A climatology of coastal rainfall and its relation to the large-scale atmosphere

(martin.bergemann@monash.edu)

- coastline associated convection is important
- coastline associated convection is less dependent on the large-scale atmosphere
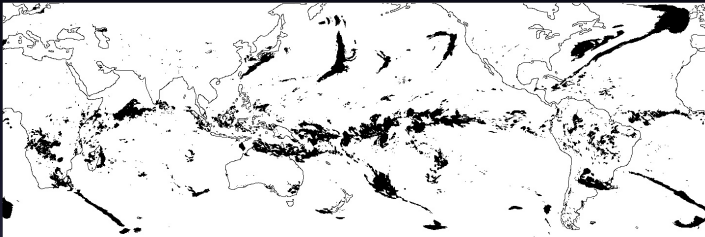
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How can coastal convection be characterized?

Objectively identify coastline associated rainfall

1. higher rainfall intensity
2. meso-scale systems
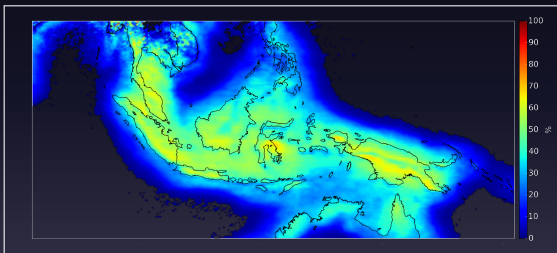3. in coastal vicinity
4. aligned with coast

Method is based on canny-edge detection

- convert rainfall data to 2D-image
- isolate rainfall domains
- test domains for defined heuristics

How much rainfall comes from the detected features?

fraction of total yearly rainfall coming from detected rainfall

- fraction: detected rain / total rain
- reveals regions where land-sea interaction is important [1]

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[1] http://arxiv.org/abs/1501.06265
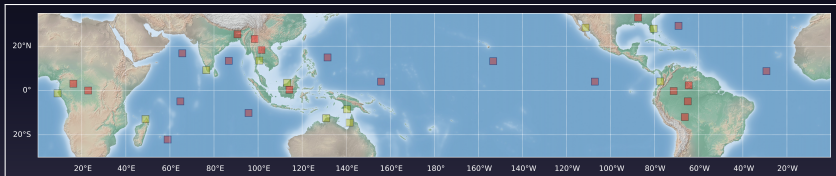
Coastline associated rainfall does matter

How is coastal rainfall linked to the large-scale state?

Pick atmospheric variables that are crucial for convection.

- Convective instability $k(T, T_D, T - T_D)$
- Moisture Q_n ($\int \dfrac{q}{q_S}$)
- Vertical velocity ω_{600hPa} [1]
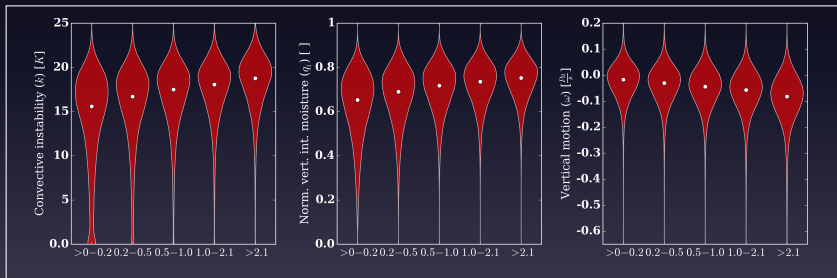
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[1]Era-Interim (0.75×0.75)

Choose 33 different boxes $(300 \times 300$ km) in **coastal** and **non-coastal** regions

- box-avg of k, Q_n and $\omega_{600hPa} \Longleftrightarrow$ rainfall
- split rainfall into quantiles and compare PDF of k, Q_n, ω_{600hPa} in each quantile.

How are the variables distributed when it rains a certain amount?
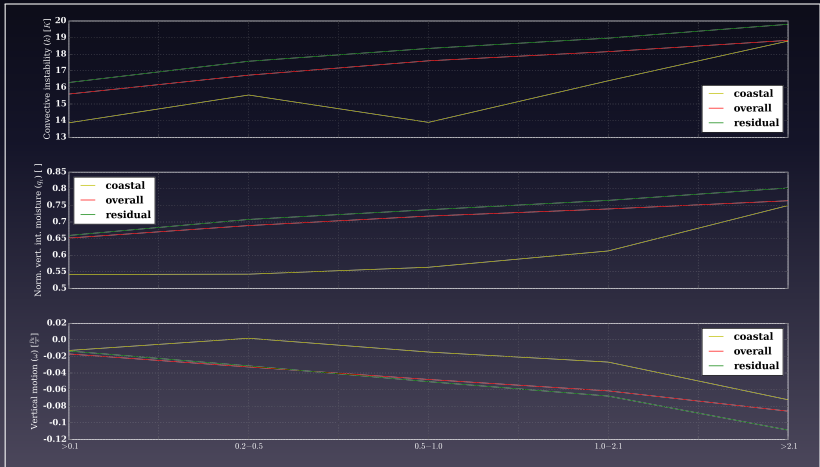

Distributions for all boxes

Comparison detected detected **coastal** and non-detected **residual** rainfall
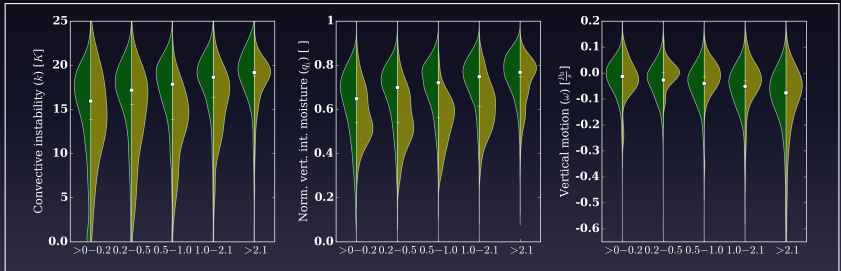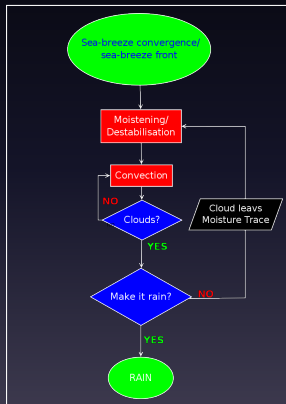
How do large-scale variables change with rainfall?

Comparison of the trend of the medians for all boxes

Coastal rainfall is less dependent on the large-scale atmosphere

A possible mechanism?

Future plans:

1 implement possible mechanisms into stochastic multi-cloud model

2 look for mechanisms during night time
$\rightarrow$ apply algorithm to Clair's WRF simulation