

Coastal Tropical Convection

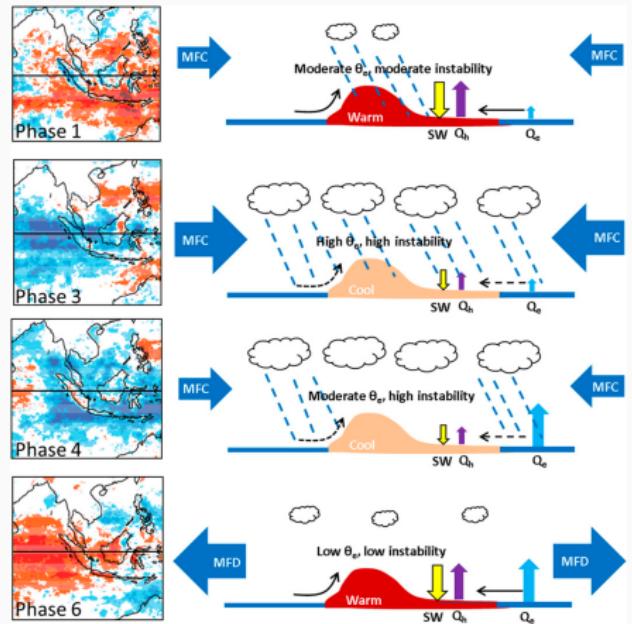
an outline for a stochastic modeling approach

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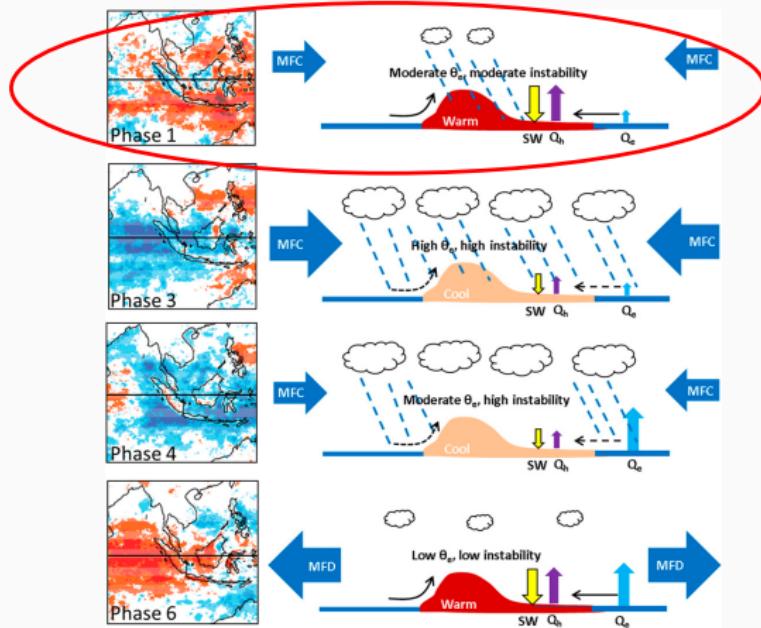
04. July 2017

MJO \leftrightarrow MC rainfall



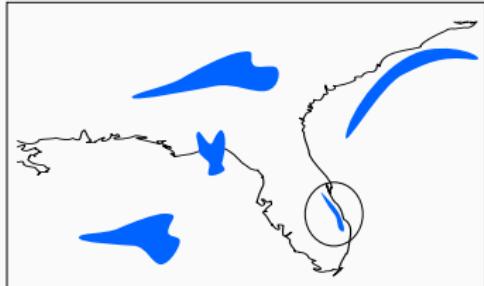
Birch et al. (J Clim 2016)

MJO \leftrightarrow MC rainfall



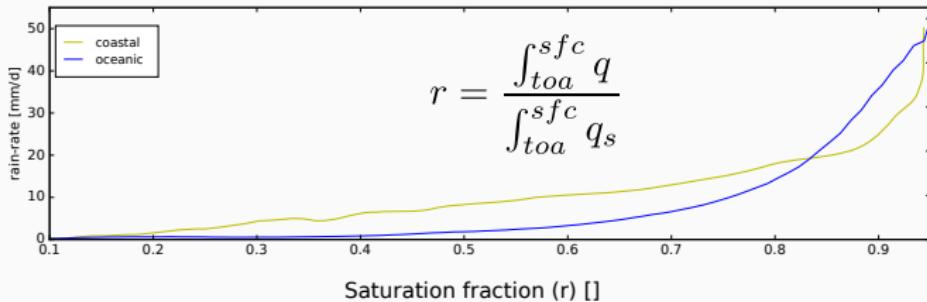
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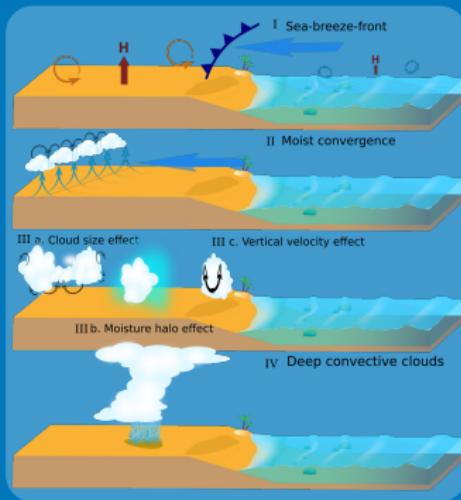
Rainfall \longleftrightarrow Humidity



Detect rainfall patterns:

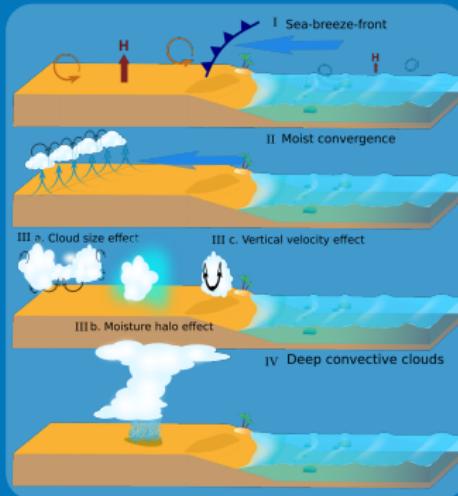
- occur in coastal areas
- are not synop scale
- are aligned with the coastline



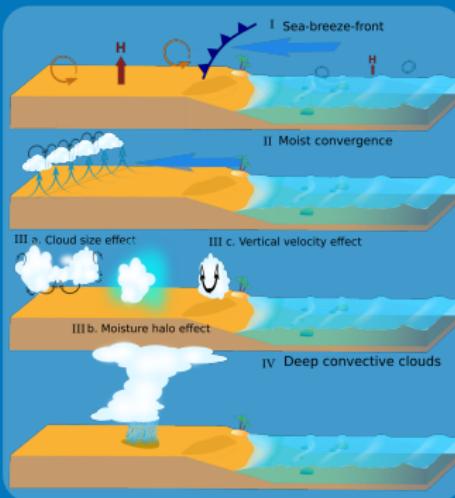




When
coastal
effects
are
present?

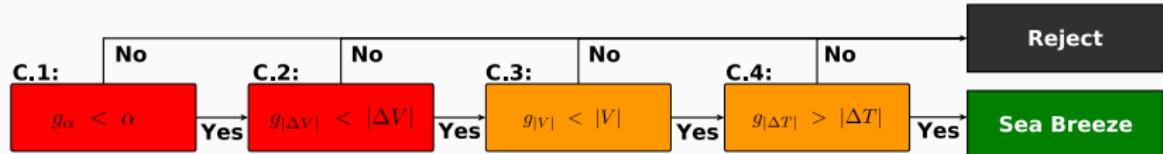


When
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How to
change the
cu. param.?

Identification of sea-breeze conditions



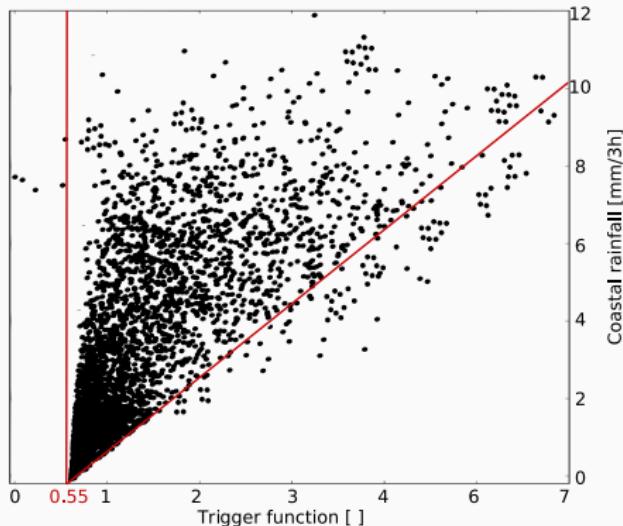
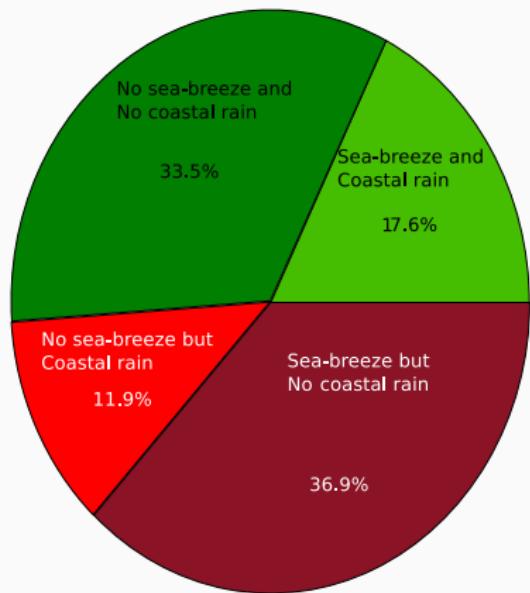
large-scale conditions only (Borne et al. 1998)

Binary (yes/no):

Scale the output by $|V|$ and $|\Delta T|$

$$f(t) = \begin{cases} 0 & \text{if } f(t) = 0 \\ \underbrace{\frac{|g_{\Delta T}(t)|}{\Delta T}}_{>0} \cdot \underbrace{\frac{|\vec{V}| - g_{|\vec{V}|}(t)}{|\vec{V}|}}_{>0} & \text{if } f_B(t) = 1 \end{cases}$$

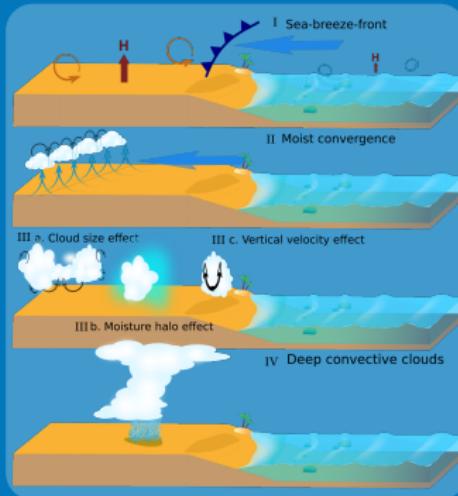
Performance test with coastal rainfall



$$\Delta T = 1.75 \text{ K} \quad |\vec{V}| = 11 \frac{\text{m}}{\text{s}} \quad \Delta |\vec{V}| = 6 \frac{\text{m}}{\text{s}} \quad \Delta \alpha = 90^\circ$$

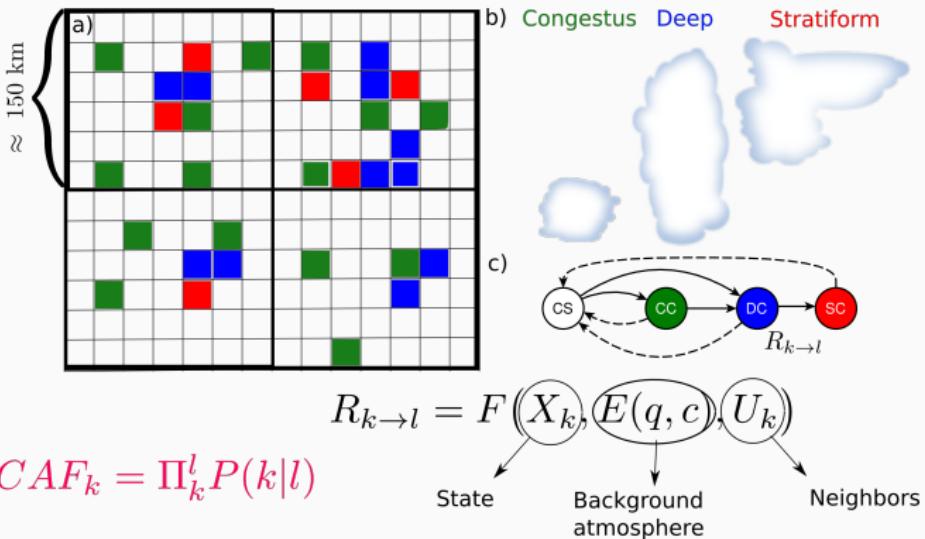


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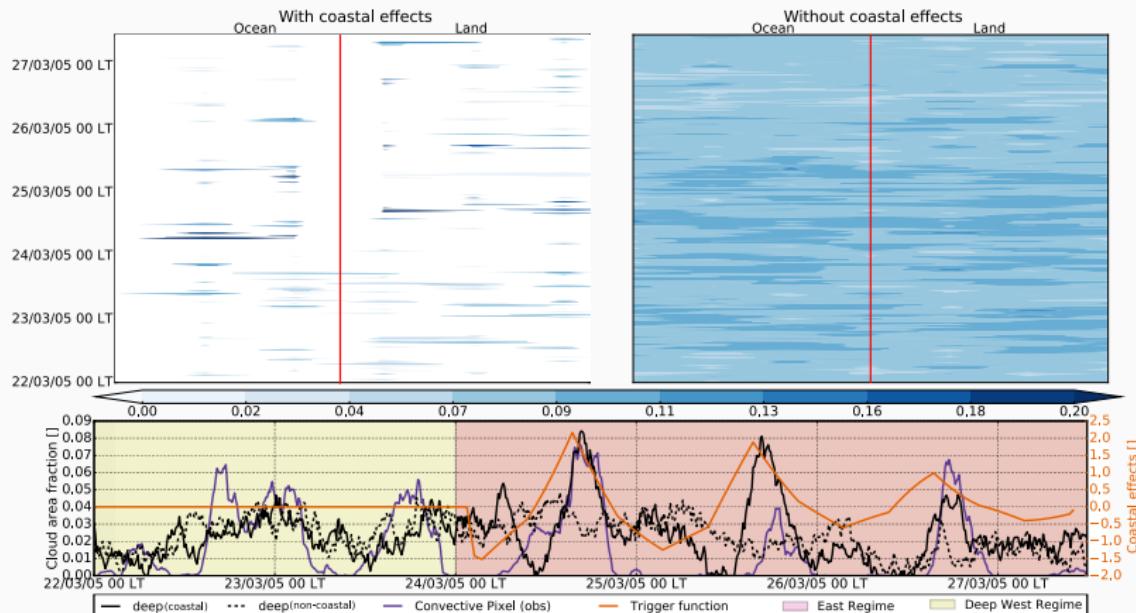
The stochastic multi-cloud model (smcm)



calculate transition rates R_{kl} of 3 cloud types

Increase/decrease occurrence of convection according coastal effects.

A real world example-Darwin, Australia





⚡ coastal trigger → UM



⚡ SMCM → ECHAM6