Efforts to use Ka-band radars for continuous probing of precipitation

Arunchandra, Chidong Zhang and Pavlos Kollias

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Dr. Wanda Szymer, McGill University
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ASR Fall meeting, 2013

Warm Low Cloud Case 1: AMIE-Gan/Manus MJO Inactive Phases

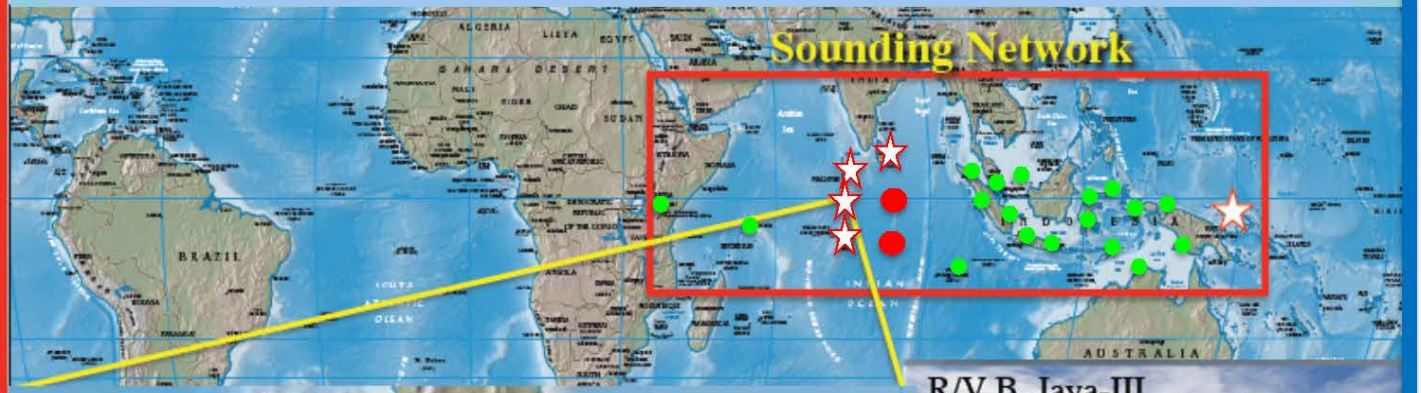
Arun Arunchandra, Min Deng, Zhe Feng, Matthew Janiga, Pavlos Kollias, Chuck Long, David Zermeno, Chidong Zhang

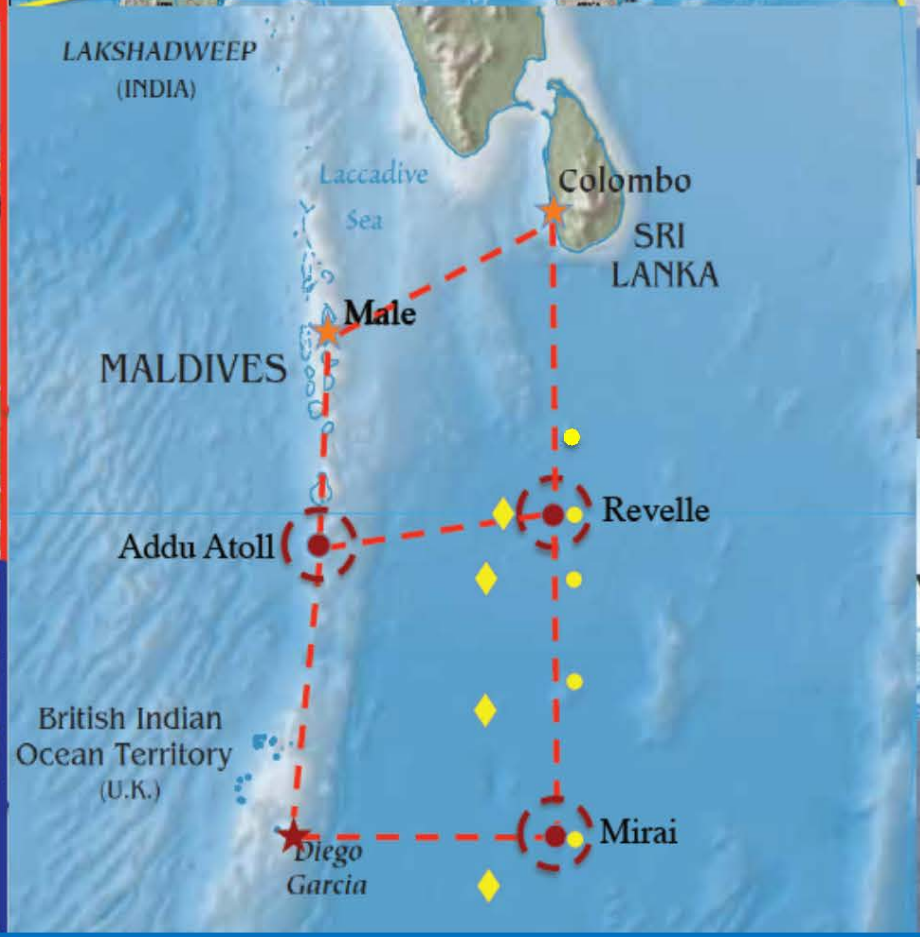
ASR Fall meeting, 2013

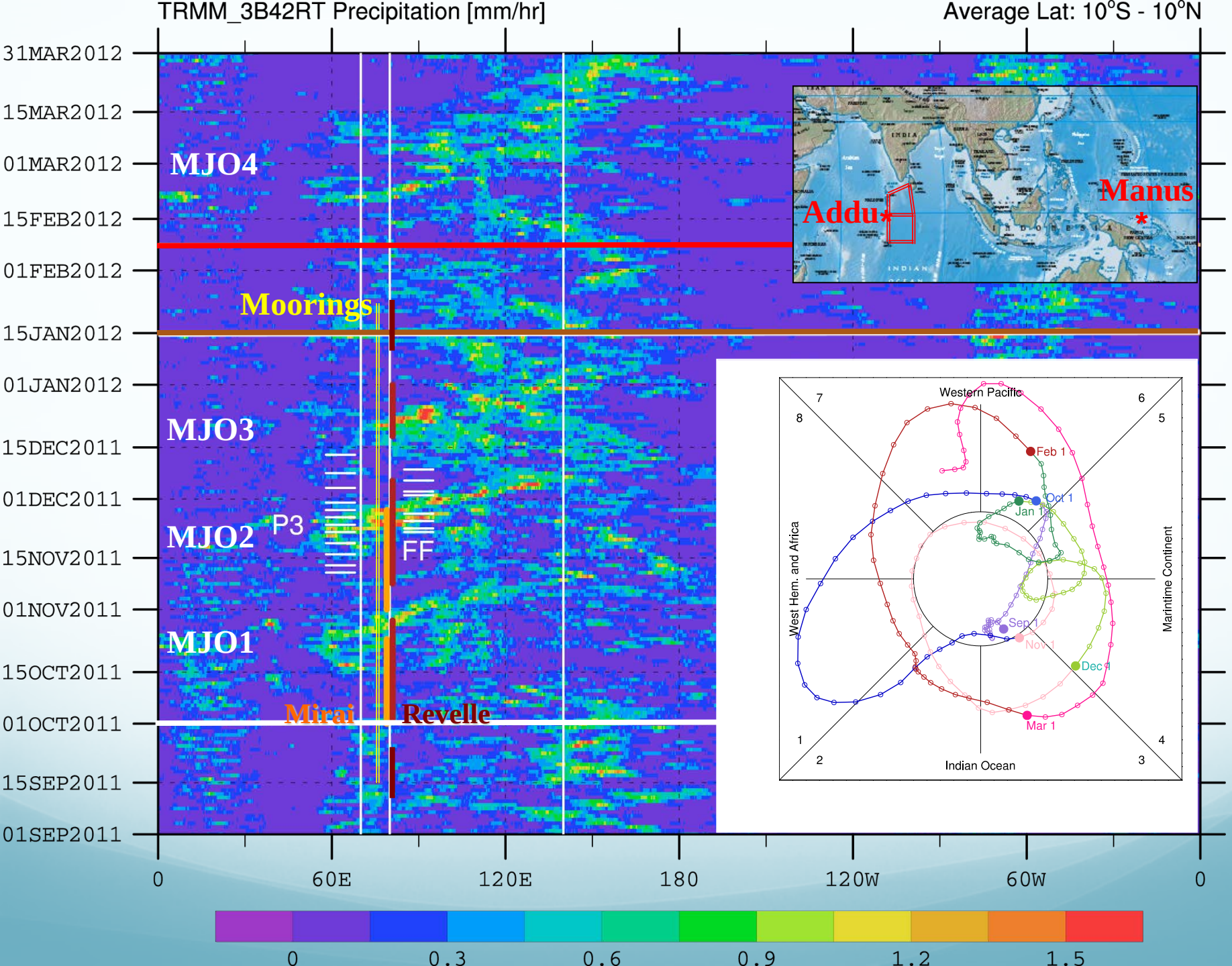
Issues Related to Warm Low Cloud in Tropical Convective Regimes

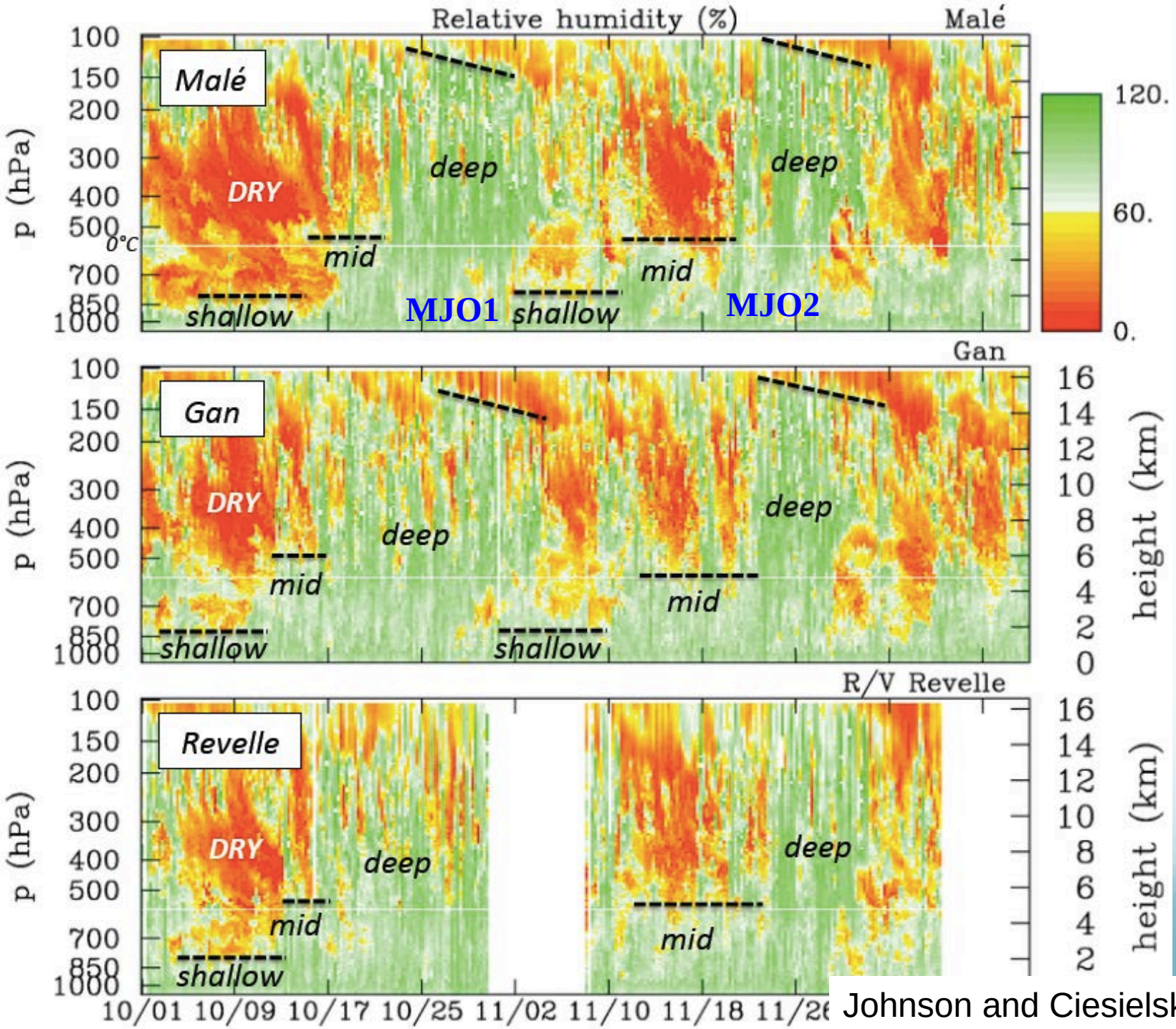
- **Part of the continuum in the cloud life cycle**
- **Potential roles in moistening and heating the lower troposphere**
- **Large uncertainties in quantifying precipitation**
- **Unquantified entrainment and detrainment rates**
- **New products of combined instruments**

CINDY/DYNAMO Field Campaign (Oct 2011-Mar 2012)



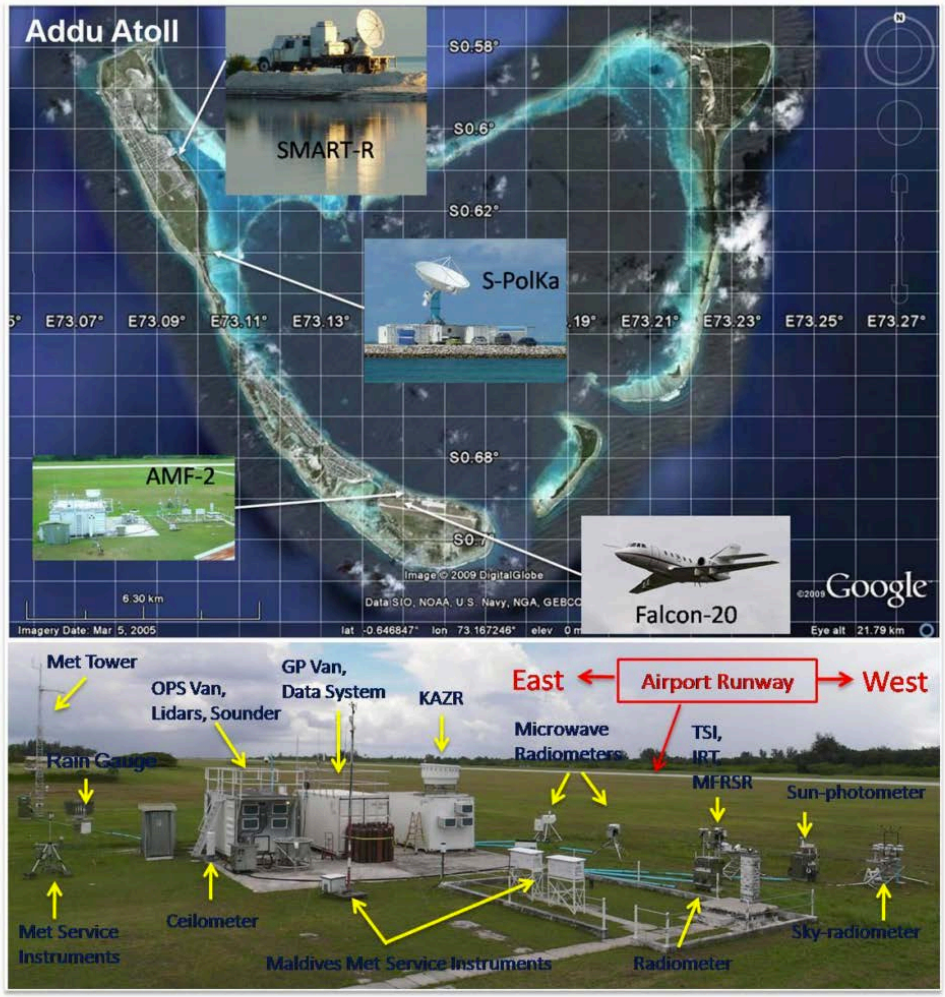


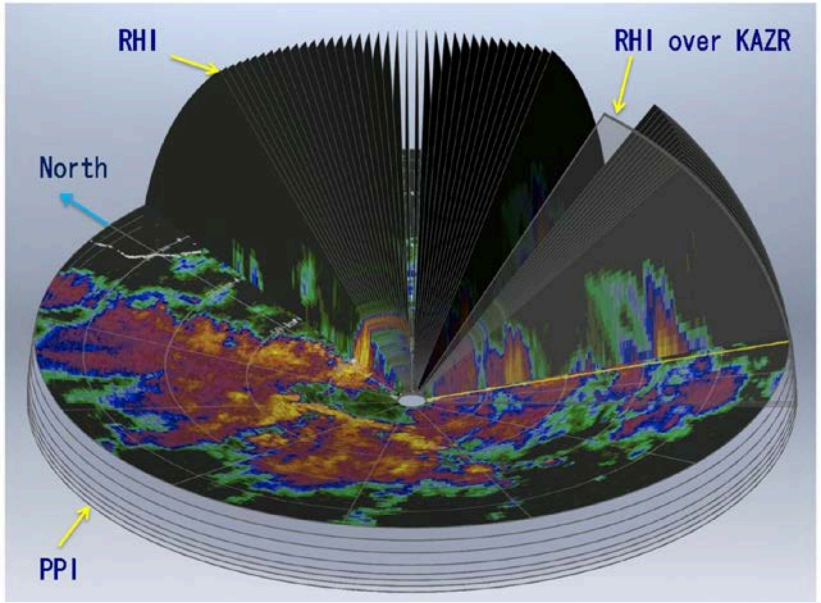

TRMM_3B42RT Precipitation [mm/hr]
Average Lat: 10°S - 10°N
31MAR2012
15MAR2012
01MAR2012
15FEB2012
01FEB2012
15JAN2012
01JAN2012
15DEC2011
01DEC2011
15NOV2011
01NOV2011
15OCT2011
01OCT2011
15SEP2011
01SEP2011
MJO4
MJO3
MJO2
MJO1
Moorings
P3
FF
Mirai
Revelle
Addu
Manus
0
60E
120E
180
120W
60W
0
0
0.3
0.6
0.9
1.2
1.5
Western Pacific
Indian Ocean
West Hem. and Africa
Maritime Continent
Feb 1
Oct 1
Jan 1
Sep 1
Nov 1
Dec 1
Mar 1
1
2
3
4
5
6
7
8



Johnson and Ciesielski (201

Instrument setup during DYNAMO

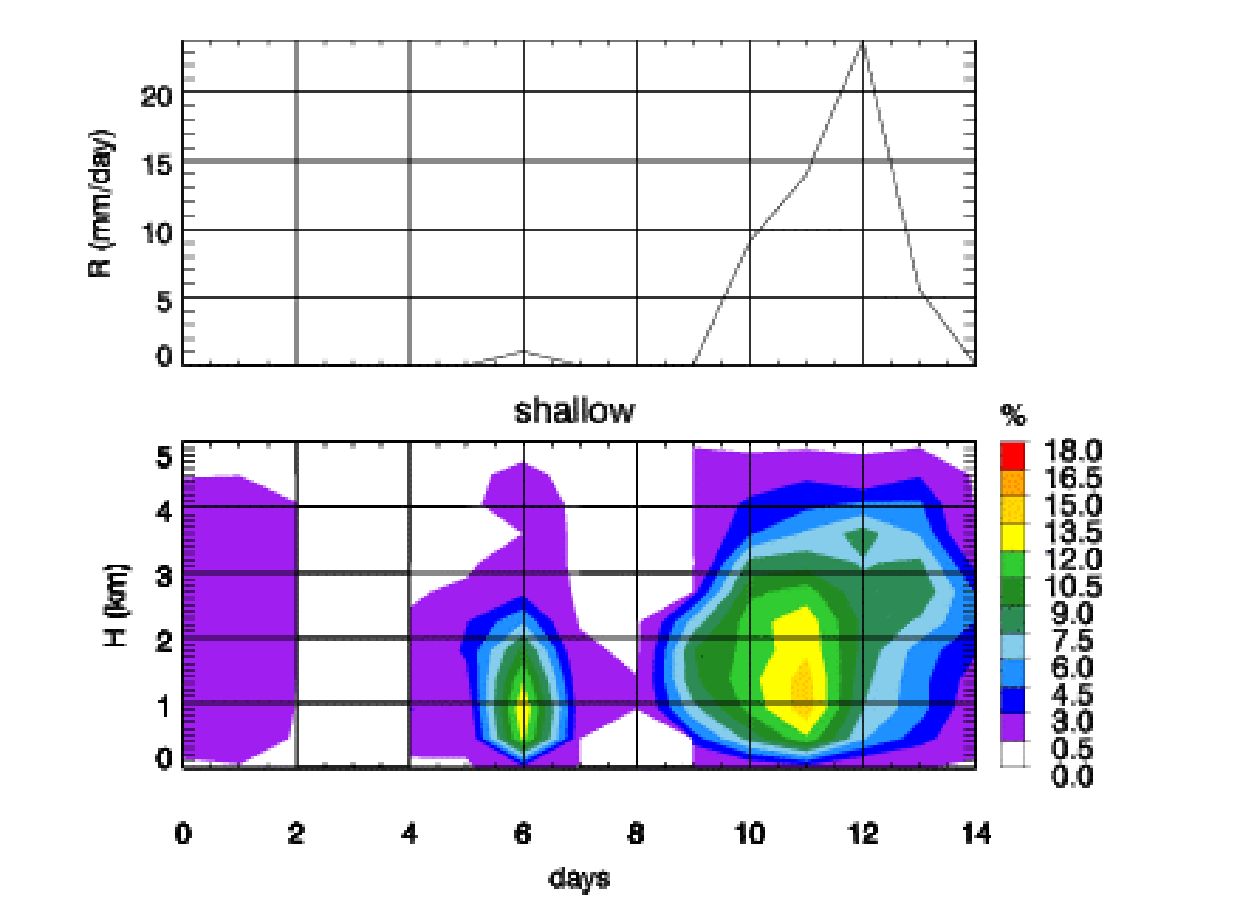




KAZR: 8.66 mm
SMARTR- 5cm
S-POL-10 cm

Yoneyama et al., 2013

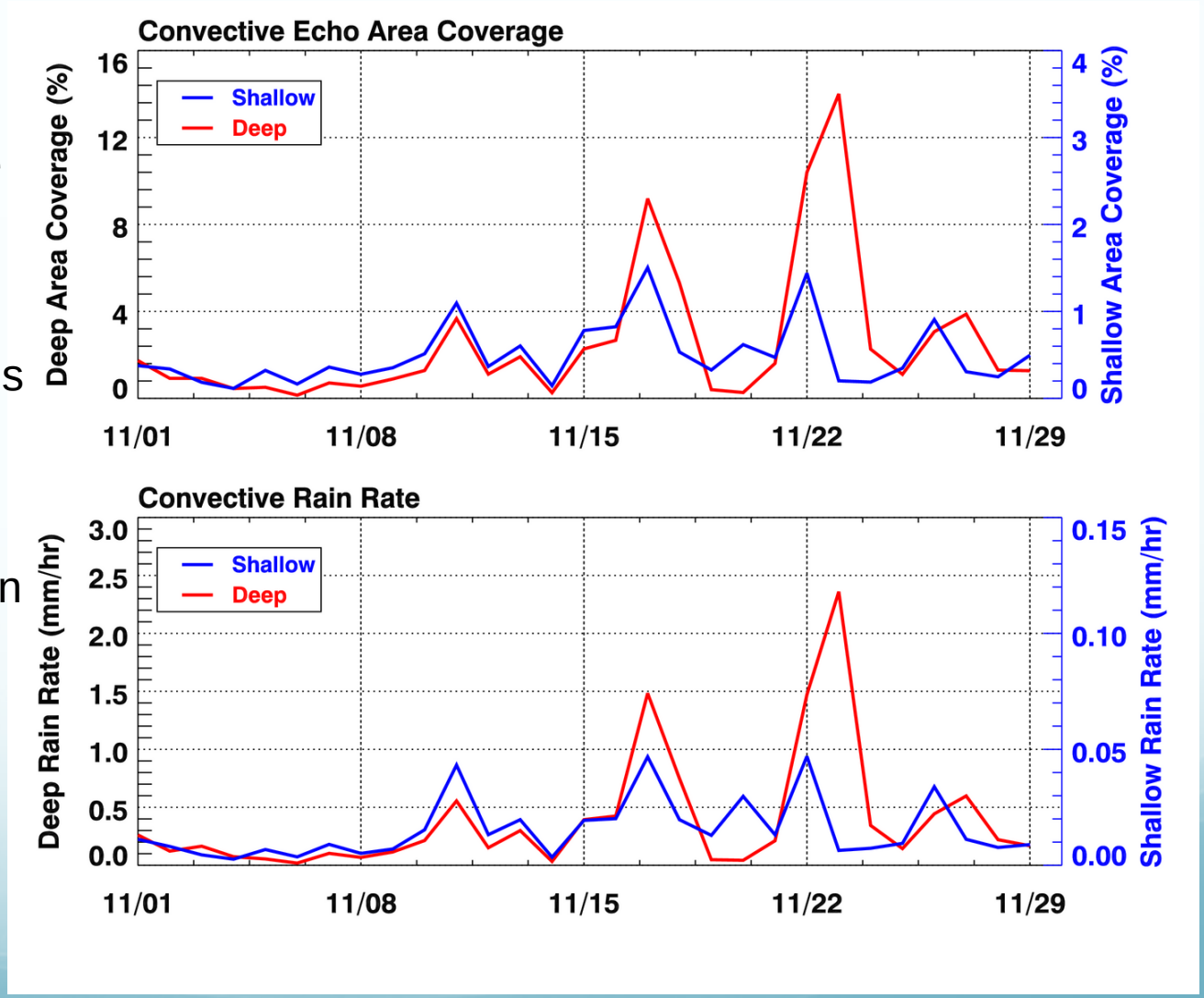
Shallow clouds variation from KAZR from Nov 1 to 15 with the daily surface rain rate



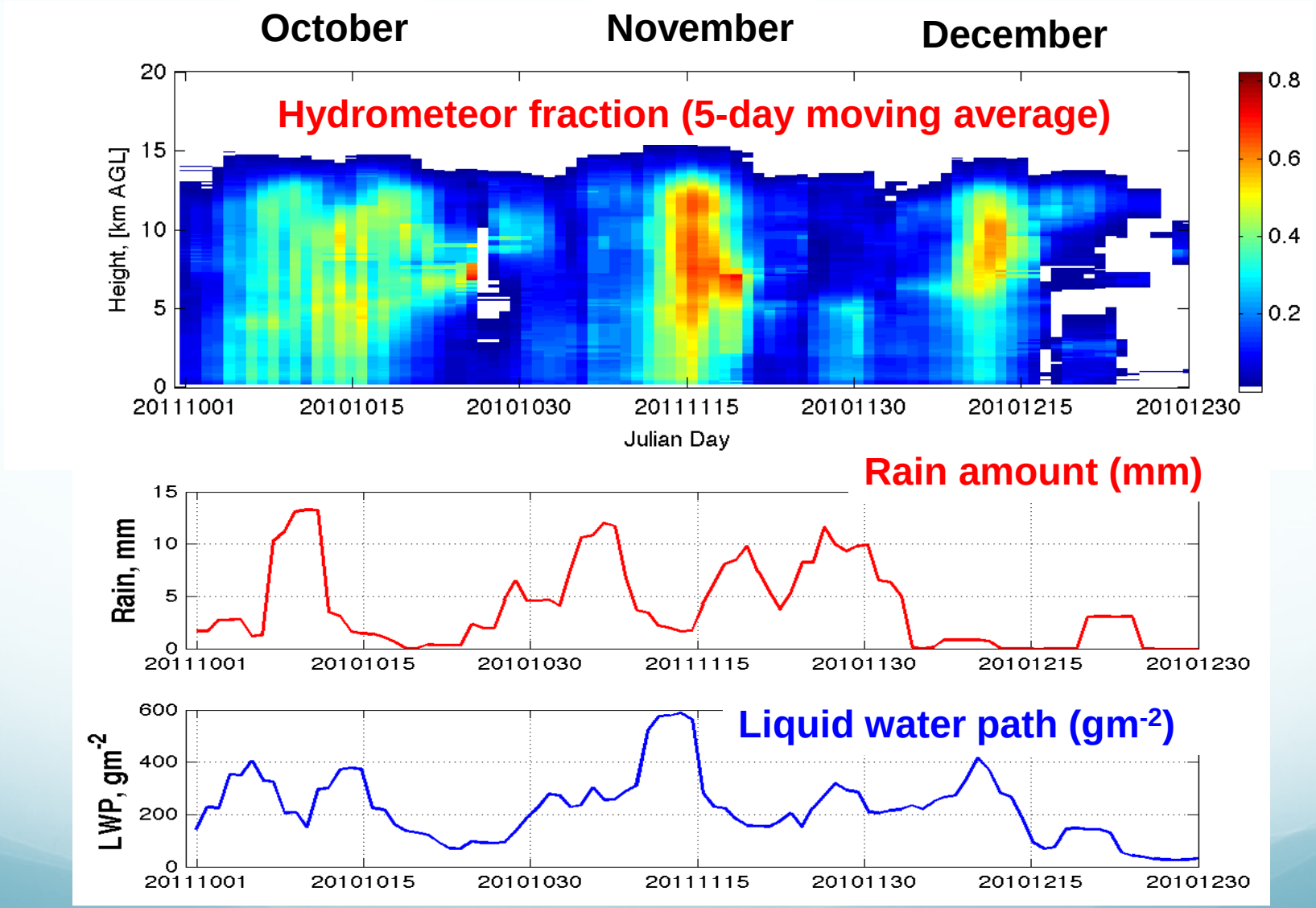
Daily shallow vs. deep convective area coverage and rain rate

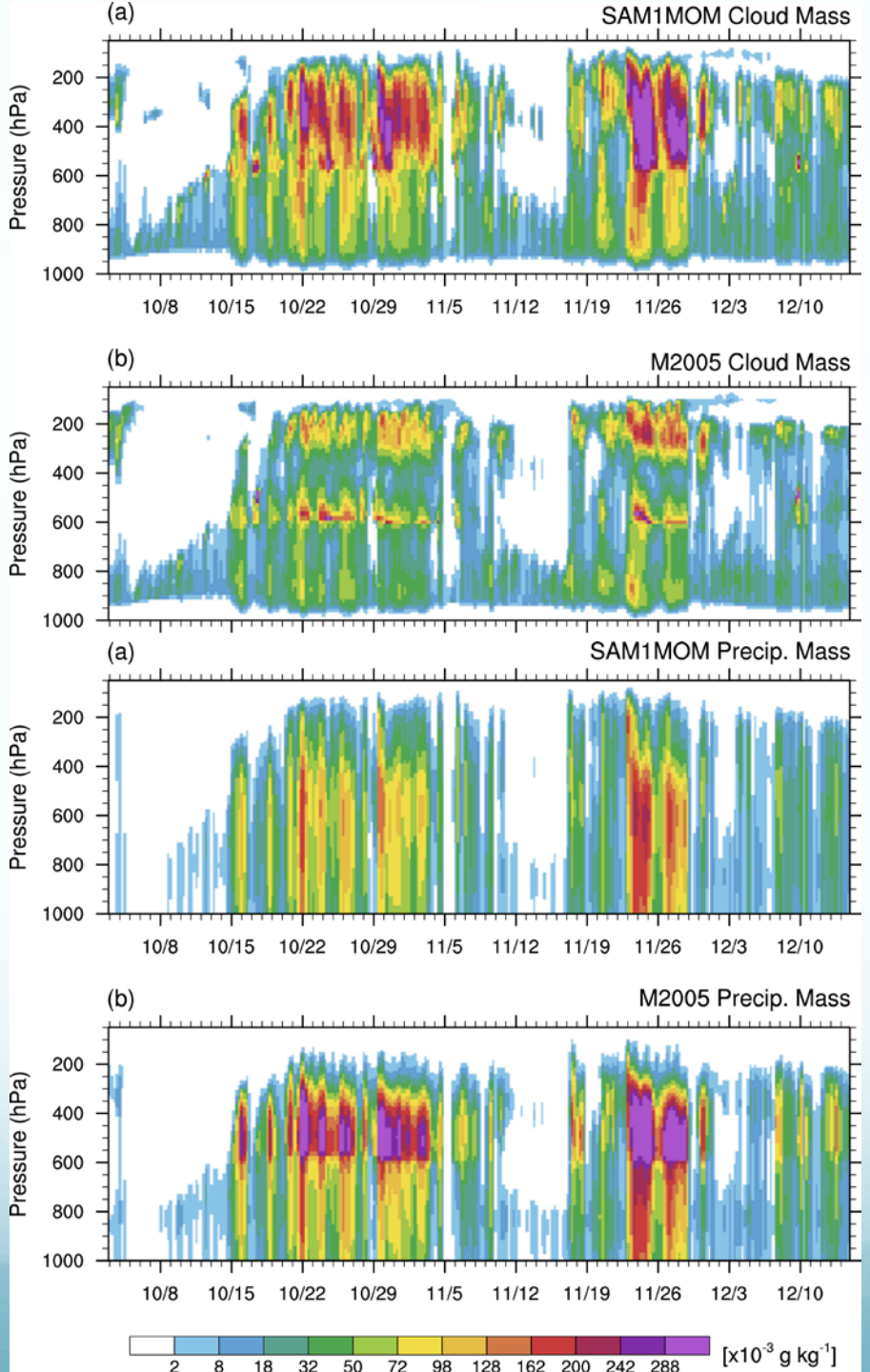
The echoes are convective echoes only, shallow/deep is defined using 0dBZ top below/above 5km.

Both area coverage and rain rate are divided by domain area (I.e. Normalized the same way).



Tropical cloud system as a cloud-precipitation continuum




(a)
SAM1MOM Cloud Mass
(b)
M2005 Cloud Mass
(a)
SAM1MOM Precip. Mass
(b)
M2005 Precip. Mass
Pressure (hPa)
200
400
600
800
1000
10/8
10/15
10/22
10/29
11/5
11/12
11/19
11/26
12/3
12/10
2
8
18
32
50
72
98
128
162
200
242
288
[x10^{-3} g kg^{-1}]