

Supplementary Video Legends

S3 and S4 Supplementary Videos The videos illustrate, in a modified time and a colour scale from black (zero) to white (peak tracer concentration), the regional kinetics of the ^{13}N tracer in an asthmatic subject at baseline (**S3**) and after bronchoconstriction by inhalation of methacholine (**S4**). Note that in baseline arrival of the ^{13}N -saline bolus to the right heart is followed by a relatively uniform distribution of the tracer within the lung (with a concentration that is proportional to regional perfusion) and then by an almost complete removal of the tracer by the end of a washout period. In contrast, after bronchoconstriction, the distribution of the tracer (blood flow) is rather heterogeneous and followed by a substantially reduced washout from large contiguous “ventilation defects” encompassing a large fraction of the left lung and a smaller fraction of the right lung.

S6 Supplementary Video Spatial distribution and histogram of terminal unit ventilation in the network model during a slow steady increase in smooth muscle relative activation from 0 to 1.0 (see blue bar). The colour of each unit represents the mean-normalized ventilation. For the range from 0 to 0.8 of smooth muscle activation the video is running with an eight times higher speed to shorten the time without major changes. Note the catastrophic formation of a cluster that enlarges in rapid steps as smooth muscle activation increases further. The histogram to the right demonstrates the changes in ventilation distribution with smooth muscle activation