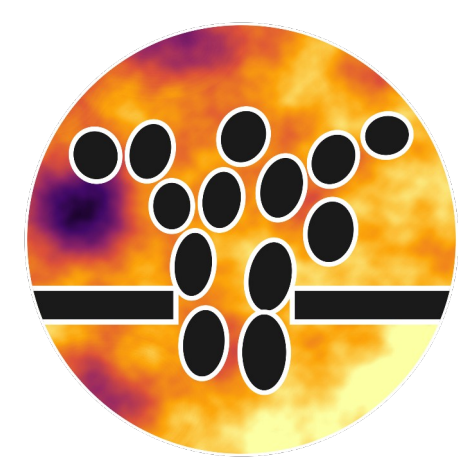




pyFDS-EVAC

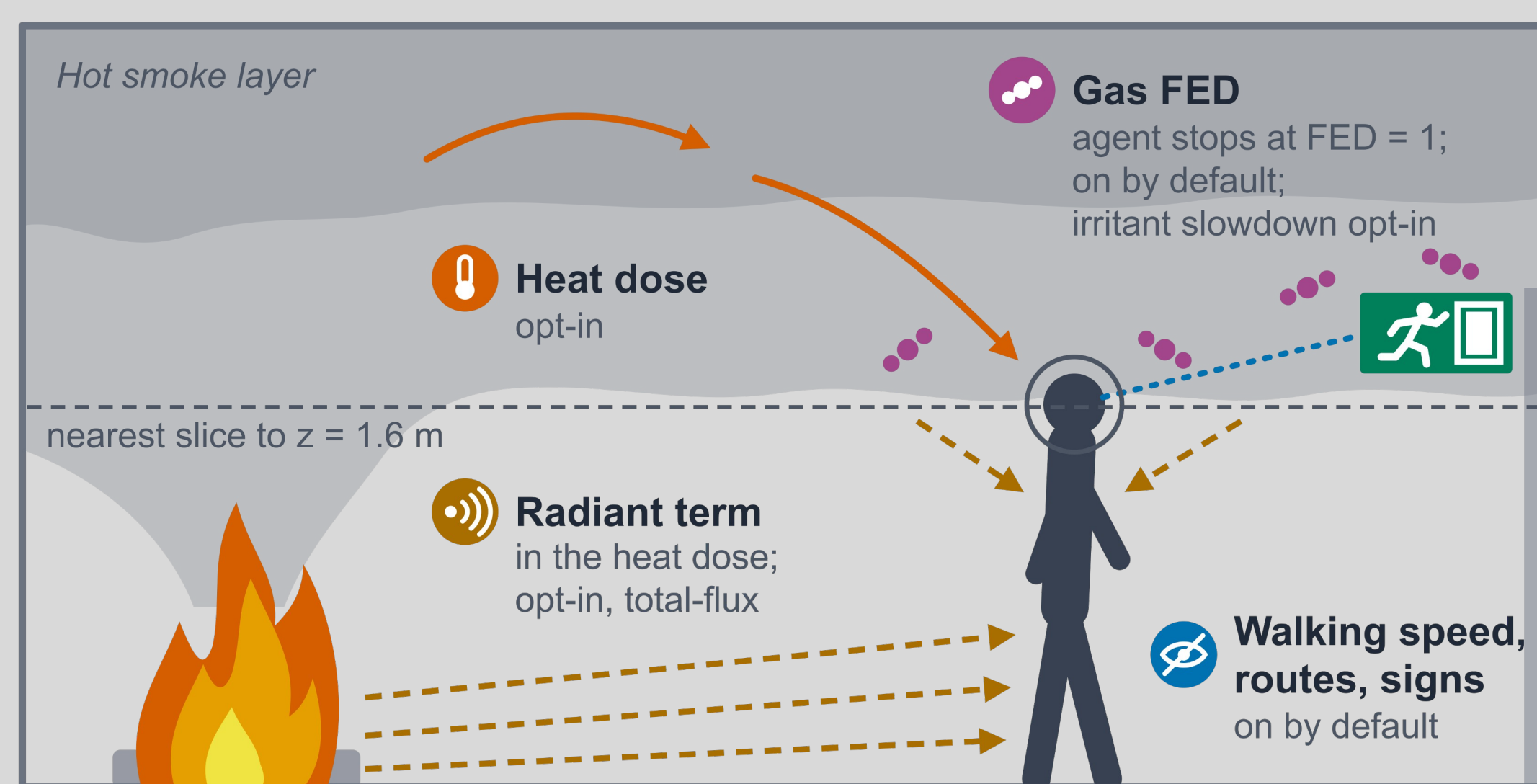
FDS smoke in JuPedSim: it slows evacuees, reroutes them and hides exits

G. Shouldice¹, K. Börger², M. Chraibi³

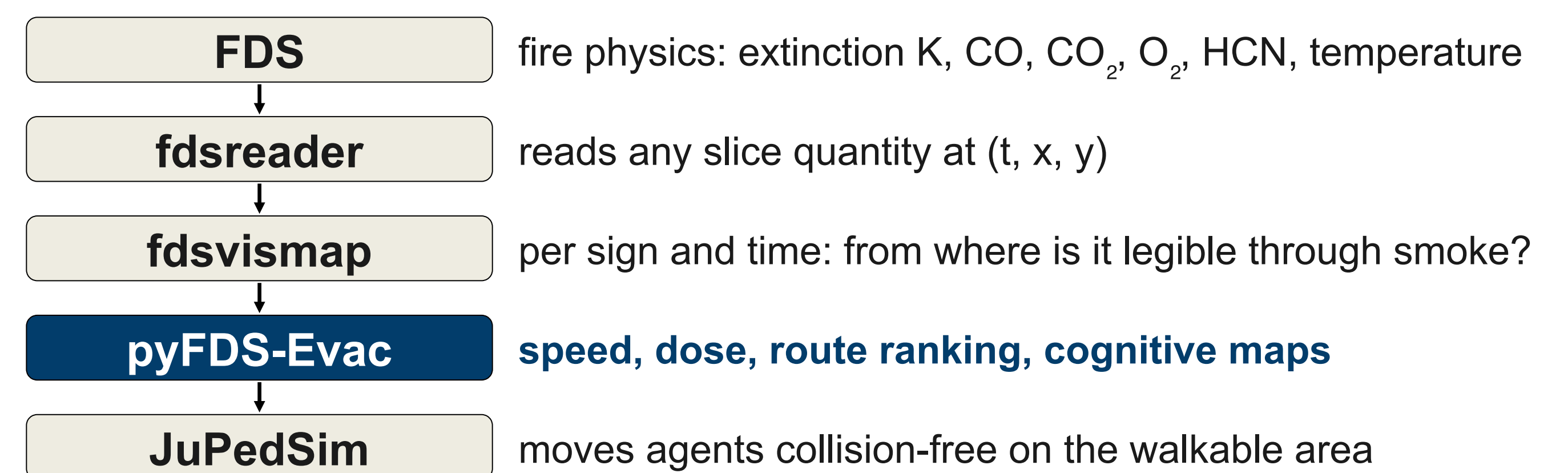
¹ McMaster University ² University of Wuppertal

³ Forschungszentrum Jülich GmbH | Institute for Advanced Simulation | Civil Safety Research (IAS-7)

Overview



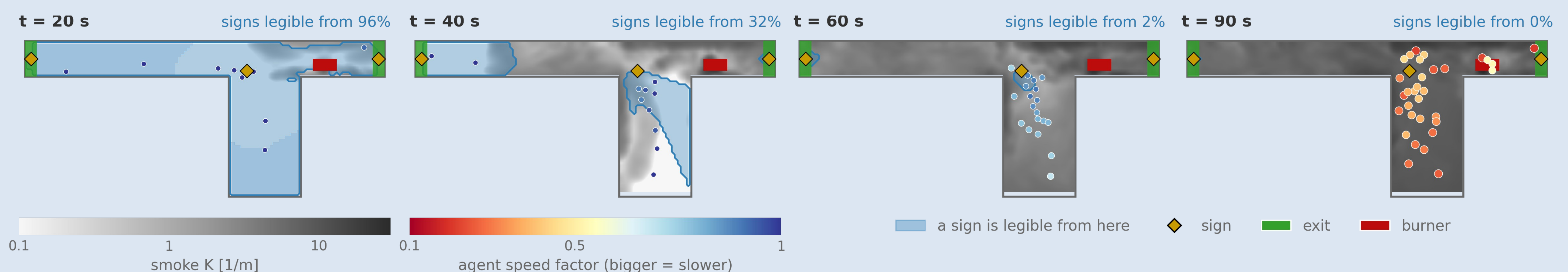
Approach



Defaults follow FDS+Evac: Frantich–Nilsson speed law, Purser FED, stop at FED 1.

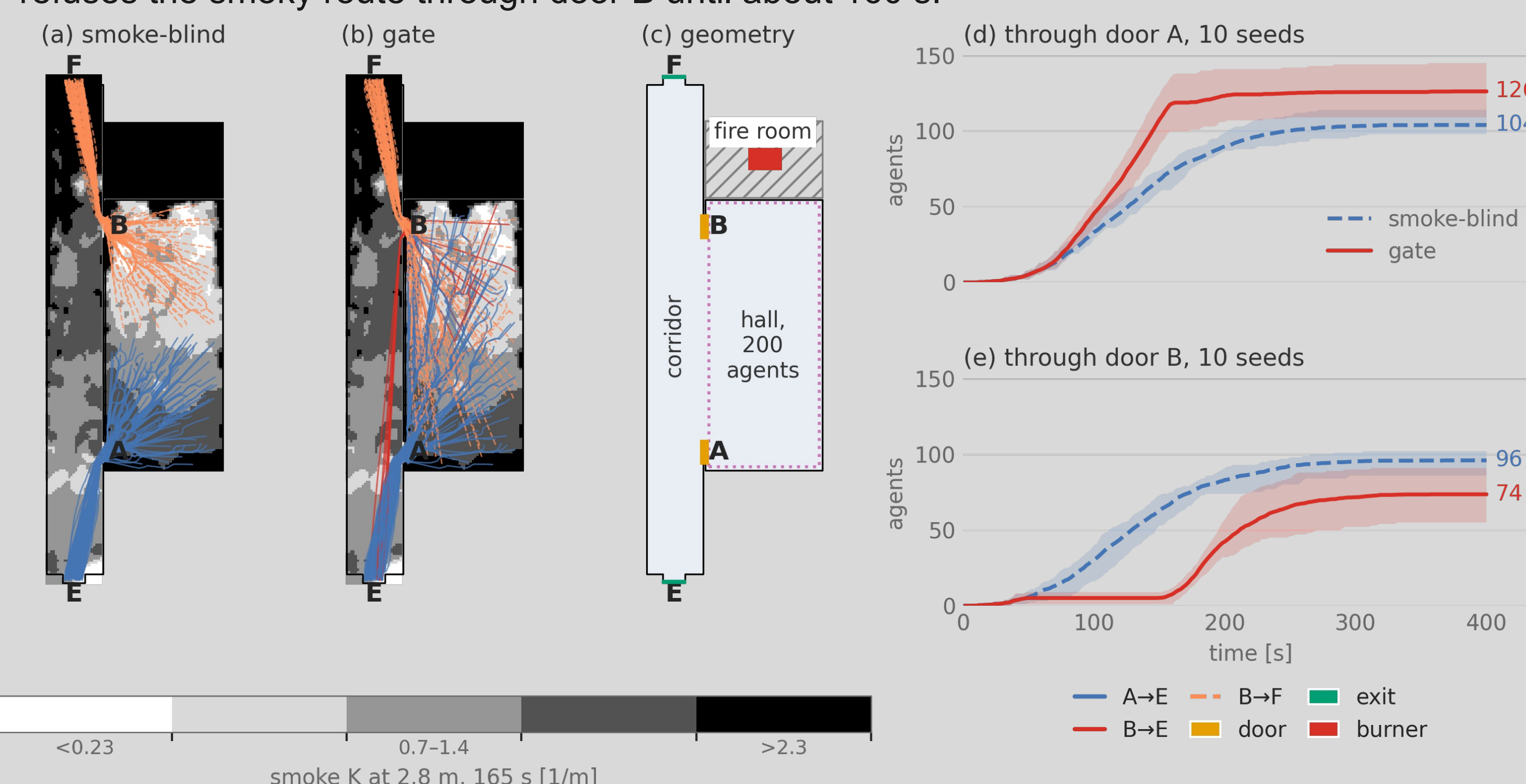
A crowd in a fire: smoke slows them and hides the signs

T-junction, 2 MW PVC fire in FDS, 150 agents. Agents slow down (red) and the floor from which a sign is legible (blue) shrinks to 0 %. Out by 300 s: 72 of 150 (clear air: 144).



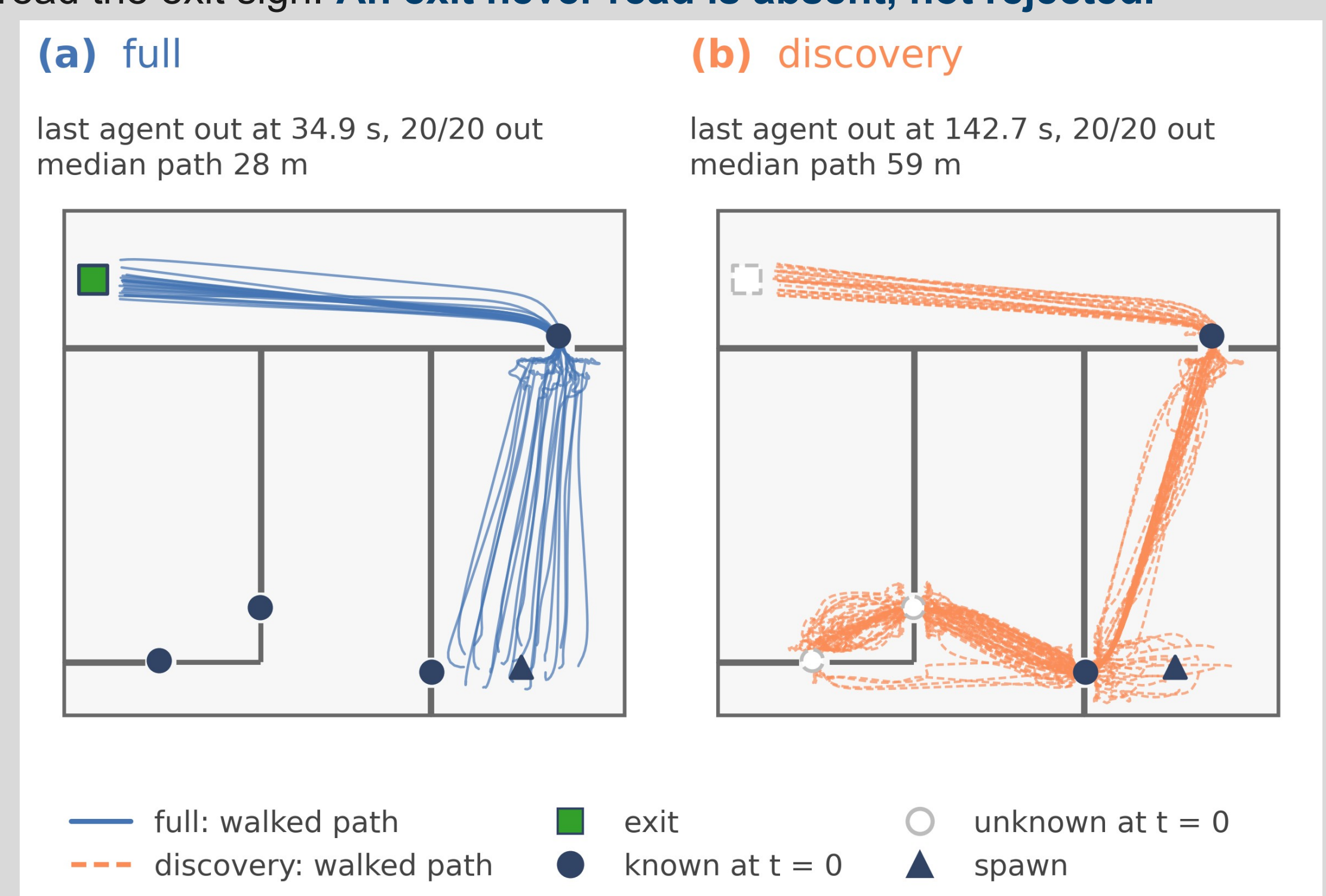
Smoke changes the route

Hall after Schröder et al. (2015), 200 agents, our own FDS fire. The default **gate** router refuses the smoky route through door B until about 160 s.



Visitors discover the building

Same floor, same signs, 20 agents. **Full** agents know every node; **discovery** agents explore until they read the exit sign. **An exit never read is absent, not rejected.**



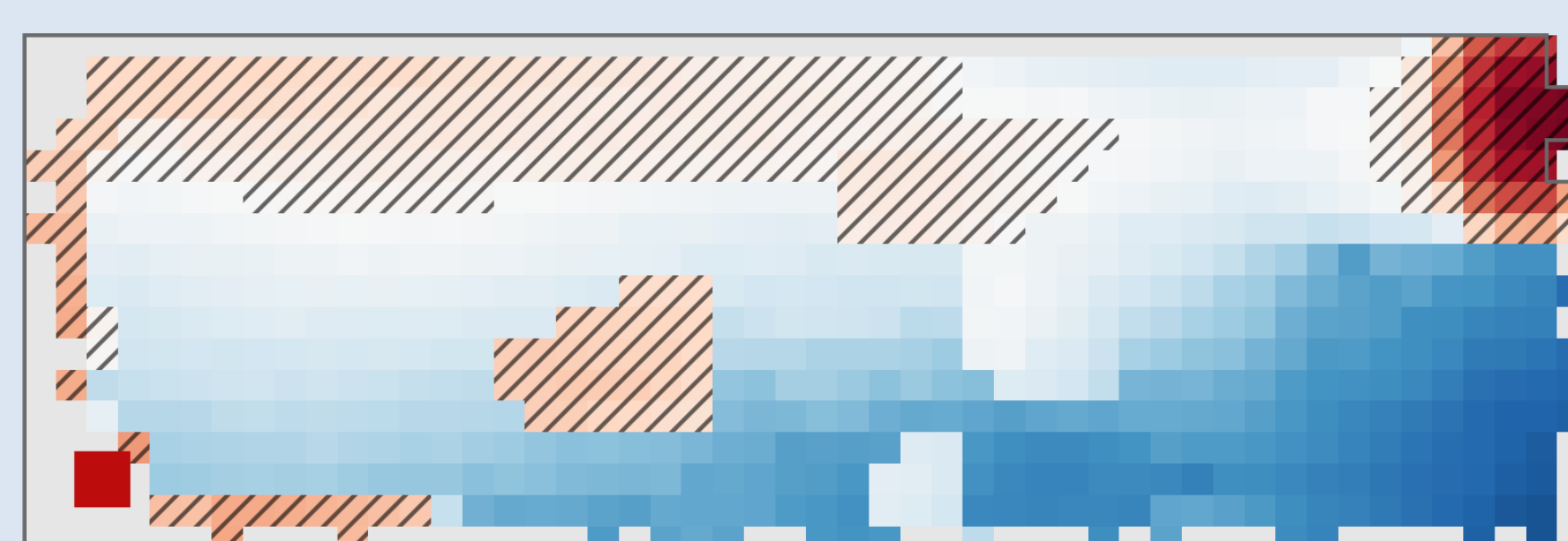
ASET – RSET

Room after Schröder, Arnold & Seyfried (2020), one door, our own FDS fire. Per cell, ASET at $K \geq 0.23$ 1/m against RSET, the last agent in the cell (maximum of 10 seeds). The later the crowd starts, the more of the room fails.

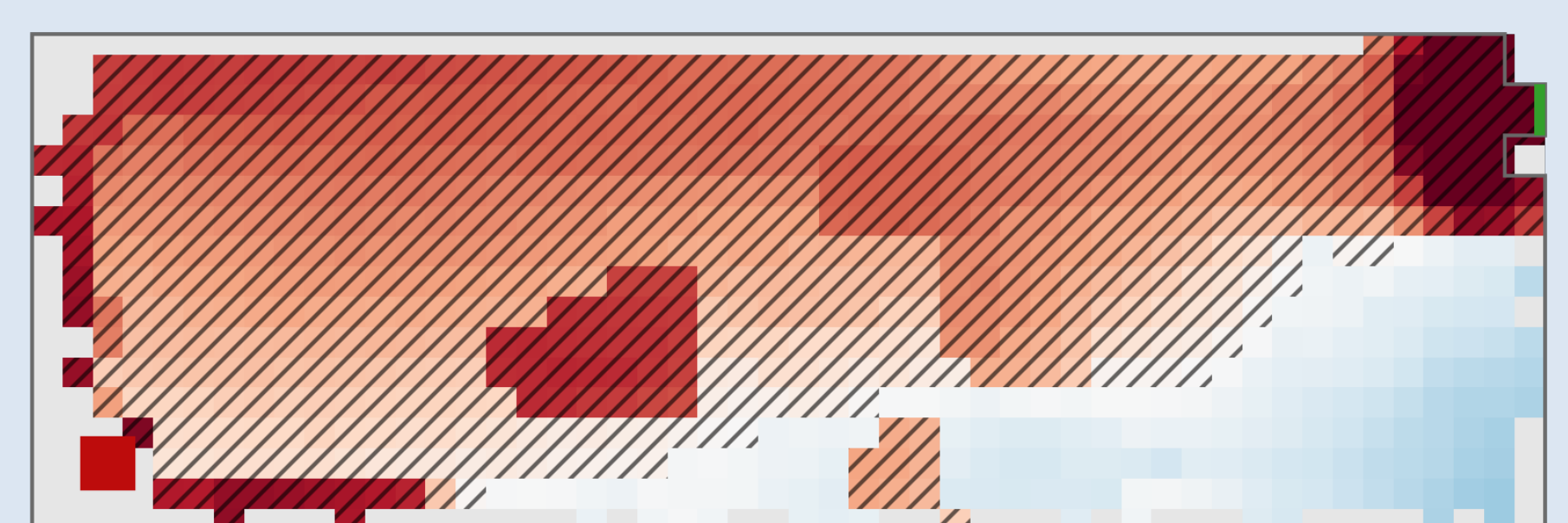
(c) smoke and agents, pre-movement 30 s, $t = 70$ s
60 inside, 24 past ASET (x)



(d) ASET – RSET, pre-movement 30 s
DIFF < 0 on 82.9 m², min DIFF -57 s



(e) ASET – RSET, pre-movement 60 s
DIFF < 0 on 208.8 m², min DIFF -87 s



Take-home: coupled to JuPedSim, FDS smoke changes how fast evacuees walk, which route they take and which exits they know.

Open-source Python, alpha, MIT licence. Research software: not for regulatory or design use.



Documentation



Code (GitHub)

Member of the Helmholtz Association