

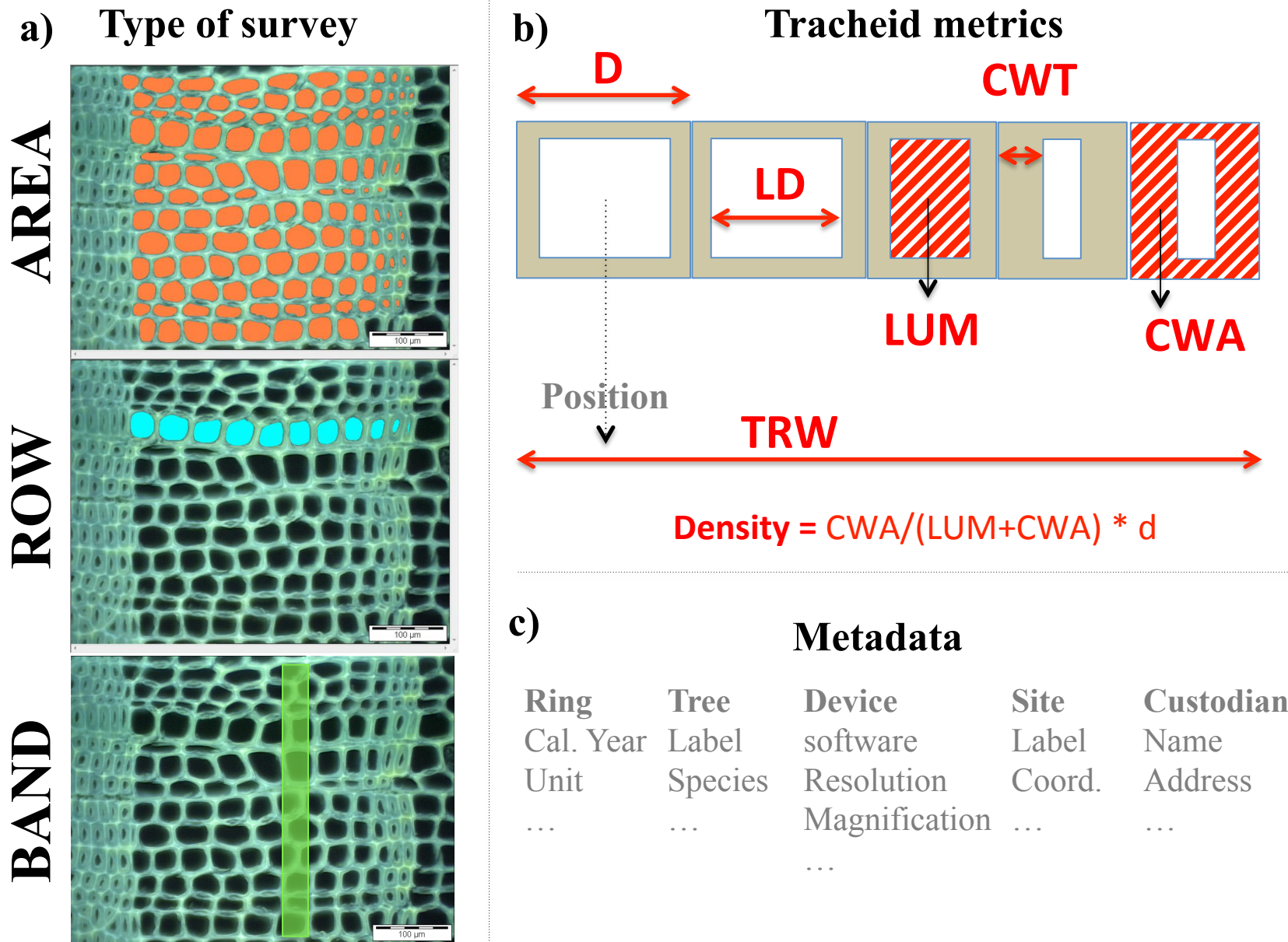
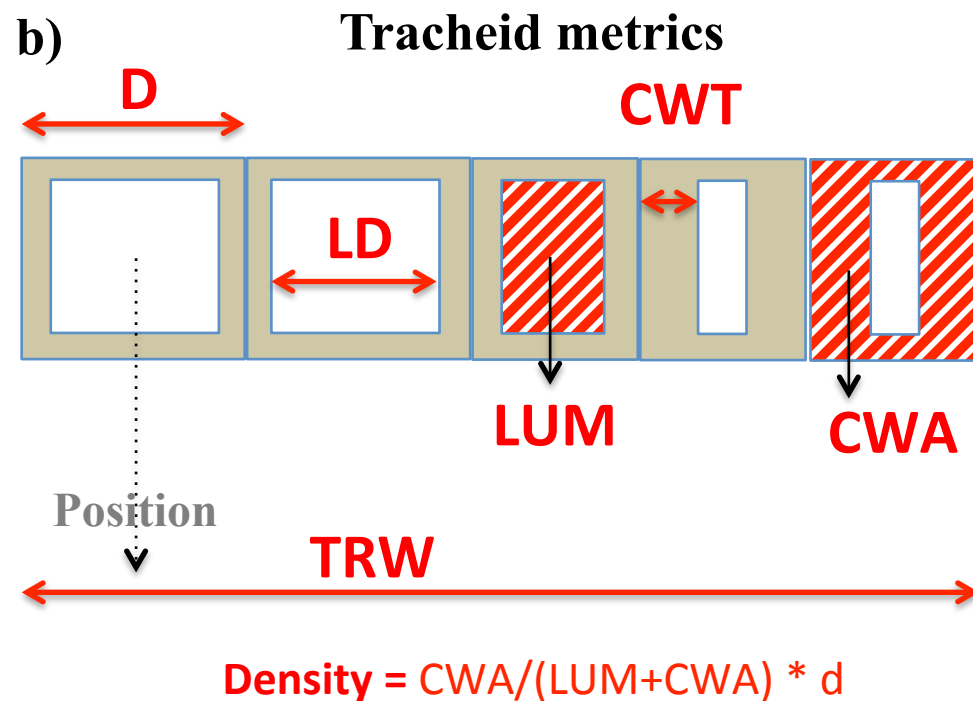
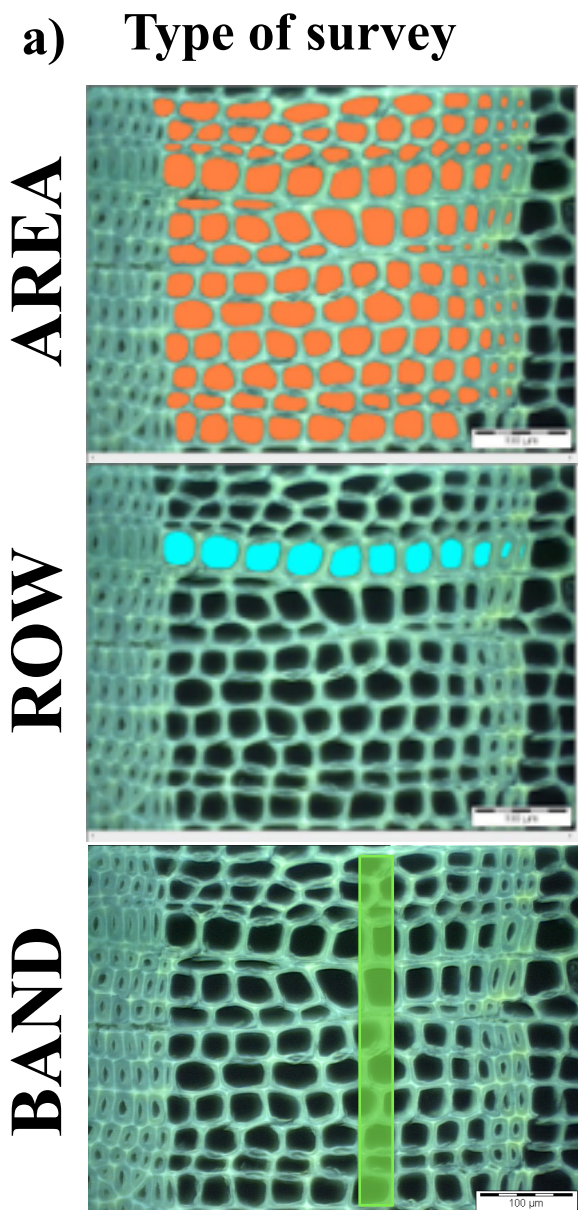


Figure: Overview of the XCELL tracheid data collection: a) type of cell survey, b) cell metrics and c) categories of metadata. D = cell diameter, LD = lumen diameter, CWT = cell wall thickness, LUM = lumen area, CWA = cell wall area, TRW = tree ring width, Density = anatomical density = $CWA / (LUM + CWA) * 1.100 \text{ g cm}^{-3}$



c) Metadata

Ring	Tree	Device	Site	Custodian
Cal. Year	Label	software	Label	Name
Unit	Species	Resolution	Coord.	Address
...	...	Magnification	...	...
		...		

Cell structure as proxy for:

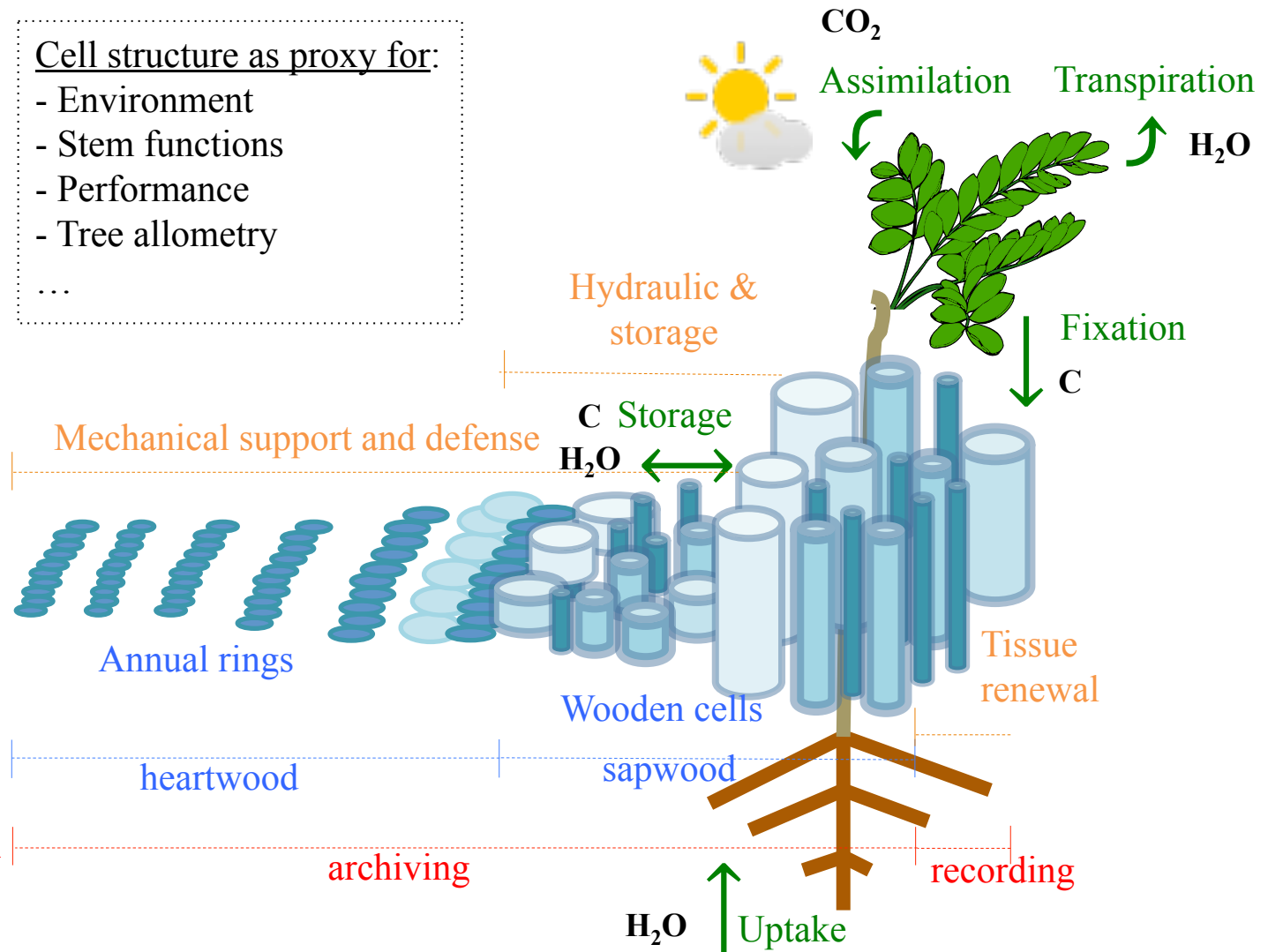
- Environment
- Stem functions
- Performance
- Tree allometry
- ...

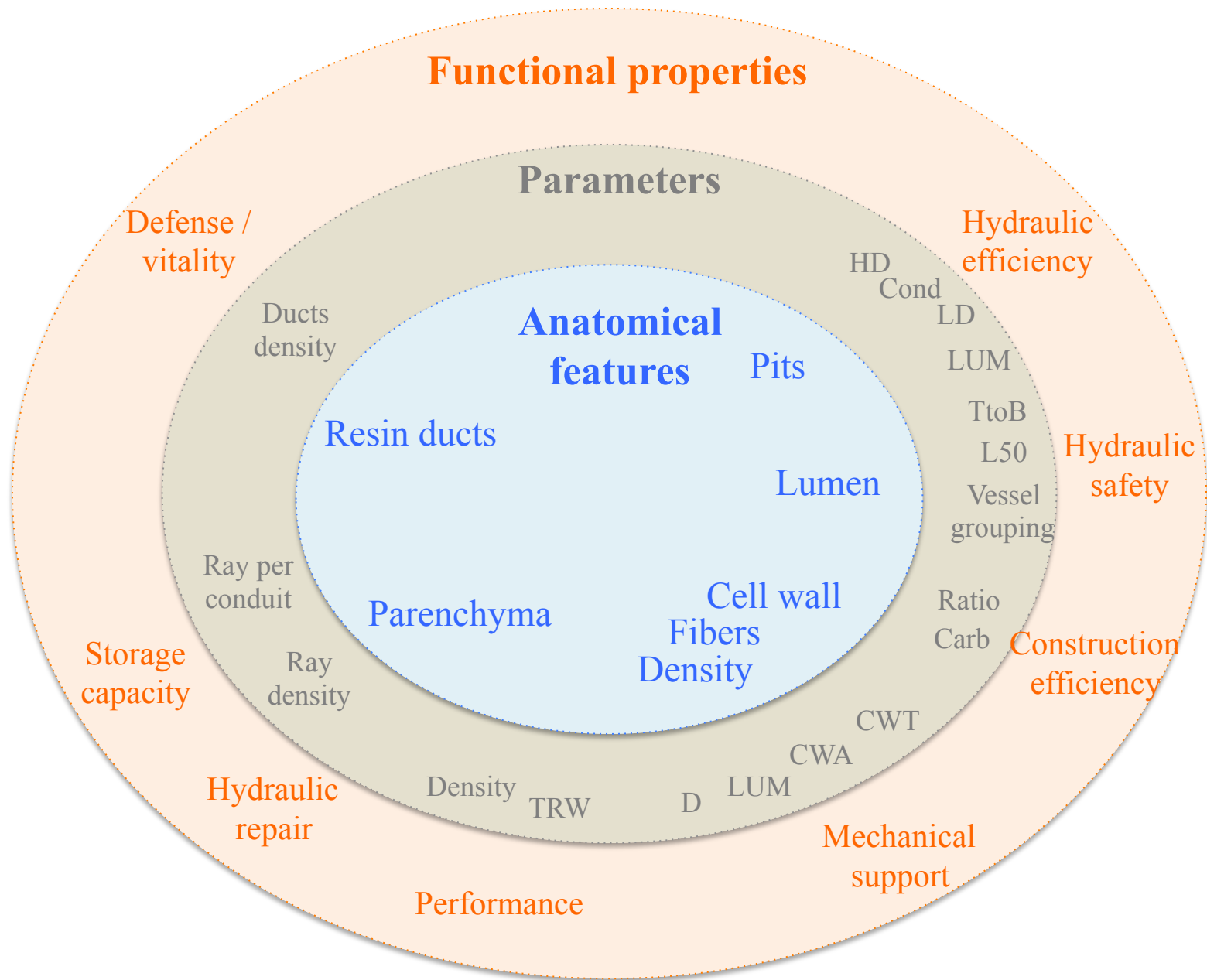
a) Processes

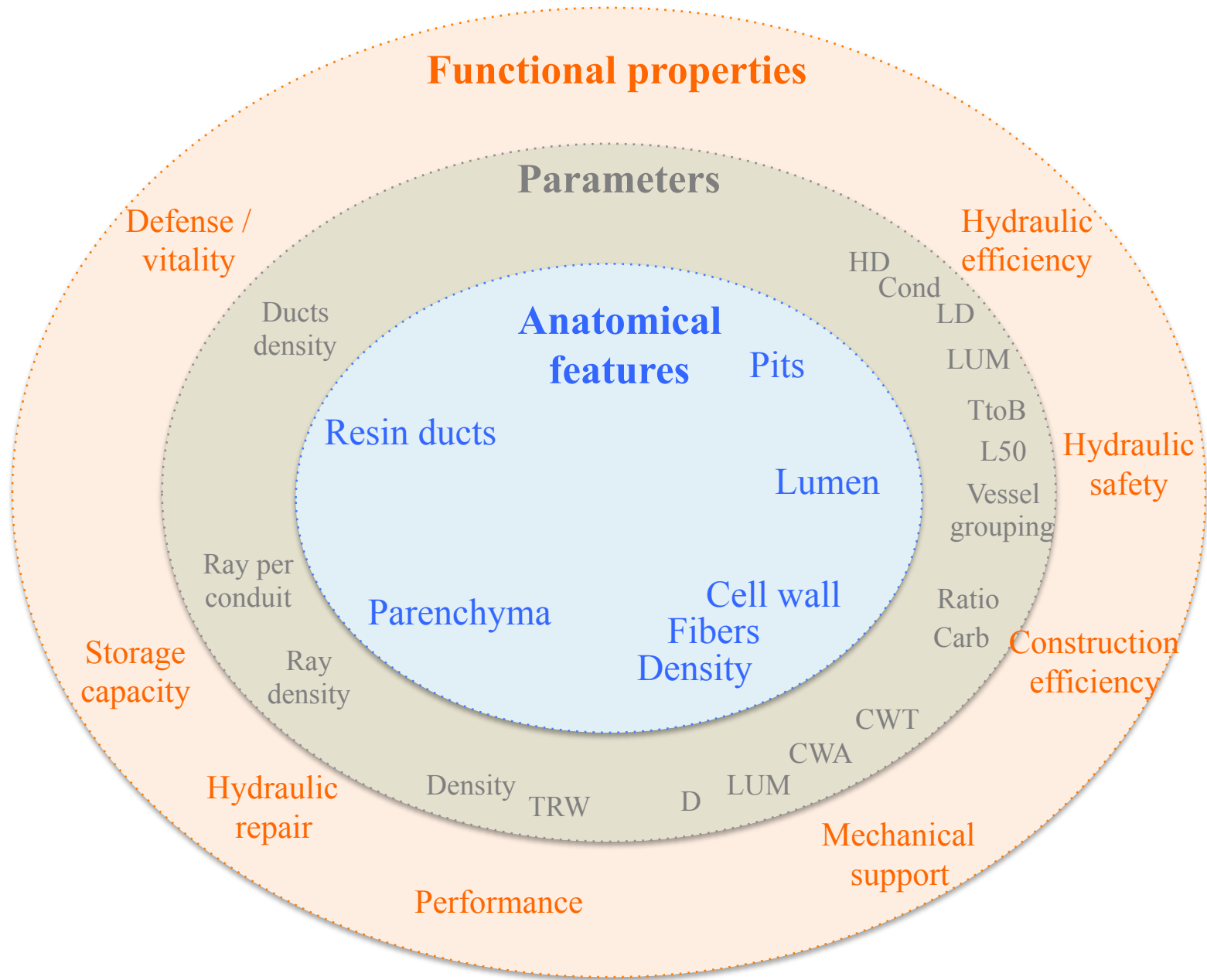
b) Functions

c) Structures

d) Information







parameter refer to: Cell = relative to each single measured tracheid, Row = relative to each radial file and then averaged per the files in the ring; Ring = for all cells in the ring, independently from which radial file the cells belong to. ET = Earlywood tracheids; LT = Latewood tracheids.

Code	Description	Unit	Formula	Level
Anatomical cell parameters				
LUM	Radial lumen diameter	μm	-	Cell
WALL	Radial double wall thickness	μm	-	Cell
D	Radial diameter	μm	D=LUM+WALL	Cell
Derived tree-ring parameters				
Growth performance				
TRW	Tree-ring width	mm	Σ D	Row
EWW	Earlywood width	mm	Σ D _E	Row
LWW	Latewood width	mm	Σ D _E	Row
NT.E	Number of ET	-	-	Row
NT.L	Number of LT	-	-	Row
Hydraulic efficiency				
MTD.E	Diameter of ET	μm	mean (D _E)	Row
MTLUM.E	Lumen diameter of ET	μm	mean (LUM _E)	Row
MaxLUM.E	Lumen diameter of the largest ET	μm	max (LUM _E)	Ring
LUM90.E	Lumen diameter of the 90 th percentiles of ET	μm	q ₉₀ (LUM _E)	Ring
Cond.E	Hydraulic conductivity of ET	μm ⁴	sum (LUM _E ⁴)	Row
Cond5.E	Hydraulic conductivity of the 5 largest ET	μm ⁴	sum (LUM _{E1-E5} ⁴)	Ring
HD.E (d _h)	Hydraulic conduit diameter of ET	μm	sum (LUM _E ⁵) / sum (LUM _E ⁴)	Row
Hydraulic safety and mechanical support				
MTD.L	Diameter of LT	μm	mean (D _L)	Row
MTLUM.L	Lumen diameter of LT	μm	mean (LUM _L)	Row
MTWALL.E	Wall thickness of ET	μm	mean (WALL _E)	Row
MaxWALL.E	Wall of the thickest ET	μm	max (WALL _E)	Ring
MaxWALL.L	Wall of the thickest LT	μm	max (WALL _L)	Ring
WALL90.E	Wall thickness of the 90 th percentile of ET	μm	q ₉₀ (WALL _E)	Ring
WALL90.L	Wall thickness of the 90 th percentile of LT	μm	q ₉₀ (WALL _L)	Ring
MTWALL.L	Wall thickness of LT	μm	mean(WALL _L)	Row
CWA.E	Cell wall area of ET	μm ²	mean (WALL _E *(T _E +D _E -WALL _E))	Row
<i>T = tracheid tangential thickness = 30.μm</i>				
CWA.L	Cell wall area of LT	μm ²	mean (WALL _L *(T _L +D _L -WALL _L))	Row
<i>T = tracheid tangential thickness = 30.μm</i>				
TtoB	Cell wall reinforcement as “thickness to span ration” (t/b) _h ² (Hacke et al., 2001)	-	mean (2*WALL/LUM) _(Dh±10.μm) ²	Ring
<i>Dh = hydraulic conduit diameter</i>				
PerLW	Percentage of latewood width	%	LTW/TRW	Row
LUMrange.E	Range between 10 th and 90 th percentiles of ET lumen diameter	μm	q ₉₀ (LUM _E) – q ₁₀ (LUM _E)	Ring
WALLrange.E	Range between 10 th and 90 th percentiles of ET wall thickness	μm	q ₉₀ (WALL _E) – q ₁₀ (WALL _E)	Ring
L50	Tracheid lumen by 50% loss of conductivity	μm	LUM _E by 50% Cond.E	Ring
Construction costs				
Ratio5.E	Ratio LUM/WALL of the 5 largest ET	-	mean (LUM _{E1-E5} / LUM _{E1-E5})	Ring

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