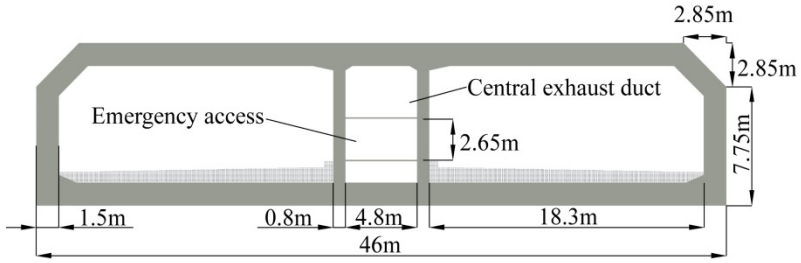
Journal of Zhejiang University-SCIENCE A

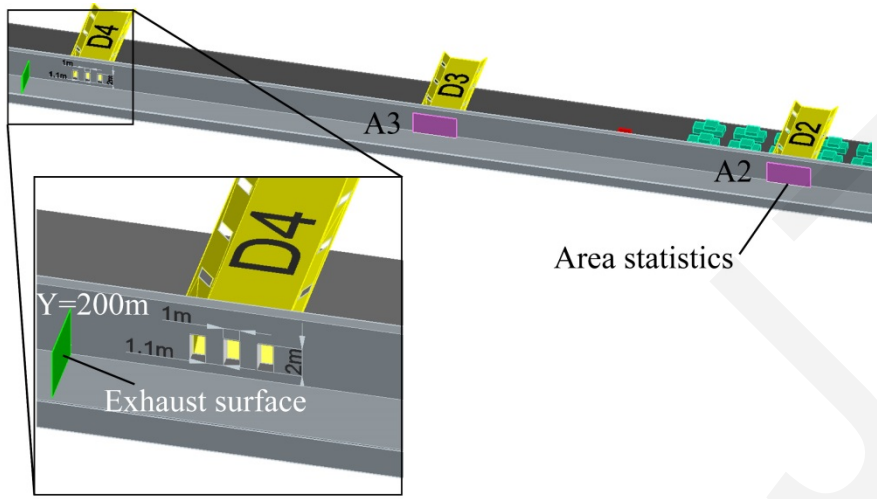
Optimization of smoke exhaust efficiency under a lateral central exhaust ventilation mode in an extra-wide immersed tunnel

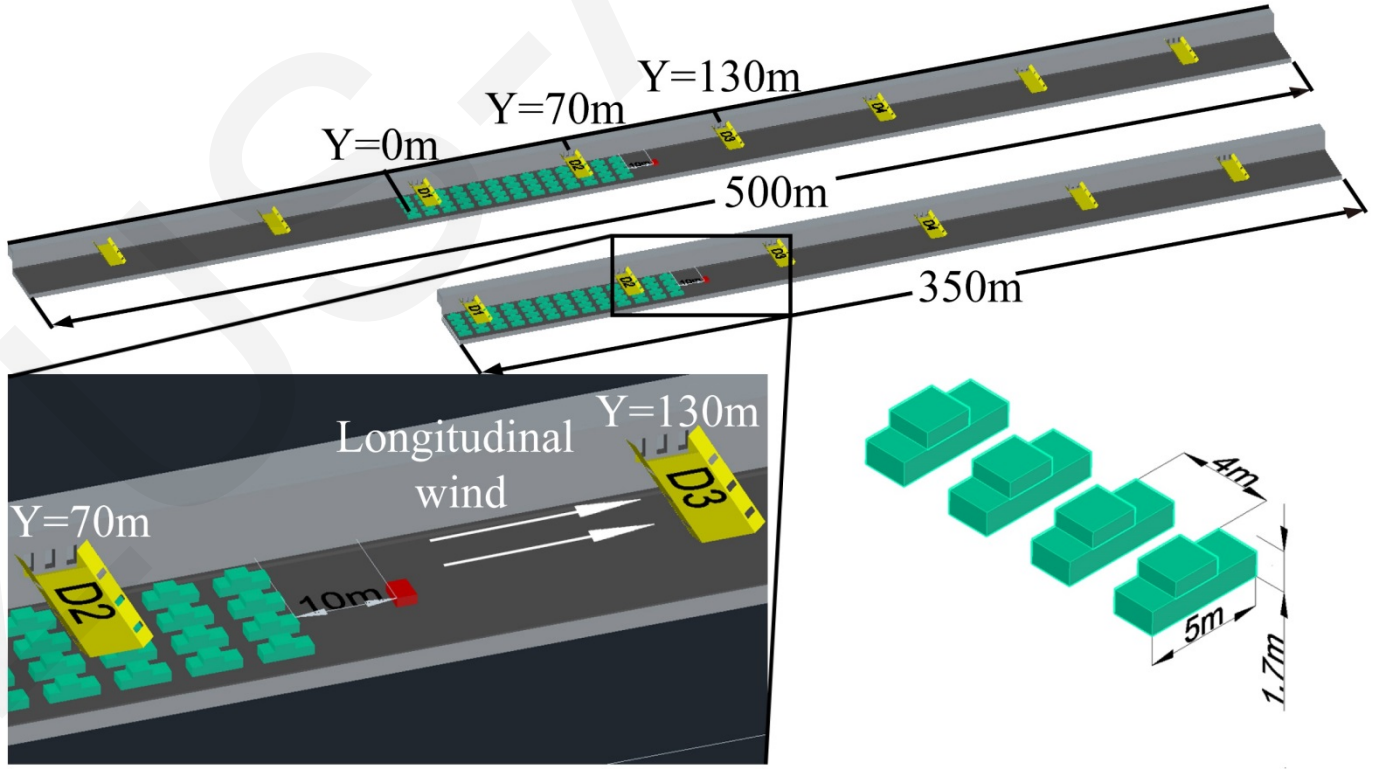
Key words: Tunnel fire; Lateral central smoke exhaust; Supplementary exhaust duct; Large eddy simulation

Cite this as: Song-lin Liu, Liang Wang, Ming-gao Yu, Yong-dong Jiang, 2021. Optimization of smoke exhaust efficiency under a lateral central exhaust ventilation mode in an extra-wide immersed tunnel. *Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)*, 22(5):396-406. https://doi.org/10.1631/jzus.A2000336

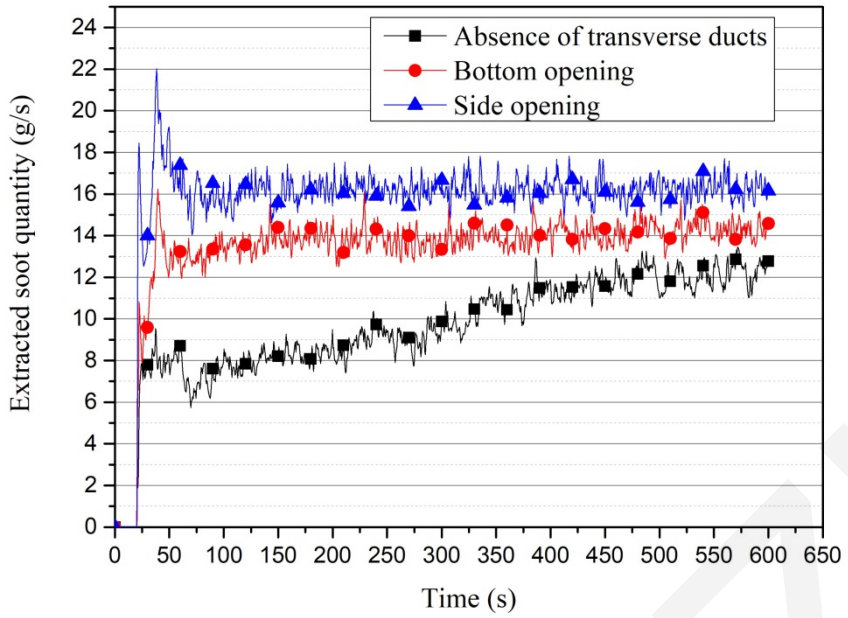
Extra-wide immersed tunnel fire (50MW)

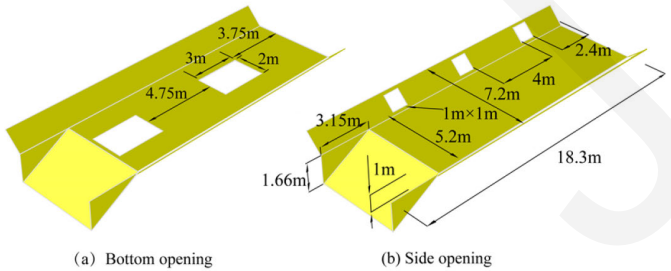




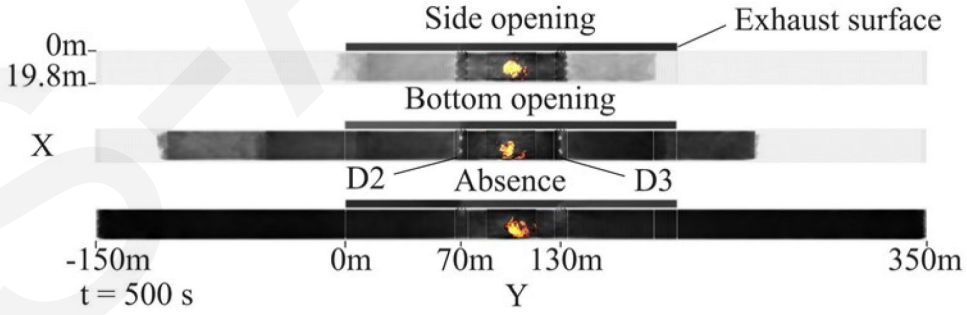


Supplementary exhaust ducts



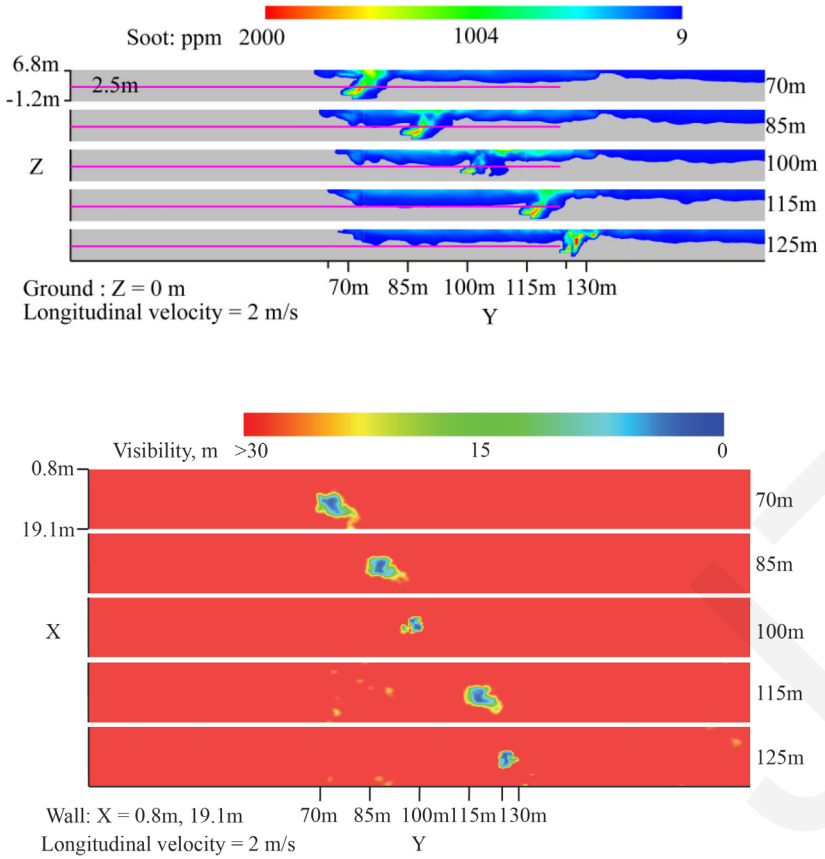


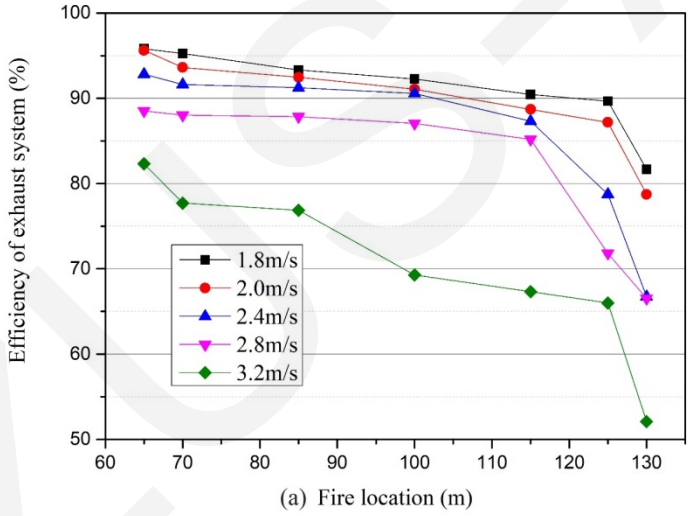
(a) Bottom opening (b) Side opening

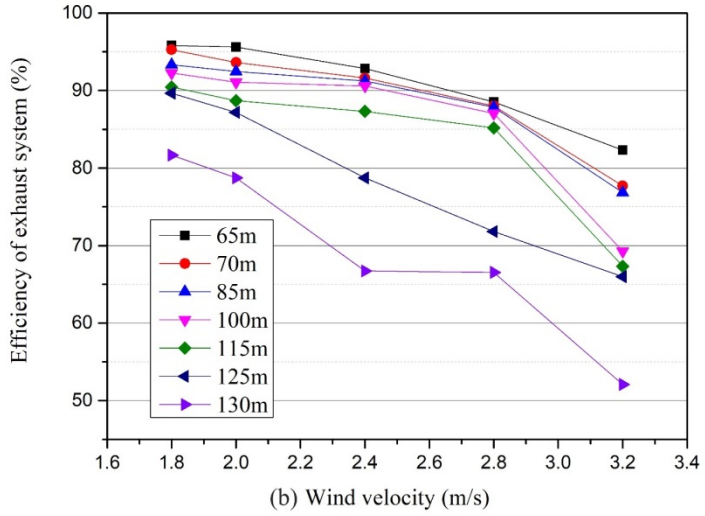


This demonstrated that the blocking effect of supplementary ducts caused the accumulation of smoke, which could increase the smoke exhaust efficiency by up to 98%.

Validity Verification







Conclusions

- To increase the efficiency of an exhaust system, using a lower longitudinal wind velocity and the blockage of supplementary exhaust ducts offers a new approach in the design of tunnel ventilation systems for extra-wide immersed tunnels. When a 50-MW fire occurred between two ducts, by regulating the longitudinal velocity at 2 m/s and opening the two adjacent ducts, the efficiency could reach 88% or more. Additionally, a safety evacuation path was ensured. For an extra-wide immersed tunnel, the addition of supplementary exhaust ducts combined with a rational longitudinal velocity is necessary.