

Rekonstruktion von Blutgefäßnetzwerken

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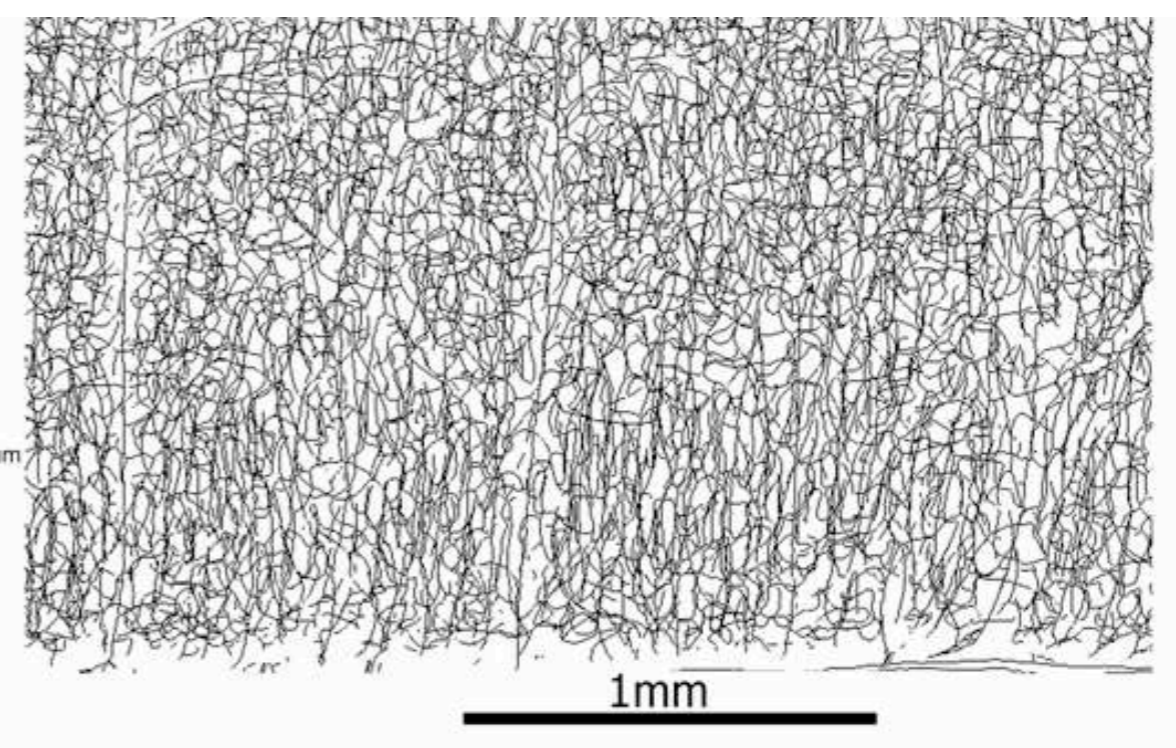
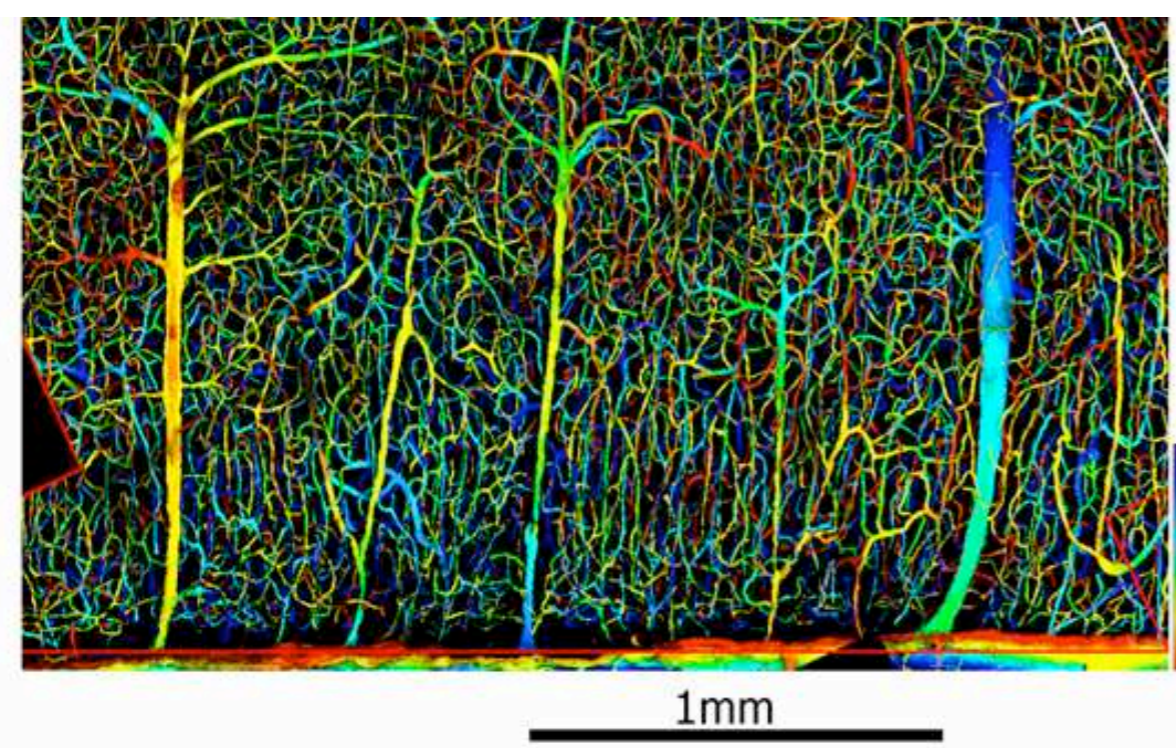
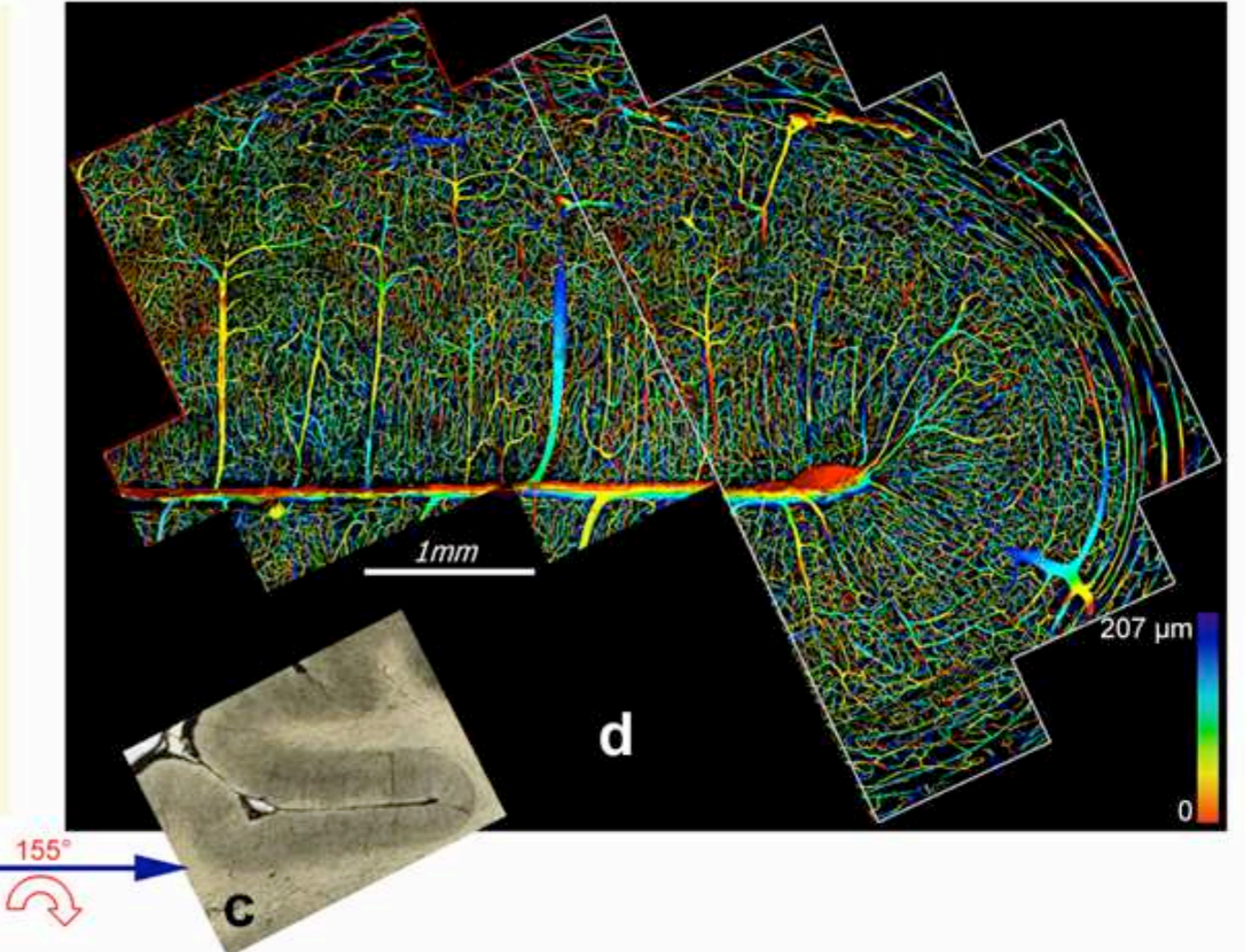
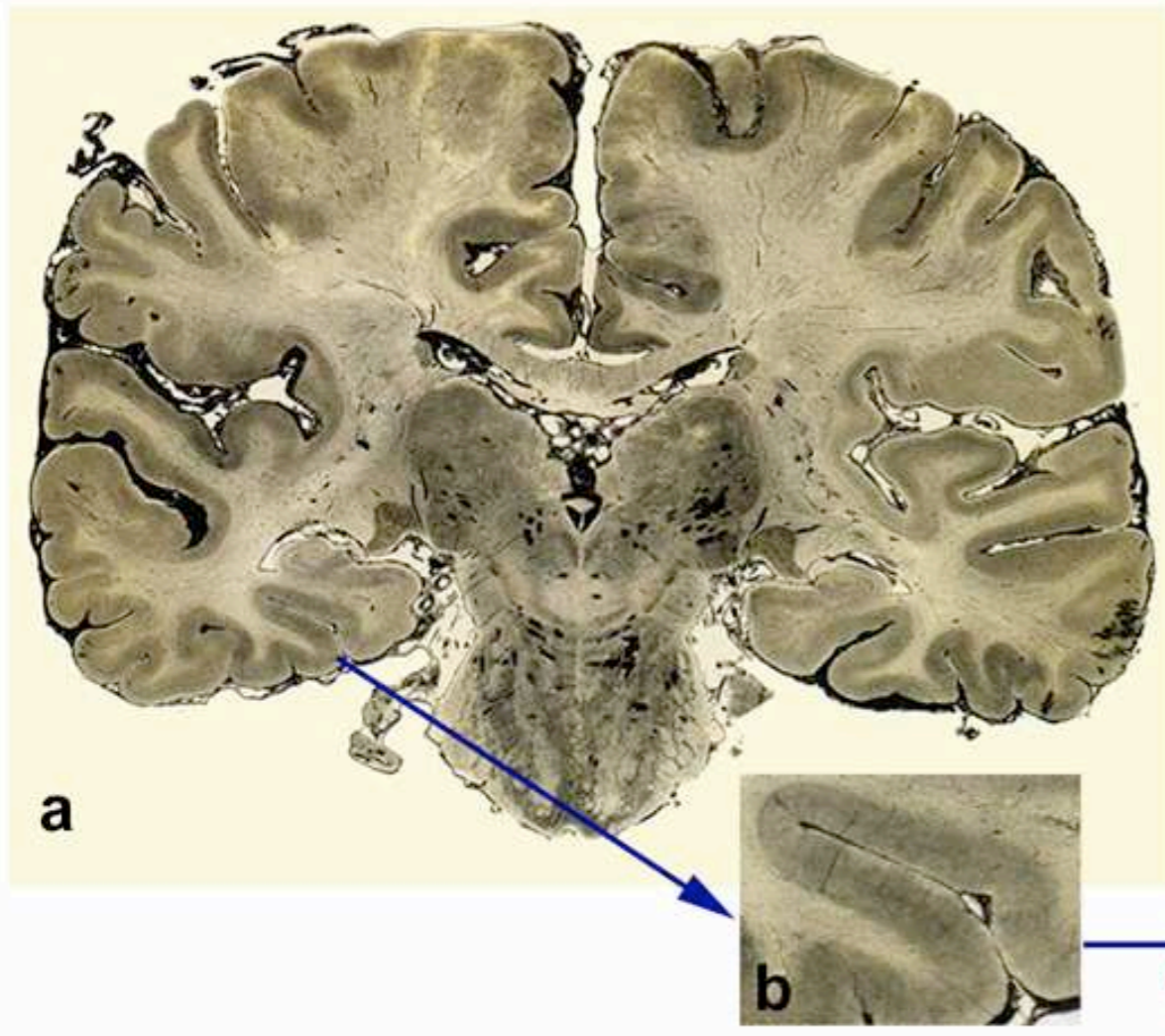
Ziele, Methoden

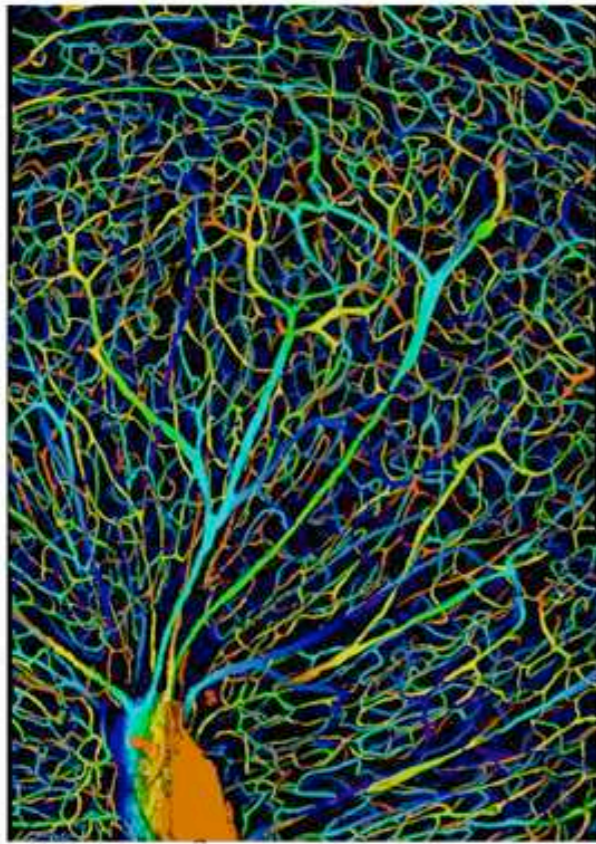
Ziele, Methoden

Besseres Verständnis der
Blutmikrozirkulation im Gehirn zur
Interpretation funktioneller bildgebender
Verfahren

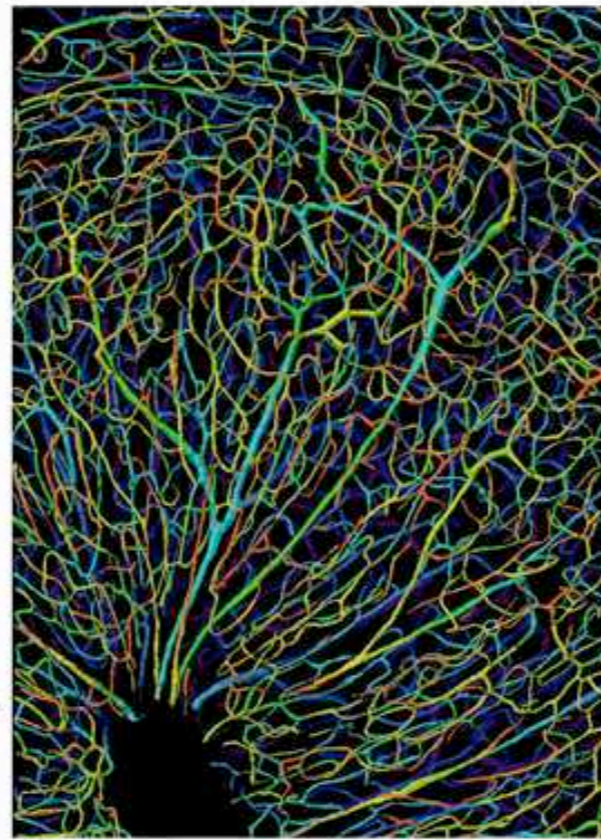
Automatische Extraktion von Mittellinien
und Durchmessern aus Konfokalmikroskopie
Aufnahmen von Mikrogefäßen im Gehirn

Quantitative Analyse der Netzwerke





a

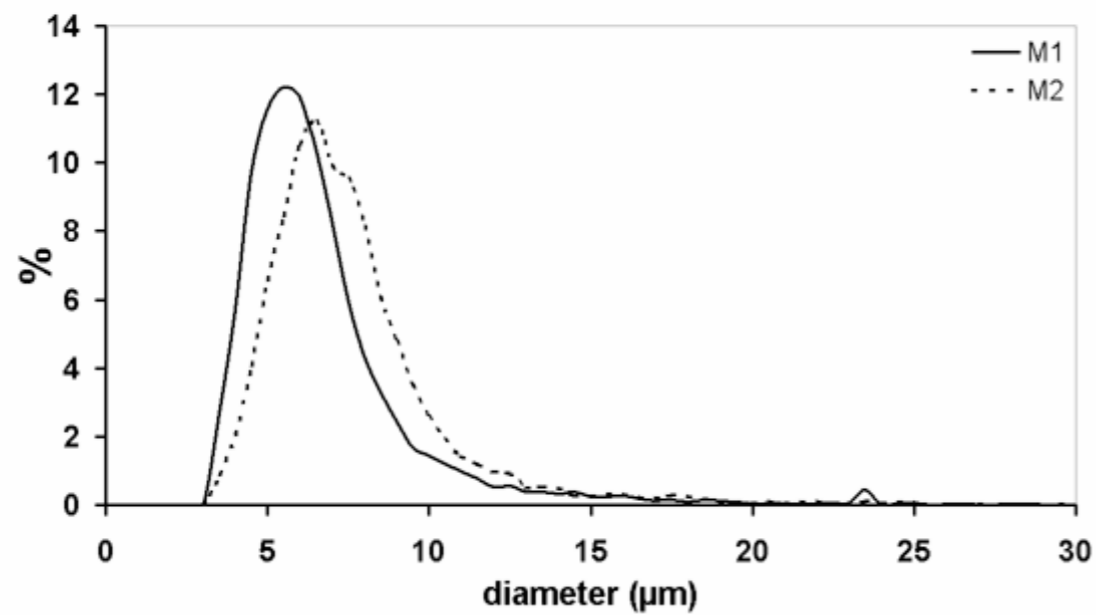


b

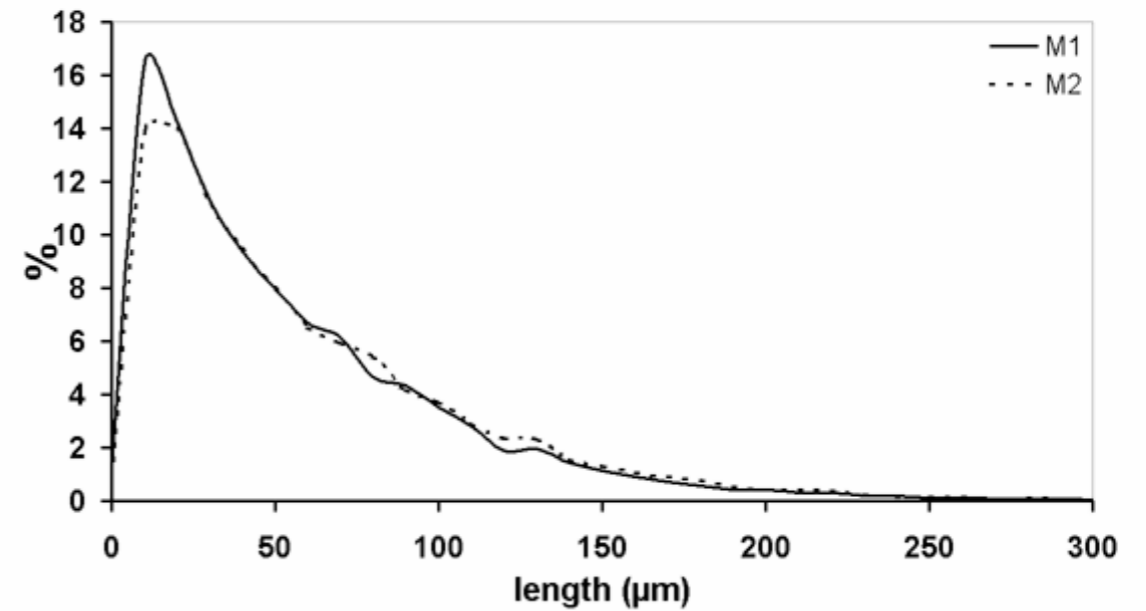


c

Frequency distribution of diameters



Frequency distribution of lengths



Workflow

Workflow

Konfokalmikroskopie in Blöcken

Filterung der Blöcke

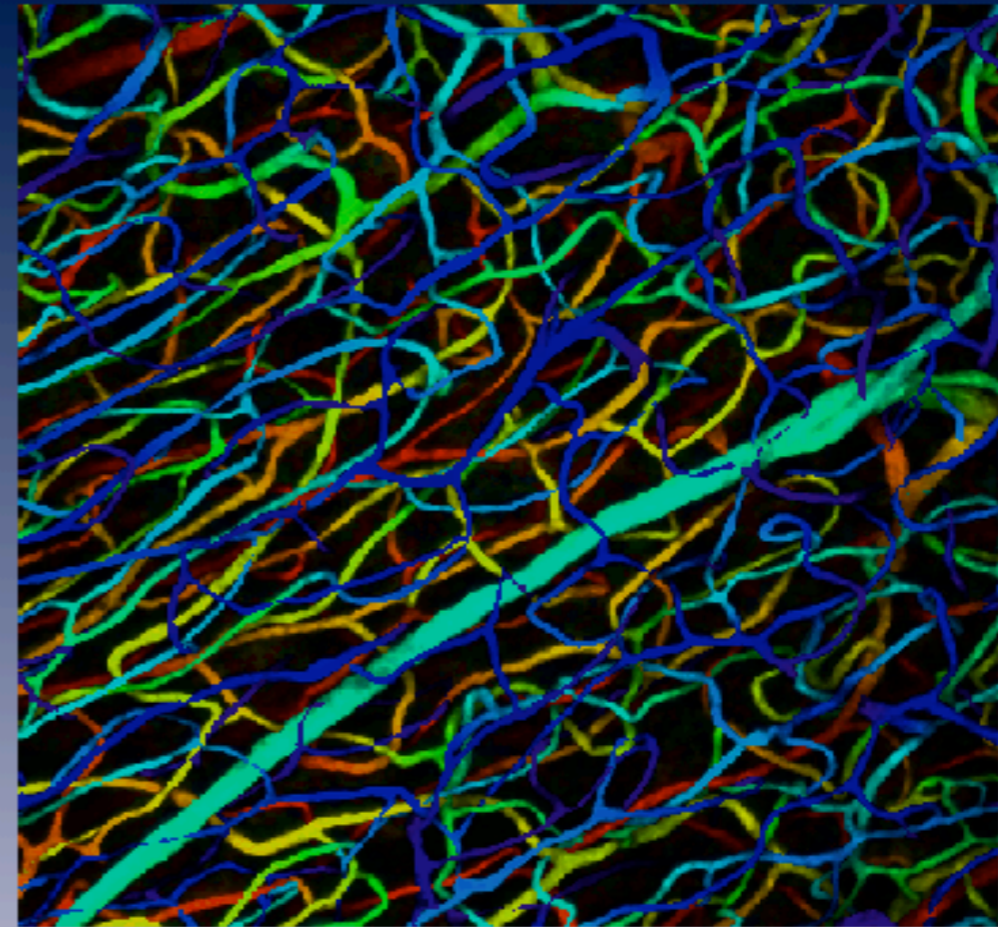
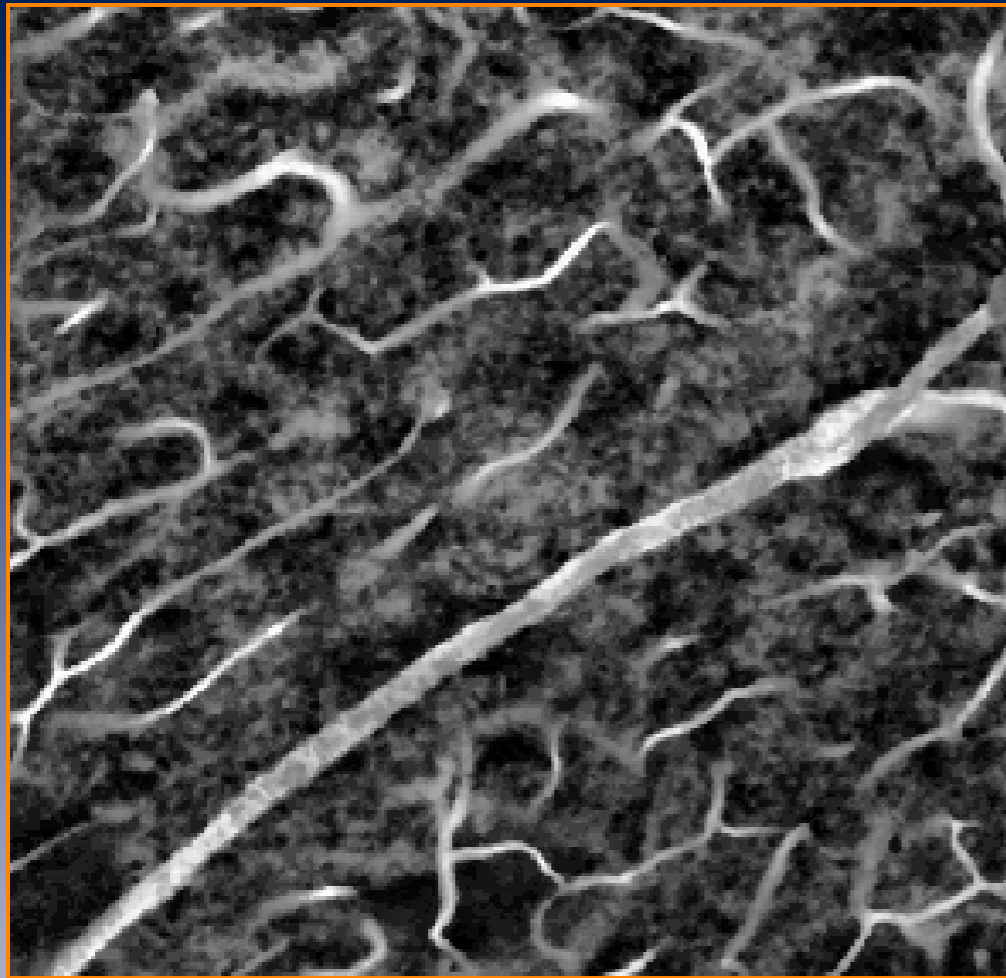
Zusammenfügen zu „out-of-core“ Volumen

Segmentierung

Skelett-Extraktion (Thinning)

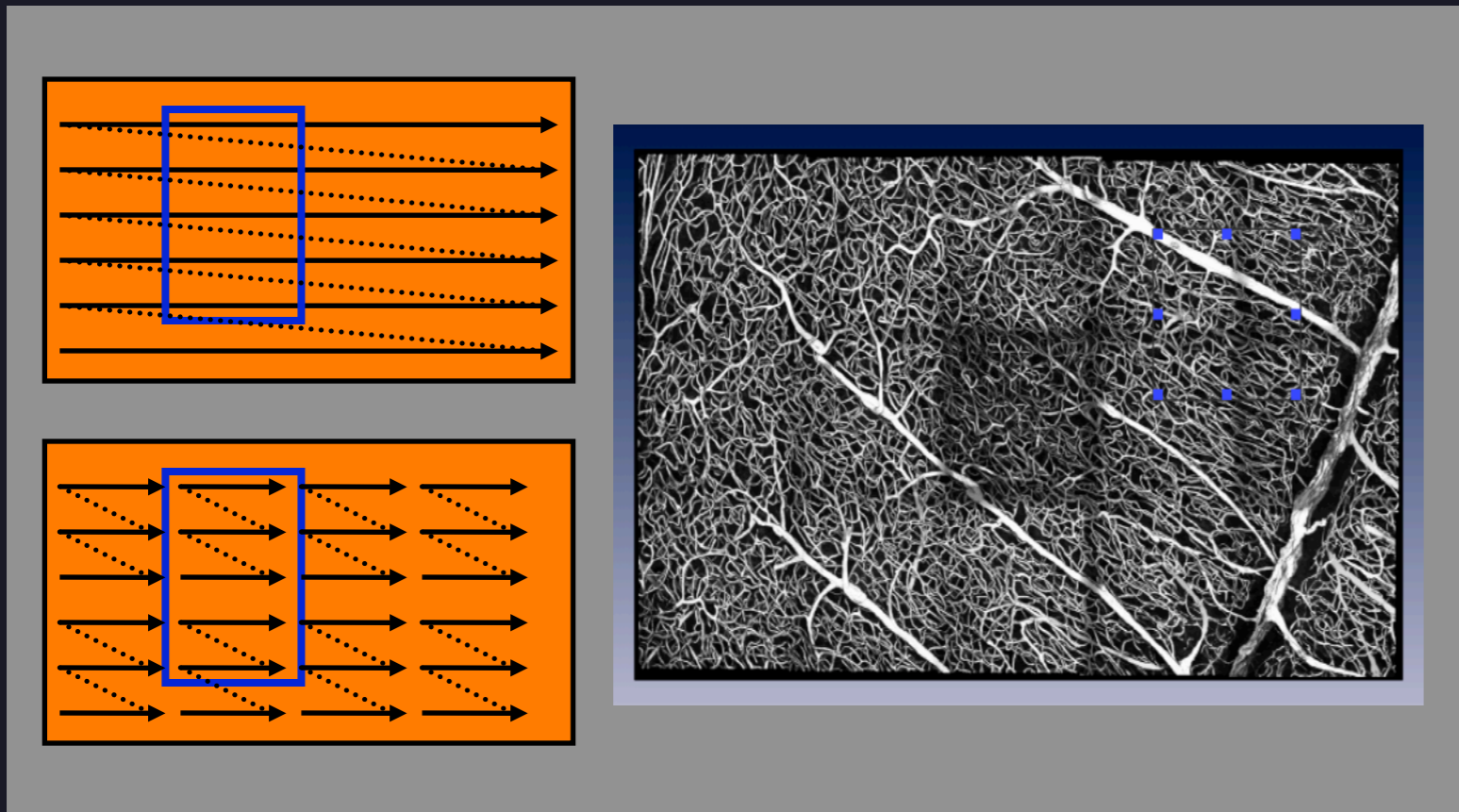
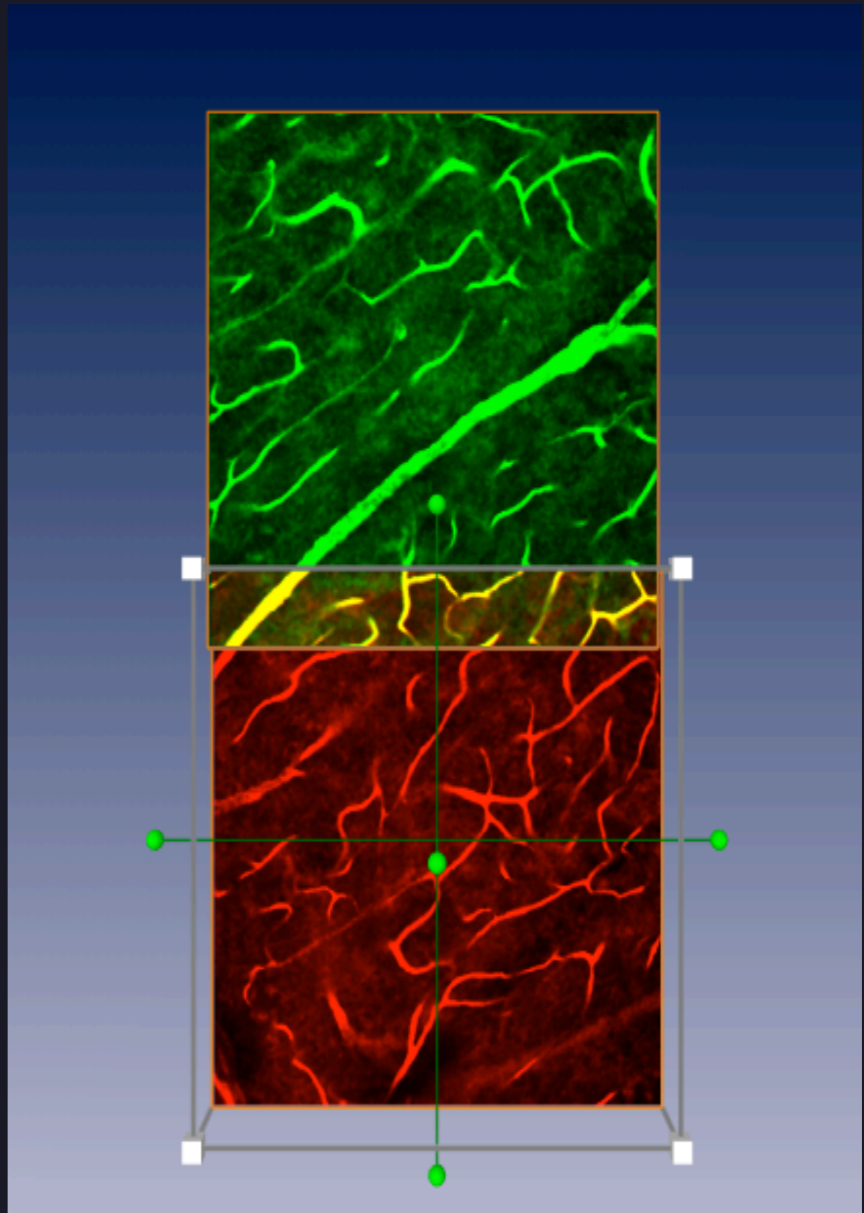
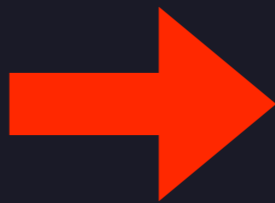
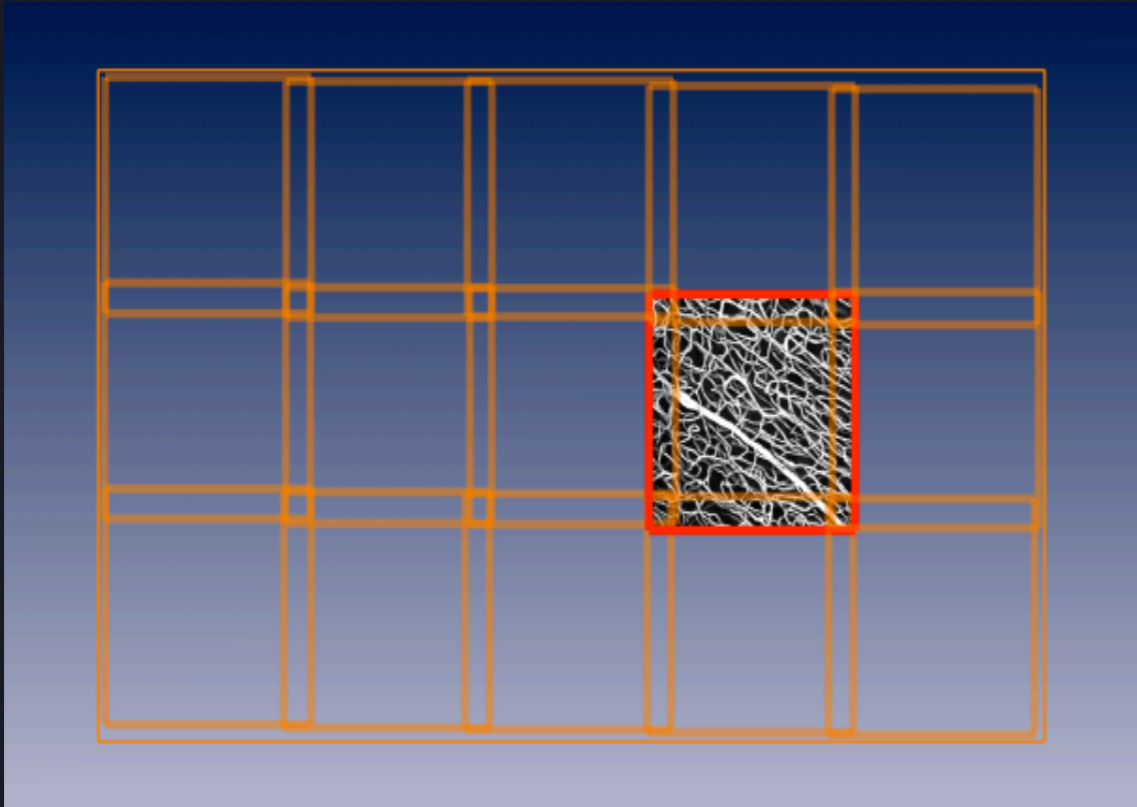
Quantitative Analyse

Daten- Vorverarbeitung



$1,22 \times 1,22 \times 3 \mu\text{m}$ Voxelsize

100 Blöcke zu $512 \times 512 \times 70$ Slices



Mittellinien

Mittellinien, Thinning

Jeweils für „out-of-core“ Volumen

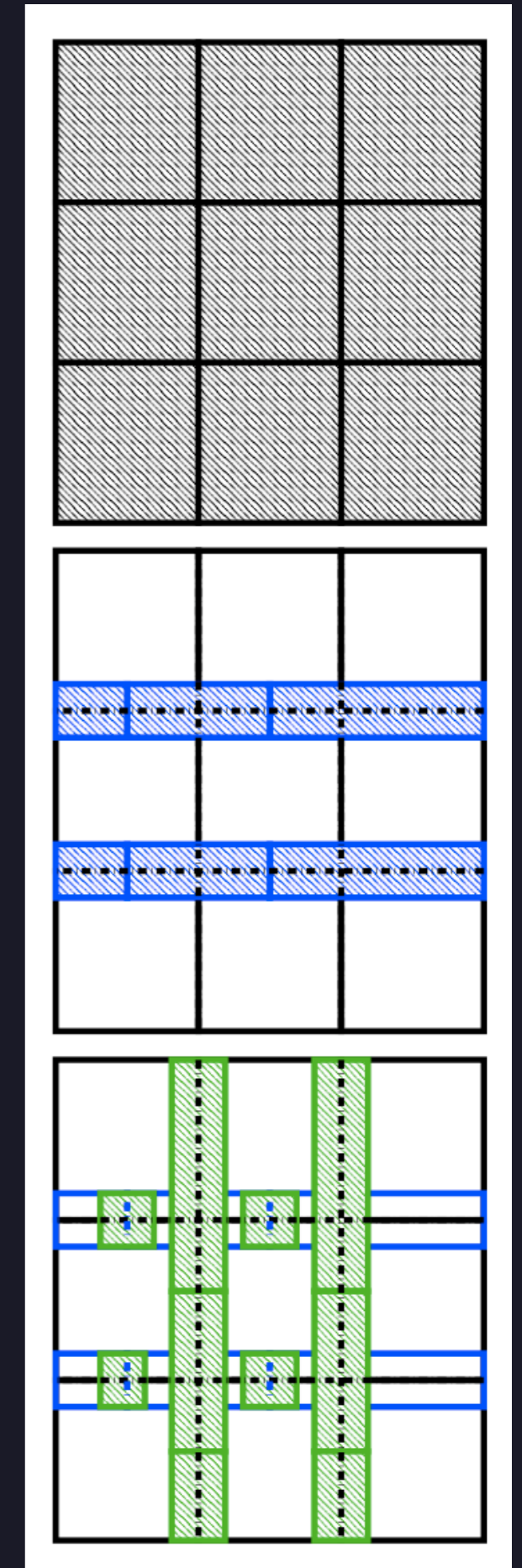
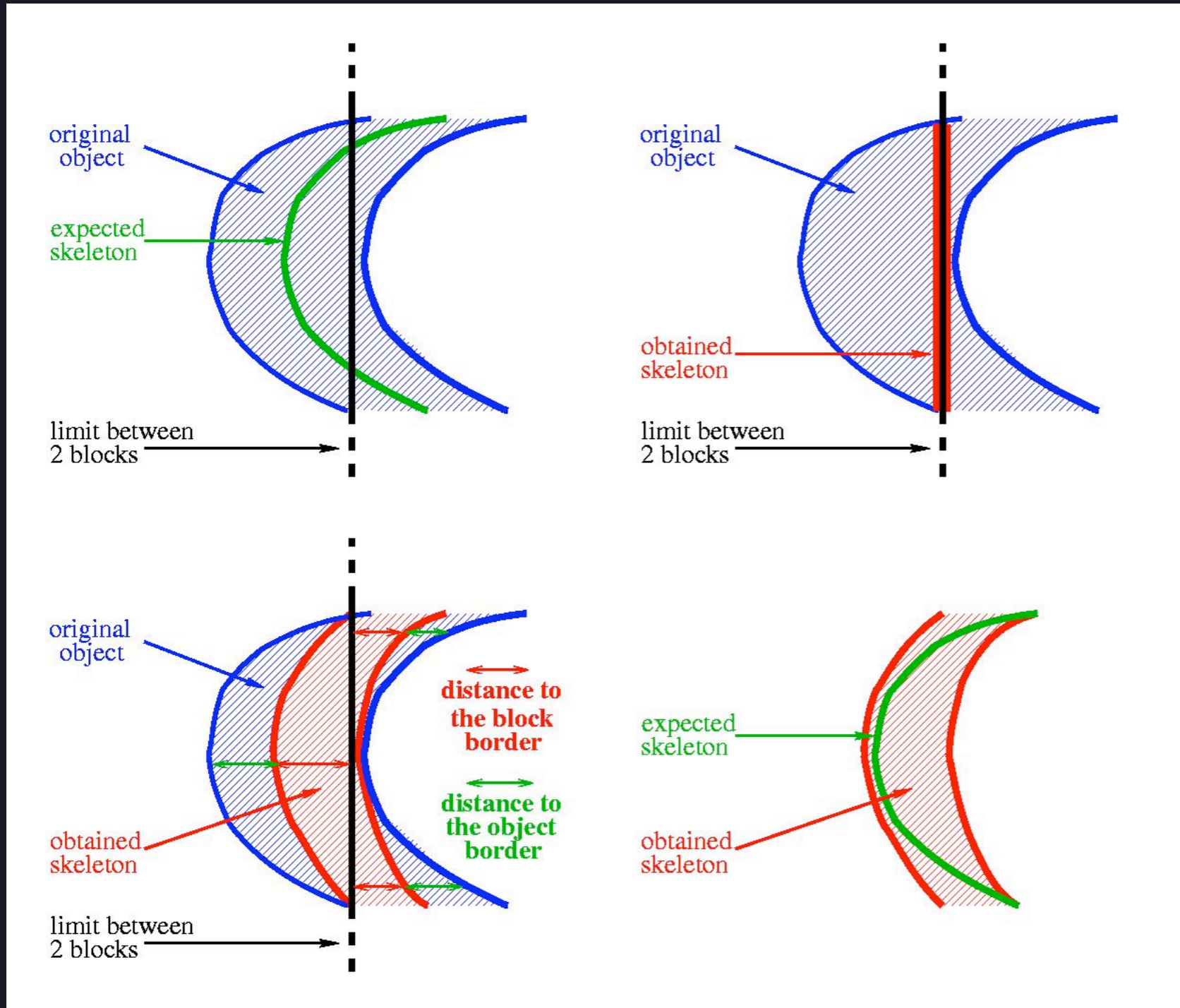
Distanzfeld

Thinning

Bekannte Verfahren erweitert auf
blockweise Berechnung

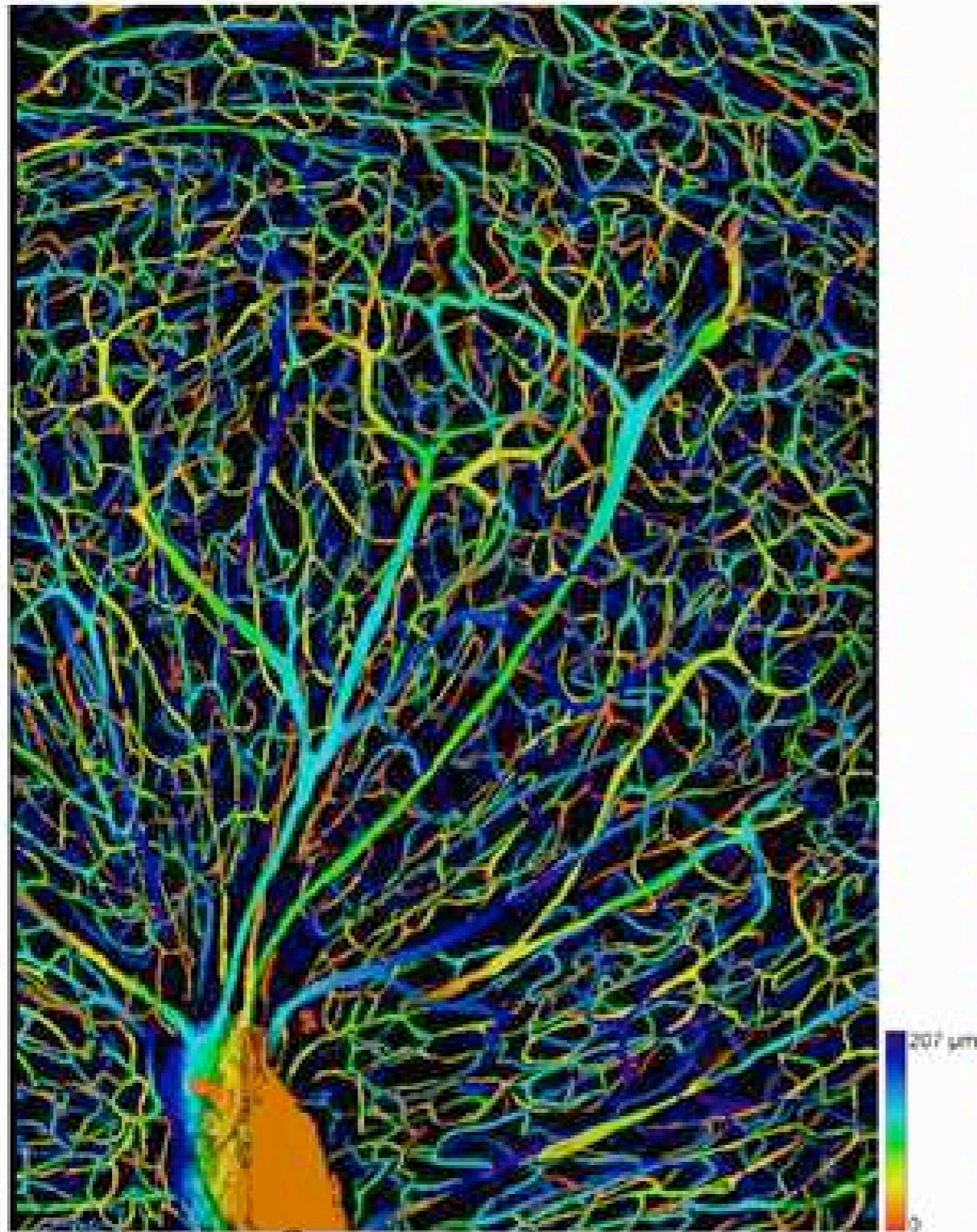
Spezielle Behandlung der Grenzen

Thinning

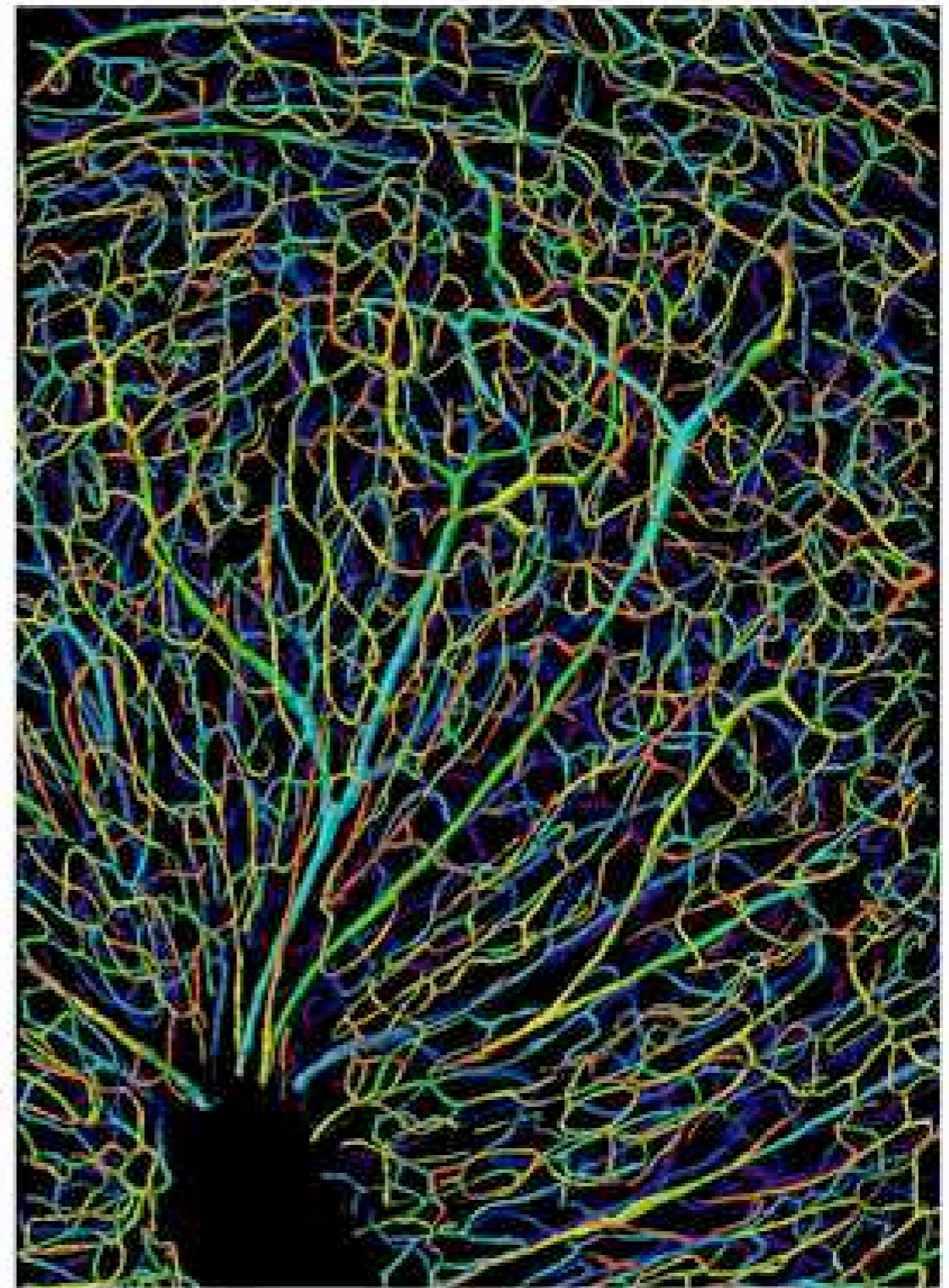


Originaldaten

Rekonstruktion



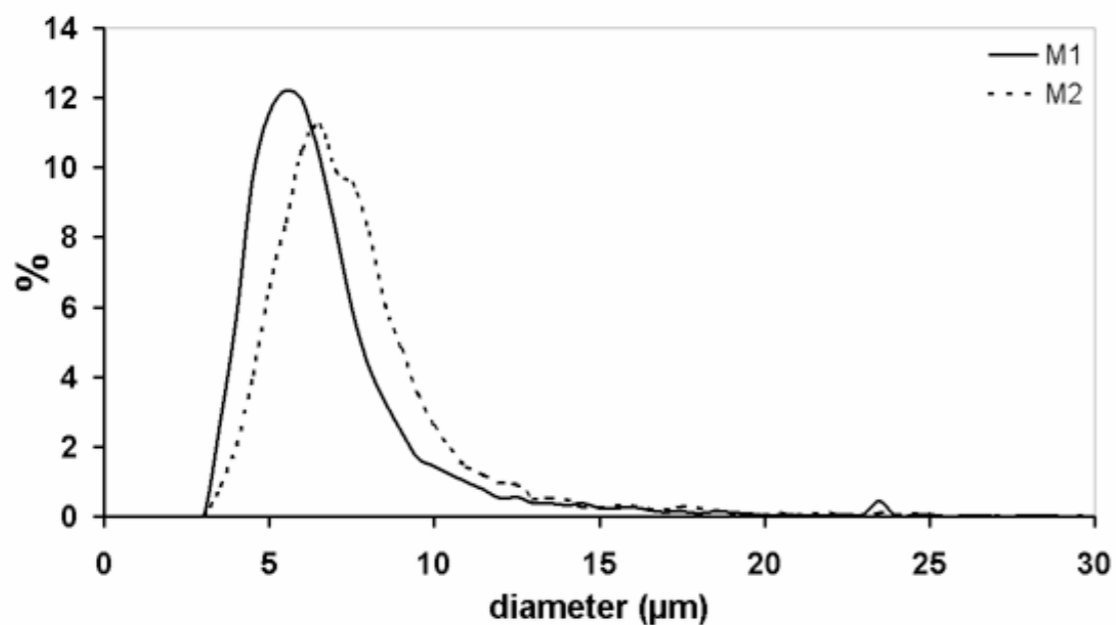
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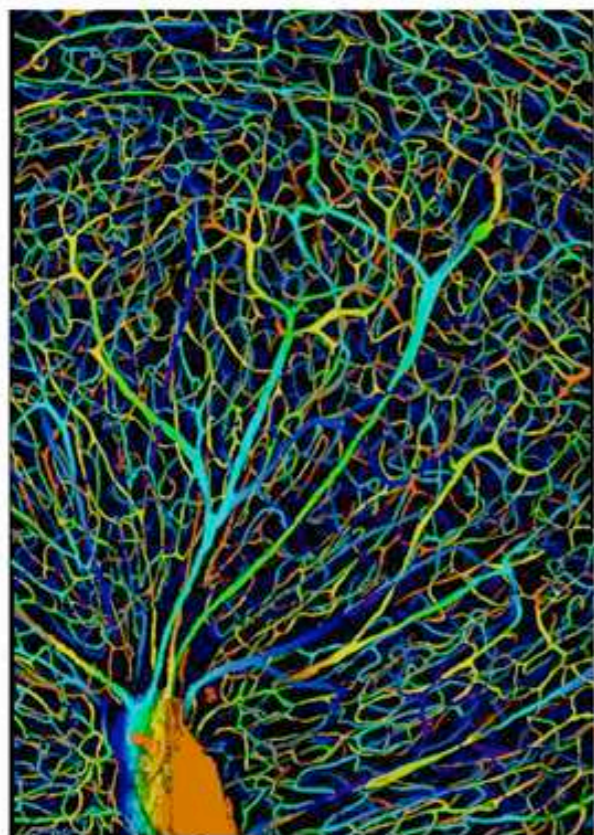
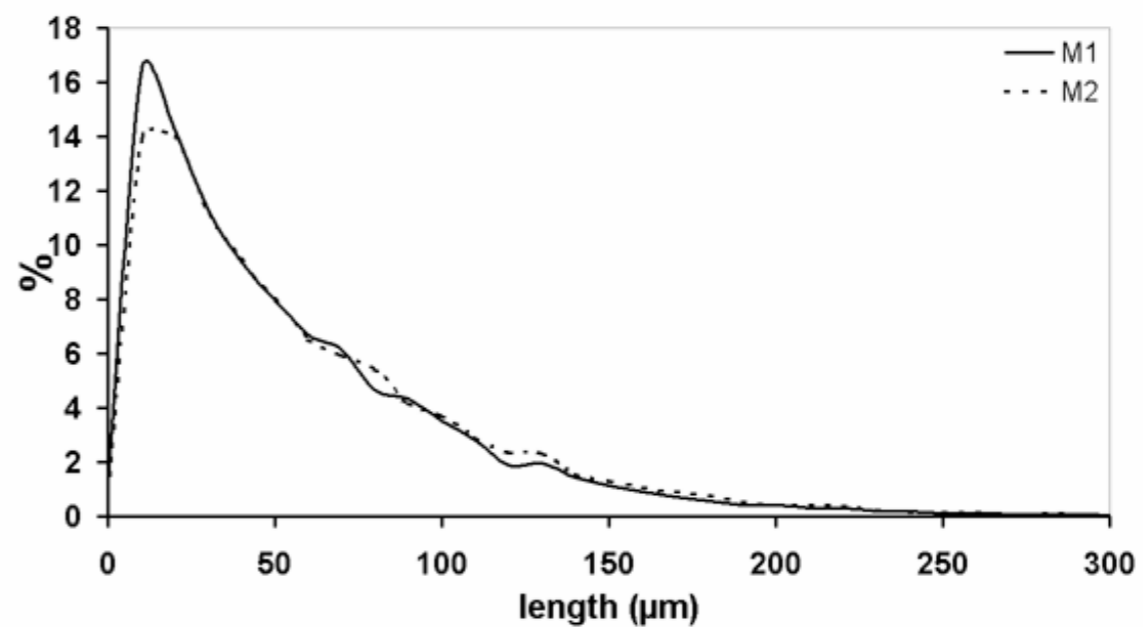
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Quantitative Analyse

Frequency distribution of diameters



Frequency distribution of lengths



a

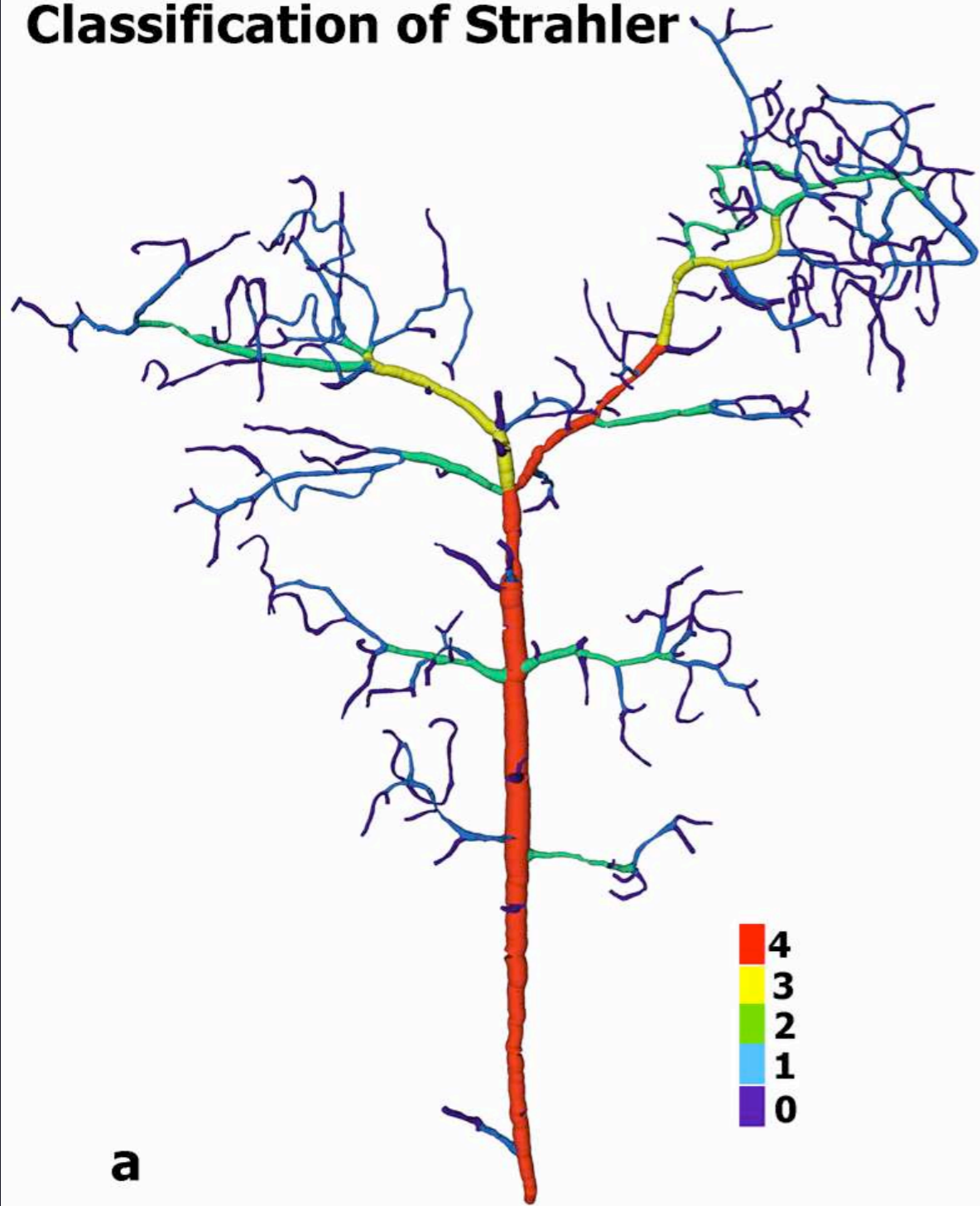


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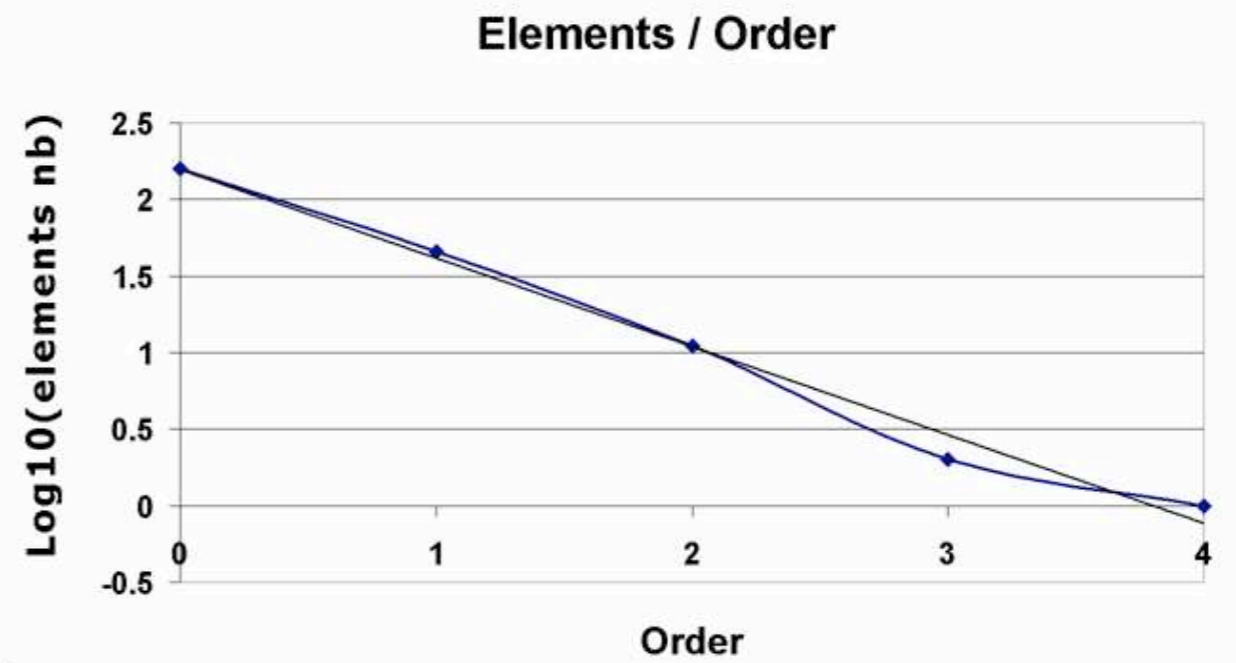
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Classification of Strahler

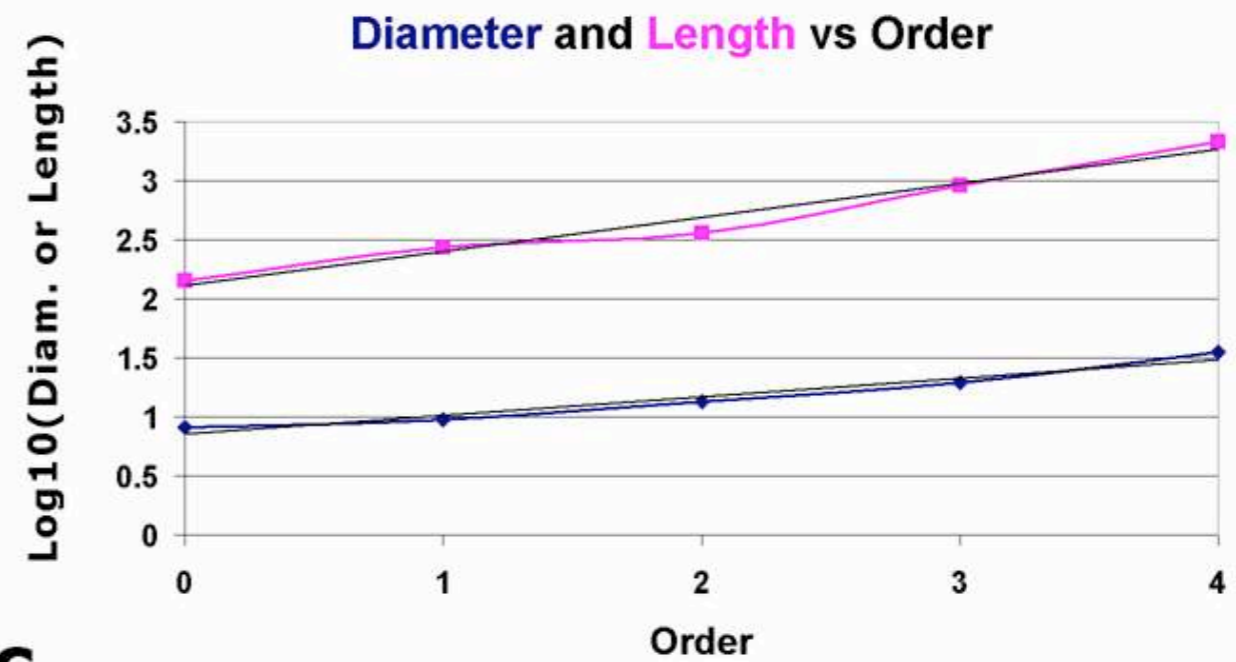


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Horton's law

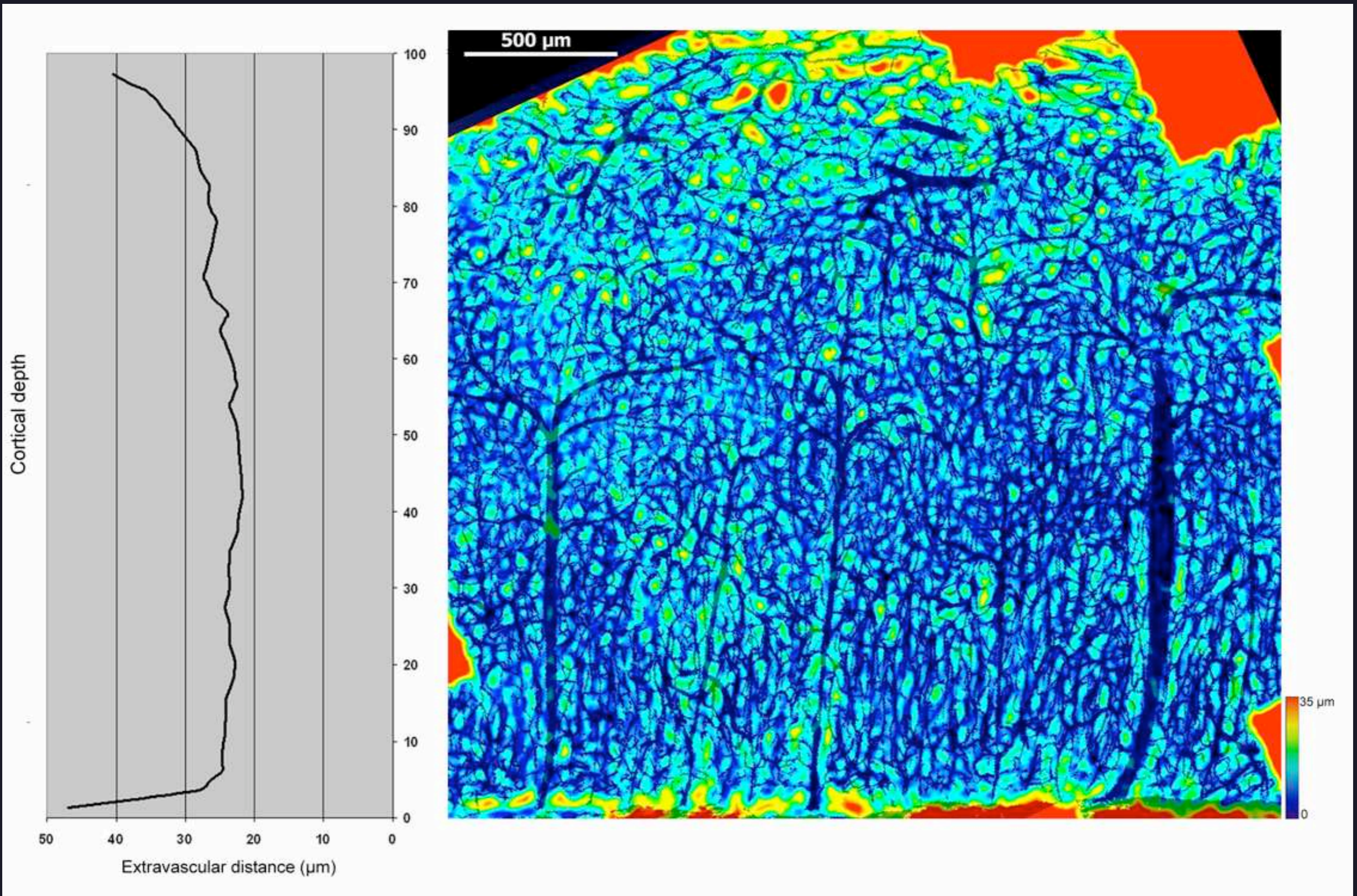


b



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Gefäßabstand



Zusammenfassung

Automatische Extraktion von Mittellinien
und Durchmessern aus Konfokalmikroskopie
Aufnahmen von Mikrogefäßen im Gehirn

Blockweise Aufnahme wird zu „out-of-core“
Volumen zusammengefügt

Distanzfeld und Thinning für Daten die
Hauptspeicher übersteigen

Quantitative Analyse der Netzwerke

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[1] C. Fouard, G. Malandain, S. Prohaska, M. Westerhoff, F. Cassot, C. Mazel, D. Asselot, and J.-P. Marc-Vergnes. Skeletonization by blocks for large 3D datasets: Application to brain microcirculation. In IEEE International Symposium on Biomedical Imaging (ISBI '04), 2004.

[1] F. Cassot, F. Lauwers, C. Fouard, S. Prohaska, and V. Lauwer-Cances. A novel three-dimensional computer assisted method for a quantitative study of microvascular networks of the human cerebral cortex. Microcirculation, accepted for publication, 2005.