CAWCR Activities in the framework of TWP-ICE and the Tropical ARM Sites

A.Protat[#], P. May[#], Ross Mitchell[#], T. Lane[&], G. McFarquhar[*], J. Um[*], and M. Whimpey[#]

[#] Centre for Australian Weather and Climate Research   [&] Melbourne University   [*] University of Illinois

CAWCR

Australian Government Bureau of Meteorology

CSIRO

A partnership between the Bureau of Meteorology and CSIRO

Introduction   In this poster we illustrate the research conducted at CAWCR in the framework of TWP-ICE and the Tropical ARM Sites (Nauru, Darwin, Manus, Niamey)

## The Statistical Properties of the *Normalized* Particle Size Distribution in the Tropics (TWP-ICE)
contact : a.protat@bom.gov.au

$N(D) = N_0 * F(D_{eq}/D_m)$ (*Delanoe et al. 1995 JGR*)
D_{eq} equivalent-melted diameter, D_m mean vol.-weighted diameter

Approximation of shape F by a single mathematical formulation for all ice clouds is possible. Best shape is $N(D) = N0\ D^\alpha \exp(-k\ D^\beta)$ with $\alpha=-2$, $\beta=4$.

Resulting errors on IWC (2±3%) extinction (3±10%) effective radius (-0.5±6 µm) & Z (0.8±1.4dB) small.
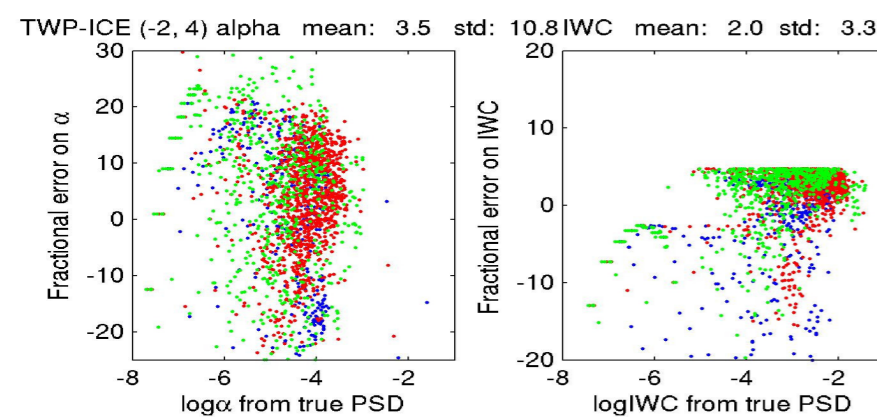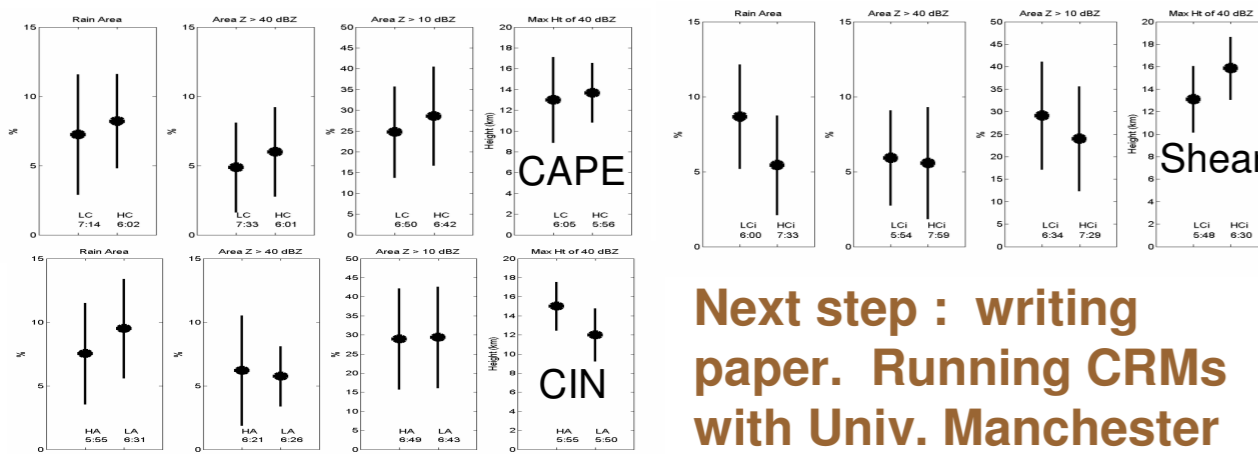

But : in-situ TWP-ICE data still under investigation (IWCs from PSDs do not agree with CVI IWCs).

Next step : Redo analysis with CPI-derived PSDs Compare with AMMA normalized PSDs

---

Tropical Ice Cloud Climatologies Using a New Doppler Cloud Radar Retrieval Method (RadOnTropics)
contact : a.protat@bom.gov.au

Previous method (RadOn, Delanoe et al. 2007, JAMC) was for 95 GHz Doppler radar, mid-latitude ice clouds, and using a single Vt-Z relationship to extract fall velocity from Doppler.
New method is for any λ, any lat, + a Vt-Z-height relationship to retrieve Vt from Doppler. Change in effective radius is very large (preliminary).

RadOn   **RadOnTropics**

NB : unsolved graphics bug …

Nauru, 04/12/2003

Next step : Evaluate the new retrievals (with in-situ data when available) – anvil climatology from Niamey / Darwin observations

---

Model evaluation with CPOL
contacts : p.may@bom.gov.au , tplane@unimelb.edu.au

Compare fraction of the domain area covered by various radar reflectivity levels, rain, snow etc in observations and model runs.

CPOL Statistics   **CRM Statistics**

Compare both qualitatively and quantitatively.
May and Lane, submitted manuscript, 2008
Next step : use with a range of modelers

Aerosols and convection
contact : p.may@bom.gov.au

Use airborne aerosol data from TWP-ICE, as well as long term aerosol data together with radar data statistics to separate aerosol and thermodynamic controls of storms. This study focuses on Tiwi Island thunderstorms.
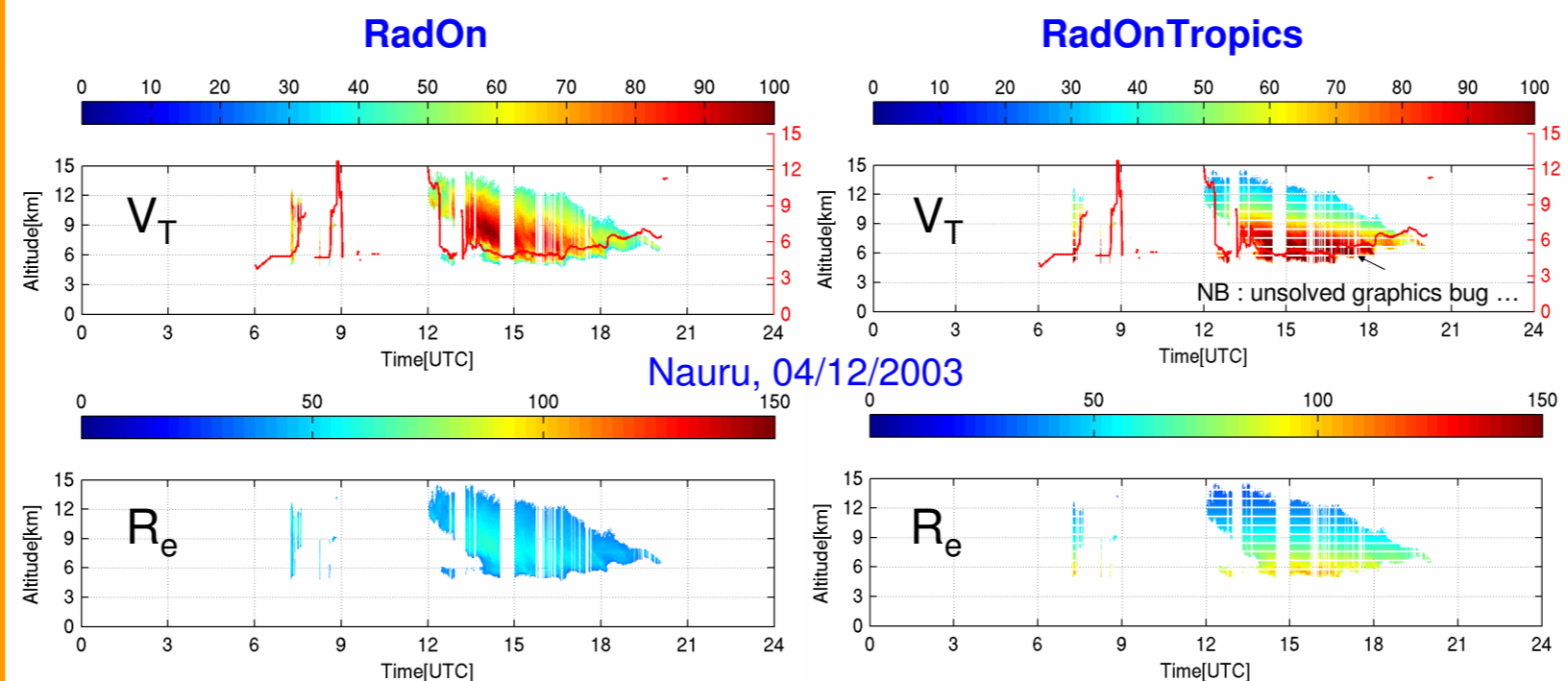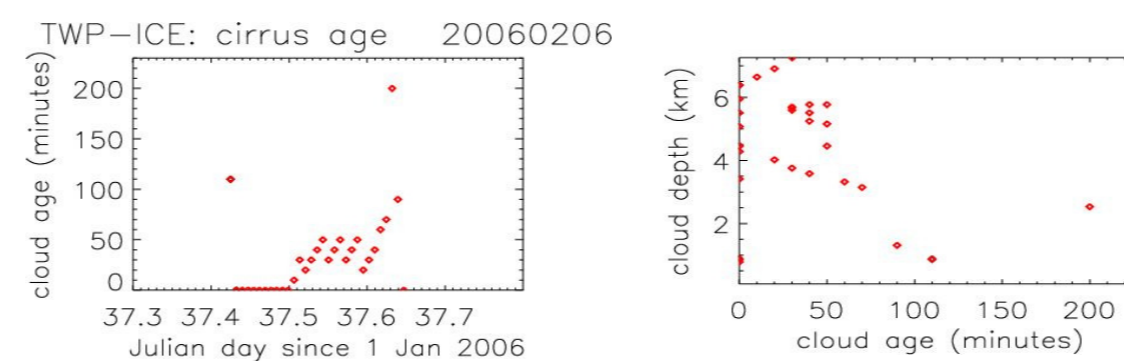

Next step : writing paper. Running CRMs with Univ. Manchester

---

Cirrus, anvils, and convection
contact : a.protat@bom.gov.au

Studying the link between the characteristics of the parent convection and the resulting cirrus and anvil characteristics is a major objective of TWP-ICE. Our first step is to estimate the "age" of cirrus sampled by the Darwin MMCR by searching for the closest convective activity as detected by CPOL. This work is complementary to starting activities using TWPICE aircraft data.
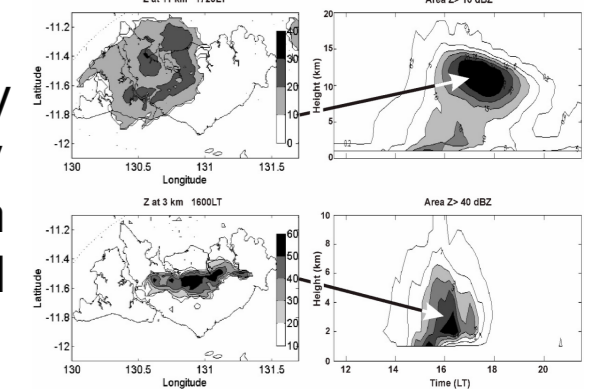

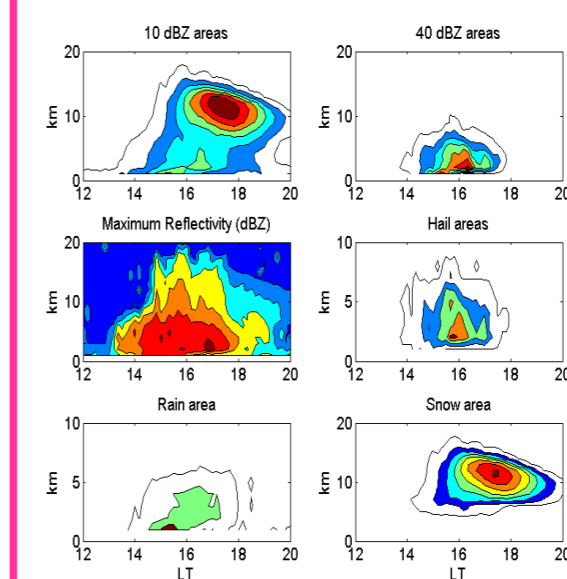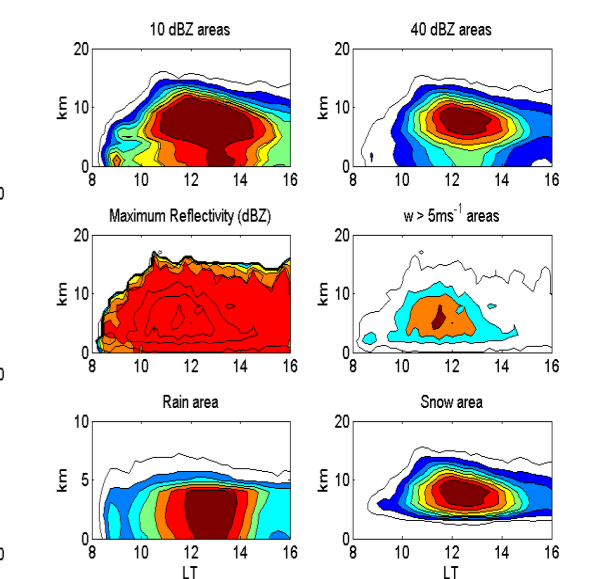**Next step : statistics of cirrus age+ retrieve cloud prop.**

Smoke emission and dispersion in the Australian savanna
contact : Ross.Mitchell@csiro.au

Smoke emission and transport have been modeled across the Top End for the 2004 burning season, with validation including ARM aerosol optical depth. Results show frequent air quality violations and significant asymmetric aerosol radiative forcing.
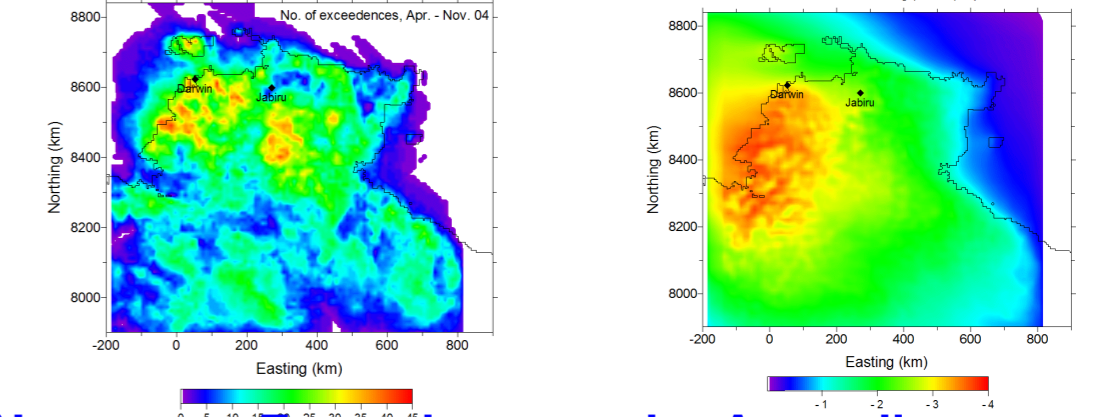
Next step : Extension to entire Australian savanna