



NCAR

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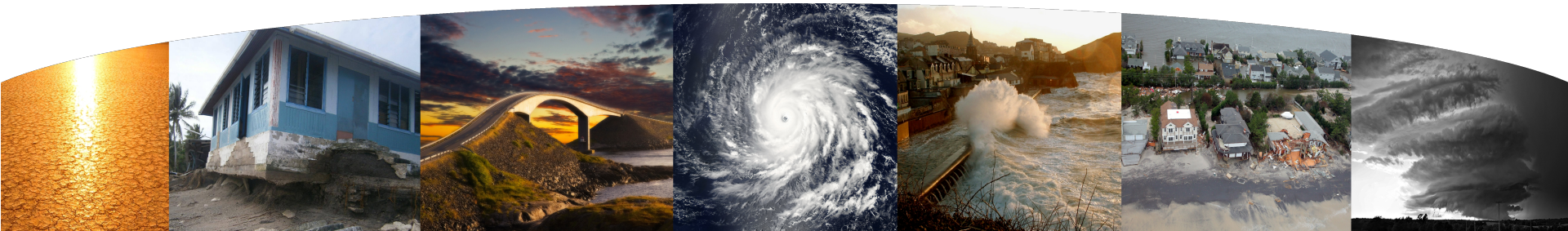
# Development of a Hybrid Real-Idealized Tropical Cyclone WRF

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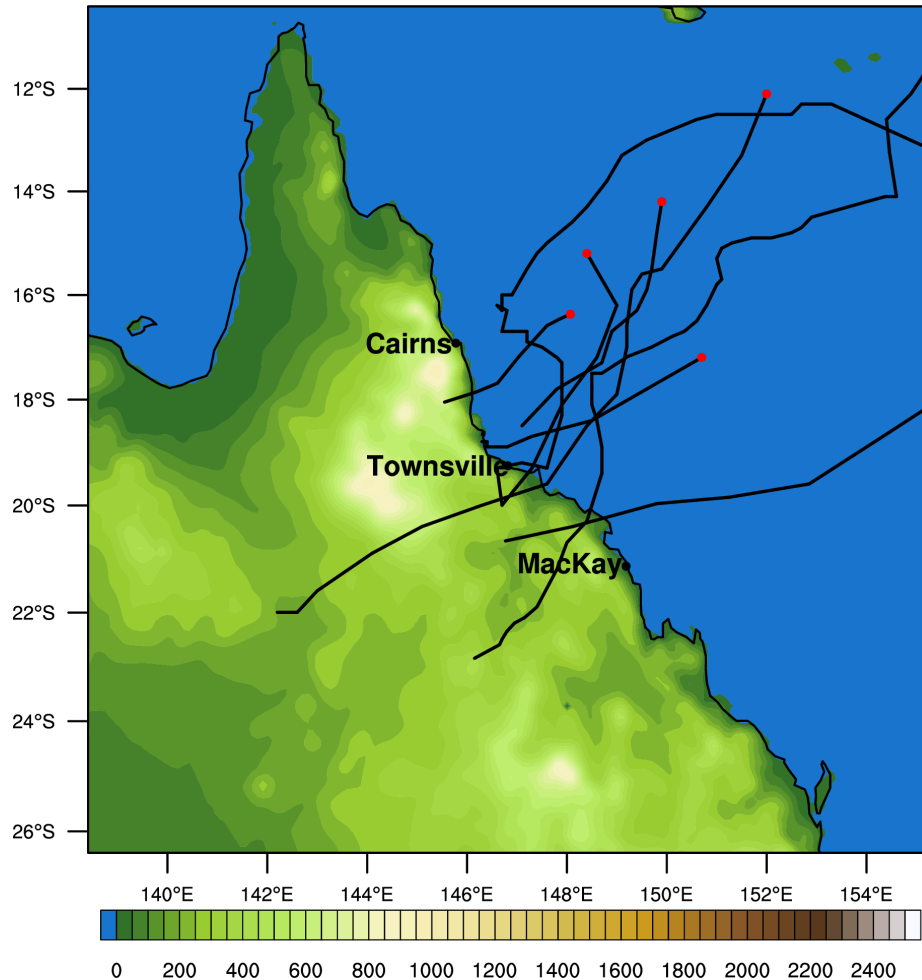
Greg Holland (NCAR), Bruce Buckley, Mark Leplastrier, Peter Chan, Martin Tingley, and Andrew Dyer (IAG)

*"Floods are acts of God, but flood losses are largely acts of man."*

Dr. Gilbert White - Environmental Geographer



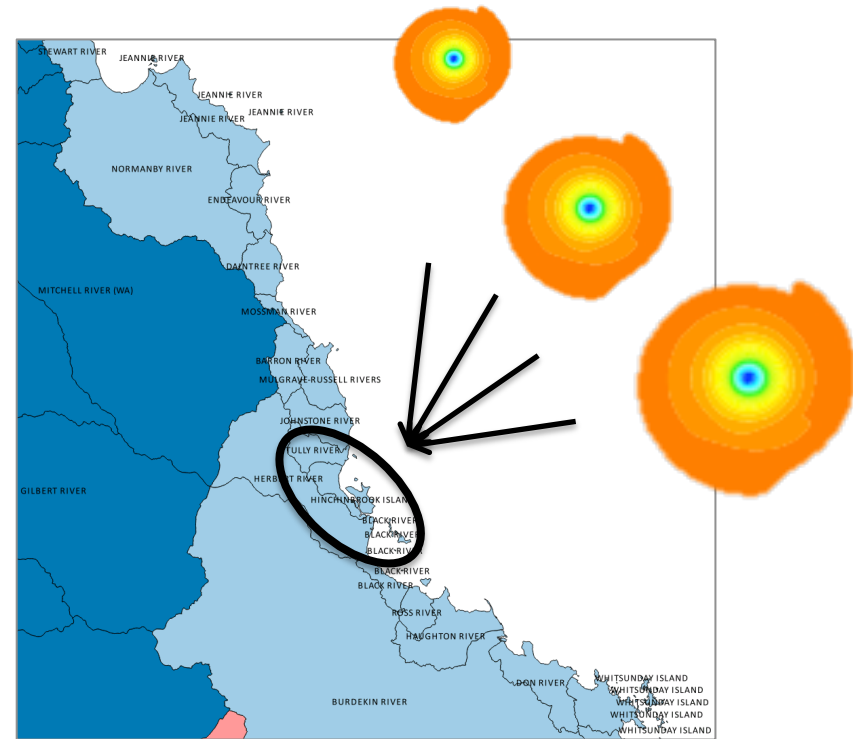
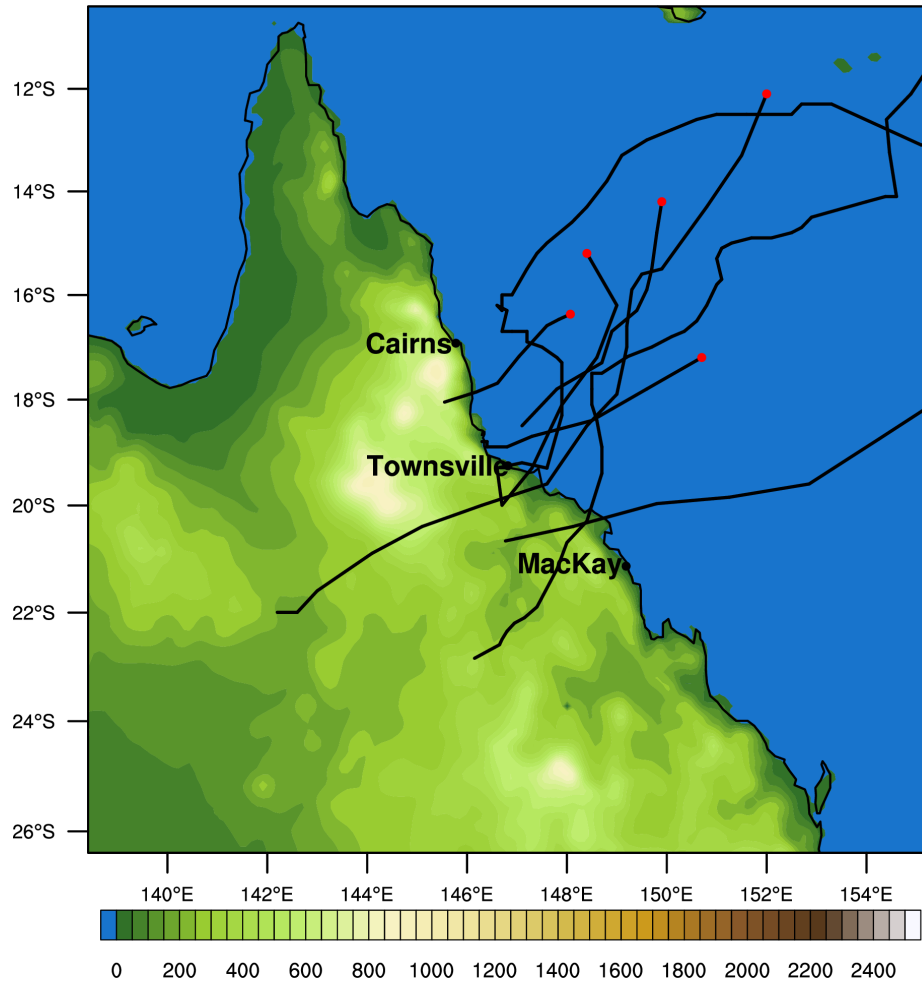
# Tropical Cyclones over Small Areas



Yasi (2011) **Cat 5**  
Tessi (2000)  
Sid (1998)  
Tayla (1996)  
Joy (1990)  
Althea (1971) **Cat 4**  
Leonta (1903)  
Sigma (1896)



# What would happen if .....?



# Possible Approaches

## Simulating Real Cyclones

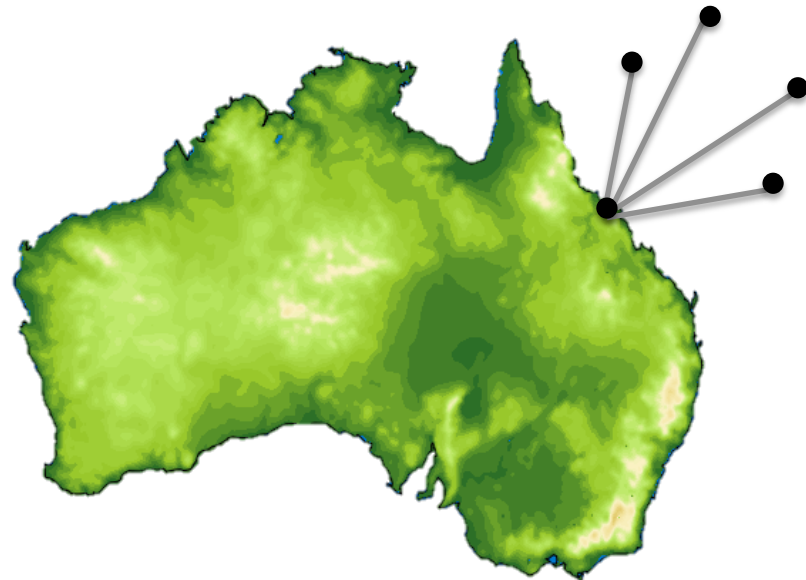
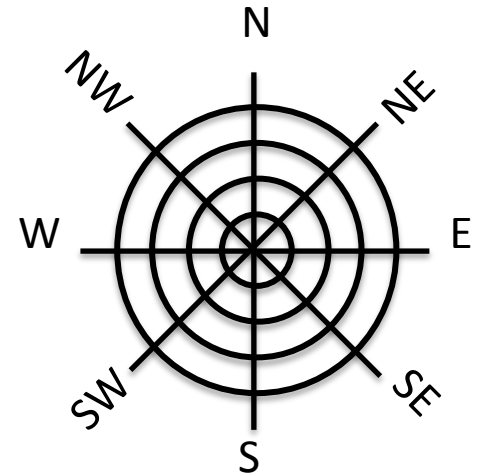
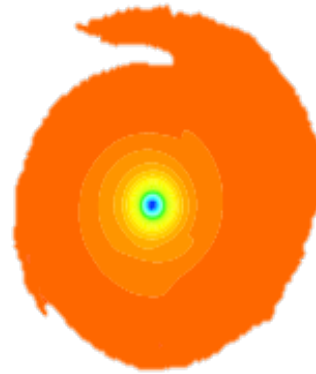
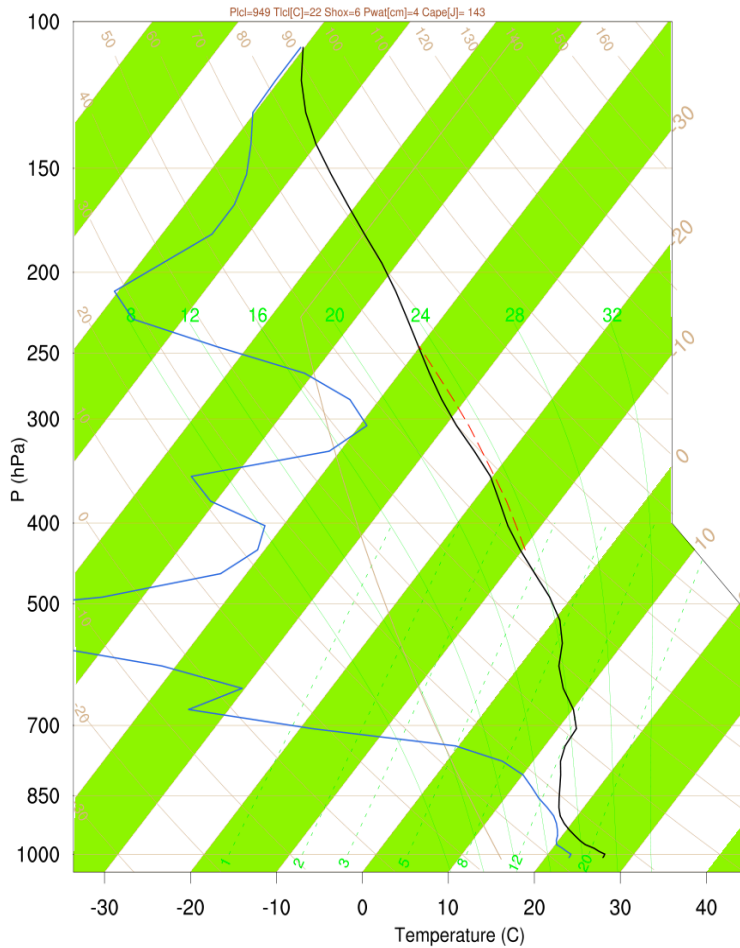
- Dynamical structure and interactions with topography and land
- Can account for Climate Change
- Only a very small sample in any location
- Can only simulate observed cyclones

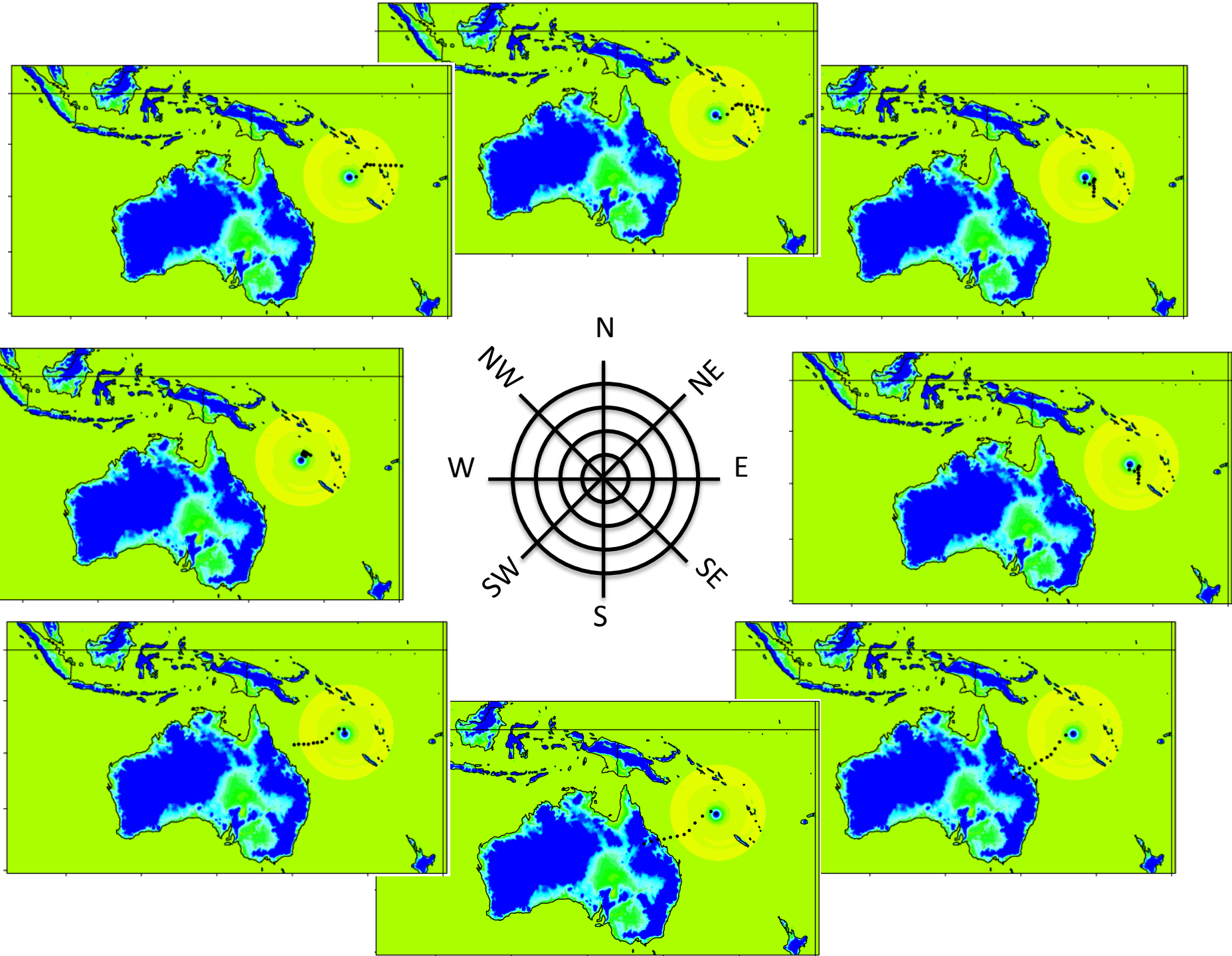
## Simulating Idealized Cyclones

- Have dynamical about Cyclones, but no interaction with land or effects due to topography
- Can add a delta to take Climate Change predictions into account
- Larger numbers of cyclones



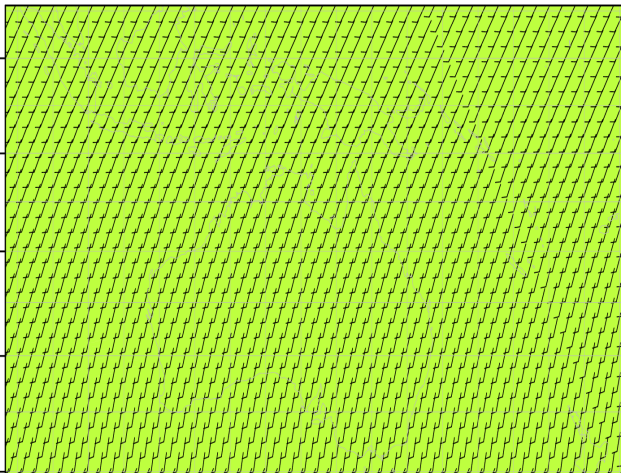
# Hybrid WRF Cyclone Model (HWCM)



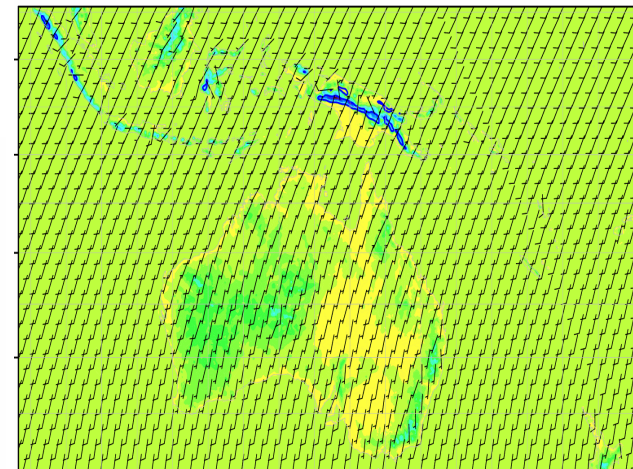


# Is the model behaviour Realistic?

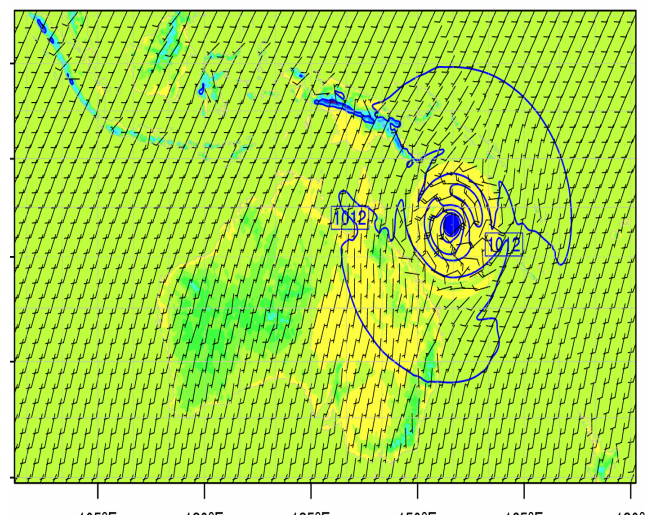
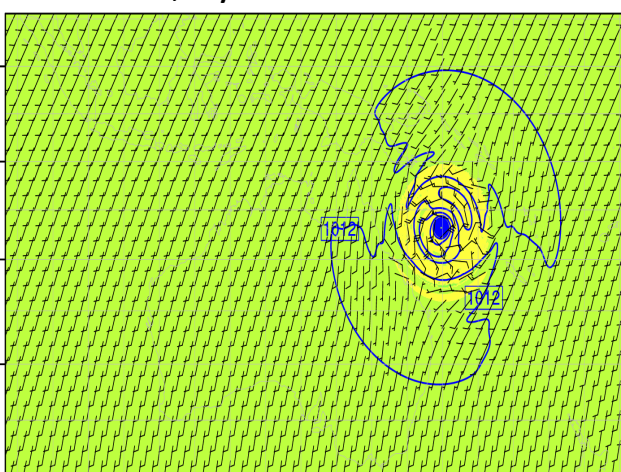
No Land ; No Cyclone



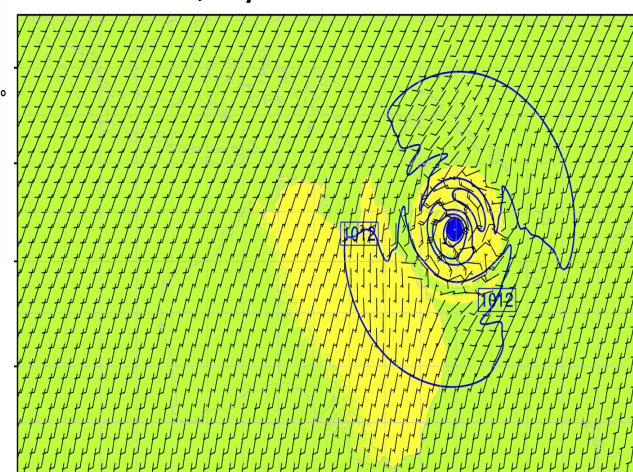
Regular Land ; No Cyclone



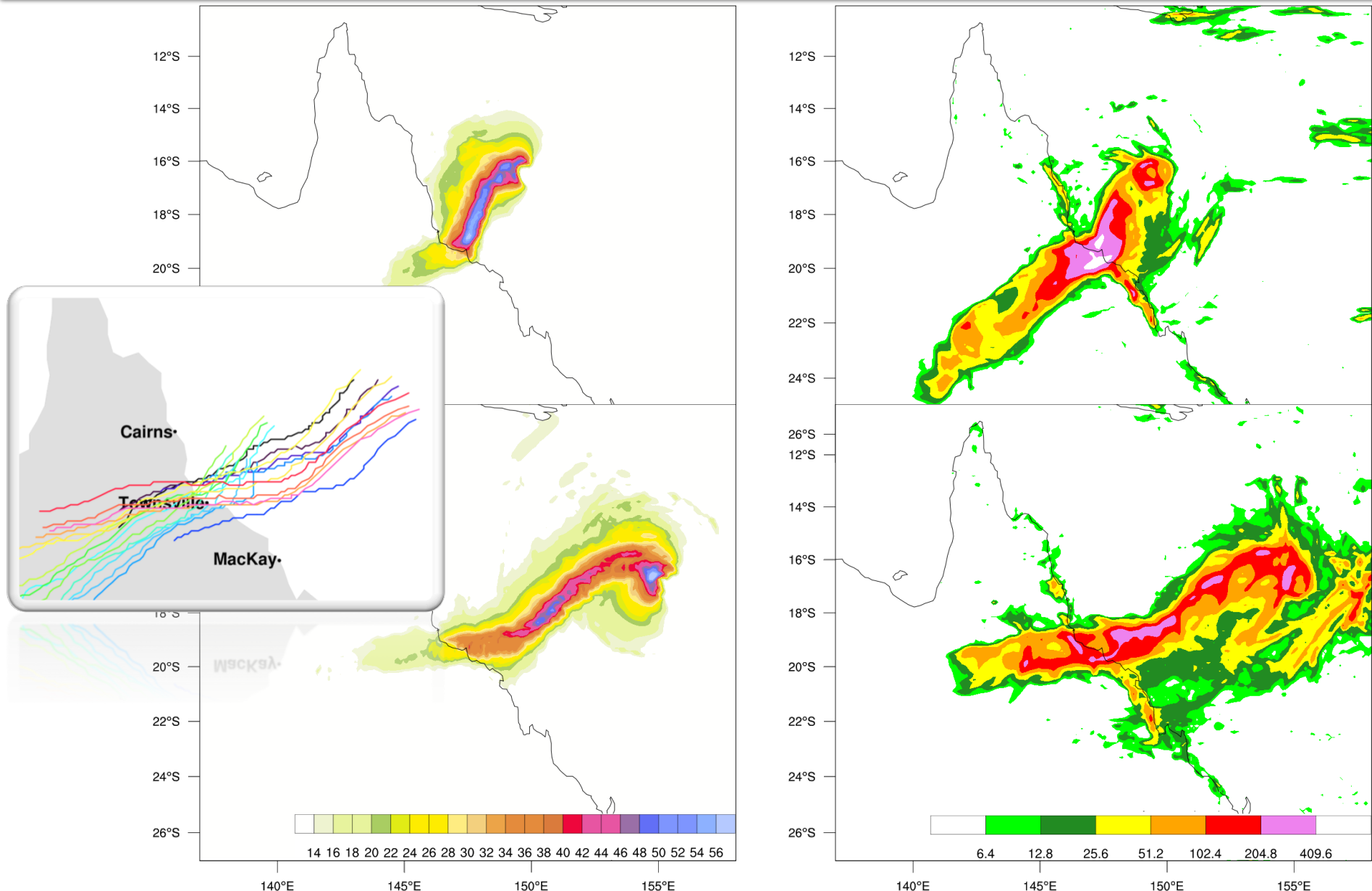
No Land ; Cyclone



Flat Land ; Cyclone

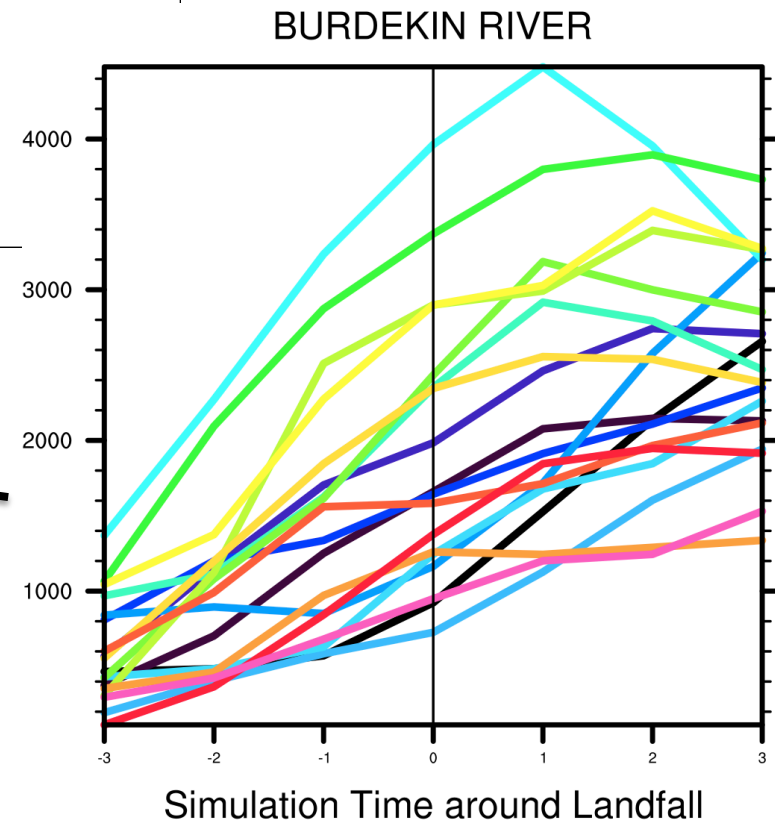
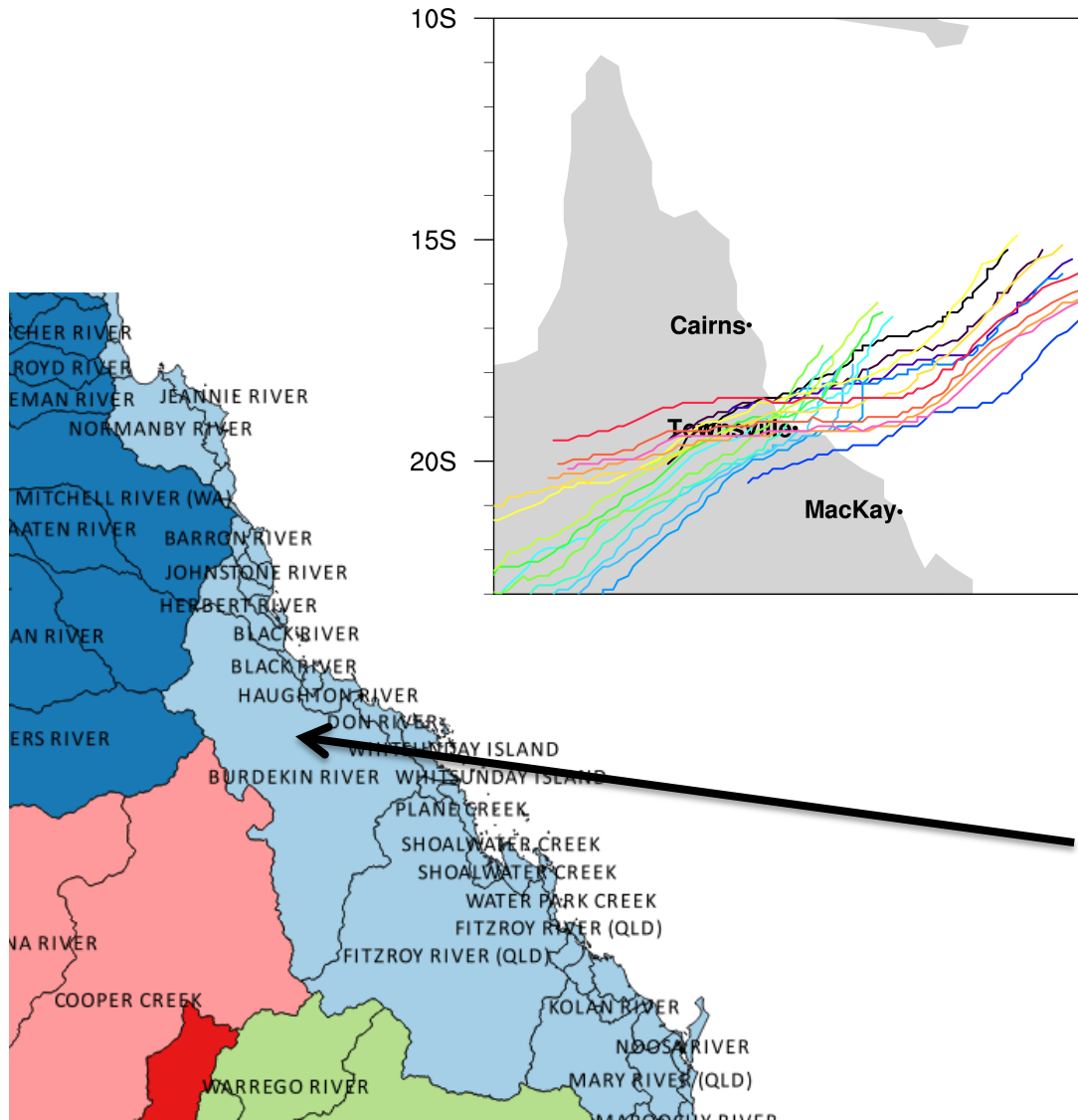


# Hybrid WRF Cyclone Model (HWCM)





## Effect on Precipitation





# Conclusions

- Effects of terrain and topography can be taken into account
- Effect of landfall approach and translation speed can be investigated
- Evaluation of damage due to speed and direction of cyclone movement at time of landfall
- Large numbers of cyclones can be simulated (*relatively*)

# Future

- More case studies needed
- Studies needed over different parts of the world
- Improved software to enable release to the community

