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# COUPLED FIRE-ATMOSPHERE MODELLING PROJECT

ACCESS-Fire

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Australian Government  
Department of Industry,  
Innovation and Science

**Business**  
Cooperative Research  
Centres Programme



## PROJECT OBJECTIVE

- Develop and test an Australian Coupled-Fire-Atmosphere modelling system, linked to the Australian NWP operational framework, embedded in Bureau forecasting capability

## PROJECT MOTIVATION

- Understand fire–atmosphere interactions
- Identify the ingredients leading to dynamic fire behaviour
- Address the limitations of surface-based, predictive approaches with linear assumptions

**= Improved capability and accuracy for fire prediction**



## PRESENTATION OVERVIEW

- Waroona case study
- Implementation and outreach activities
- Progress with ACCESS-Fire



## THE WAROONA FIRE CASE STUDY

- Detailed case study of the Waroona Fire (WA, January 2016)
- Accepted for publication JSHESS  
(Journal Southern Hemisphere Earth Systems Science)
- Collaboration : Mika Peace, Jeff Kepert, Brad Santos, Lachie McCaw, Neil Burrows and Robert Fawcett

## THE WAROONA FIRE

- 2 x PyroCB events
- 2 x destructive evening ember showers
- Highest FDI does not coincide with Extreme Fire Behaviour



## LESSONS FROM WAROONA (SLIDE 1)

### Pyro-Cumulonimbus

- Downdrafts separated from updrafts and erratic outflows
- New lightning ignitions downwind
- Appears more likely with long firelines (energy release)

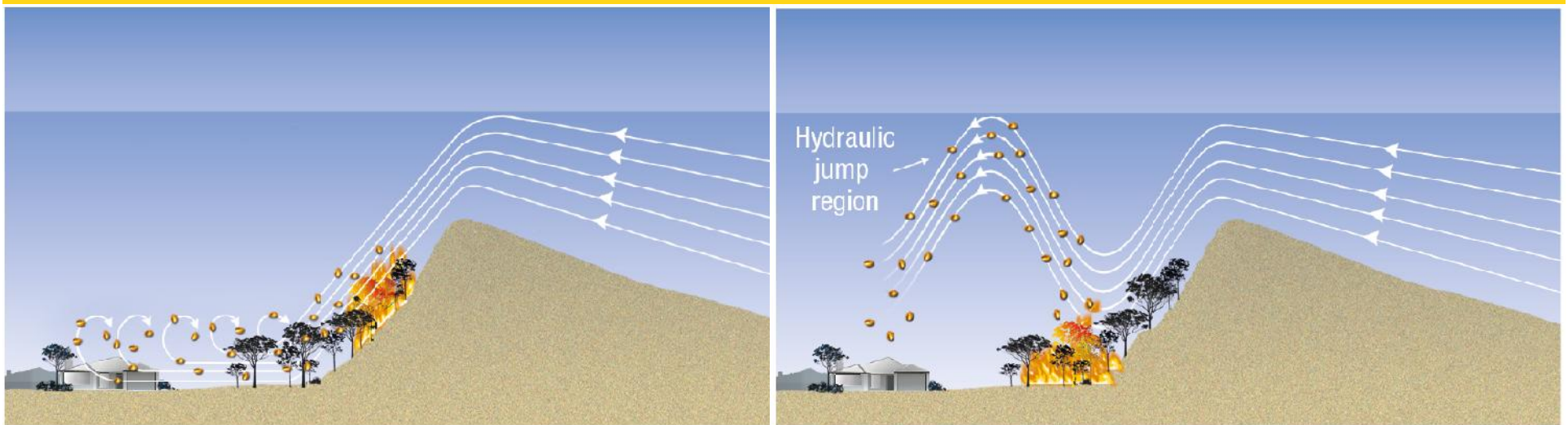




## LESSONS FROM WAROONA (SLIDE 2)

### Downslope winds

- Perth scarp and Adelaide gully winds (other locations?)
- Timing against normal diurnal cycle
- Turbulence with downslope winds conducive to ember showers



Fire



Embers



Temperature inversion



Fire



Embers



Temperature inversion



## LESSONS FROM WAROONA (SLIDE 3)

1. Timing of max FDI
  - Limited correlation with Extreme Fire Behaviour (same as other events)
  - Key meteorological ingredients were above the surface
2. Triggers or ingredients to EFB
  - Fuels plus winds plus topography plus instability



## IMPLEMENTATION ACTIVITIES

### PRESENTATIONS

- Perth 3x – DPaWS , BoM , DFES
- CFS / DEWNR, BoM internal EWD
- AFAC (full room), CRC Showcase
- Accepted for CAWCR workshop, MODSIM, and AMOS

### OTHER ACTIVITIES

- BoM training activities and policy development
- Operational support
- Contribution to development of EWD Fire Ingredients
- ABC radio and print interviews
- Outreach Fire and STEM activities

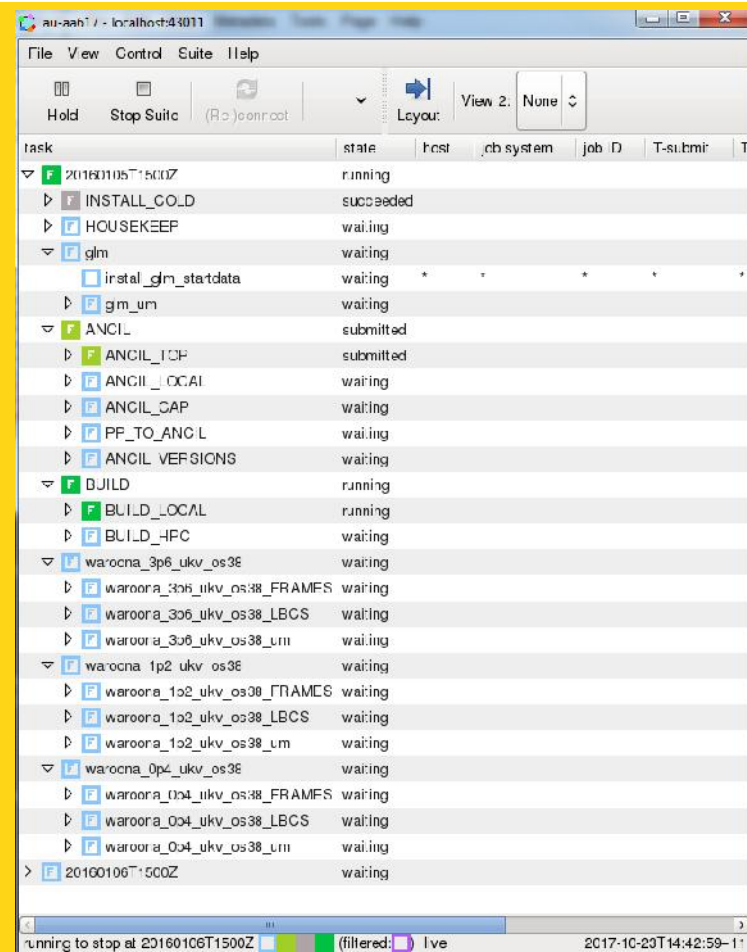
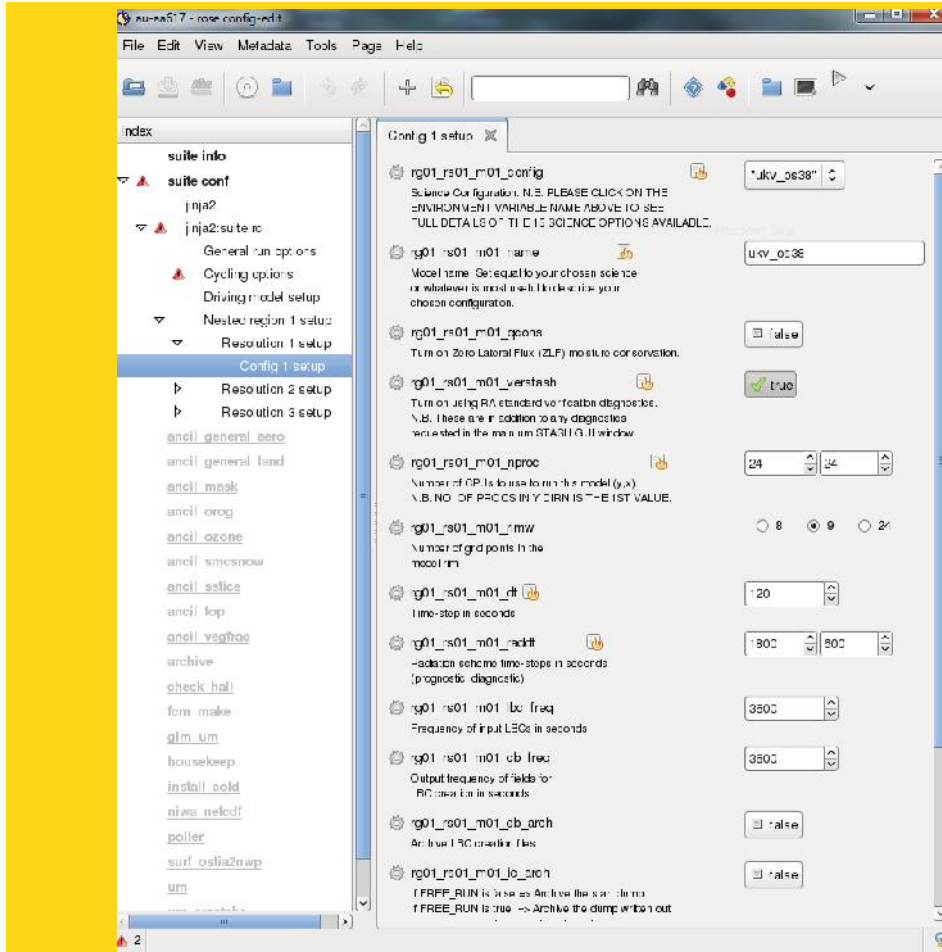




## ACCESS-FIRE MODEL

- Succession of IT problems overcome step by step
- ACCESS moved from UMUI to Rose-Cylc interface
- Nests in Rose-Cylc
- High resolution topography and data transformation
- Vertical levels
- Fire model "hooks" in new framework
- Model stability and memory

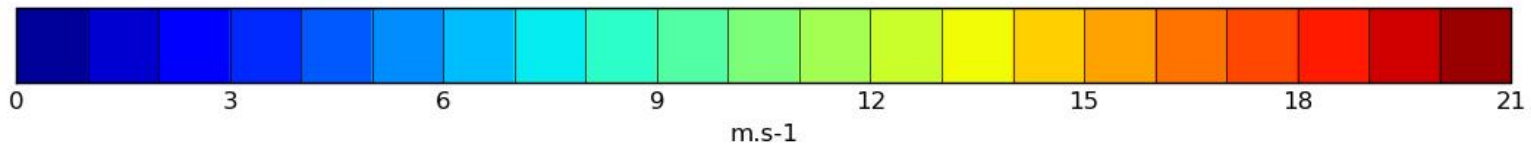
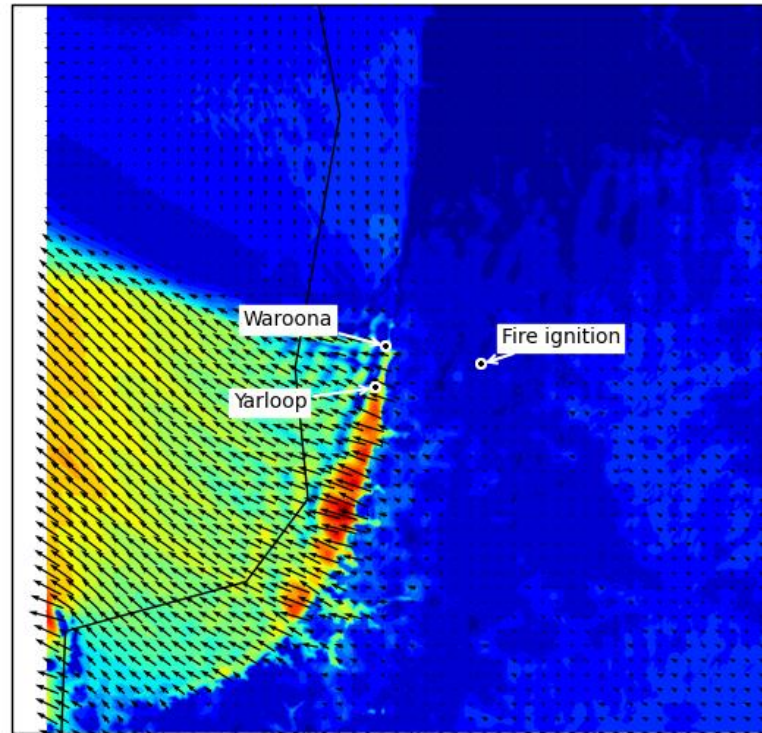
**We now have a working nested model in Rose-Cylc at 400m resolution with fire running – how best to exploit this capability**



This is what the Rose-Cylc GUI looks like



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## PLANNED ACTIVITIES 2017-2018

- Sir Ivan fire - 2<sup>nd</sup> case study
- ACCESS-Fire – Intensive effort towards coupled simulations of Waroona and Sir Ivan fires for analysis and write-up
- Ongoing engagement and implementation  
(Radio/Media/Conferences, AMOS, MODSIM  
... USA and UK?)



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## QUESTIONS?

High resolution visible image of the Waroona fire from Himawari satellite at 1810 LT 6 January 2016.

