CONV-ISO project: initial results and way forward

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Outline

1. Introduction
2. MJO event
3. Degree of Aggregation of Convection
4. Conclusion and Outlook

Introduction - Goals

Goals:

- Study q-δD dynamics of MJO events and other variability
- Understand which processes are important for MJO simulation
- Understand how MJO dynamics potentially differ from other factors:
  - Degree of organization of convection
  - Distance to convection
  - Precipitation intensity
- Use q-δD dynamics to analyse/improve model physics

Introduction - Approach

Analyse the q-δD structure in the Indian ocean (20S-20N,60E-140E):

- Use IASI q and δD, compared with strongly guided LMDZ simulations
- Study of Cindy/Dynamo MJO case, nov-dec 2011
- Relation with degree of aggregation of convection (preliminary)

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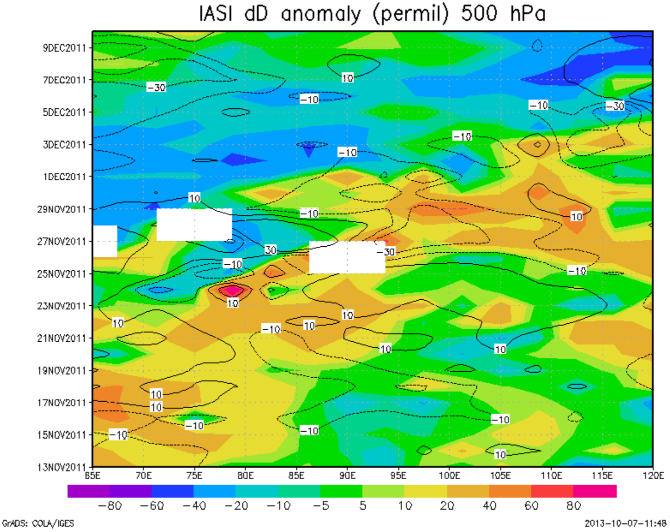
Later:

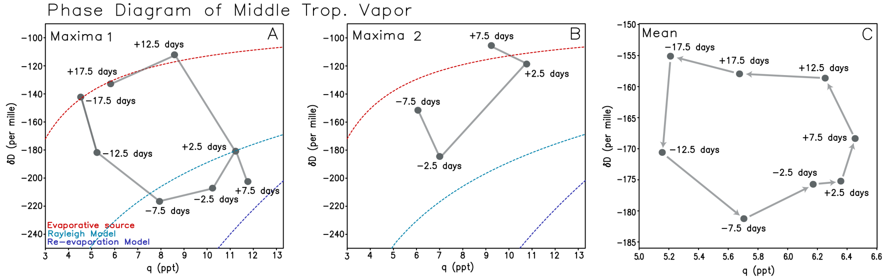
- Relation with degree of aggregation of convection
- Study specifity of MJO, compared to other modes of variability
- Co-location with IASI-cloud data (fraction,T,pres,emiss)

MJO event - November 2011

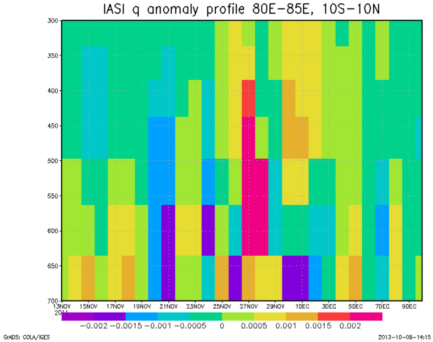


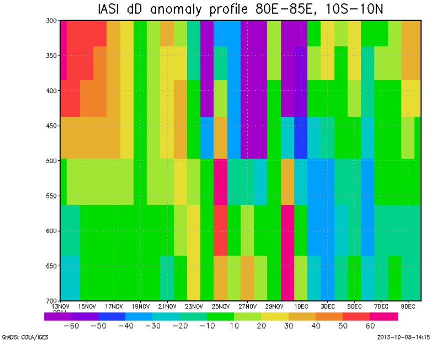
Composite of MJO events

Based on TES-data, for 12S-12N,90-120E (Berkelhammer,2012):

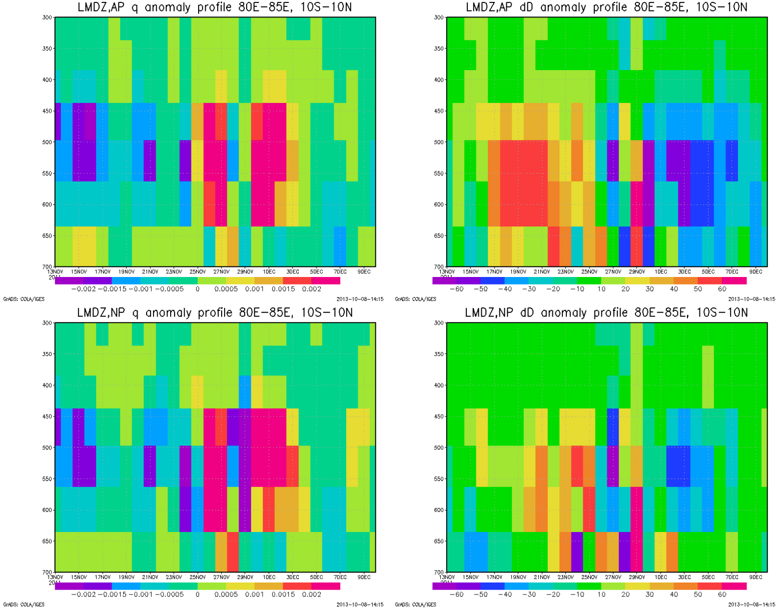


Profiles of q (kg/kg) and δD (permil) - IASI (80-85E)

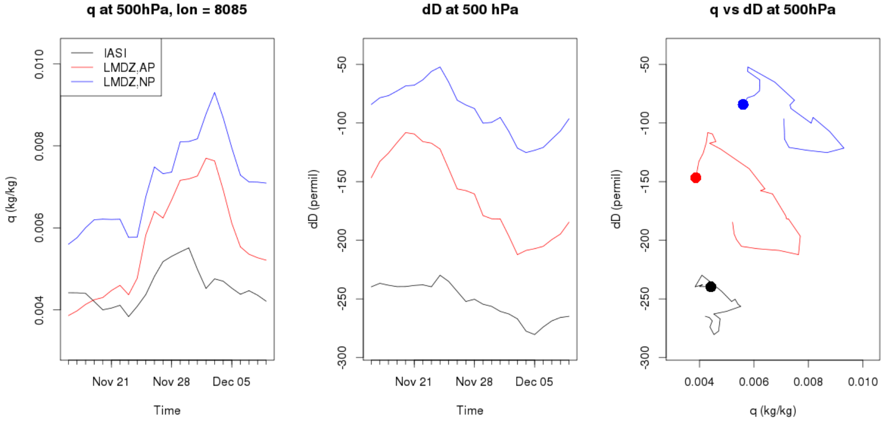




Profiles of q (kg/kg) and δD (permil) - LMDZ (80-85E)

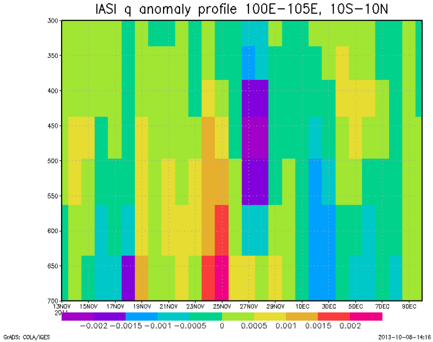


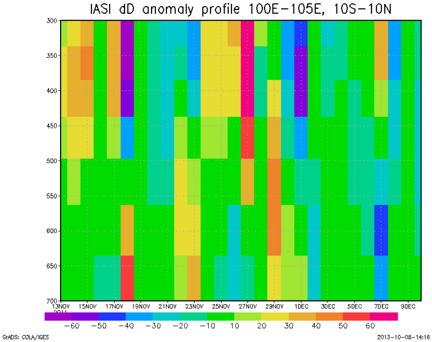
Temporal dynamics at 500 hPa (80-85E)



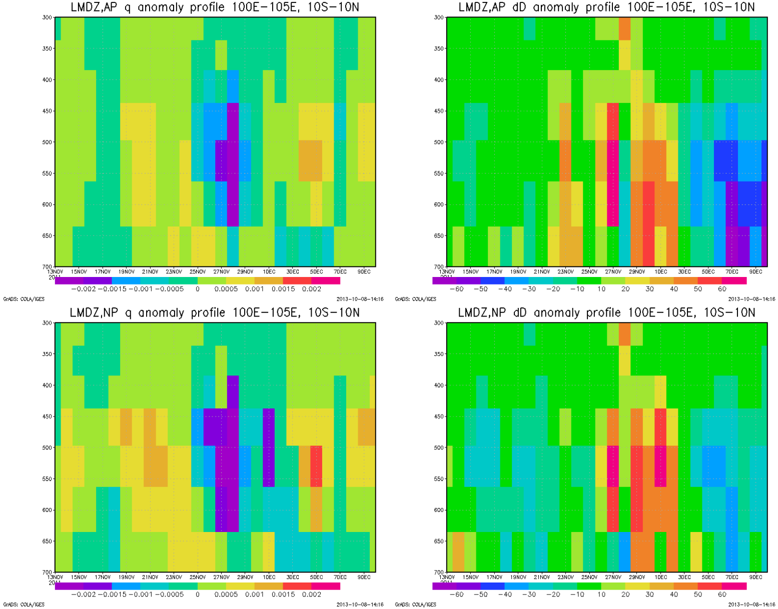
q vs δD MJO cycle opposed to Berkelhammer (2012)

Profiles of q (kg/kg) and δD (permil) - IASI, 100-105E

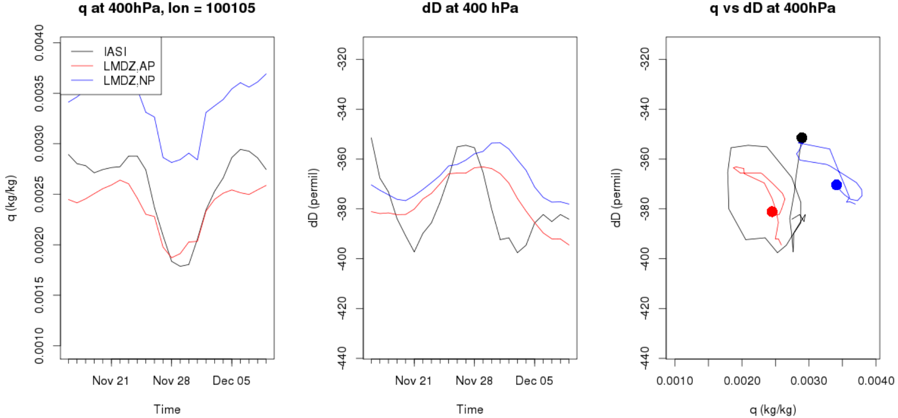




Profiles of q (kg/kg) and δD (permil) - LMDZ, 100-105E

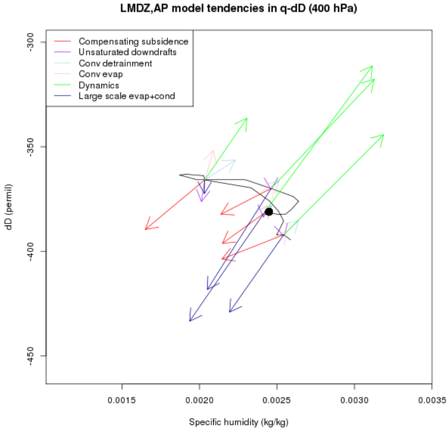


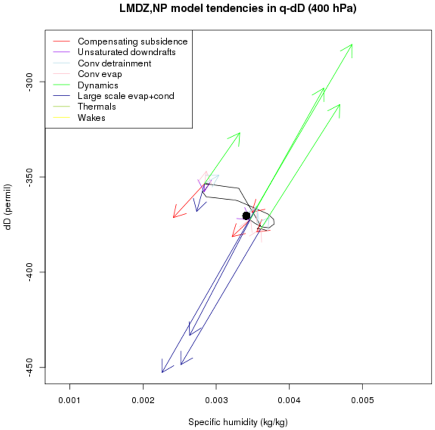
Temporal dynamics at 400 hPa, 100-105E



Phase shift compared to IASI δD, MJO cycle similar to Berkelhammer (2012).

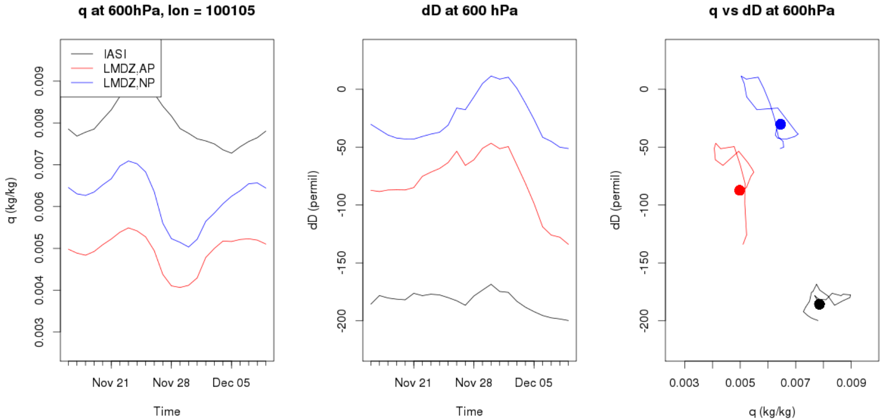
LMDZ tendencies at 400 hPa, 100-105E





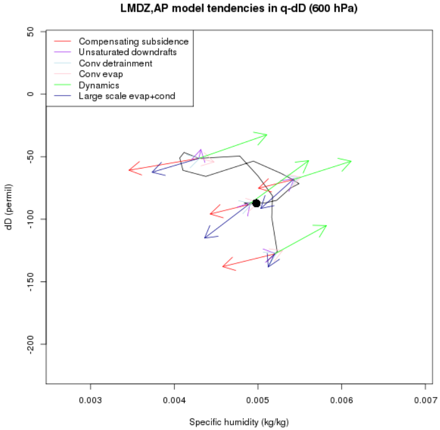
Larger convective tendencies in LMDZ,AP.

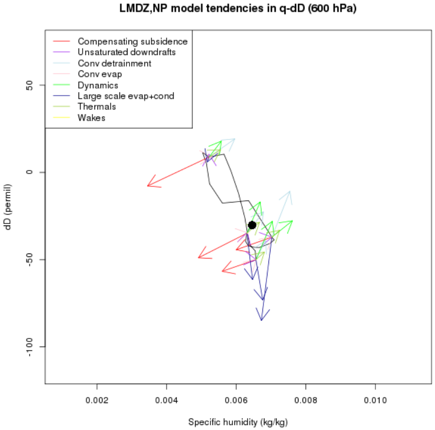
Temporal dynamics at 600 hPa, 100-105E



Less δD variability in IASI than in LMDZ.

LMDZ tendencies at 600 hPa, 100-105E





Larger convective tendencies in LMDZ,NP.

Sub-conclusions

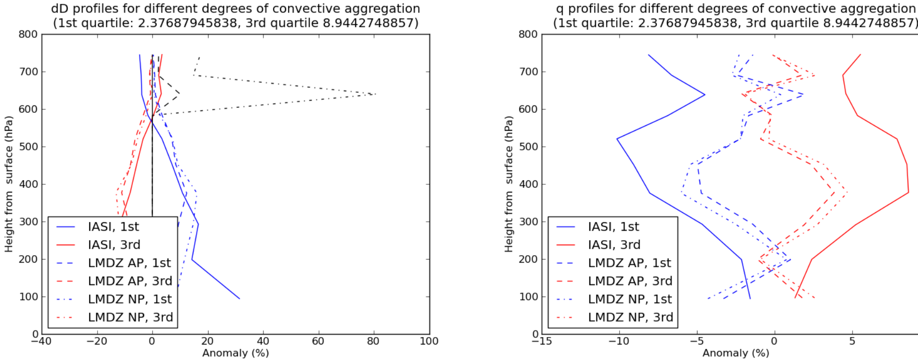
- MJO q vs δD cycles are not always like Berkelhammer, 2012
- LMDZ bias in q, δD, but dynamics are reasonable (sometimes with phase-shift)
- LMDZ δD dynamics are at lower levels than for IASI (100E)
- These differences could lead to sensitivity tests in LMDZ physics, such as:
  - precipitation efficiency
  - entrainment speed
  - precipitation droplet fall speed
  - fraction of droplets inside/outside the cloud
  - etc.

Degree of Aggregation of Convection

Expectation:

- When same amount of P falls in small number of convective centres, precipitation is more intense
- Less re-evaporation from falling droplets
- Air is more depleted
- Possibly, convective detrainment is smaller due to smaller number of convective centres (?)
- In LMDZ, re-evaporation and convective detrainment tendencies will be mostly affected (?)

Profiles for extremes of DOA (preliminary)



- Probably, the signal of the amount of precipitation is still present.
- Use smaller precipitation bins, but more data needed.

Conclusions and Outlook

- Generalize analysis of MJO events for period 2010-2012
- Formulate hypothesis on LMDZ physics improvements for MJO events (based on 1D LMDZ sensitivity experiments)
- Test these hypothesis in LMDZ 3D simulations
- Extend degree of aggregation analysis to entire IASI period to improve statistics
- Use co-located IASI cloud data to test LMDZ cloud variables