

Australian plans for YMC

**Matthew Wheeler¹, Alain Protat¹, Christian Jakob²,
Todd Lane³, Harry Hendon¹, and Susan Wijffels¹**

**¹ *The Centre for Australian Weather and Climate Research
A partnership between CSIRO and the Bureau of Meteorology***



² *Monash University, Victoria, Australia*

³ *Melbourne University, Victoria, Australia*

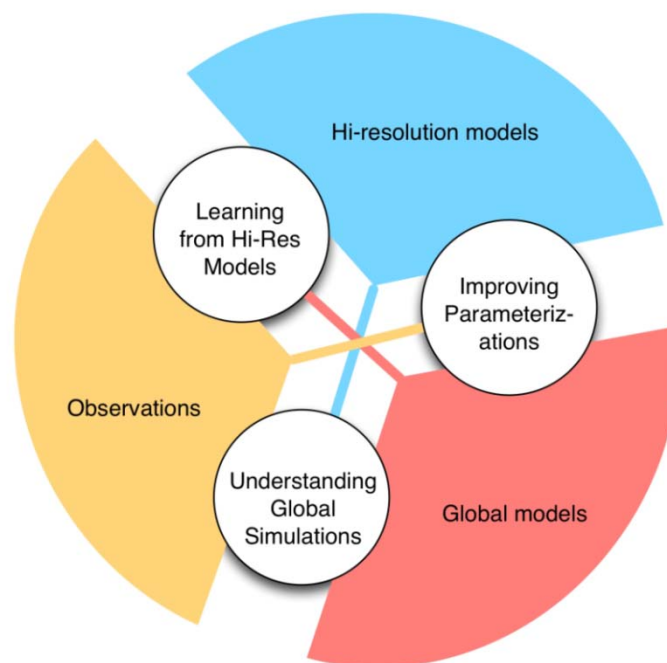


Australian Government
Bureau of Meteorology



Background of Australian interest

Motivated by large precipitation and other **biases** in our global numerical models in the MC region, Australian institutes (BoM, CSIRO, Universities) began a joint "Maritime Continent Initiative" in 2013. We identified a three component approach comprising global models, hi-resolution models, and observations.



Later we learned of the **YMC** concept which gained the interest of our scientists and managers, especially given the capabilities offered by our new research ship, **RV Investigator**.

Australia's modelling collaboration with the UK Met Office has also lead to the spin-up of a **Process Evaluation Group** (PEG) on Maritime Continent biases (focussed solely on the Unified Model/ACCESS).

Australia – Marine National Facility

New research vessel: *RV Investigator*

Statistics:

93.9 m long, up to 300 days at sea per year (60 days max per voyage)

It can accommodate 40 scientists on board

Constructed in Singapore – 1 year commissioning period for instrumentation and functionalities began in September 2014.

Available instrumentation:

Dual-pol C-band Doppler radar (MNF/BOM)

Cloud radar and lidar (BOM)

Radiative and air-sea fluxes (BOM)

Atmospheric composition (CSIRO)

Ozone and COBALD backscatter sondes

Has space for:

A microwave radiometer

Radiosonde launch facility (lease ? borrow ?)

Wind profilers (?)

The MNF is very open to hosting new instruments
(e.g. Seagliders from Adrian Matthews, University of East Anglia)



Timeline/Location

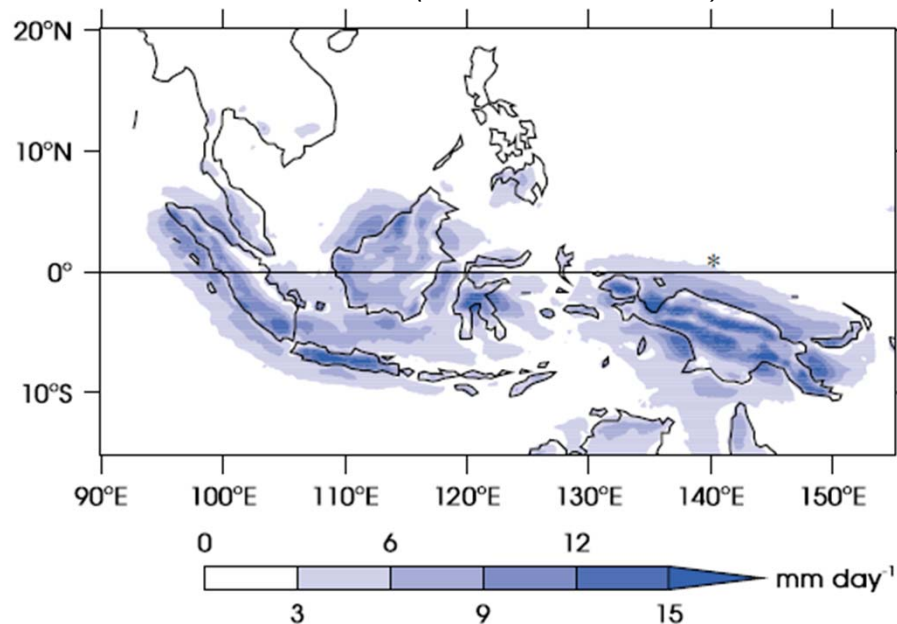
Late 2015: Commissioning period ends.

Mid 2016: Proposals due for 2018-2019 period.

Late 2018 – early 2019: ≤ 60 day cruise using Darwin port facilities.

Our main research target will be atmospheric convection and the diurnal cycle, suggesting a stationary location just offshore of one of the main islands (blue shaded areas below).

Climatological amplitude of the diurnal harmonic of precipitation rate from TRMM 3B42HQ (Peatman et al. 2014)



RV Investigator – Instrumentation details #1

In-situ meteorological observations:

Main objective is to calculate the 1-min bulk turbulent fluxes and then net fluxes of heat, mass & momentum

Wind speed and direction
Air temperature, humidity, pressure
Precipitation
SW and LW radiation
SST



On request the following parameters can also be measured:

Total particulate organic carbon (POC)
Phytoplankton physical/optical properties
Photo synthetically-active-radiation,
Sea surface salinity,
Currents,
Profiles of ocean temperature & salinity,
pCO₂, ocean oxygen, biological indicators, waves ...

RV Investigator – Instrumentation details #2

In-situ atmospheric composition observations (CSIRO):

Permanent

Scanning Mobility Particle Sizer (SMPS): 10 – 700 nm particle size distribution (5 min res.)

MultiAngle Atmospheric Photometer- aerosol absorption at one λ and multiple angles in real time and calculates BC

Nephelometer – aerosol scattering at 520, 807 and 400 nm in real time

Cavity ringdown – CO₂, CH₄, N₂O and CO in real time

Ozone monitor – Tropospheric ozone concentrations in real time

NO_x monitor – measures NO and NO_x and calculates NO₂ in real time

Sun Photometer – measures AOD



CMAR instrumentation for campaigns

CCN counter – ability of a particle to act as a cloud condensation nuclei in real time

Nano-SMPS: 3 – 150 nm particle size distribution (5 min res.)

Aerosol Particle sizer (APS): 500 nm – 10 μ m particle size distribution (5 min res.)

Aerosol Chemical Speciation Monitor (ACSM-ToF) – measures the composition of particles between 250 nm and 2.5 microns at 5-10 minute resolution

Cascade Impactor- collects size-resolved aerosol samples for post analysis.

Proton Transfer Mass Spectrometer (PTRMS) – concentration of VOCs at 5-10 minute intervals

On-line GC – measures concentration of VOCs at 30 minute intervals

Sequencer- collection of VOC and carbonyl samples on absorbent tubes for post analysis

CN counters – concentration of the number of particles greater than 3 and 10 nm in real time

RV Investigator

