Synoptic Classification

Applications to Brazil AMF Deployment

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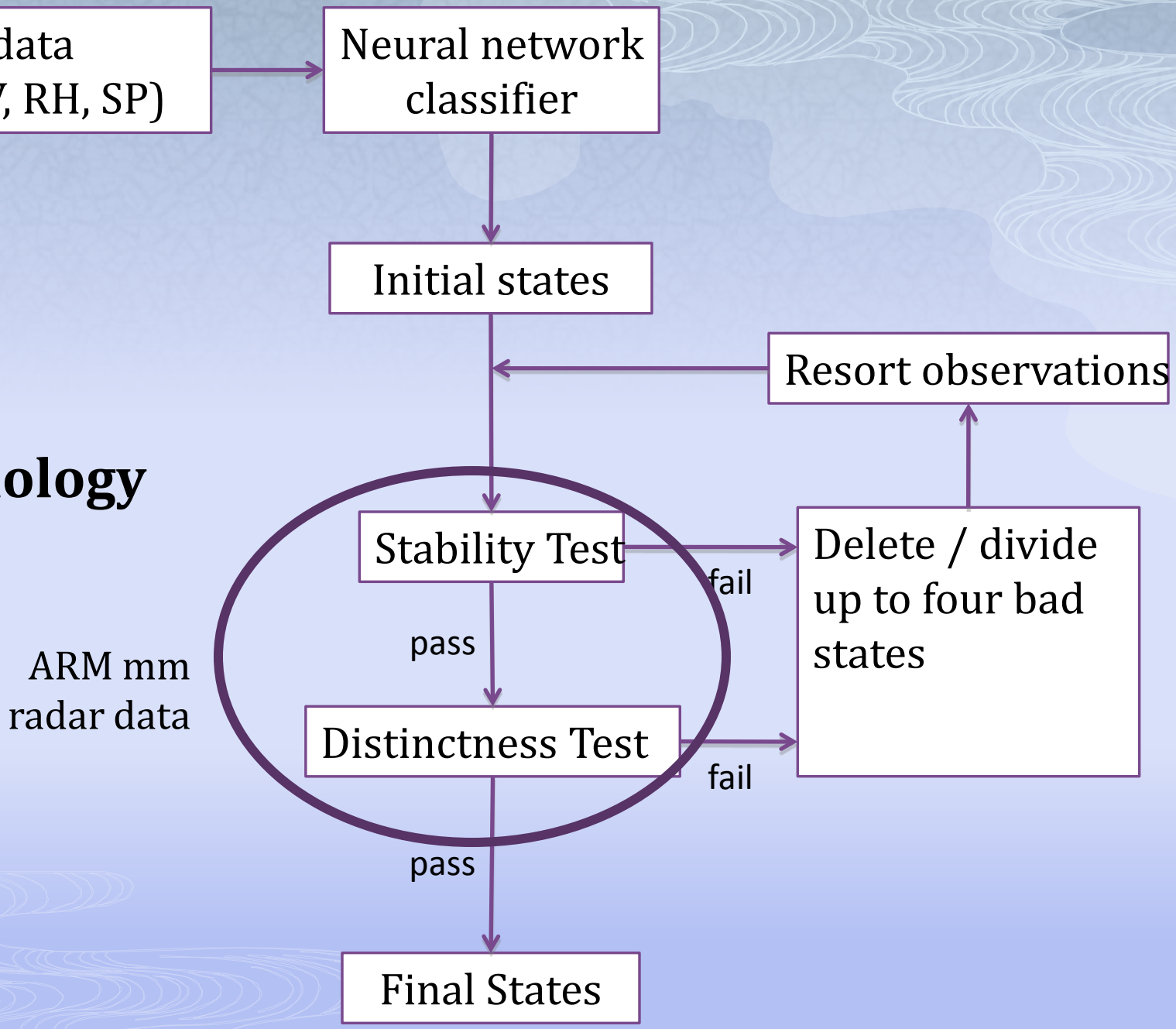
The question

- Can we establish a statistical relationship between dynamical forcing at the large mesoscale and cloud occurrence and properties?
- More specifically: can we do this in the convective tropics where variations in large-scale forcing fields may be more subtle?

Methodology



Example: Darwin classification

ECMWF reanalysis

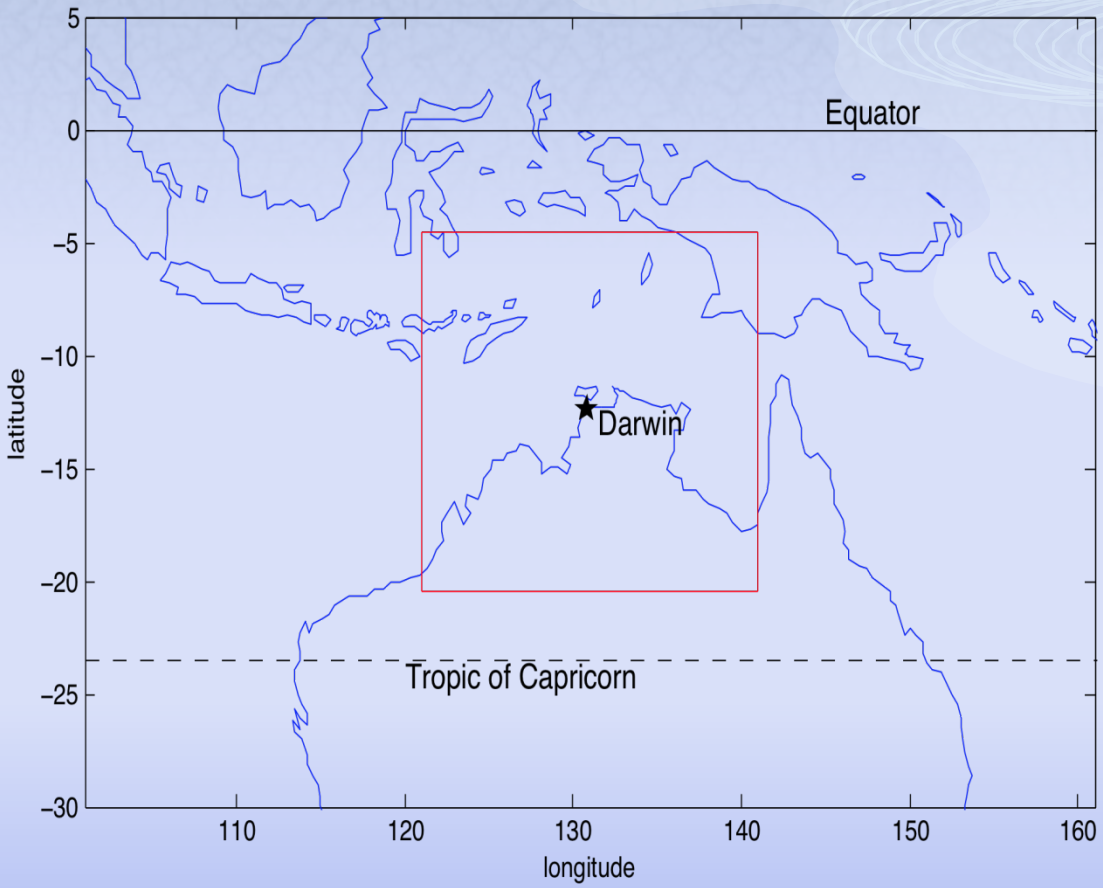
- June 06 – Sept 10
- 8x daily

At each timestep

- 9 x 9 horizontal grid
- centered on Darwin
- 2° x 2.5° spacing
- 7 vertical levels

Variables at each point

- T, U, V, RH, SP

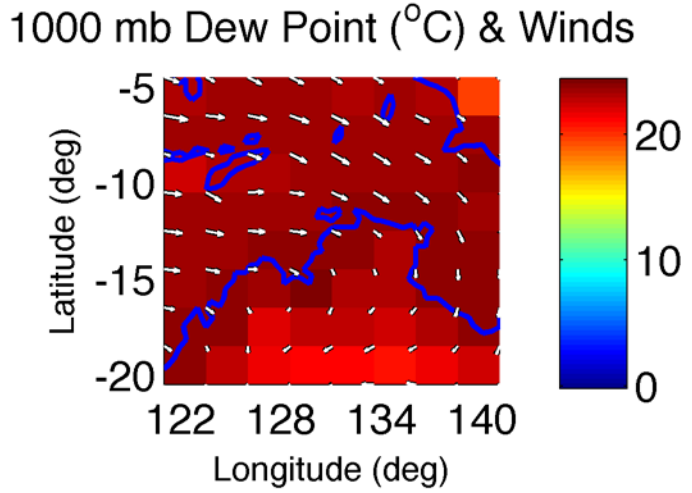


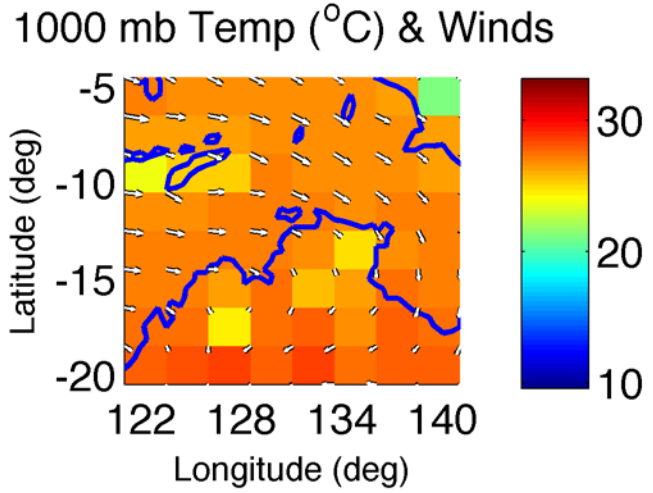
2349 variables = 1 event or observation

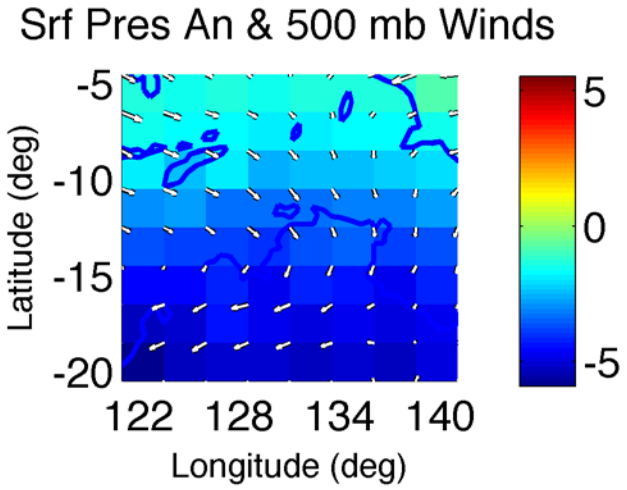
Outcome

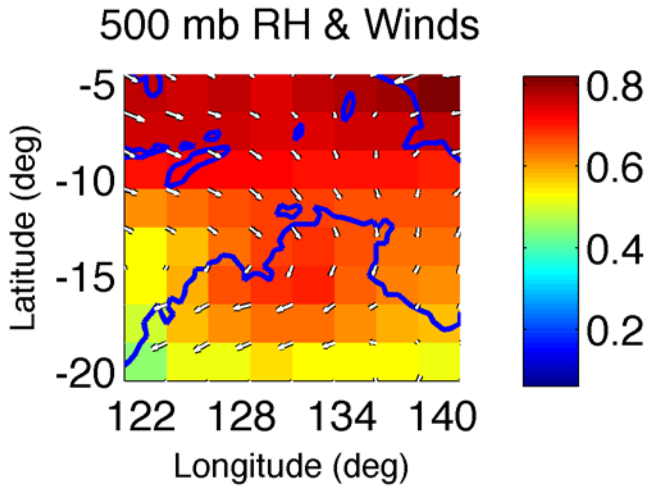
- 9 distinct states
- Meteorology associated with each state
- Cloud occurrence profiles associated with each state
- Statistical distribution of associated physical properties

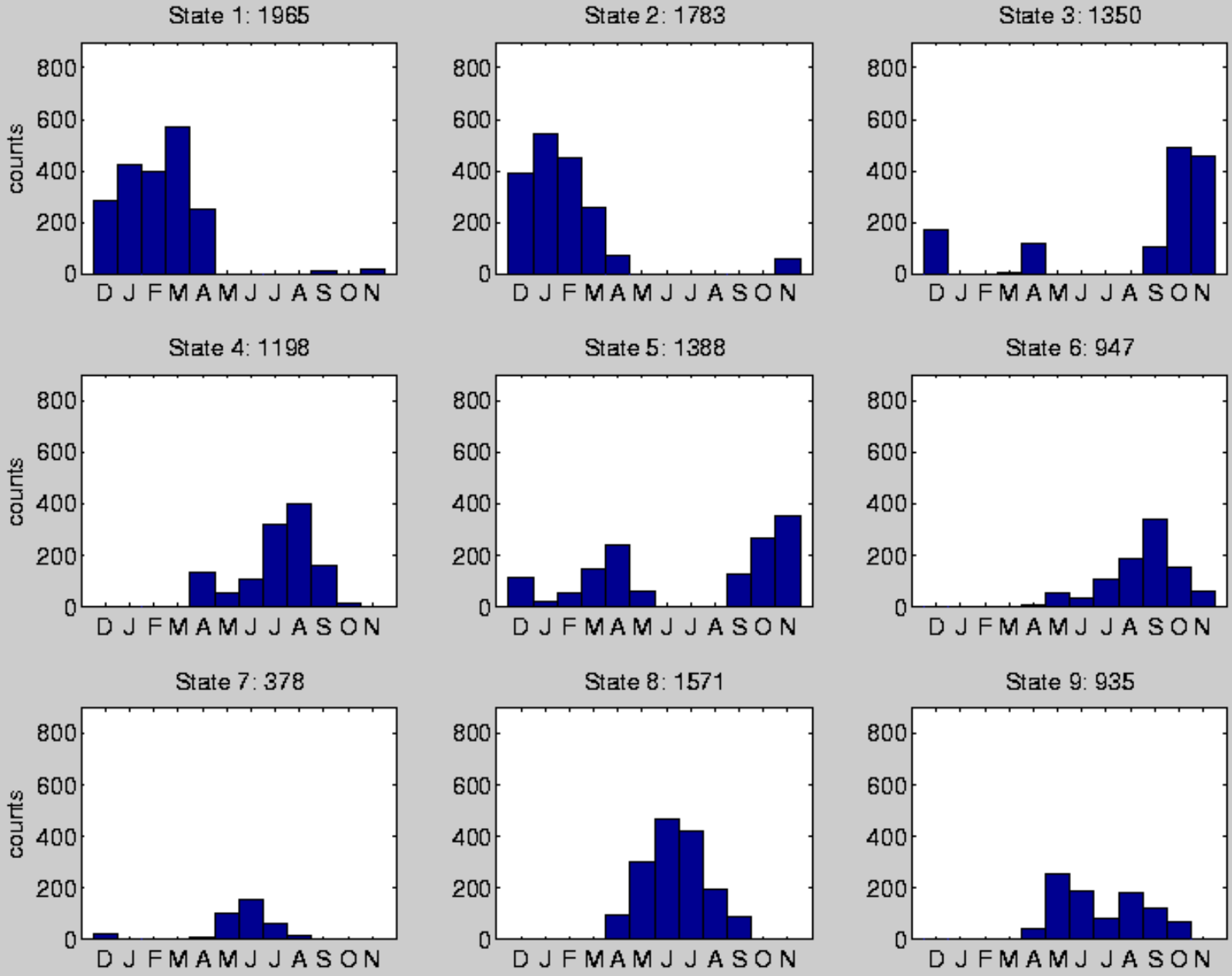
State 2 – heart of monsoon season

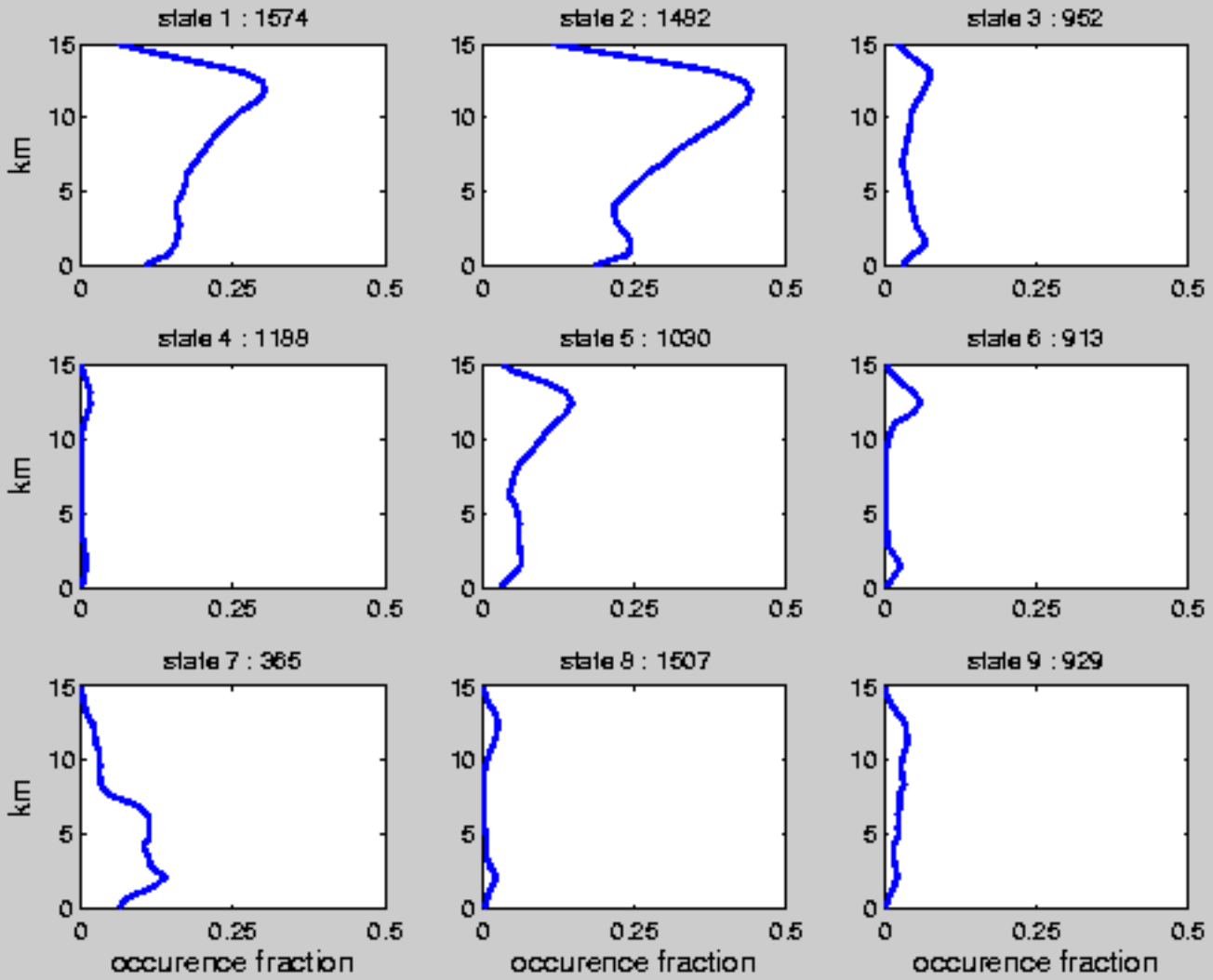


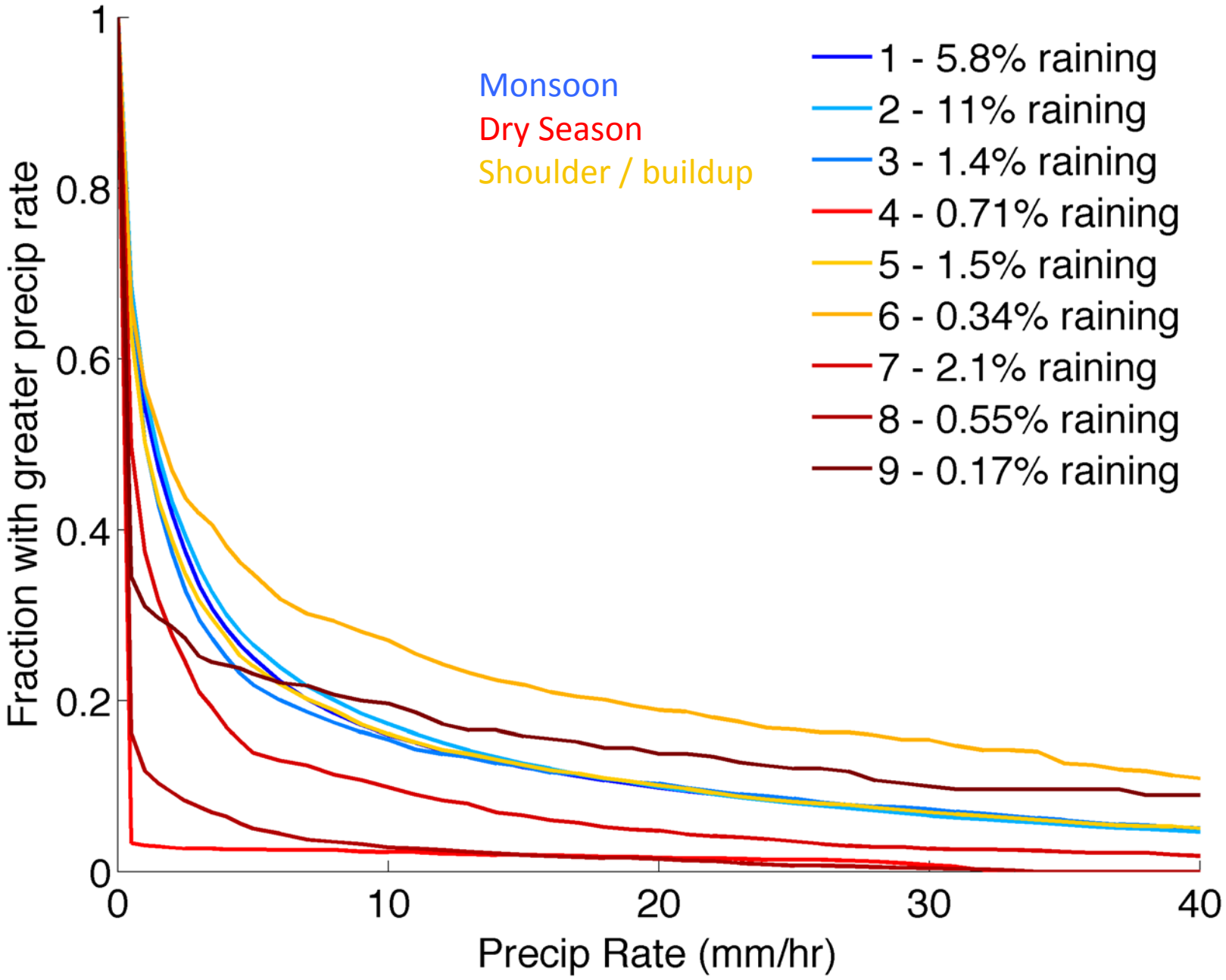







State 1: 1965
State 2: 1783
State 3: 1350
State 4: 1198
State 5: 1388
State 6: 947
State 7: 378
State 8: 1571
State 9: 935
counts
0
200
400
600
800
D J F M A M J J A S O N

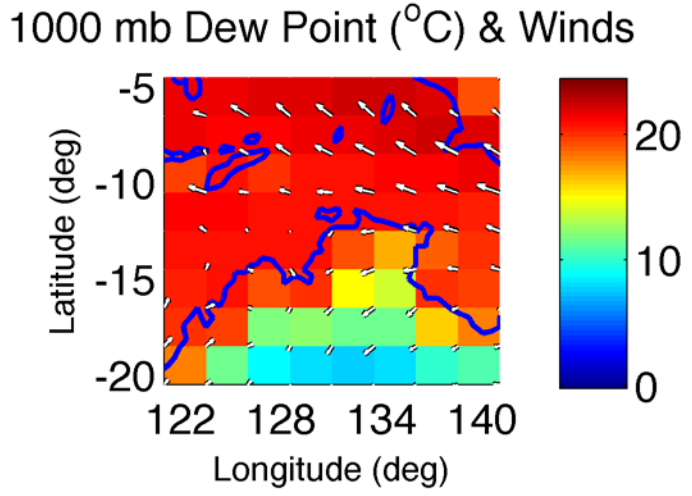

state 1 : 1574
state 2 : 1482
state 3 : 952
state 4 : 1188
state 5 : 1030
state 6 : 913
state 7 : 365
state 8 : 1507
state 9 : 929
km
occurence fraction
0
5
10
15
0.25
0.5

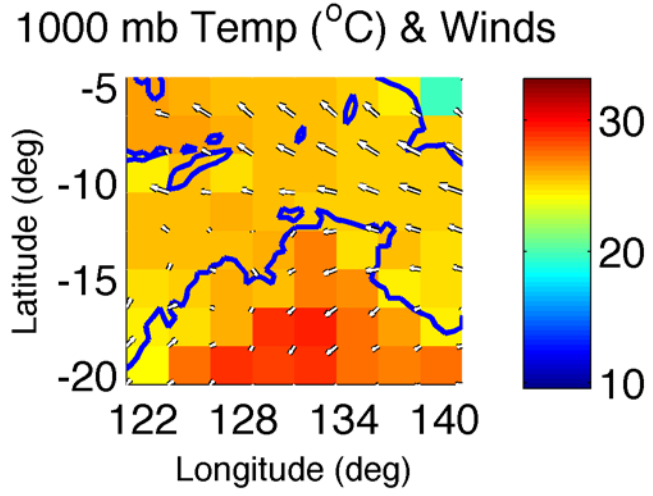

Monsoon
Dry Season
Shoulder / buildup
1 - 5.8% raining
2 - 11% raining
3 - 1.4% raining
4 - 0.71% raining
5 - 1.5% raining
6 - 0.34% raining
7 - 2.1% raining
8 - 0.55% raining
9 - 0.17% raining
Fraction with greater precip rate
0
0.2
0.4
0.6
0.8
1
0
10
20
30
40
Precip Rate (mm/hr)

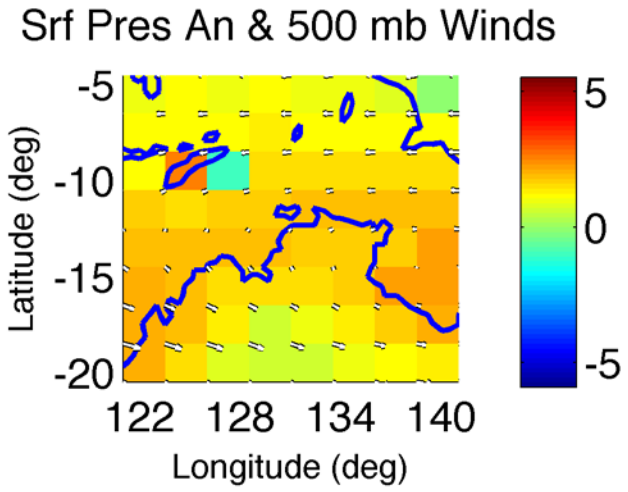
Plans for Brazil

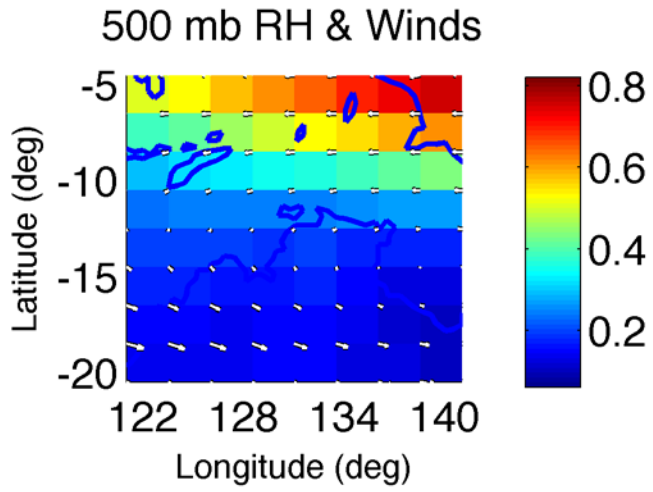
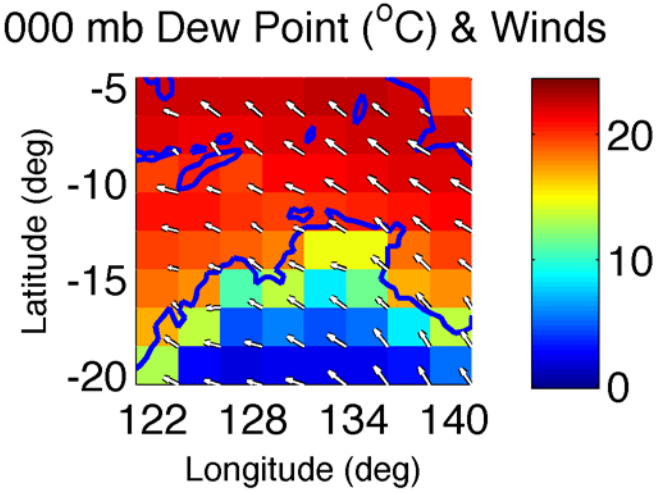
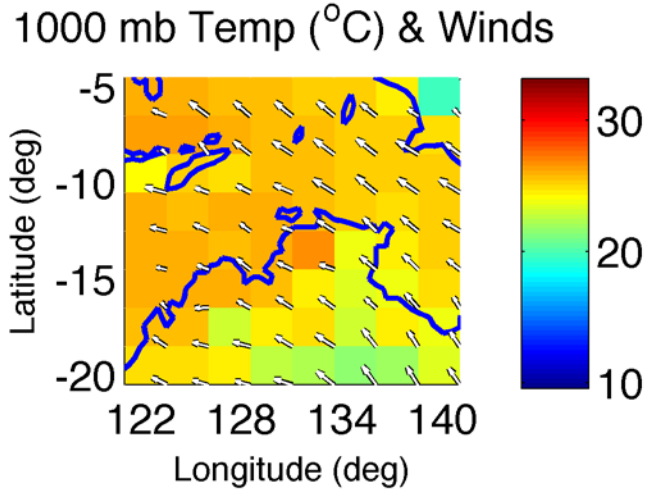
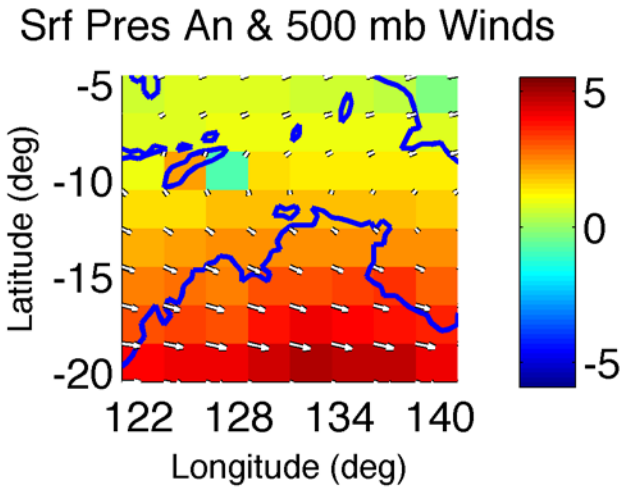
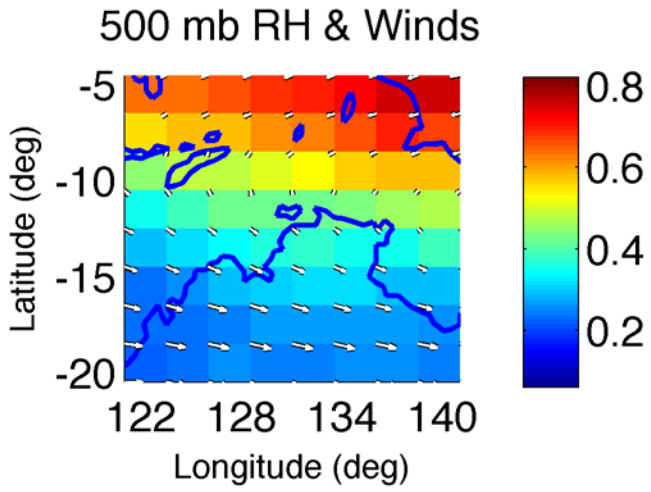
- Before deployment: Develop
  - Technique to substitute CloudSat profiles for ground-based radar profiles
  - Classification for Amazon
- During/after deployment
  - Map observed conditions into existing classification
  - Use ARM data to compare with and expand on existing distributions of cloud properties
  - Compare observed class properties with distributions from regional models

State 6 – build up to the monsoon featuring isolated convection









State 9 – dry season with isolated convection