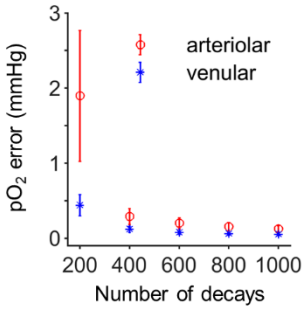
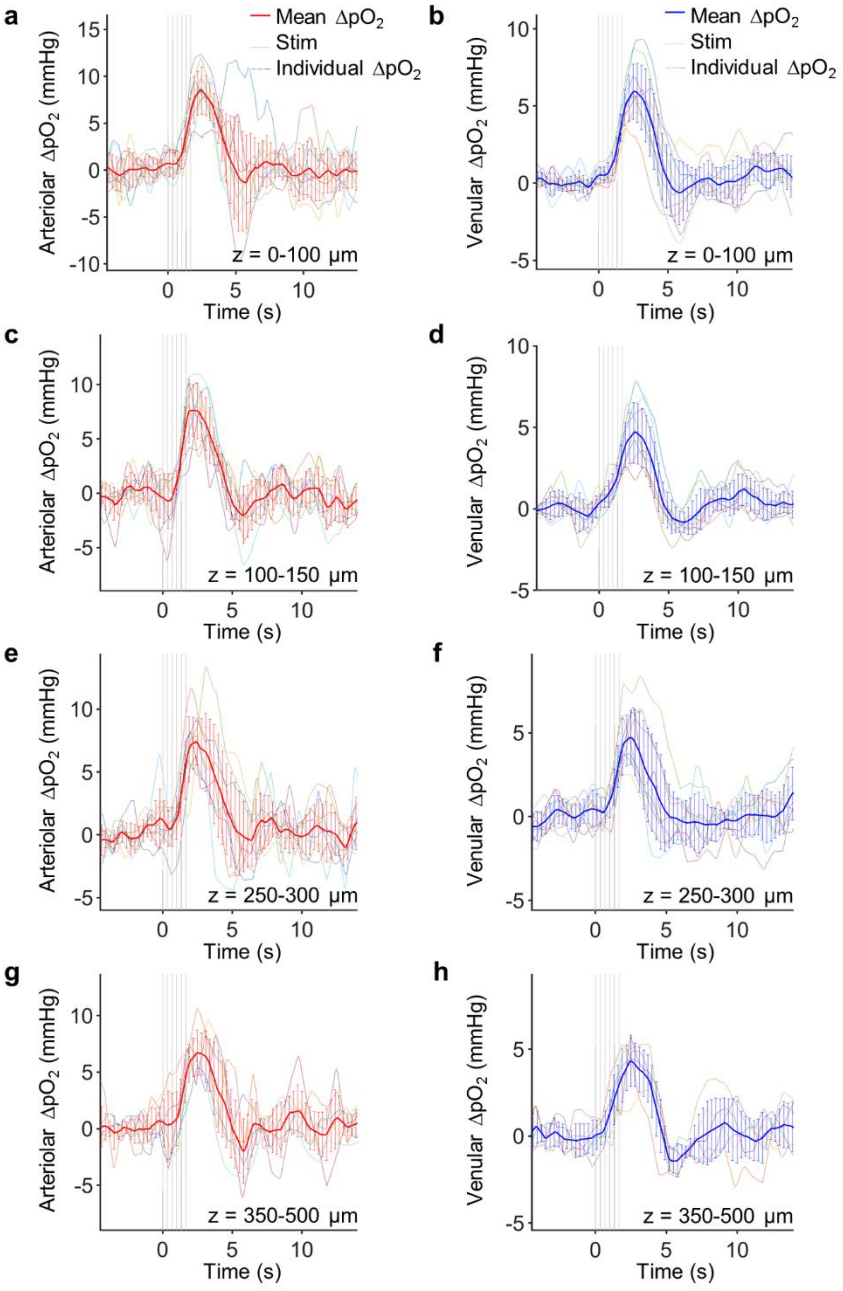
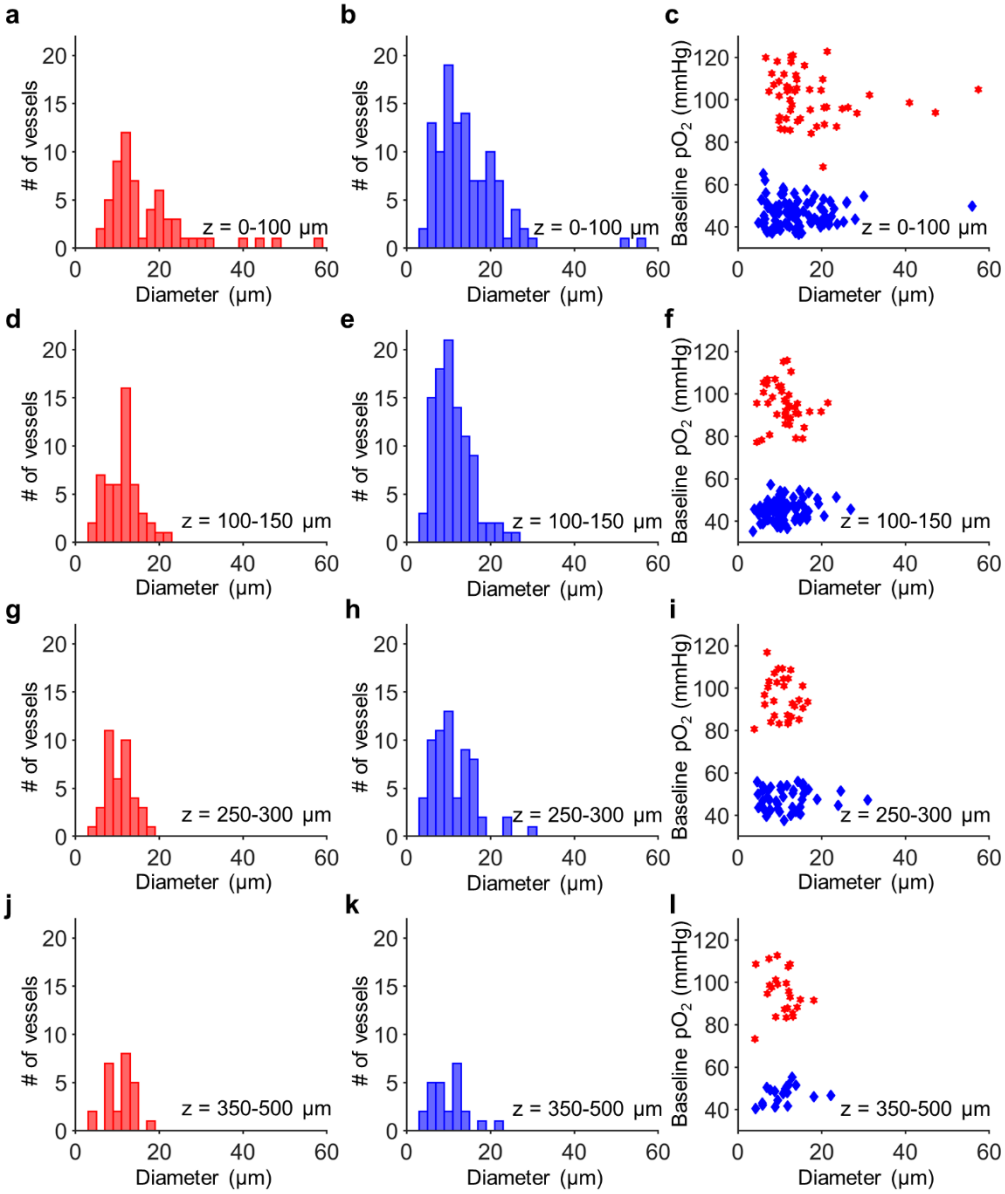
Supplementary Material



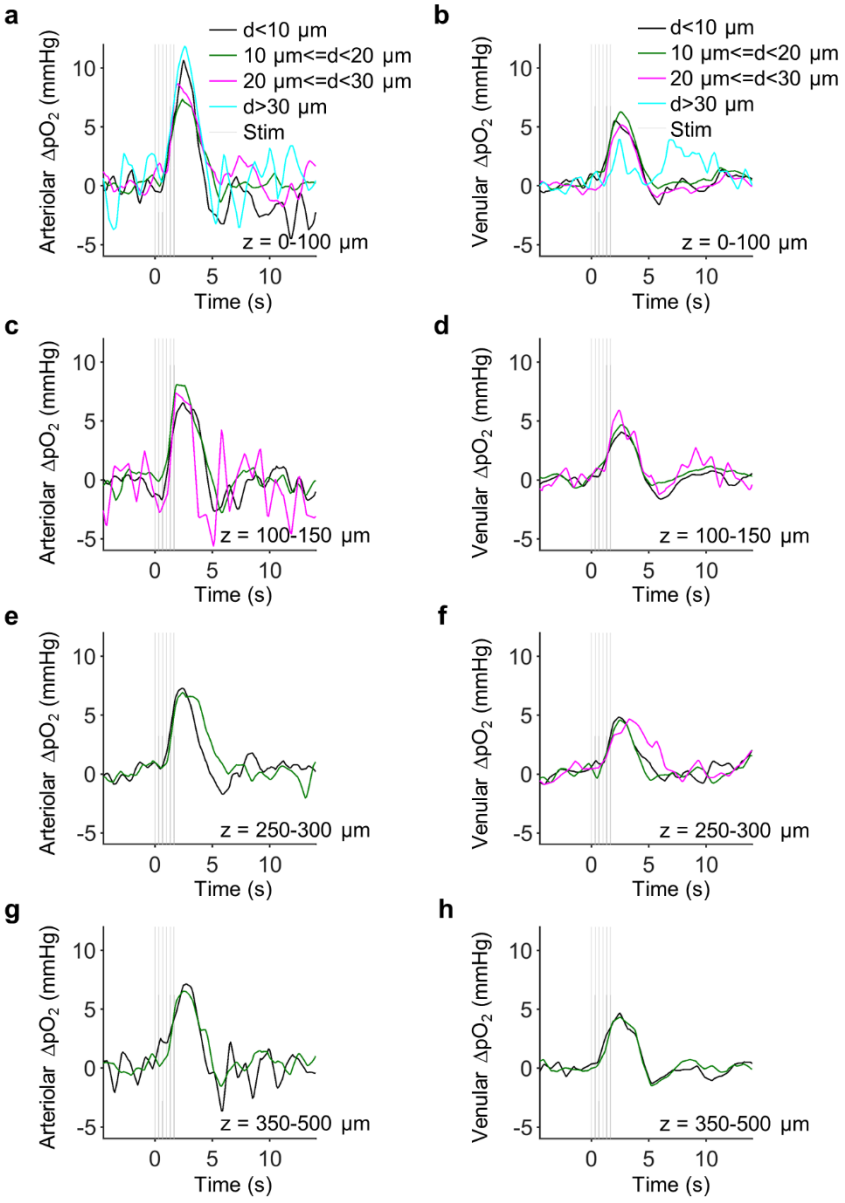
Supplementary Figure 1. pO_2 error as a function of number of decays. Although the error is higher for measurements performed in arteriole, both the venular and arteriolar pO_2 error dropped below 0.5 mmHg when ≧400 decays were averaged. The measurements were done in a diving arteriole and surfacing venule of an awake mouse at cortical depth of 600 μm. Error bars are the standard deviation across repeated (n=3) measurements.


a
b
c
d
e
f
g
h
Mean ΔpO2
Stim
Individual ΔpO2
Arteriolar ΔpO2 (mmHg)
Venular ΔpO2 (mmHg)
Time (s)
z = 0-100 μm
z = 100-150 μm
z = 250-300 μm
z = 350-500 μm

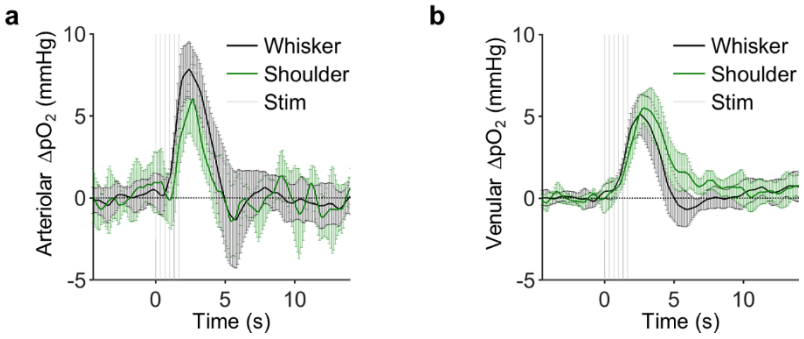
Supplementary Fig. 2. Intravascular ΔpO_2 transients during whisker stimulation are fairly similar across cortical depths (0-100, 100-150, 250-300, and 350-500 µm). (a, c, e, and g) ΔpO_2 transients in arterioles of individual animals (thin lines), the mean and standard deviation across animals (red thick line with error bars), and (b, d, f, and h) ΔpO_2 transients in venules of individual animals (thin lines), the mean and standard deviation across animals (blue thick line with error bars).Note how the response amplitude and time vary across animals. In some animals a secondary peak at t>=7 s was observed due to voluntary whisking. Numbers of mice that were measured for each cortical depth categories were: n = 10 at z = 0-100 µm, n = 9 at z = 100-150 µm, n = 9 at z = 250-300 µm, and n = 7 at z = 350-500 µm.


a
b
c
d
e
f
g
h
i
j
k
l
# of vessels
Baseline pO_2 (mmHg)
Diameter (μm)
z = 0-100 μm
z = 100-150 μm
z = 250-300 μm
z = 350-500 μm

Supplementary Fig. 3. Baseline diameters (d_A and d_V) of penetrating vessels across cortical depths (z). Histograms of arteriolar (a, d, g, and j) and venular (b, e, h, and k) diameters at cortical depths of z = 0-100 µm (d_A=17.3±10.2 µm, d_V =14.5±8 µm; mean±std), z =100-150 µm (d_A=11.1±3.9 µm, d_V =11±4.5 µm), z = 250-300 µm (d_A=10.6±3.2 µm, d_V =11.1±5.2 µm), and 350-500 µm (d_A= 10.6±3.3 µm, d_V = 10.1±4.2 µm). (c, f, i, and l) For vessels at each cortical depth, corresponding baseline pO_2 vs. diameter values are plotted.


a
b
c
d
e
f
g
h
d<10 µm
10 µm<=d<20 µm
20 µm<=d<30 µm
d>30 µm
Stim
Arteriolar ΔpO2 (mmHg)
Venular ΔpO2 (mmHg)
Time (s)
z = 0-100 µm
z = 100-150 µm
z = 250-300 µm
z = 350-500 µm

Supplementary Fig. 4. Intravascular ΔpO_2 transients during whisker stimulation across cortical depths did not show significant differences when grouped into diameter ranges of d<10 µm (black), d=10-20 µm (green), d=20-30 µm (magenta), and d>30 µm (cyan). Similar to Suppl. Fig. 2, ΔpO_2 responses in penetrating arterioles (a, c, e, and g) and venules (b, d, f, and h) are shown across cortical depths of 0-100, 100-150, 250-300, and 350-500 µm.



Supplementary Fig. 5. Mean ΔpO_2 transients during whisker and shoulder stimulation. The average (a) arteriolar and (b) venular ΔpO_2 over depths of z = 0, 100-150, and 250-300 µm in awake mice during whisker (black, n=10) vs. shoulder (green, n=5) stimulation. Error bars are showing the standard deviation across animals.