The DYNAMO/AMIE International Field Campaign: Cloud Population of the Madden-Julian Oscillation

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and


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Radar experiment goal

→ Characteristics and evolution of the MJO cloud population in the region where the disturbance builds up

→ Role of clouds in humidification of troposphere prior to MJO onset
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- Characteristics and evolution of the MJO cloud population in the region where the disturbance builds up

- Role of clouds in humidification of troposphere prior to MJO onset
S-PolKa: Moderate cumulonimbus

Hydrometeor type:
- small ice
- melting ice
- graupel
- heavy rain
- large non-melting ice

Doppler velocity: range folding corrected

Slide courtesy R. Houze
Falcon (F-20) microphysical data

Particle size distributions

Comparison with S-PolKa hydrometeor type

Figures courtesy D. Coppin

See Talks 3.1-6 (Friday, 9:45AM) and 3.2-5 (Friday at 11:30AM) in HS9.
Convective and stratiform observed by S-PolKa

![Graph showing the fraction of radar range against MJO Phase for convective and stratiform clouds.](image)
Filtered specific humidity anomalies

![Image of filtered specific humidity anomalies graph]

- Pressure (hPa)
  - 01-Oct
  - 15-Oct
  - 01-Nov
  - 15-Nov
  - 01-Dec
  - 15-Dec
  - 01-Jan
  - 15-Jan
  - 01-Feb

- Date

- 20–60 Day Filtered Specific Humidity Fractional Difference
  - 0.6
  - 0.4
  - 0.2
  - 0.0
  - -0.2
  - -0.4
  - -0.6

2 August 2012
S.W. Powell: Convection during DYNAMO
Convective echotops observed by S-PolKa
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Echotop PDFs grouped by “bi-phase”

Echotop PDFs during “wet” and “dry” days of active phases
Convective echotops observed by S-PolKa

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Echotop PDFs during “wet” and “dry” days of active phases
Relative Humidity profile comparison by phase
150 hPa zonal wind anomalies in ERA-I
Conclusions

→ Successful field campaign with an enormous radar and radiosonde dataset over the Indian Ocean

→ Clouds of all depths are present during all MJO phases.

→ Variability in MJO clouds dominated by changes in stratiform frequency

→ Stratiform clouds likely contribute greatly to moistening prior to MJO onset.

→ Environmental humidity is not the only factor that controls depth of convection.

→ DYNAMO MJO cases strongly linked to 150 hPa zonal wind anomaly
Large mesoscale system

Slide courtesy R. Houze
Organization of convection
Radiosondes

ERA-I

$u'$

$q'$
Reflectivity structure of precipitating clouds

Convective

Stratiform
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