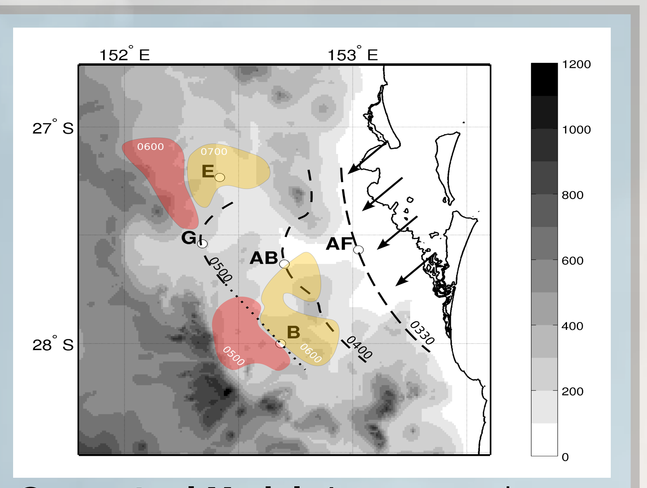
Impact: 27 November 2014 hailstorm, Brisbane (Courier Mail). Insured damages have now exceeded $1.2B AUD

Regions of South East Queensland (SEQ) are known to experience particularly frequent and severe storms by forecasters and the public alike, however the concepts and understanding of this phenomena are limited to anecdotal evidence.

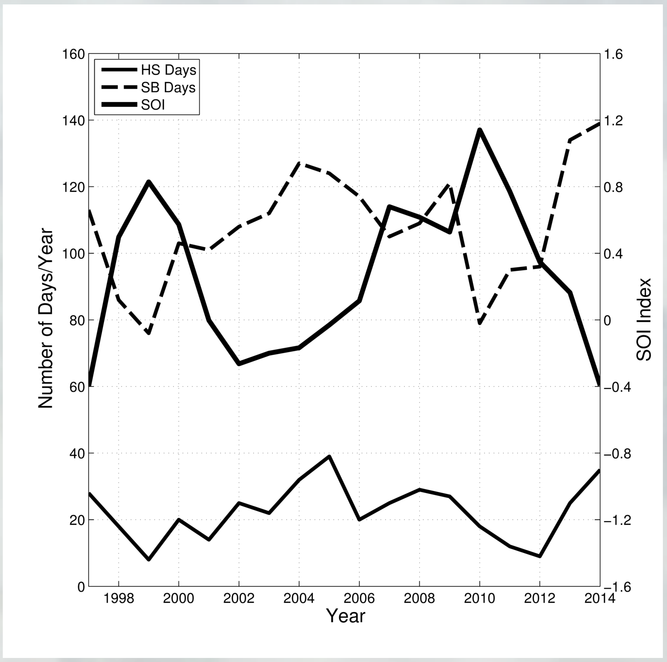
It is hypothesised the sea-breeze interactions with storms contributed to this behaviour. A climatological and meteorological study were designed to explore this phenomena in SEQ.

Climatological analysis has provided a spatial - temporal understanding of historical hailstorm hotspot activity and a conceptual model of the underlying mechanisms to support the forecasting of hailstorms in the SEQ region.

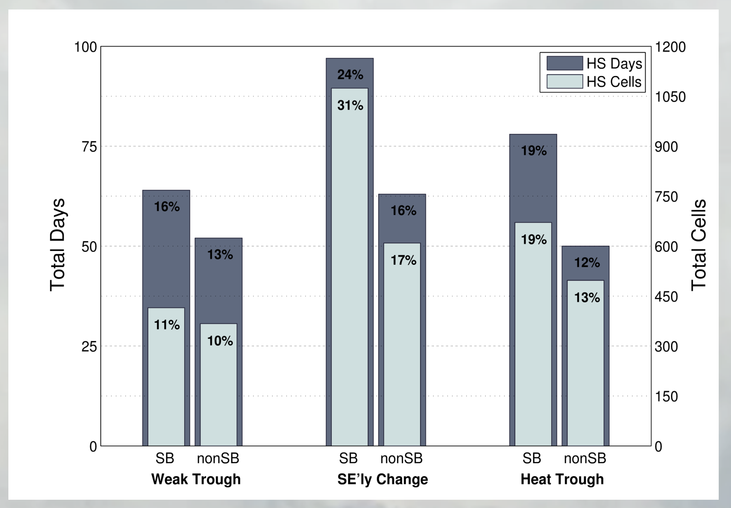
Further analysis of field campaign data for sea breeze induced changes to the storm effective inflow layer and latent heat flux will be explored next.



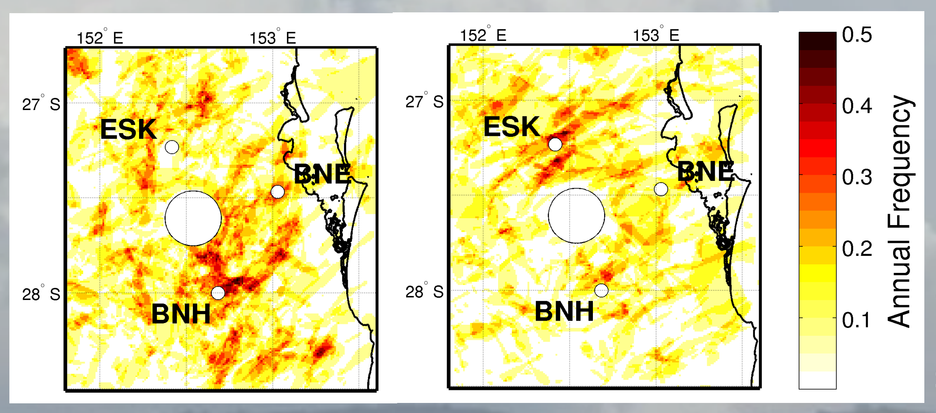
Conceptual Model: Average sea breeze arrival time and hailstorm initiation (CI) and enhancement (CE). Hailstorm CE occurs after the sea breeze front arrival.



Temporal: Rain year (July-June) frequency of sea breeze (SB), hailstorms (HS) days and yearly averaged (July-June) SOI. Suppression of SB/HS frequency is possibly related to ENSO forced trade wind intensity.



Statistical: Total number of hail storm days and cells for sea breeze and non sea breeze days within 3 synoptic types for 1997-2014. The SE'ly Change - sea breeze setup is the optimal condtions for hailstorms within this climatological analysis.



Spatial: Hailstorm swath frequency across 1997-2014 for sea breeze days (left) and non sea breeze days (right) using WSR74 S-band radar at Marburg in western SEQ. WDSS-ii algorithms implemented in MATLAB with rawinsonde data analysis for maximum expected size of hail (MESH) threshold of 21mm and surface station detection of sea breeze activity.

CCIE

Coastal Convective Interactions Experiment

Motivation

Outcome

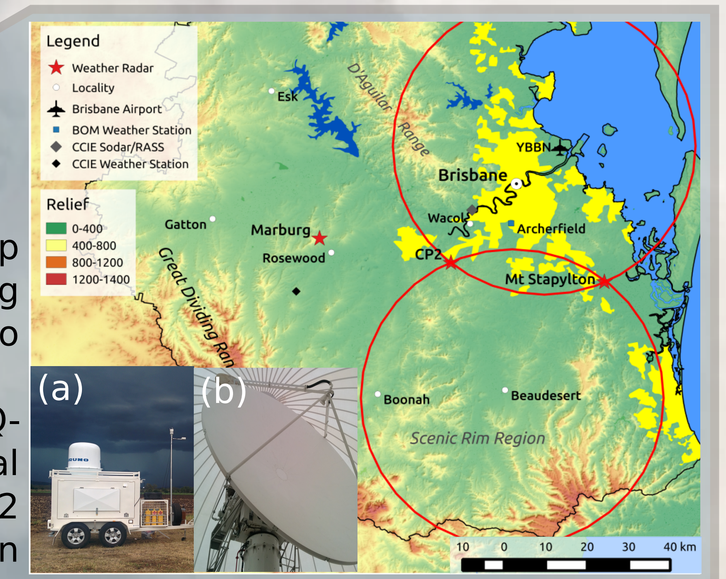
Climatological Analysis

Meteorological Analysis

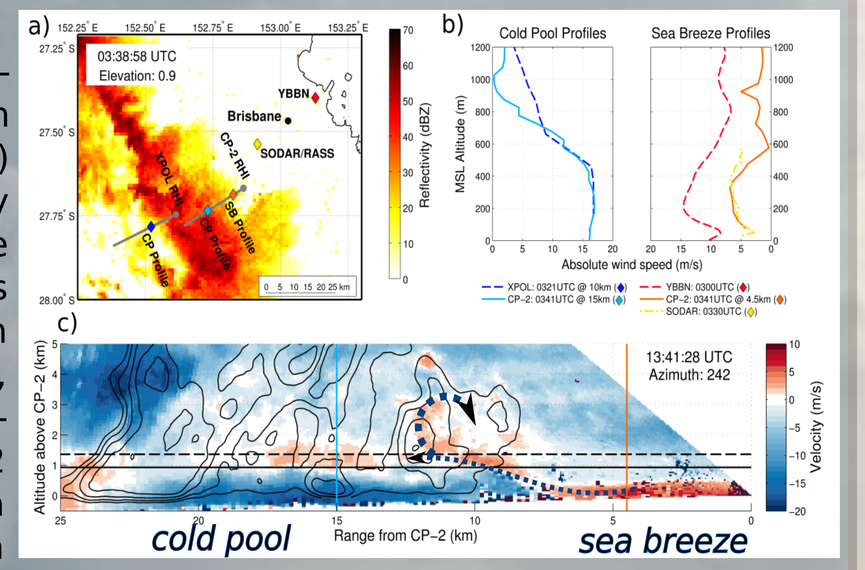
Joshua Soderholm

The University Of Queensland
AUSTRALIA

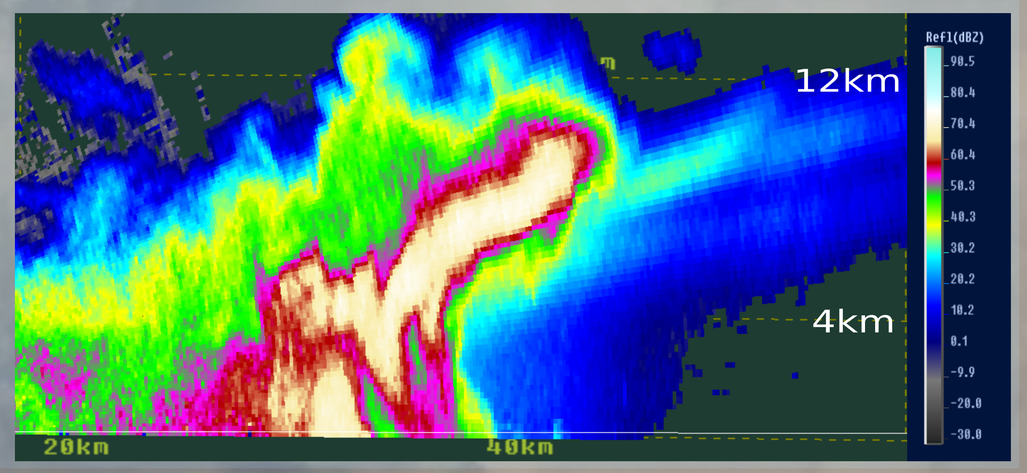
Strategy: Operations map for the CCIE during 2013 & 2014 seasons to observe sea breeze - storm interactions. UQ-XPOL shown in (a). Dual Doppler lobes for CP2 (b) and Mt Stapylton



Interaction: Sea breeze - squall collision shown in (a) CP-2 reflectivity PPI, (b) absolute wind profiles derived from CP-2, RASS, soundings and UQ-XPOL and (c) CP-2 Doppler RHI of sea breeze - squall collision



Analysis: Reflectivity RHI cross-section of the 27 November Brisbane hailstorm from the CP-2 research radar. RHI oriented at 34deg, through the SW to NE quadrants of the storm. Pre-storm soundings indicated negligble 0-6km shear and instability present. The storm developed in a sea breeze air mass over the Brisbane region.



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September 2015

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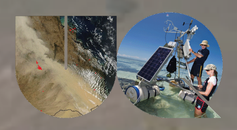

Climate Research Group
School of Geography, Planning and Environmental Management

Australian Government
Bureau of Meteorology

ROAMES

EOL
Earth Observing Laboratory