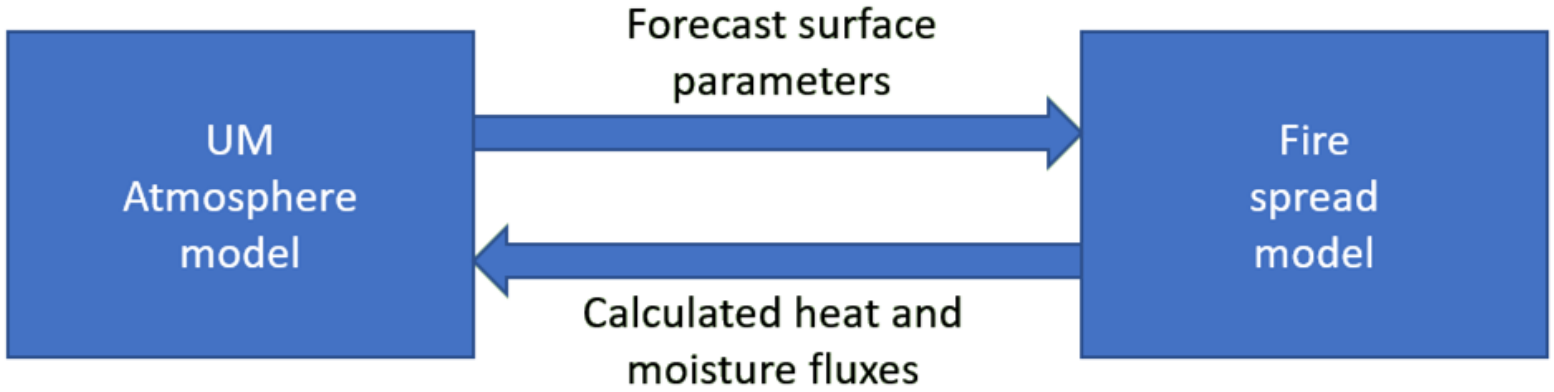
ACCESS-Fire: Case studies

Two case studies in 2019/2020

- Sir Ivan (NSW)
- Waroona (WA)
- Black Saturday (VIC)

Five more in 2021 (Black summer fires)

- Badja (NSW)
- Corryong (VIC)
- Kangaroo Island (SA)
- Stanthorpe (QLD)
- Yanchep (WA)



Aims:

- Fire reproduction capability
- Elucidate reasons for unexpectedly catastrophic fire spread
- Enhance understanding of atmospheric fire mechanics

Collaborations:

RFS, DEW, DBCA, Tas Fire, CFA, UKMO

BOM High Impact Weather ++:

Jesse Greenslade (talking), Paul Fox-Hughes, Jeff Kepert, Mika Peace, Dragana Rajak, Abhik Santra, Tasfia Shermin, Harvey Ye

Kangeroo Island

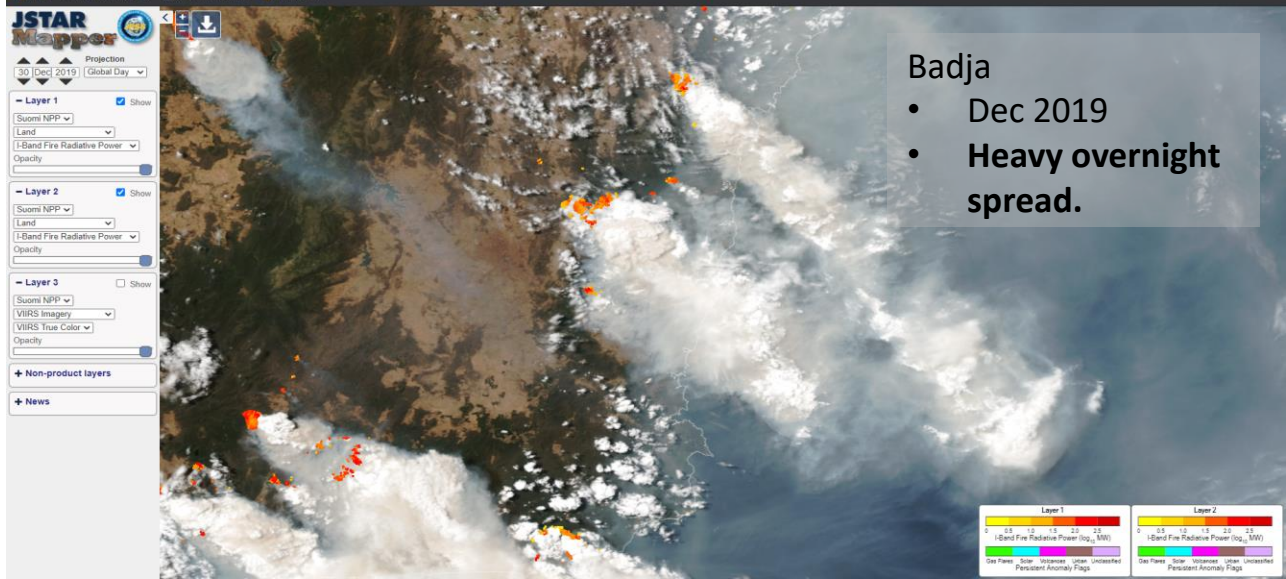
- January 2020
- **~5km/hr fire spread day and night**

Sir Ivan

- 12 February 2017
- 55 homes lost.
- NSW worst fire conditions ever

Waroona

- 6-7 January 2016.
- 166 homes destroyed.
- **Did not reconcile with FDI's.**



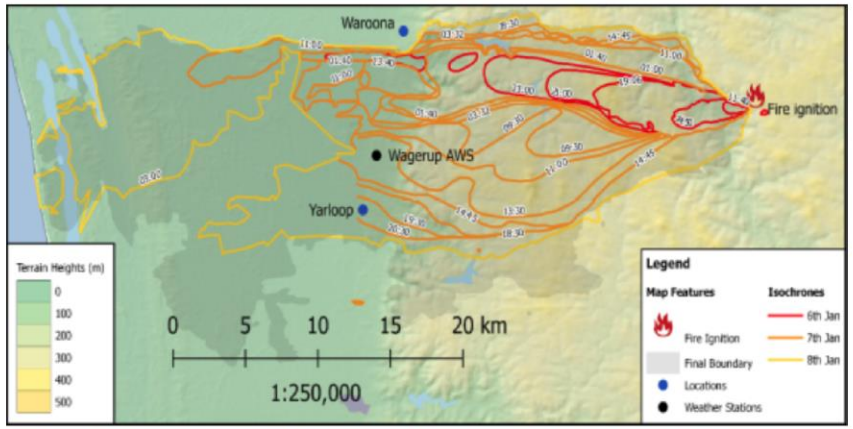
Badja

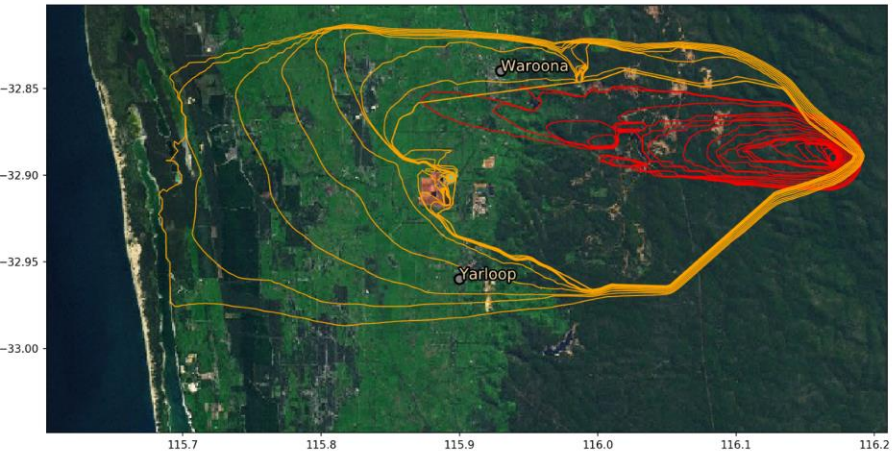
- Dec 2019
- **Heavy overnight spread.**

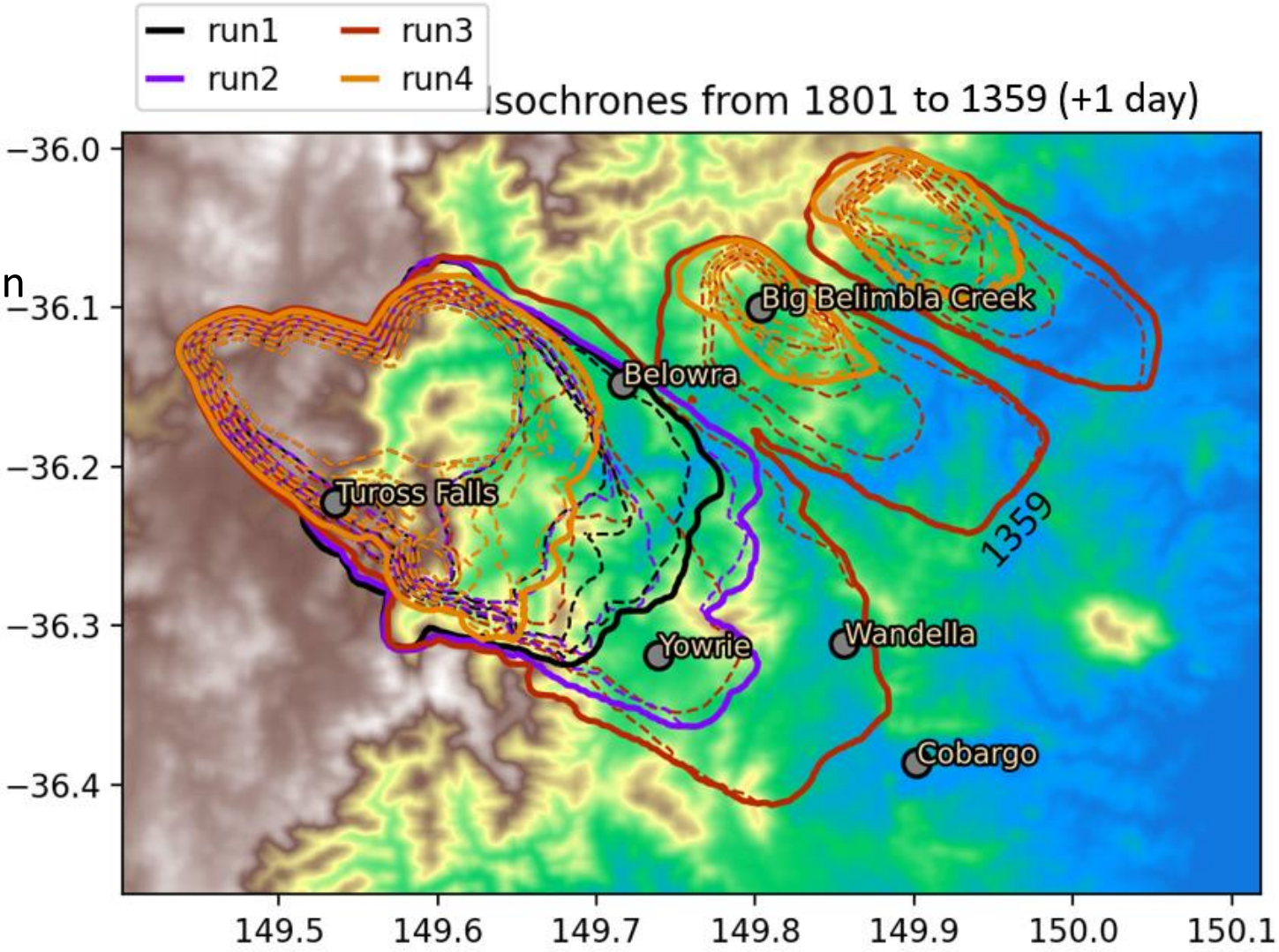
Fire spread

- Can match fire spread in unorthodox conditions

- Sensitivities to fuel load, topography, inversion layer, nearby fires (in addition to fire spread parameters)



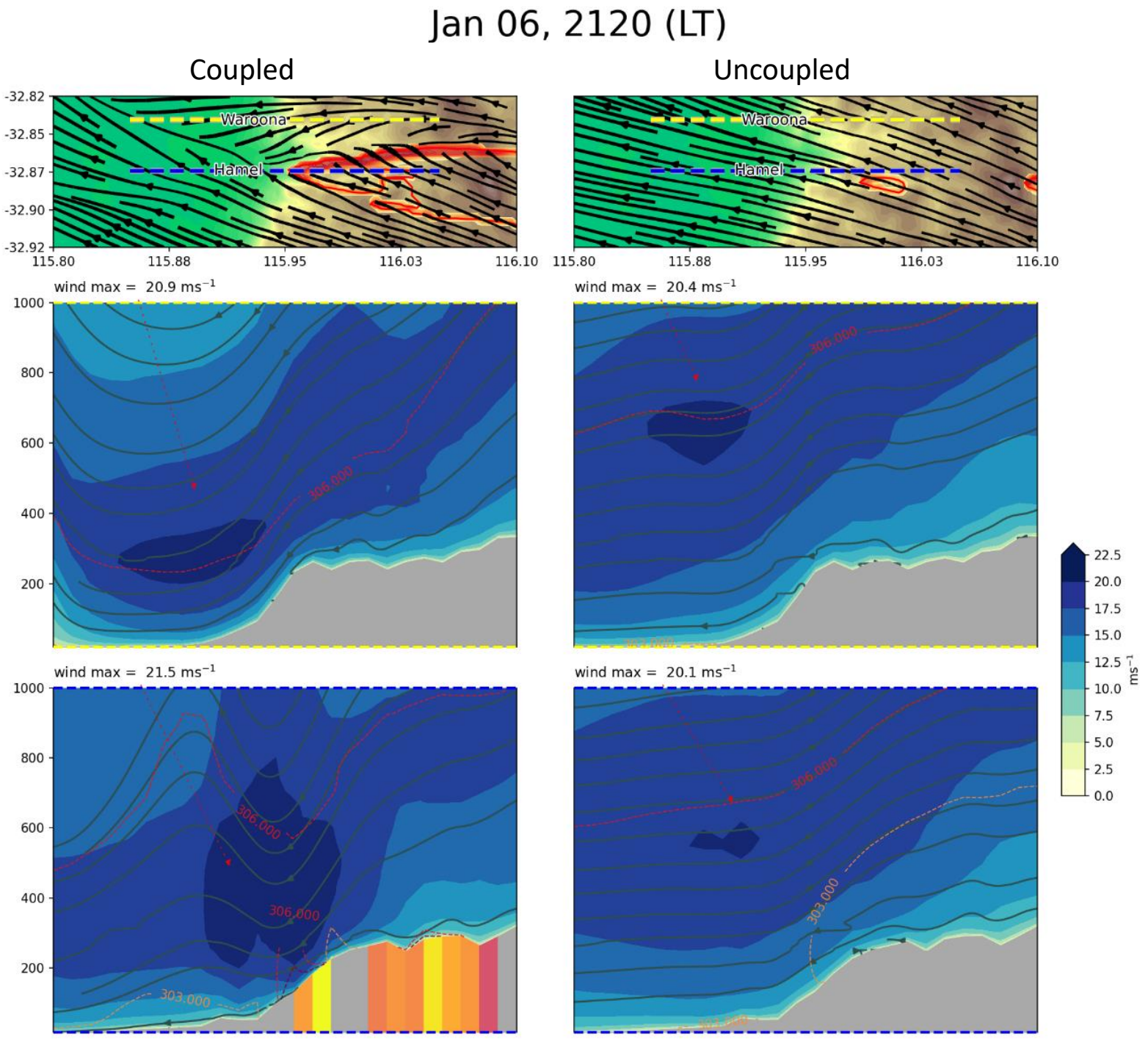




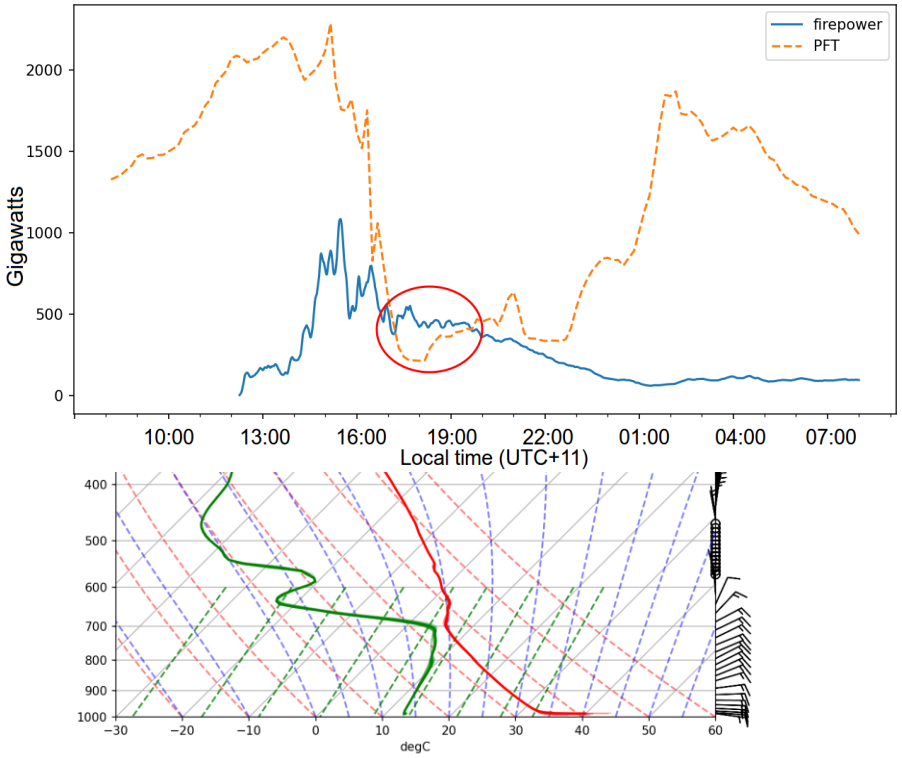
- Spread increases due to increased fuel load (run1 -> run2)
- Spread increases with addition of nearby fires (run2 -> run3)
- Spread reduced with coupling turned off (run4)

Low level winds

- Stronger low level winds apparent at several catastrophic fires
- Example: Downslope winds at Waroona.
- Fire coupling lead to stronger winds being pulled down to the fire front.



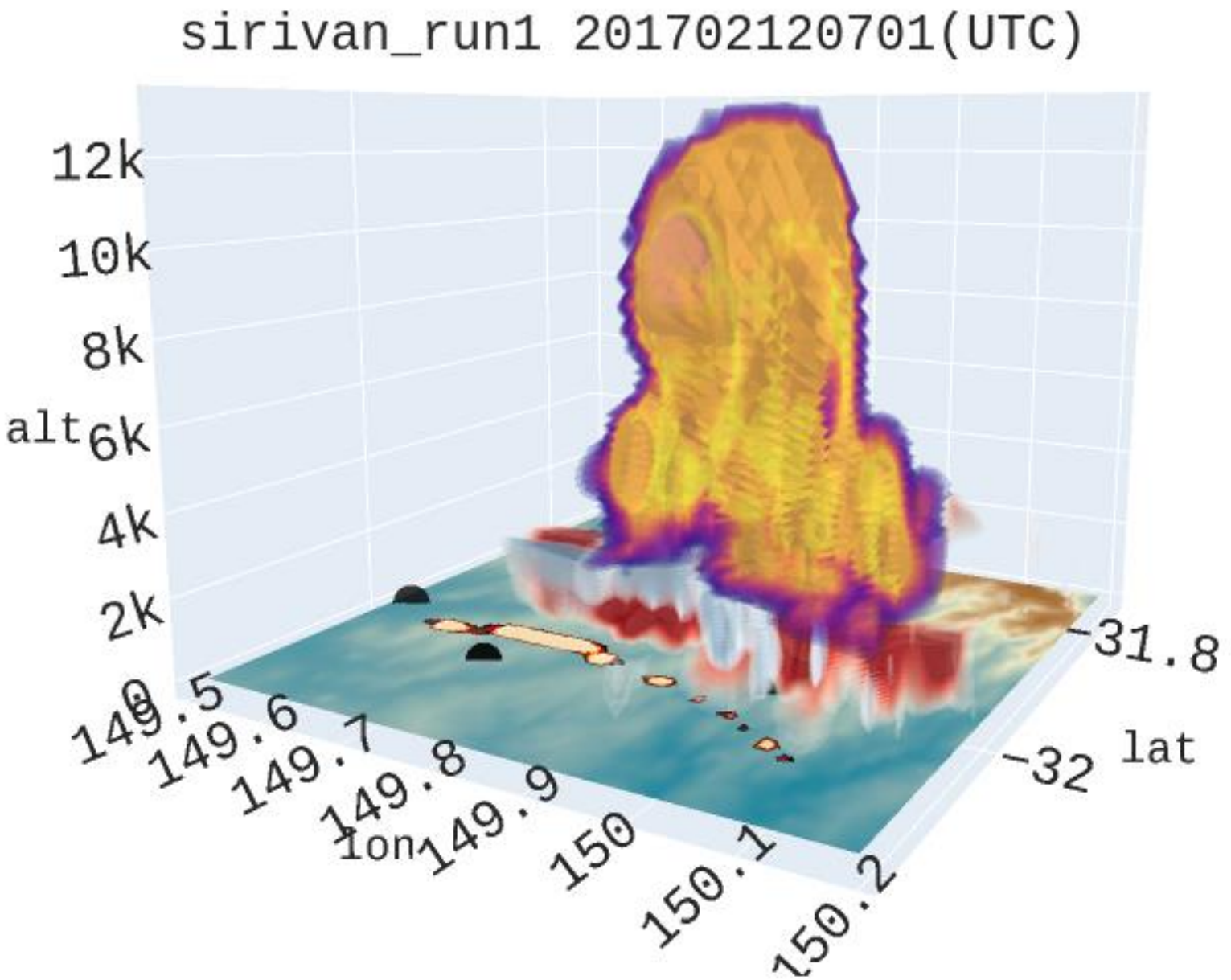
Pyrogenic thunderstorms (PCB)



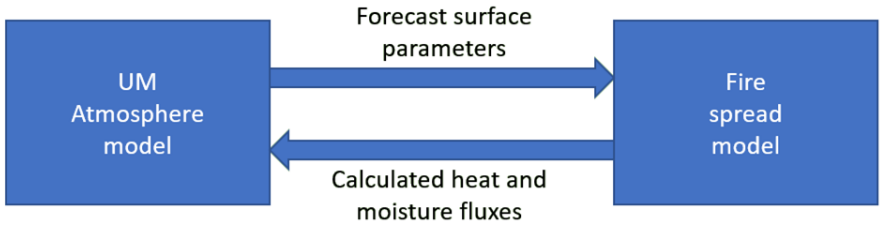
$$PFT = C\,(Z_{fc})^2\,U\,b_{fc}$$

PFT: PCB Fire power Threshold

C : constant
Z_{fc} : free convection altitude
U : wind speed
b_{fc} : Plume escape threshold

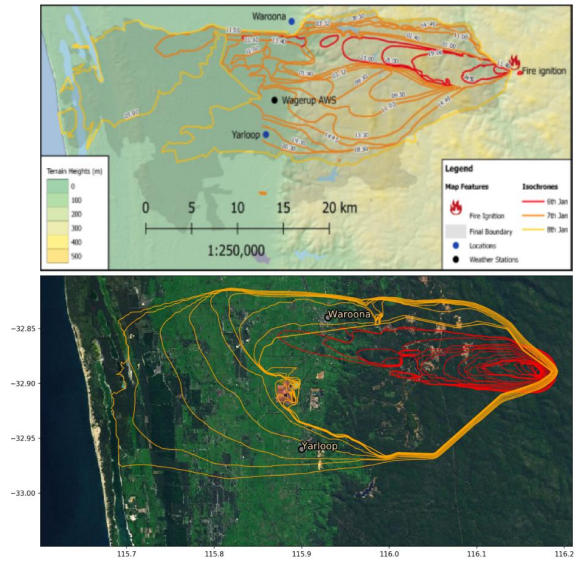


Summary



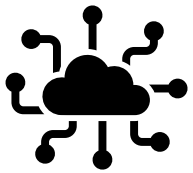
Coupling captures atmospheric influences

Spread can be captured

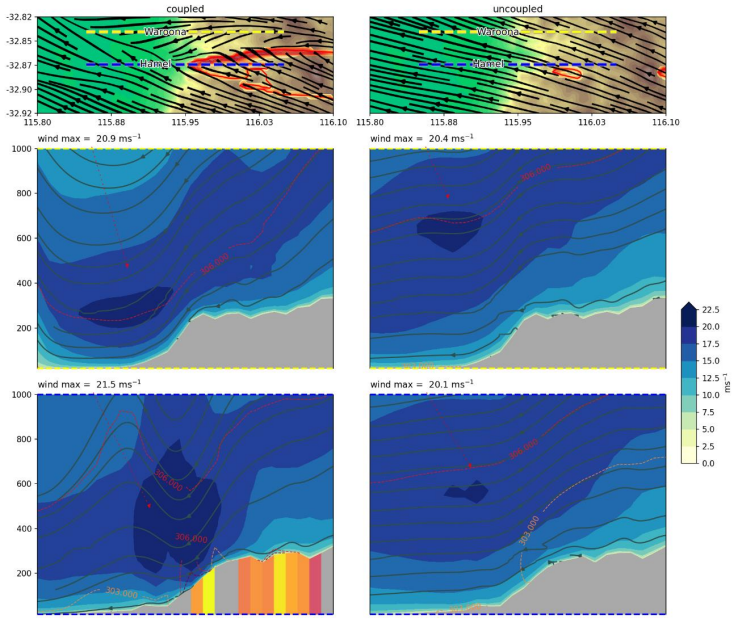


Jan 06, 2120 (LT)

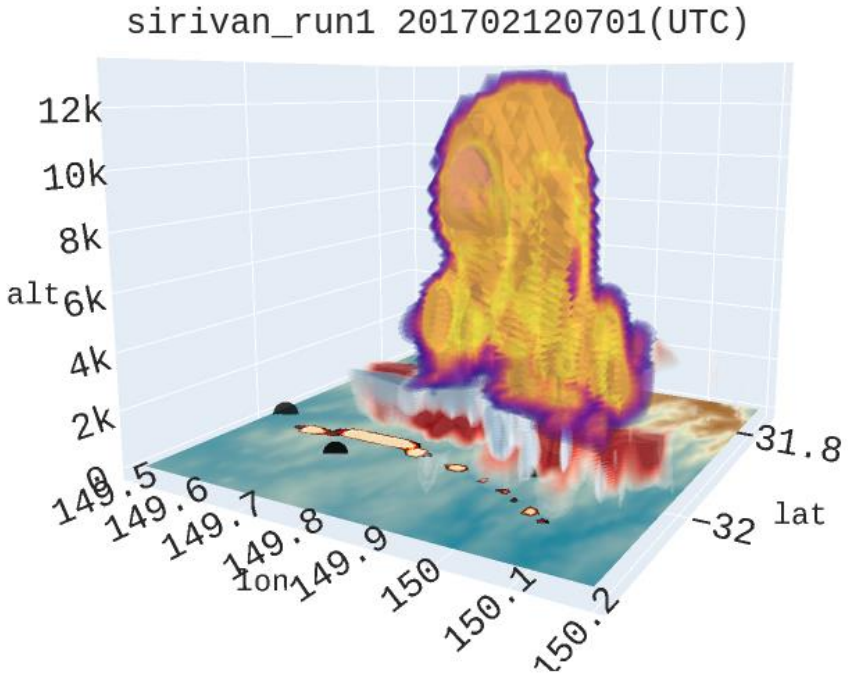
Big fire outbreaks may only become explicable with coupled modelling.



Wide scope for further research



Wind jets can be pulled down to the surface



Pyrogenic thunderstorms can be resolved