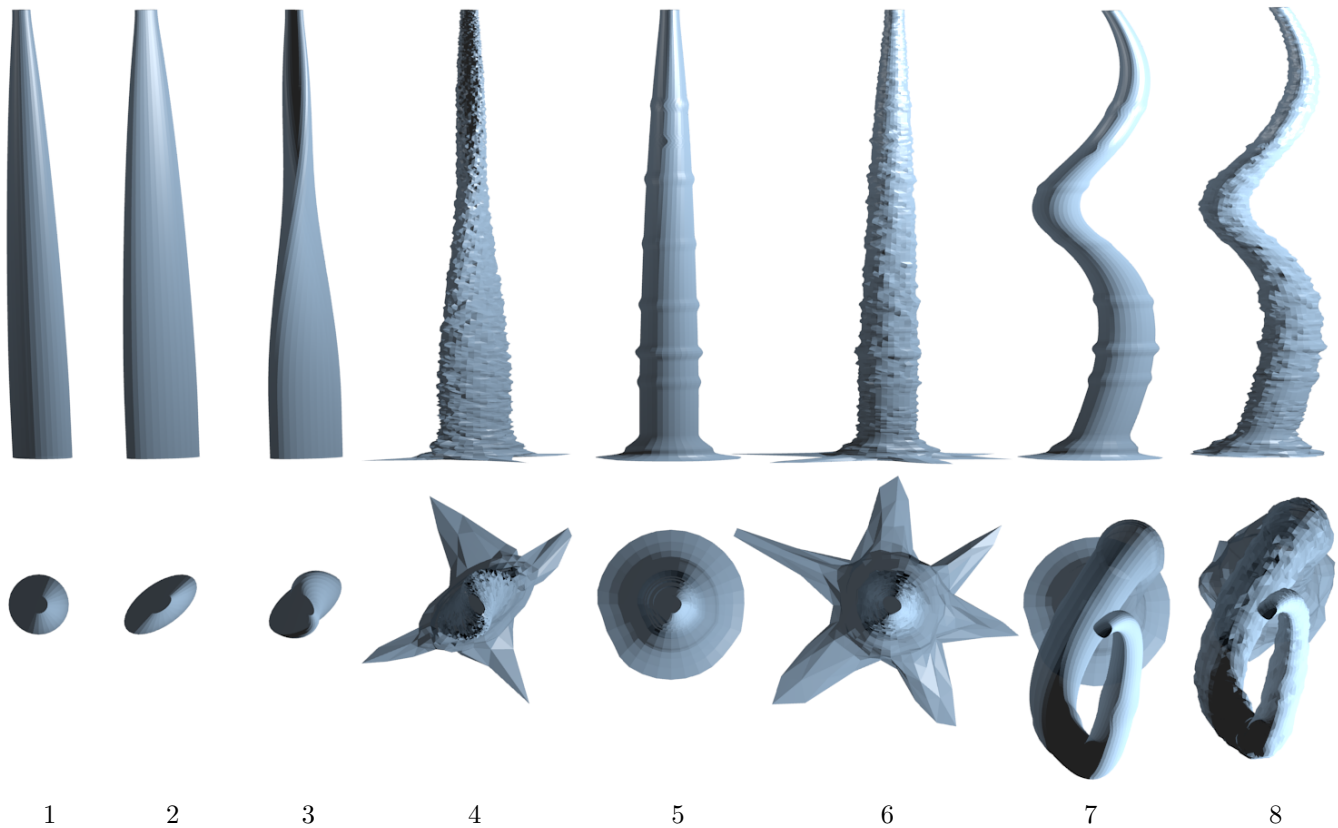
Markku Åkerblom, Pasi Raumonen, Mikko Kaasalainen and Eric Casella

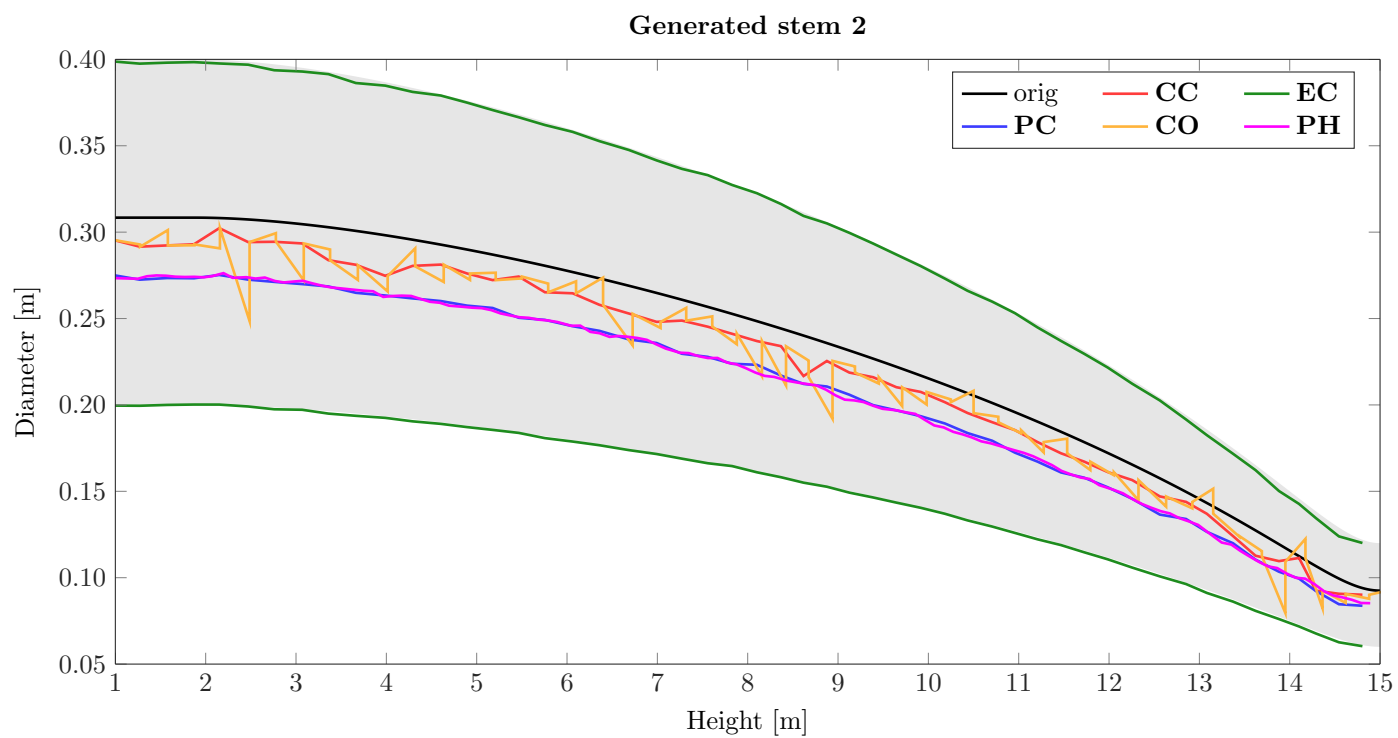
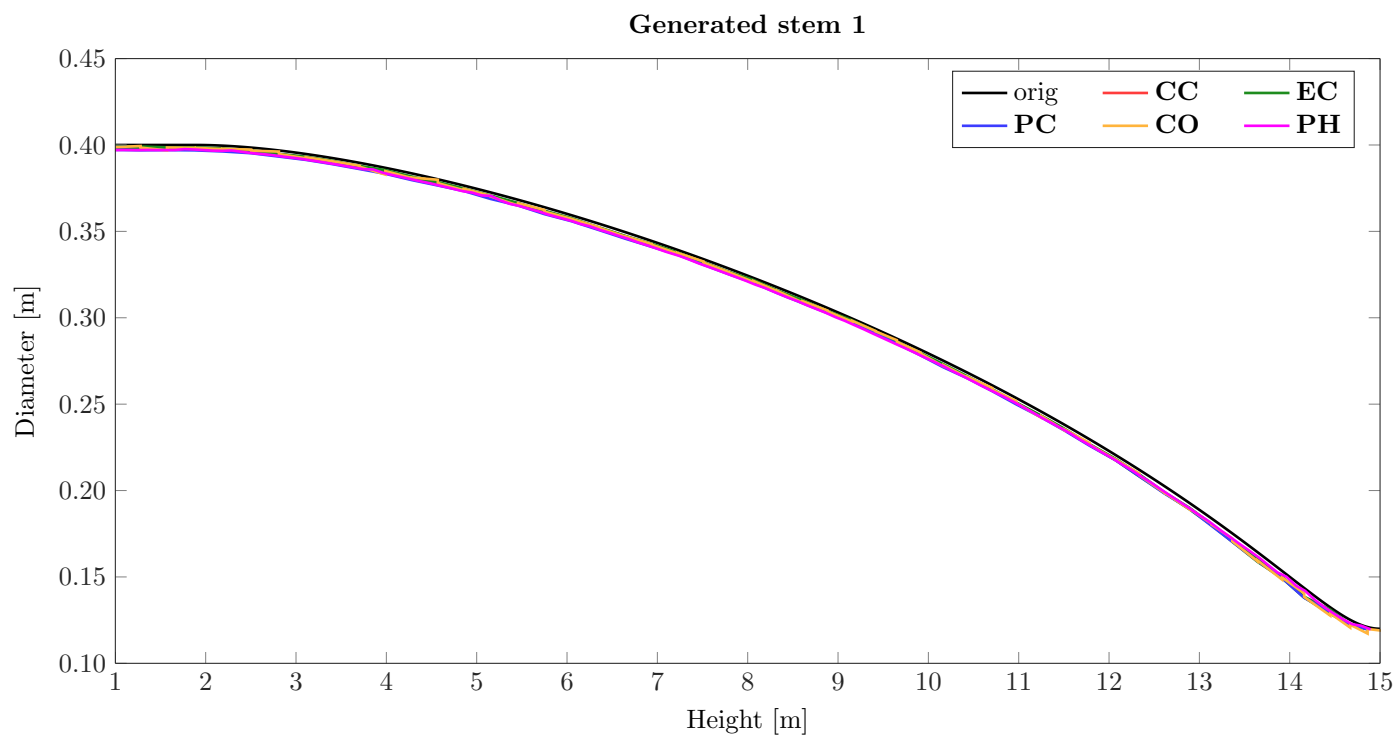
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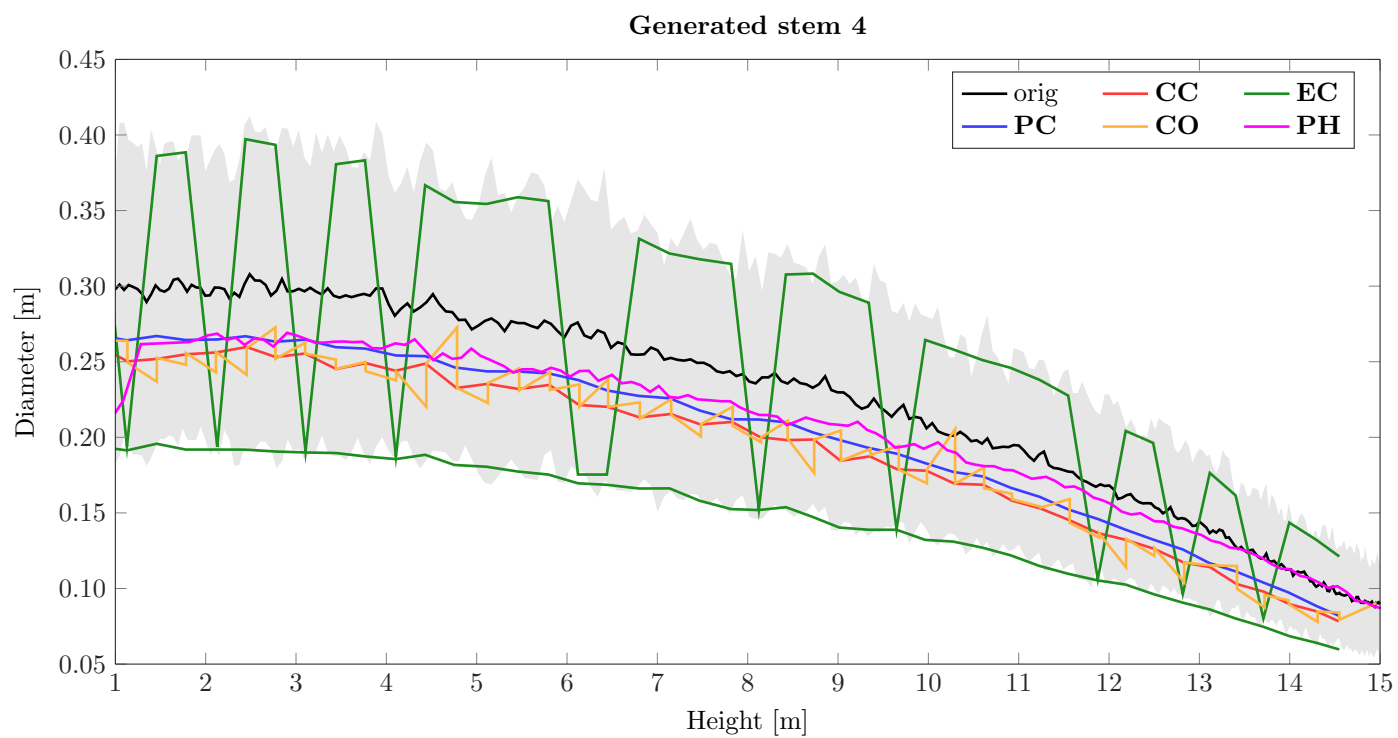
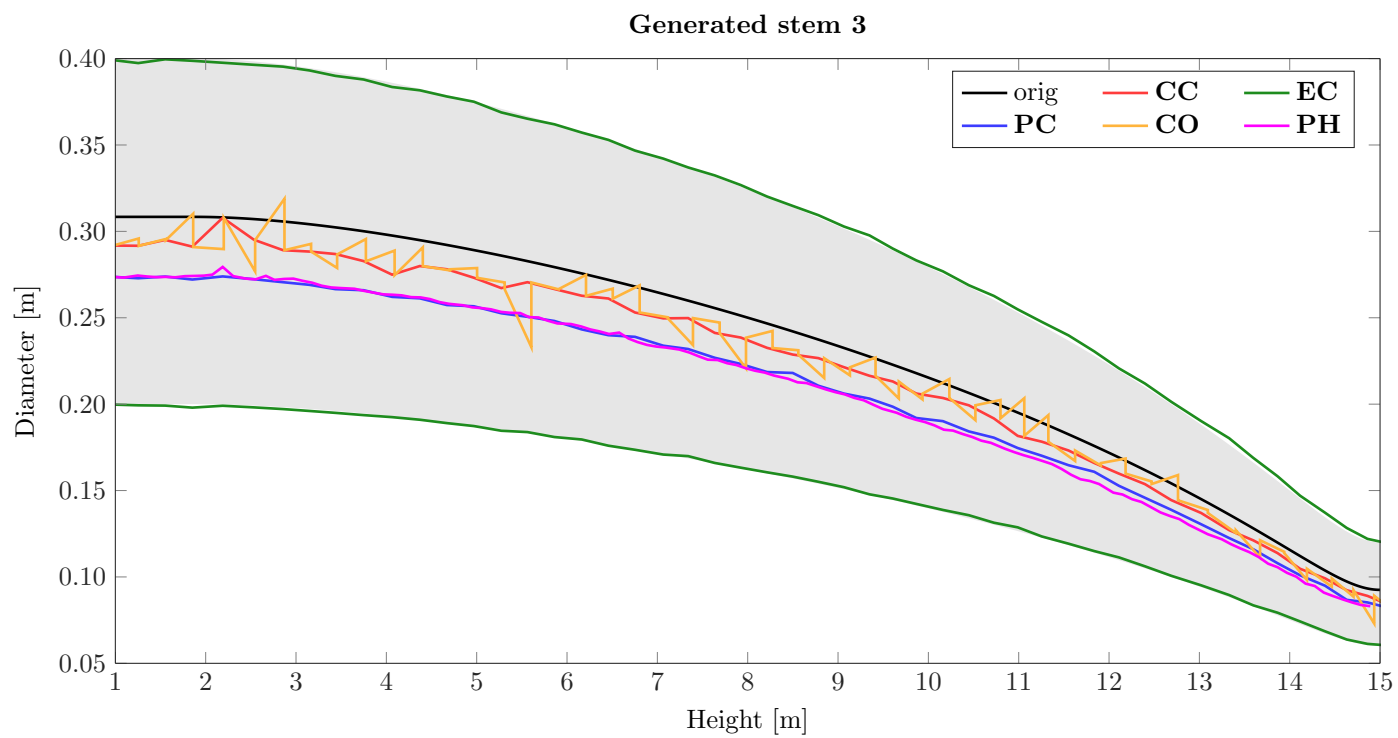
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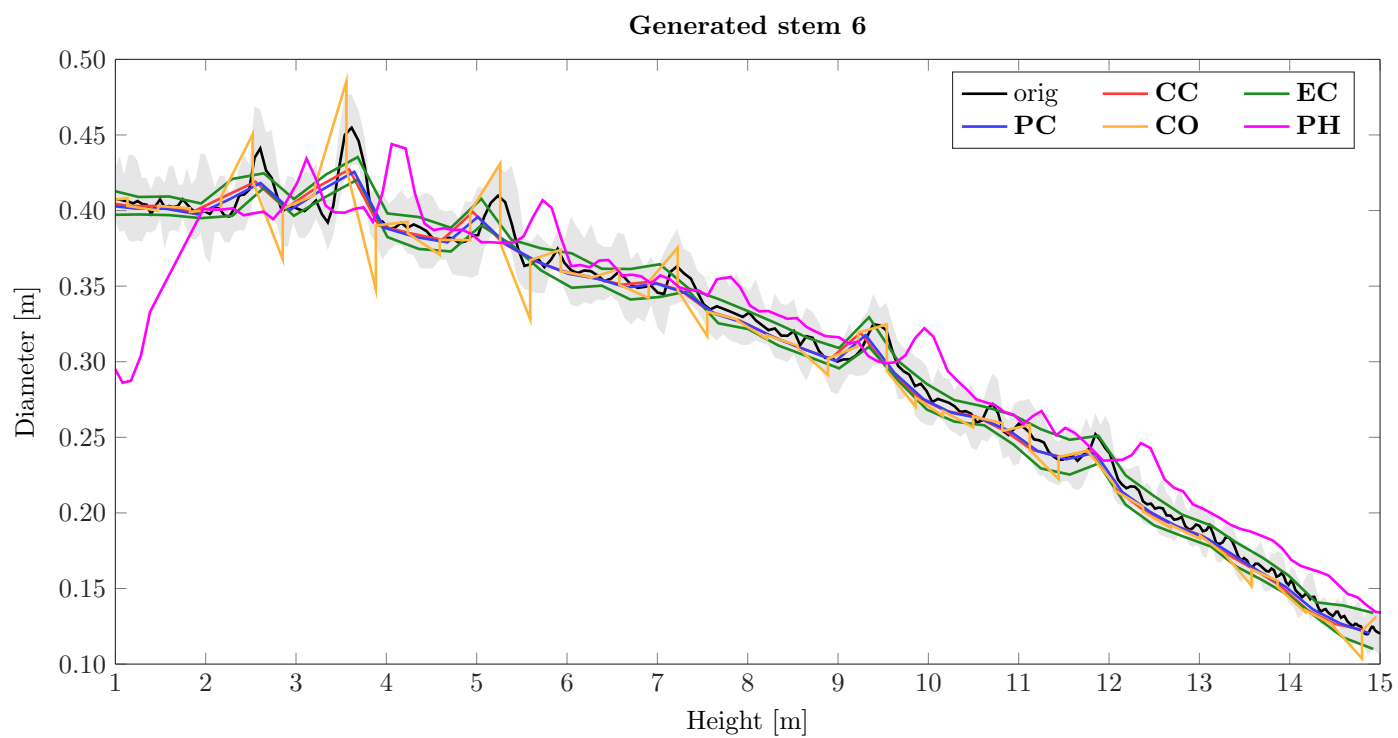
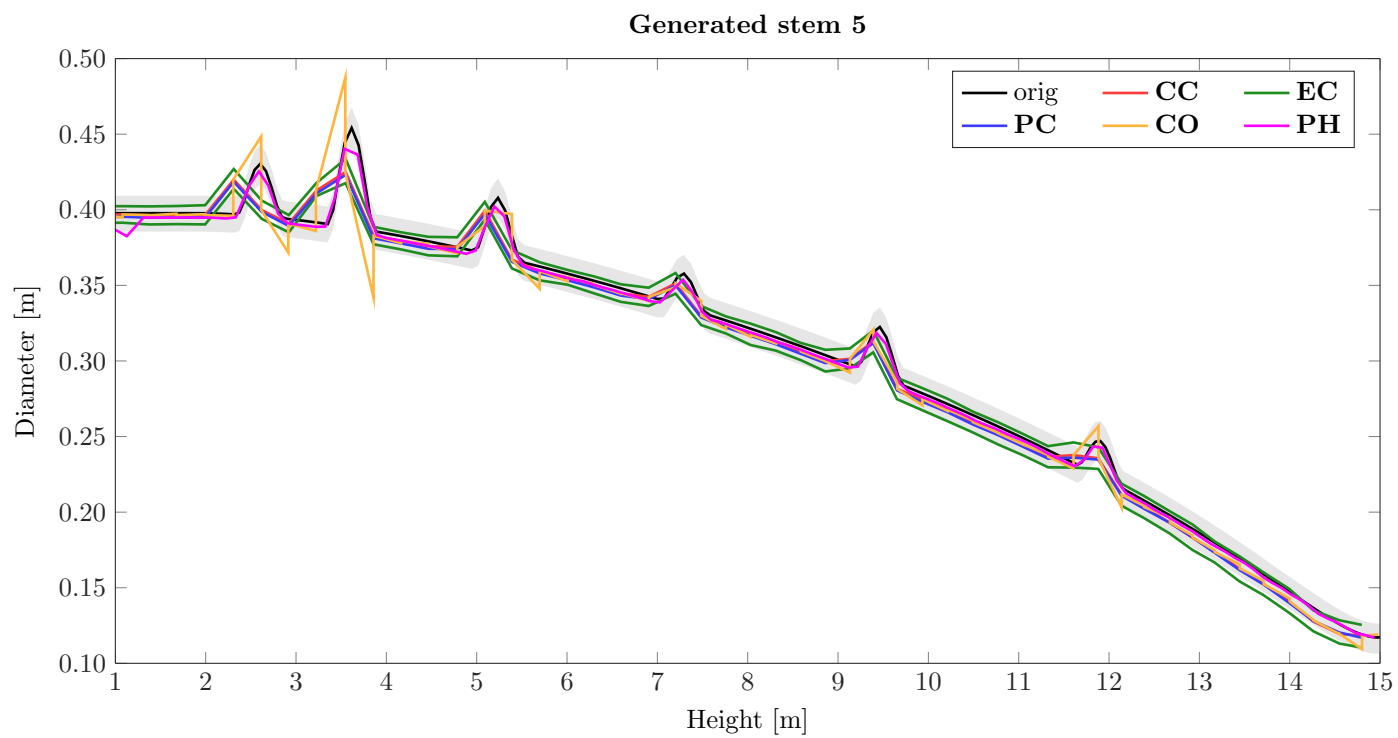
1 Taper curves for generated data

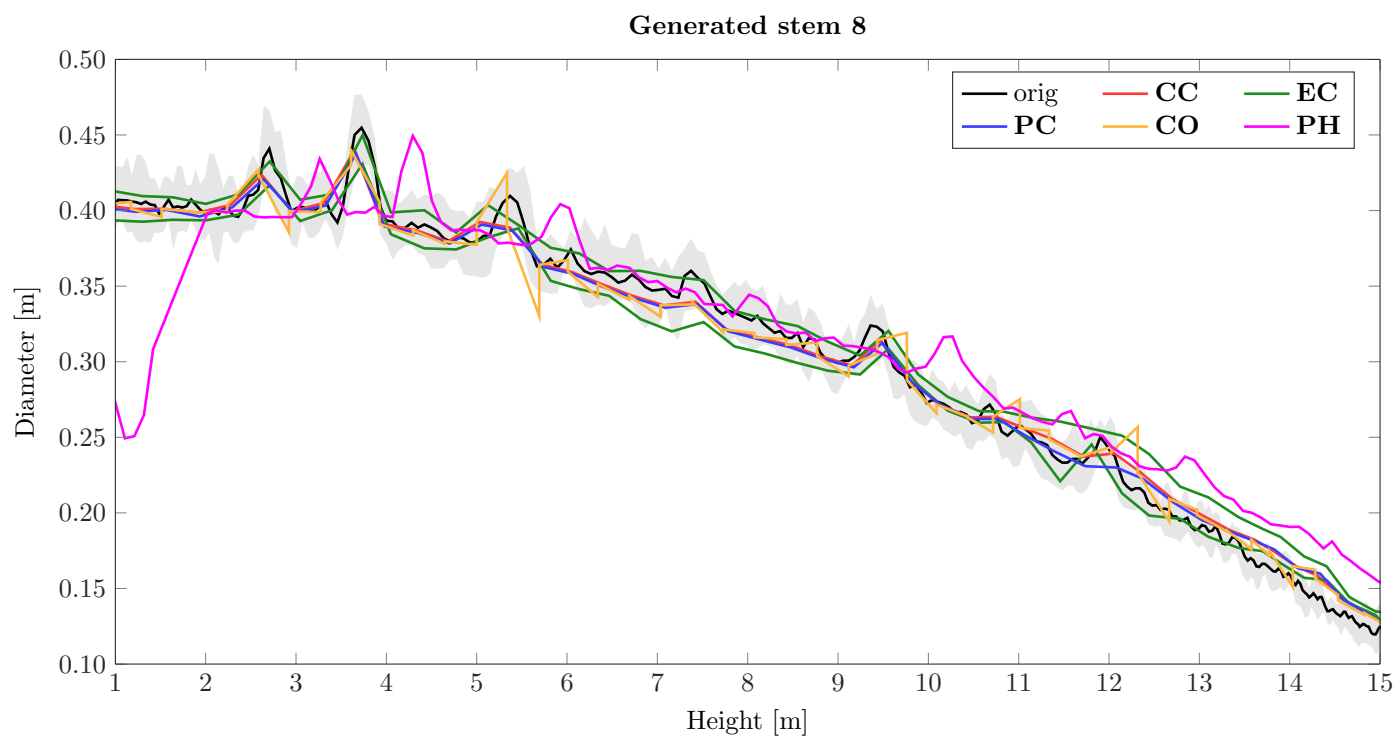
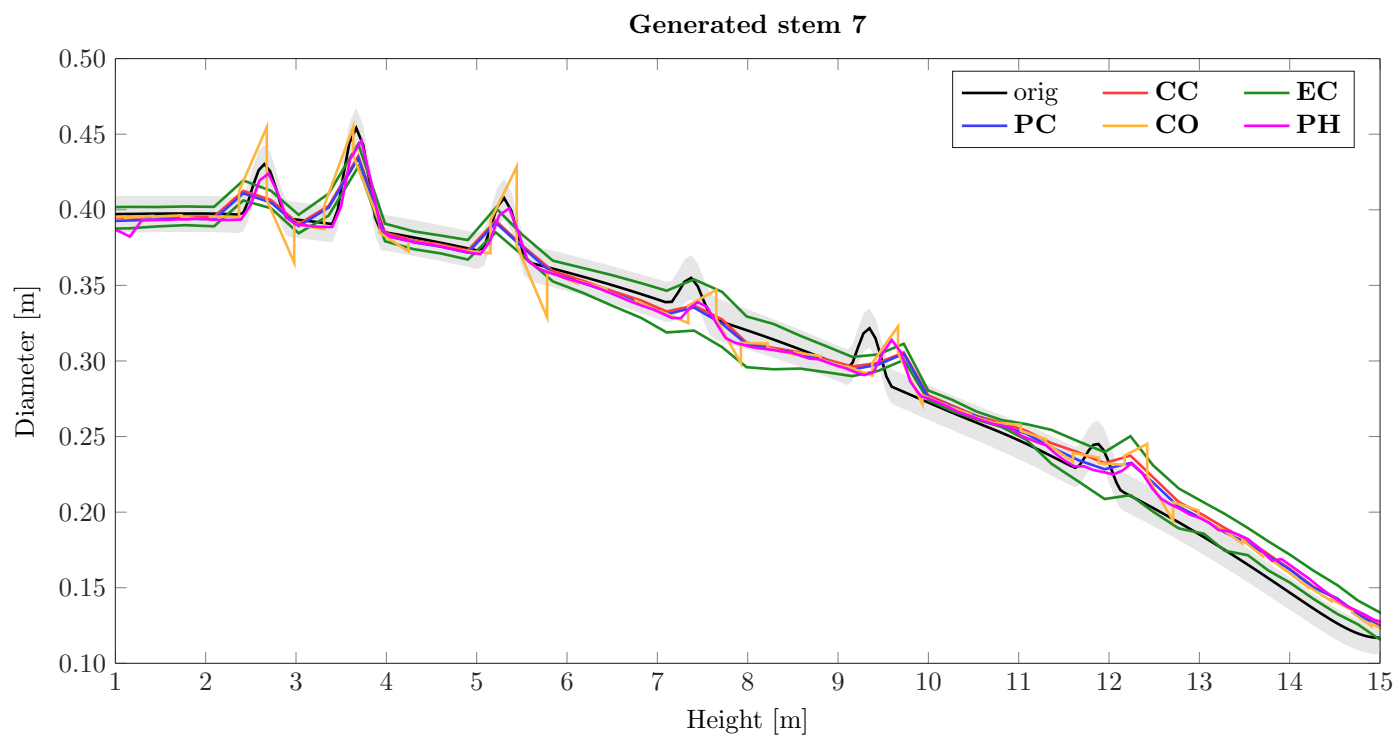
Below are the computed taper curves for the 8 generated stem models analyzed in Sect. 4 of the article. The taper curve from the original models is computed as the average distance between opposite vertices and it is drawn in black. Furthermore, the minimum and maximum of these distances are also drawn and their interval is colored as gray. For the **CC**, **EC** and **PC** models the curve is interpolated linearly from the radii at the bases of consecutive cylinders. For the **EC** the minor and major diameters are drawn. The first meter from the base of the stem has been omitted for better visualization. The reconstructions were repeated 10 times, but the curves shown here are from an individual run and not averages of all of them. The stem models are visualized below.





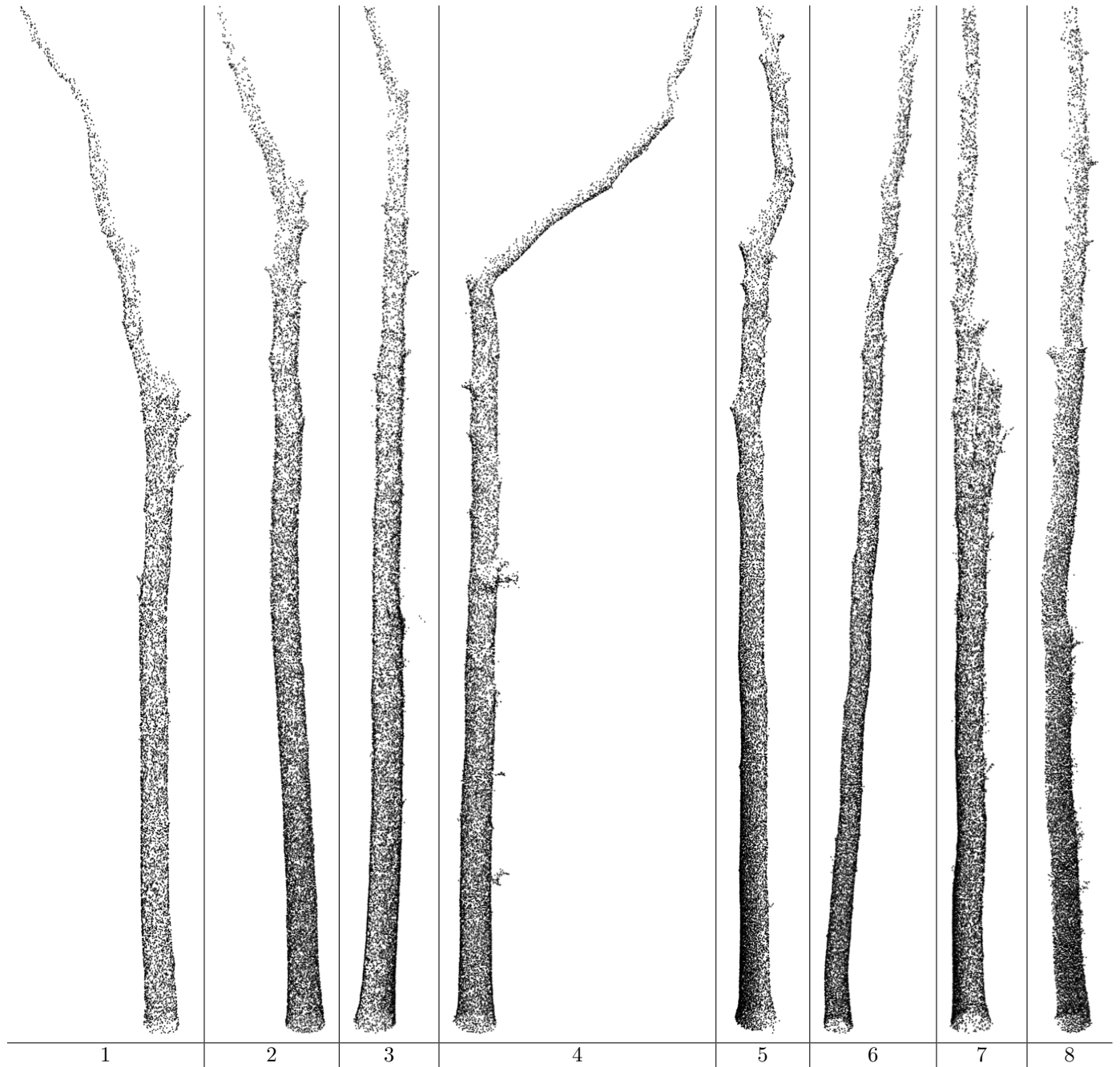


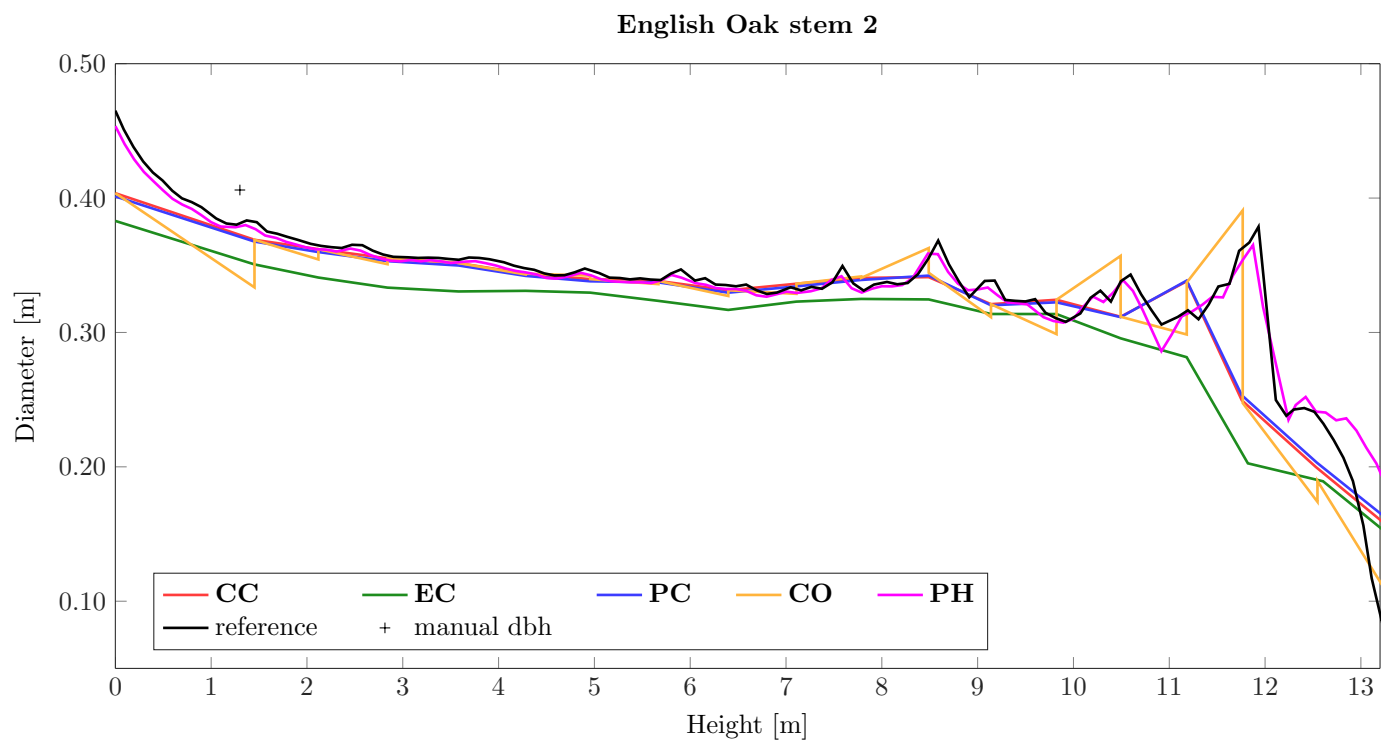
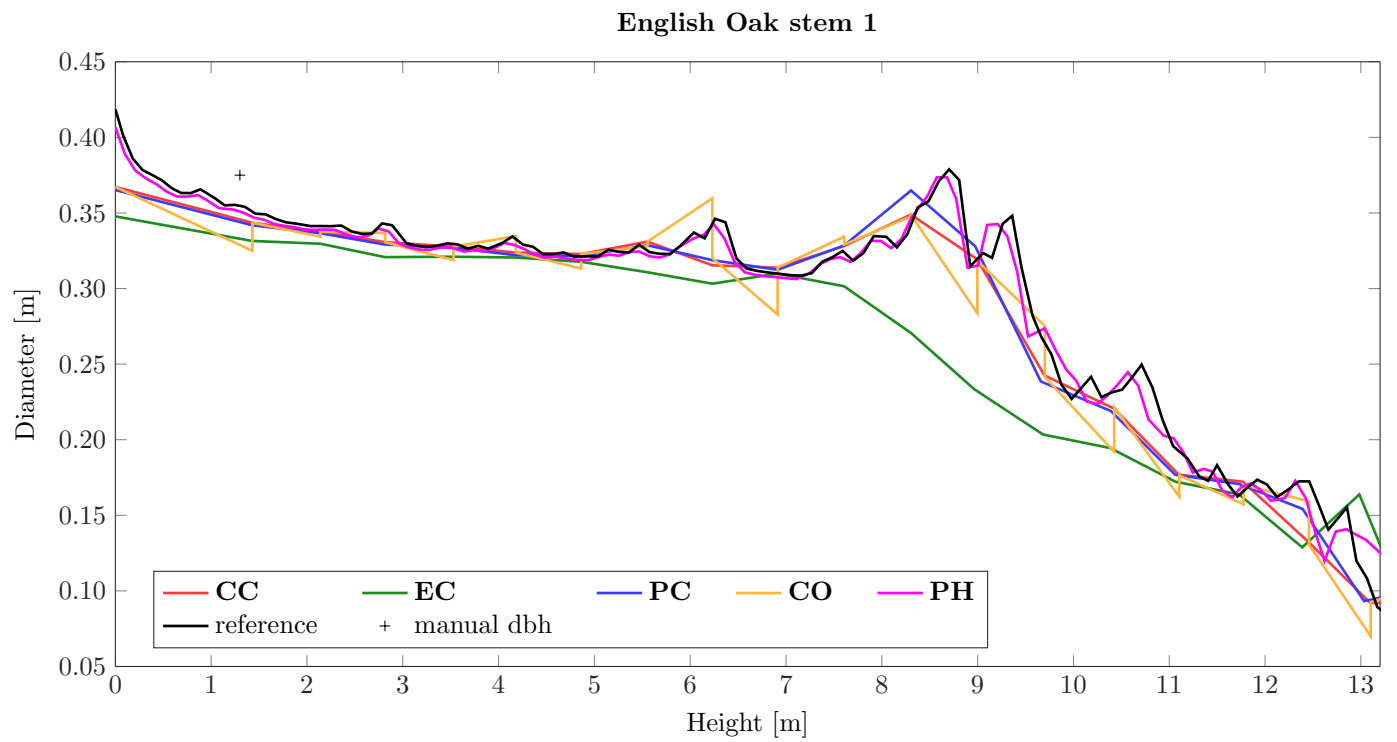


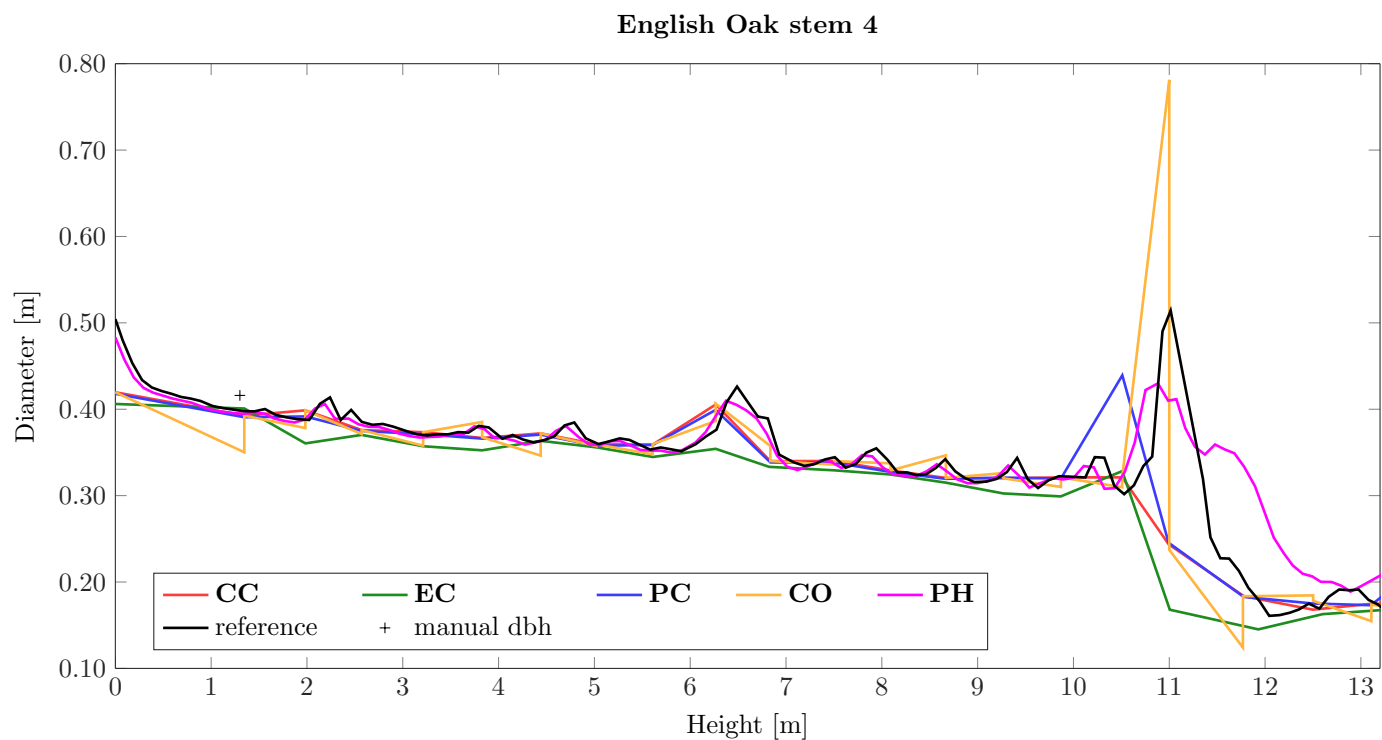
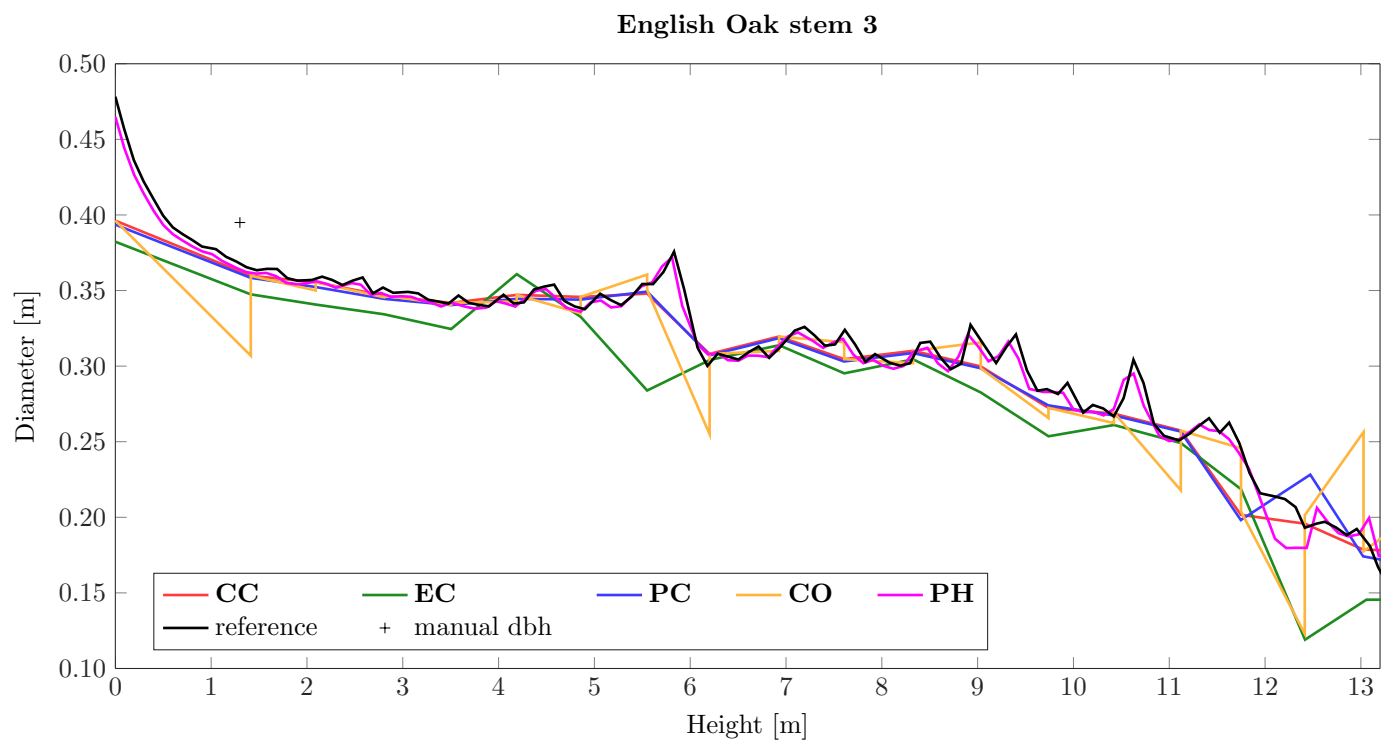


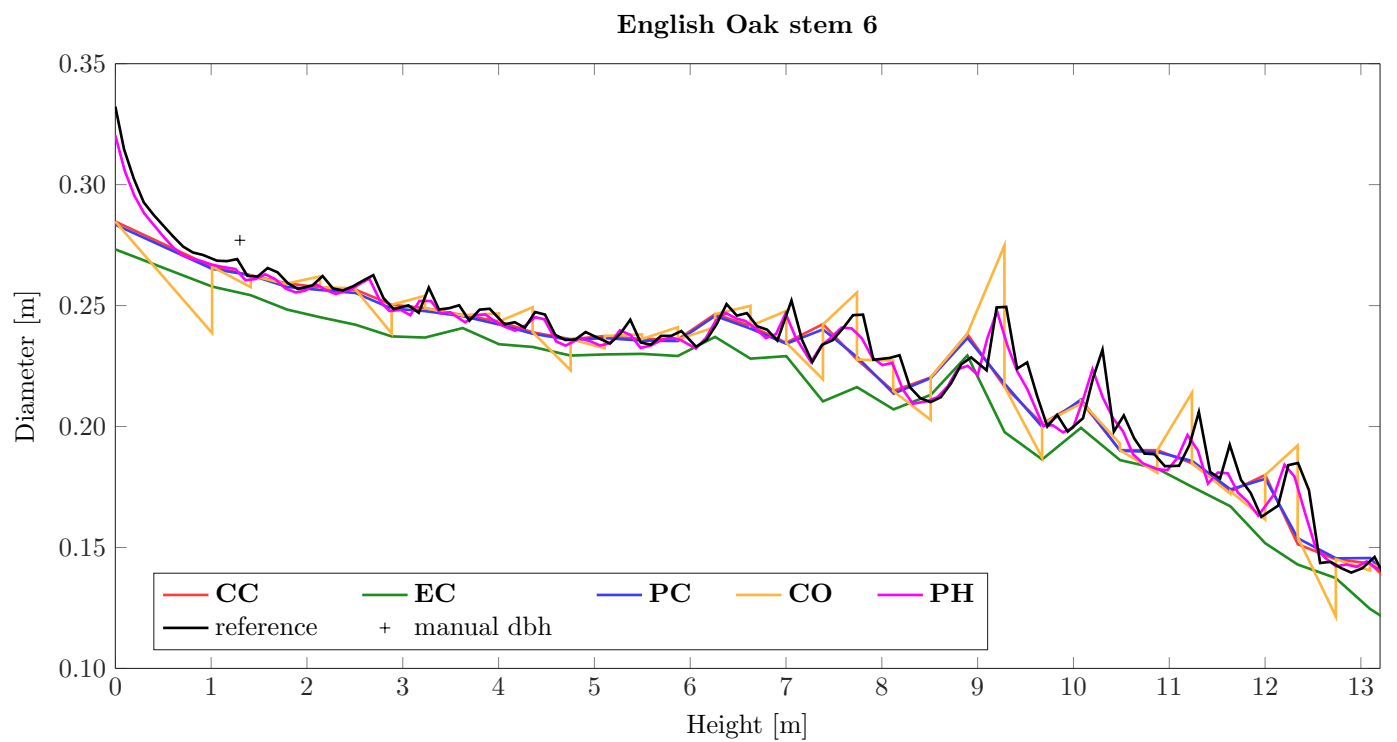
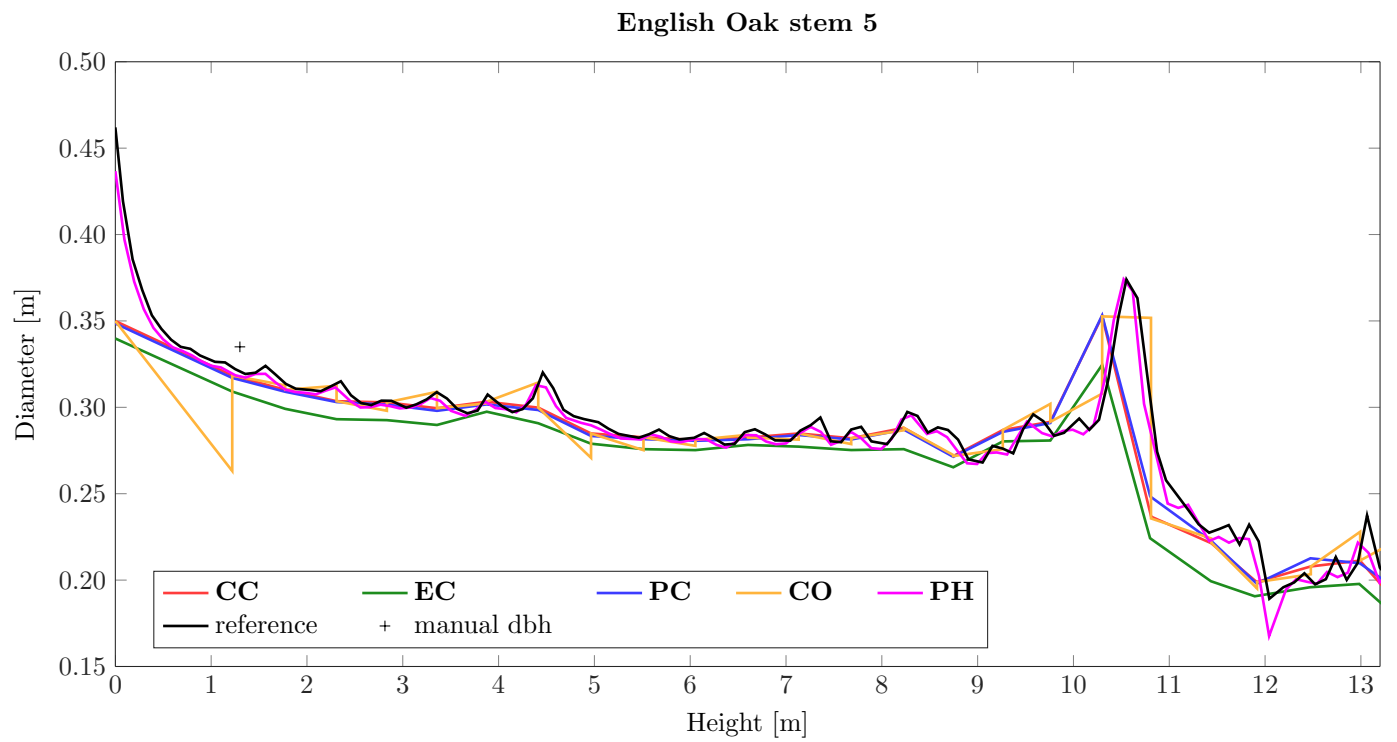
2 Taper curves for real data

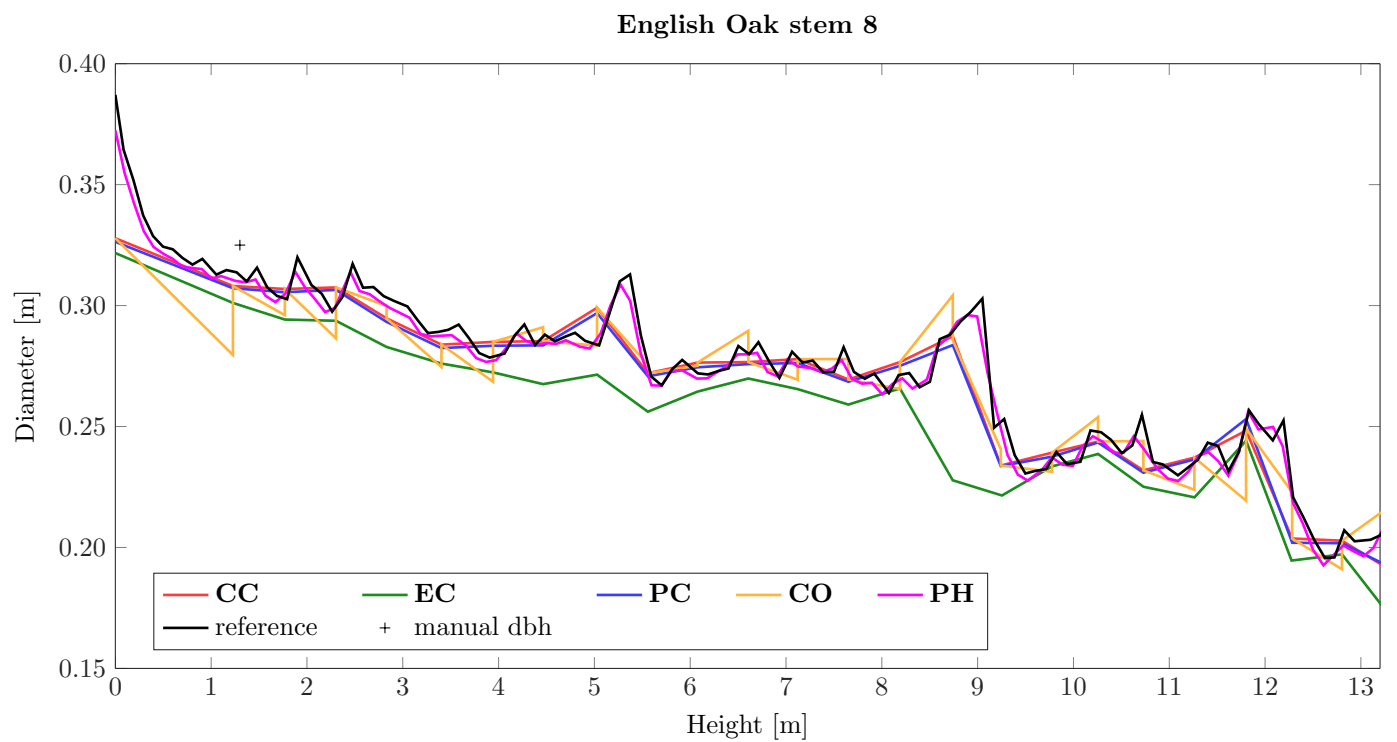
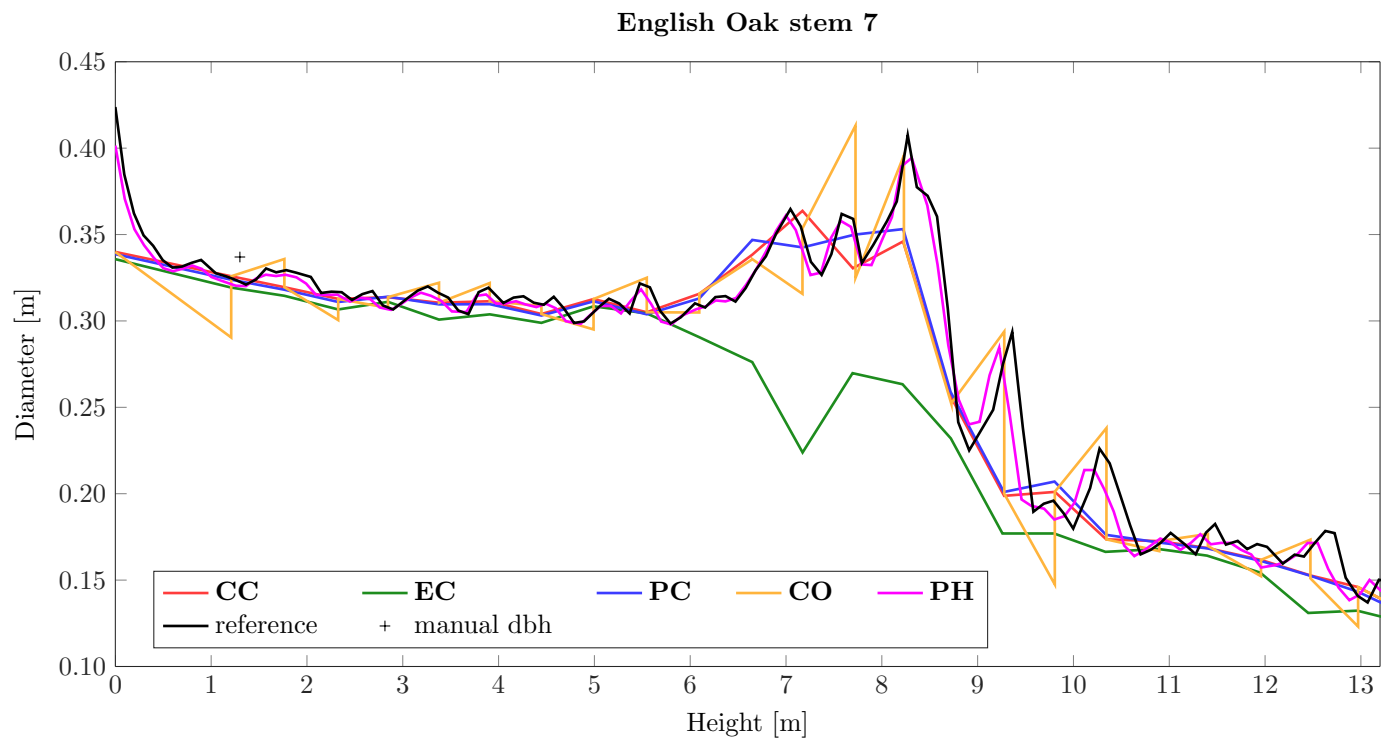
Below are the computed taper curves for the 8 scanned English Oaks analyzed in Sect. 5.1 of the article. Each of the figures shows the manual dbh measured with a girth tape, the reference taper curve computed from the first order triangle mesh reconstruction, and taper curves computed from the second order reconstructed models. For the **CC**, **EC** and **PC** models the curve is interpolated linearly from the radii at the bases of consecutive cylinders. The reconstructions were repeated 10 times, but the curves shown here are from an individual run and not averages of all of them. The original point clouds of the 8 stems are visualized below; each cloud has been thinned-out to every 50th point.







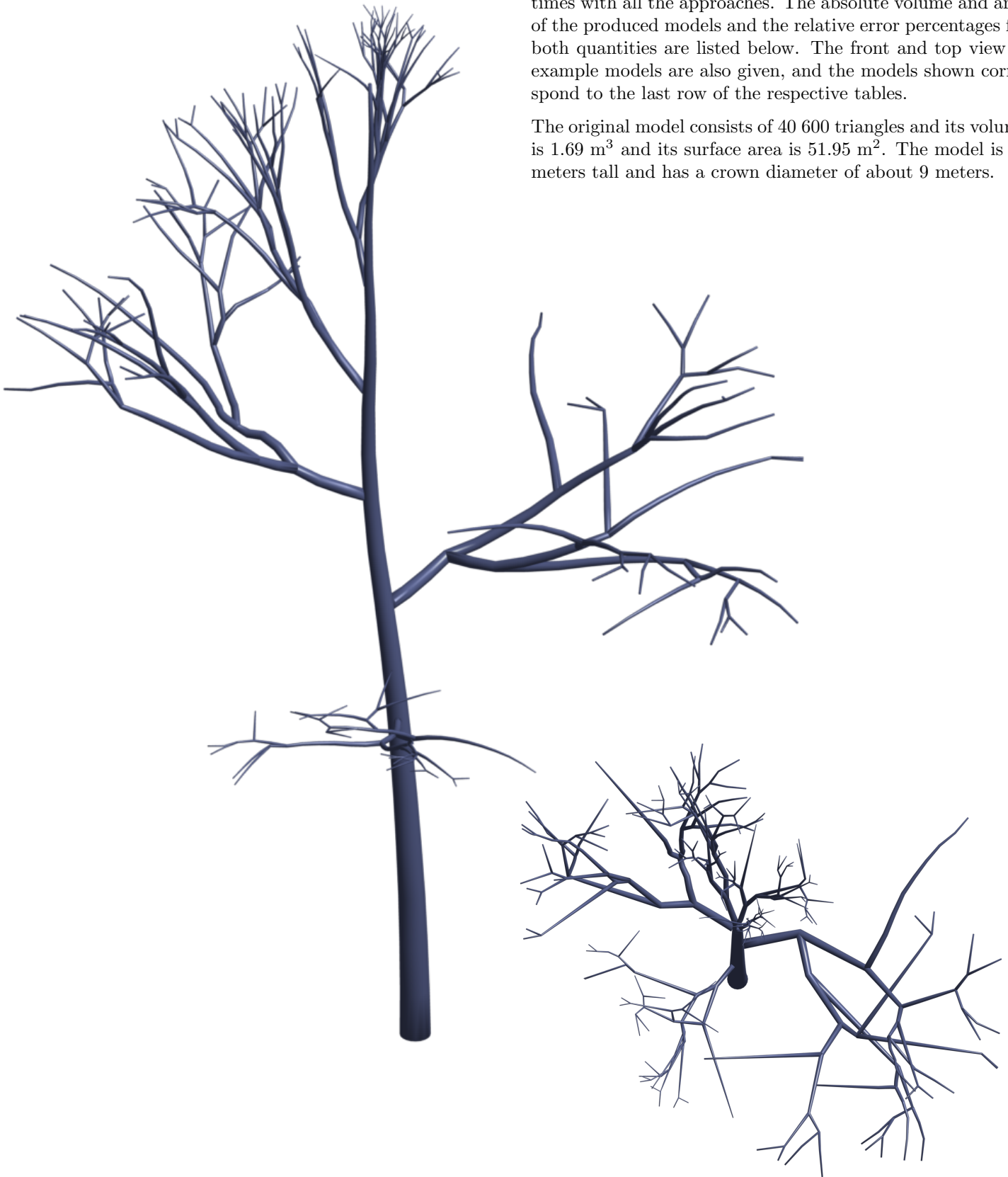




3 Complete tree model results

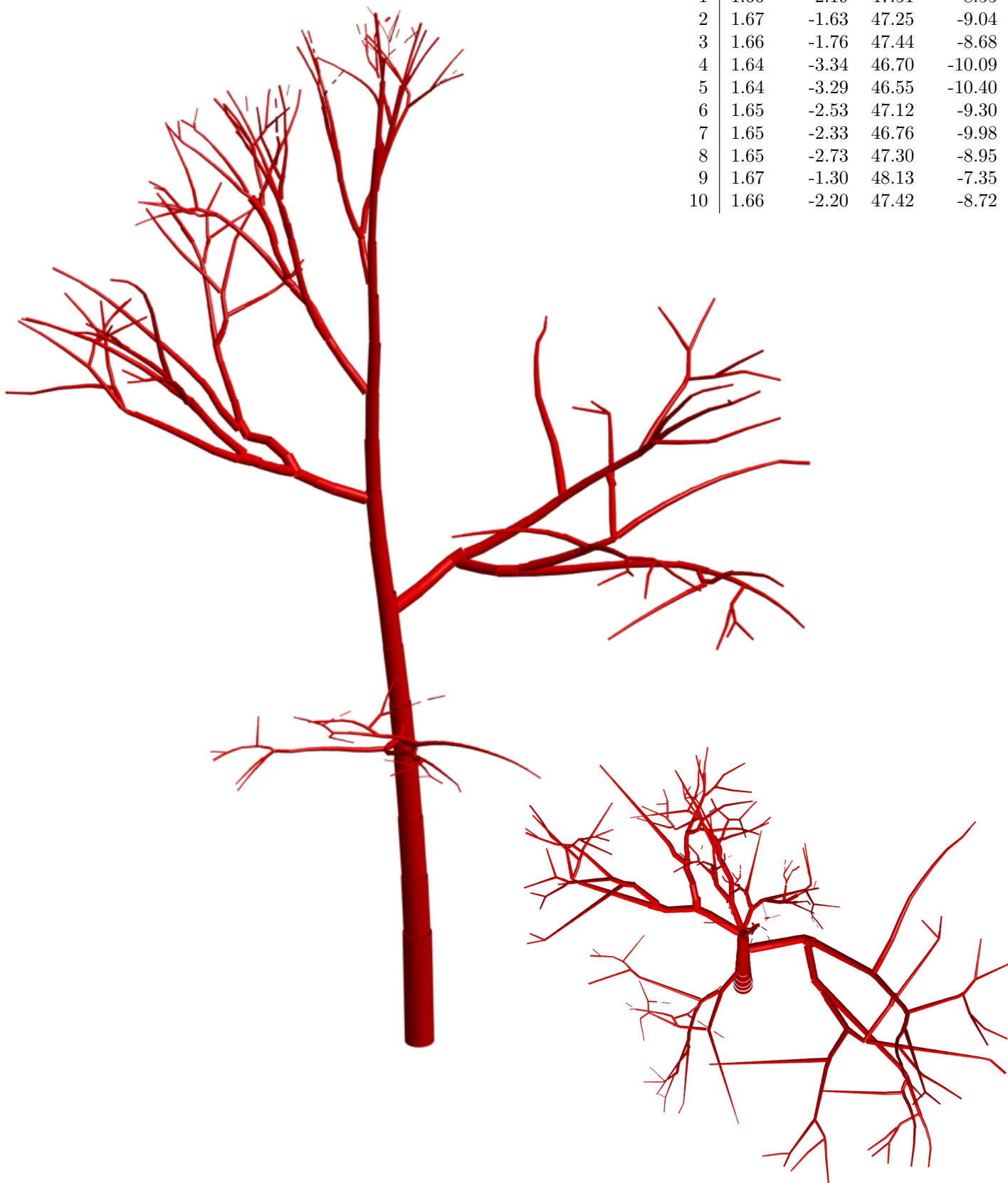
The artificial tree model on this page was reconstructed ten times with all the approaches. The absolute volume and area of the produced models and the relative error percentages for both quantities are listed below. The front and top view of example models are also given, and the models shown correspond to the last row of the respective tables.

The original model consists of 40 600 triangles and its volume is 1.69 m^3 and its surface area is 51.95 m^2 . The model is 16 meters tall and has a crown diameter of about 9 meters.



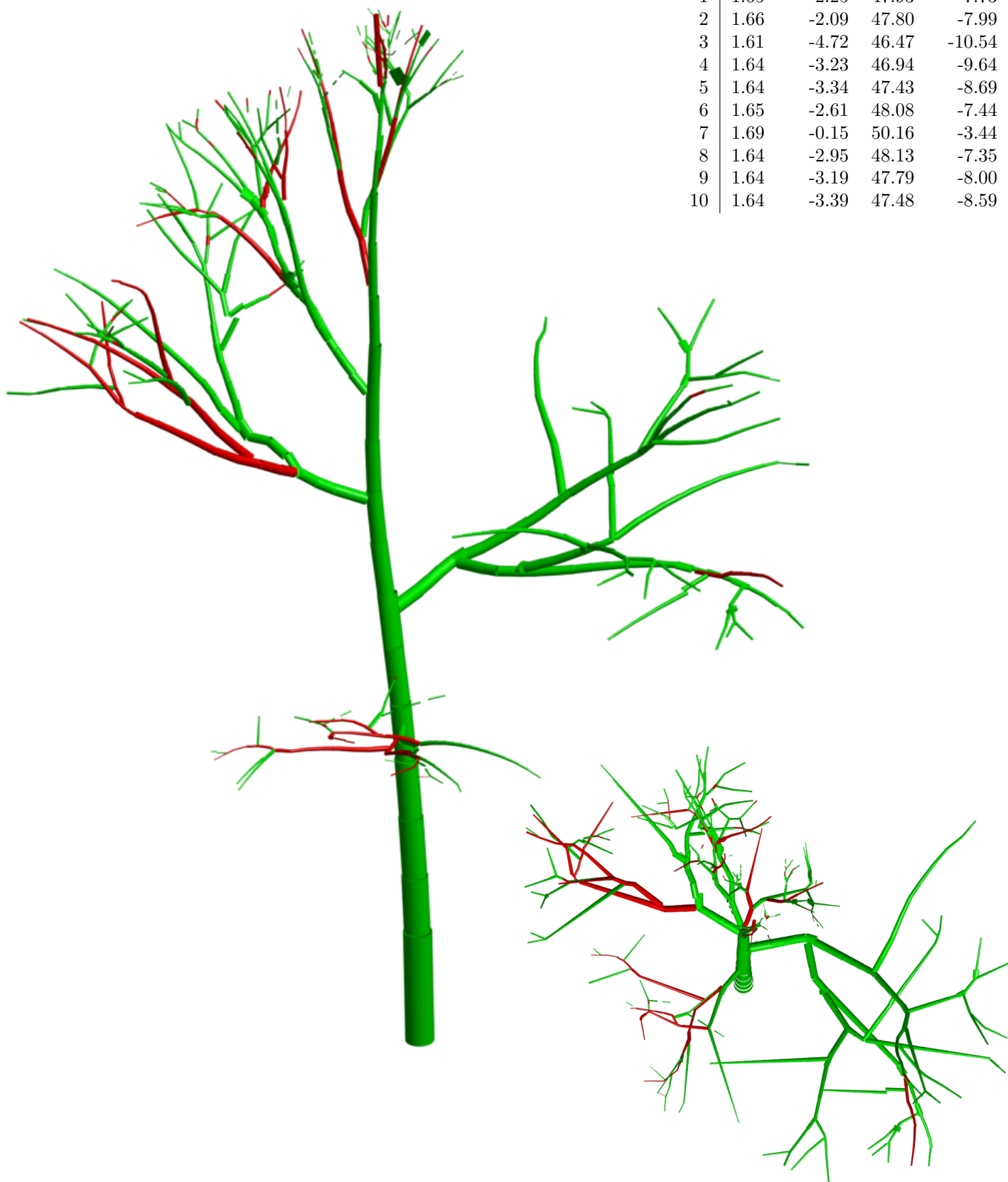
Circular cylinder

#	V	$\Delta V(\%)$	A	$\Delta A(\%)$
1	1.66	-2.19	47.51	-8.55
2	1.67	-1.63	47.25	-9.04
3	1.66	-1.76	47.44	-8.68
4	1.64	-3.34	46.70	-10.09
5	1.64	-3.29	46.55	-10.40
6	1.65	-2.53	47.12	-9.30
7	1.65	-2.33	46.76	-9.98
8	1.65	-2.73	47.30	-8.95
9	1.67	-1.30	48.13	-7.35
10	1.66	-2.20	47.42	-8.72

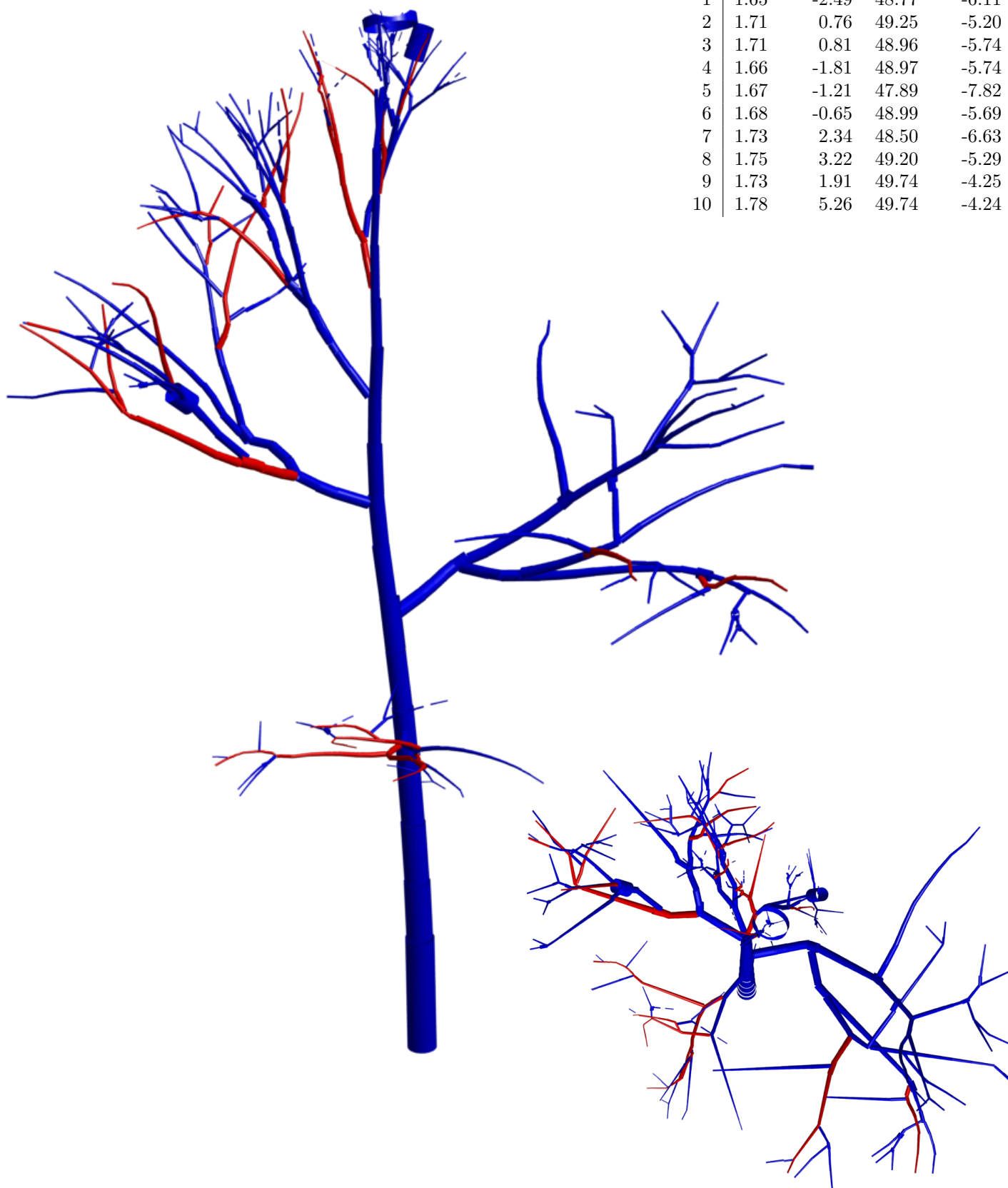


Elliptic cylinder

#	V	$\Delta V(\%)$	A	$\Delta A(\%)$
1	1.65	-2.25	47.93	-7.73
2	1.66	-2.09	47.80	-7.99
3	1.61	-4.72	46.47	-10.54
4	1.64	-3.23	46.94	-9.64
5	1.64	-3.34	47.43	-8.69
6	1.65	-2.61	48.08	-7.44
7	1.69	-0.15	50.16	-3.44
8	1.64	-2.95	48.13	-7.35
9	1.64	-3.19	47.79	-8.00
10	1.64	-3.39	47.48	-8.59

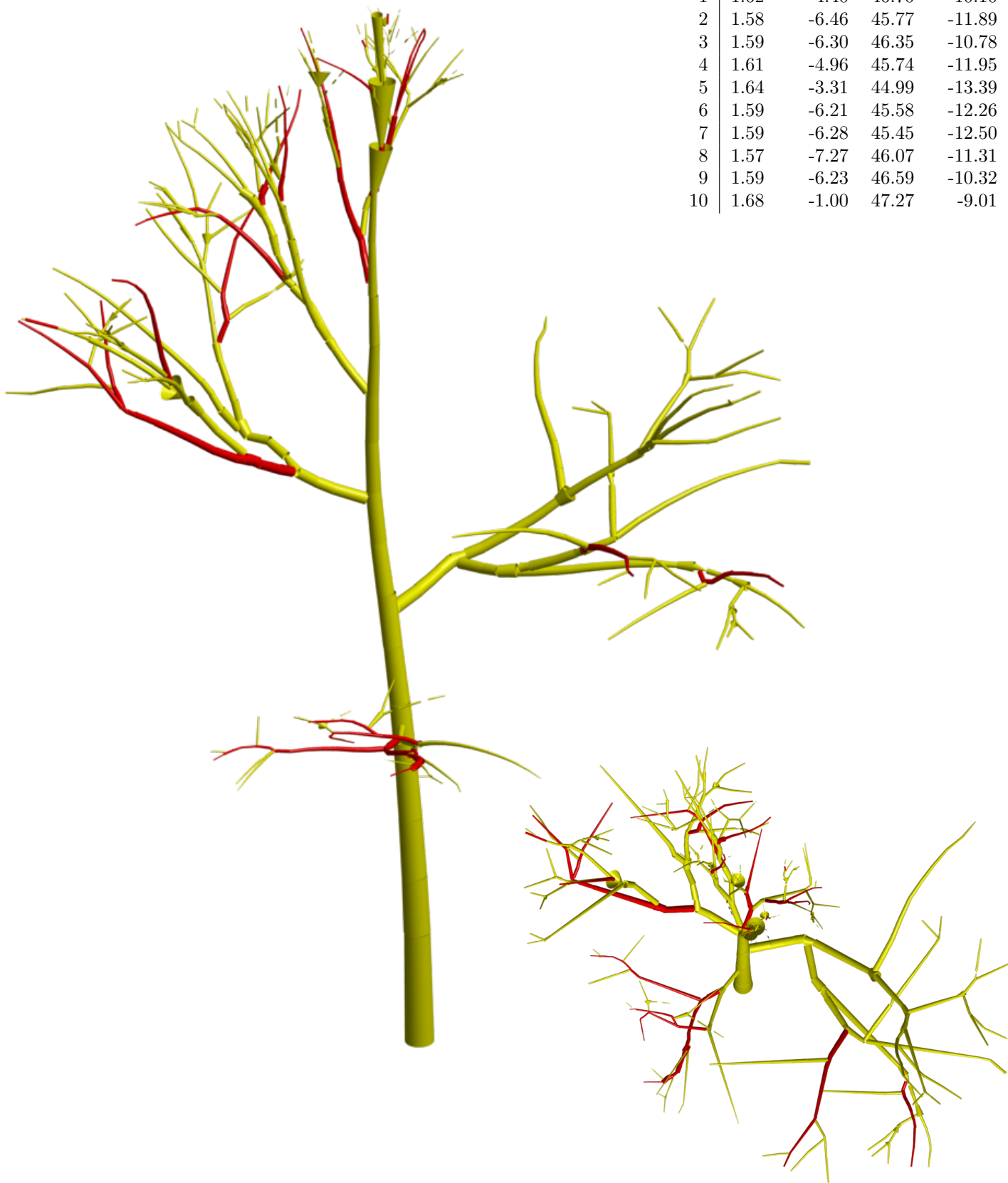


Polygon cylinder



Circular cone

#	V	$\Delta V(\%)$	A	$\Delta A(\%)$
1	1.62	-4.40	46.70	-10.10
2	1.58	-6.46	45.77	-11.89
3	1.59	-6.30	46.35	-10.78
4	1.61	-4.96	45.74	-11.95
5	1.64	-3.31	44.99	-13.39
6	1.59	-6.21	45.58	-12.26
7	1.59	-6.28	45.45	-12.50
8	1.57	-7.27	46.07	-11.31
9	1.59	-6.23	46.59	-10.32
10	1.68	-1.00	47.27	-9.01



Triangulated mesh

