IASI δD and q during MJO events

Obbe Tuinenburg[1] Camille Risi[1] Jean-Lionel Lacour[2]
David Coppin[1]

[1]Laboratoire de Météorologie Dynamique, Paris
[2]Université Libre de Bruxelles

November 15, 2013

Introduction - Goals

Goals:

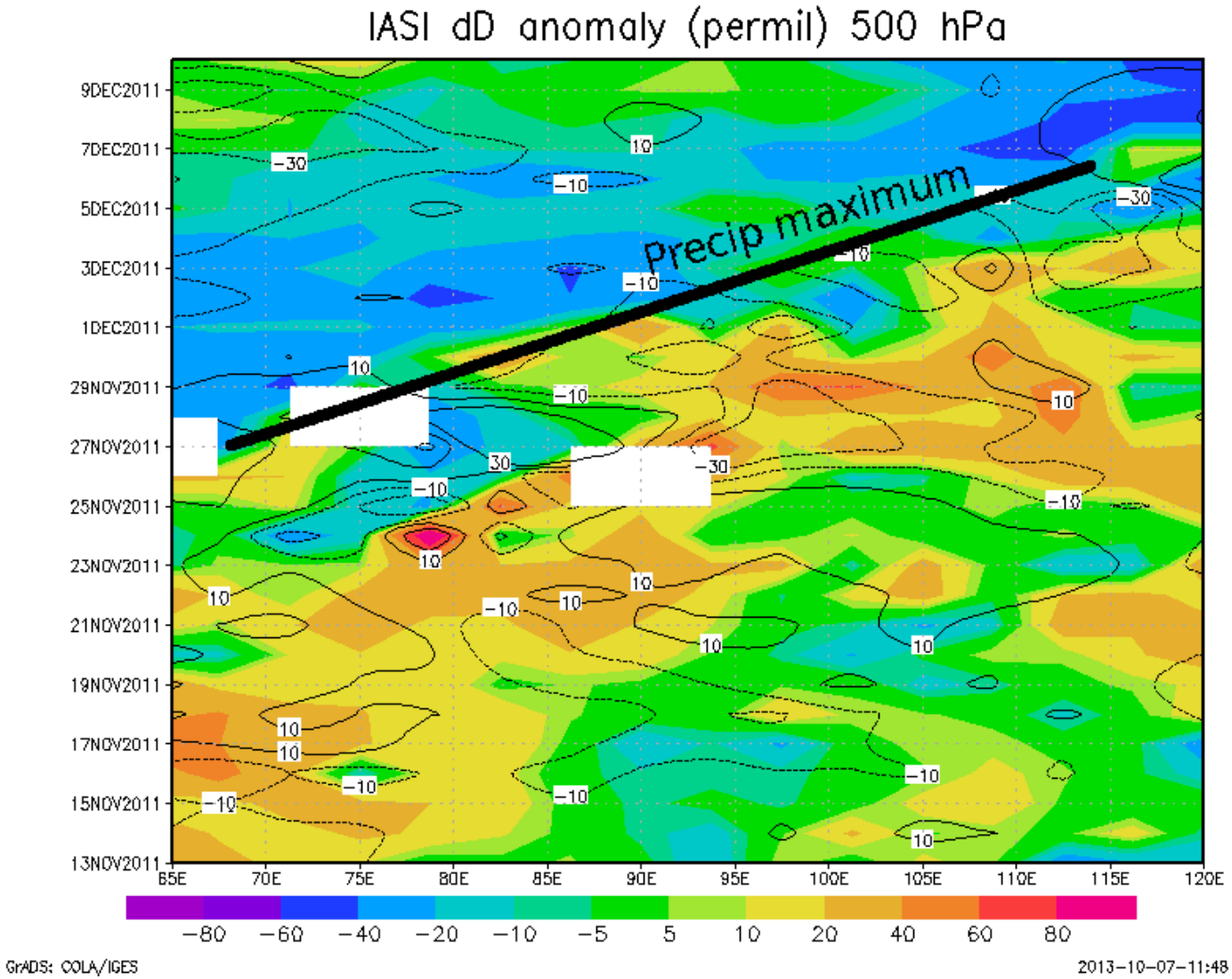
- Study q-δD dynamics of MJO events and other variability
- Understand which processes are important for MJO simulation
- Understand how MJO dynamics potentially differ from other factors:
  - Degree of organization of convection
  - Distance to convection
  - Precipitation intensity
- Use q-δD dynamics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

Introduction - Approach

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

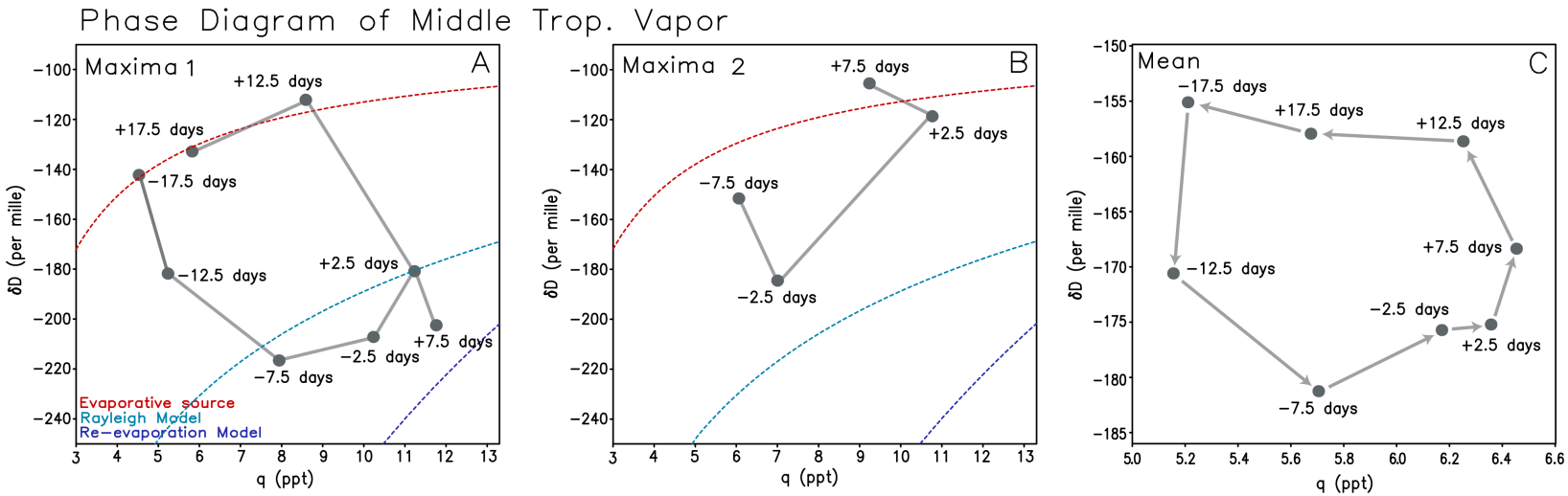
- Use IASI q and δD, compared with strongly guided LMDZ simulations
- Study of Cindy/Dynamo MJO case, nov-dec 2011
- Study composites of MJO events from total dataset (mar 2010-mar 2012)

MJO event - November 2011 (mean for 10S-10N)

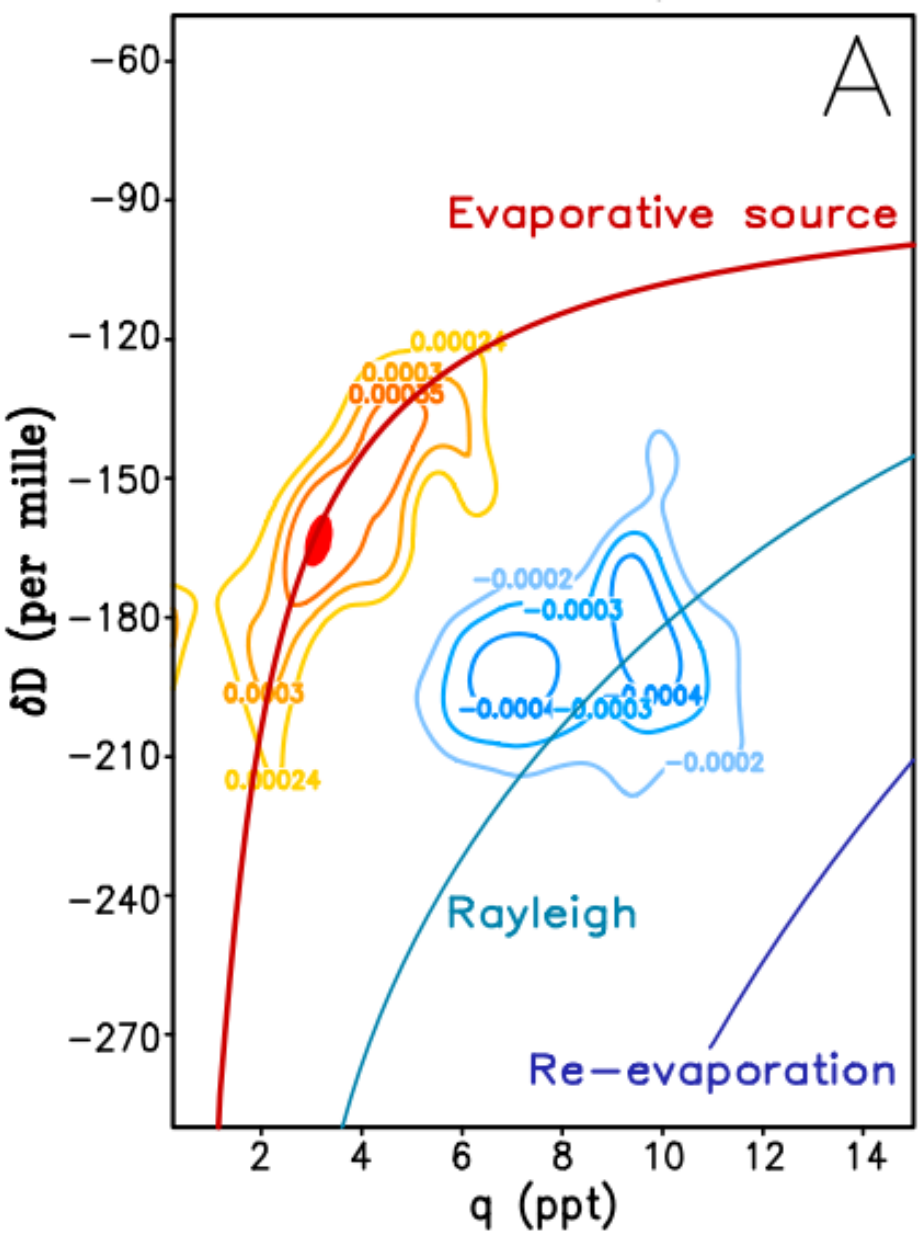


Composite of MJO events

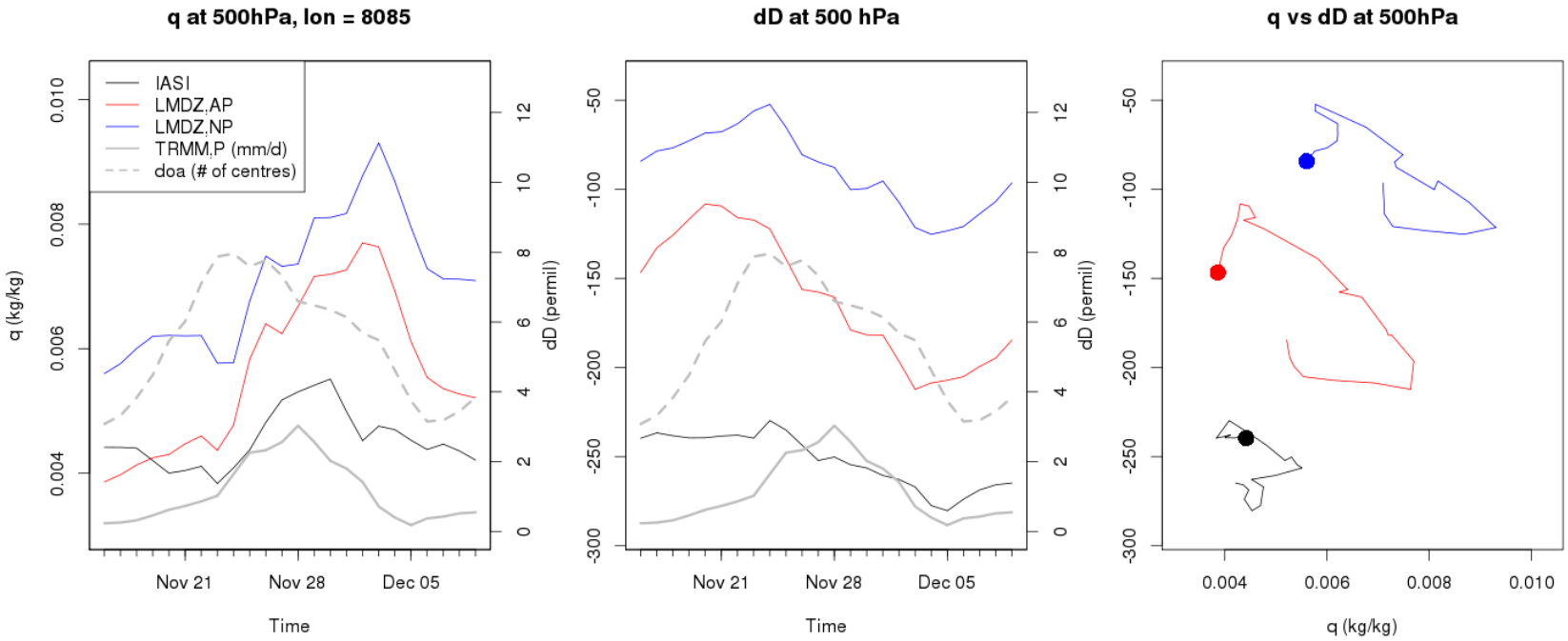
Based on TES-data, for 12S-12N,90-120E (Berkelhammer,2012):



From δD-q to physics

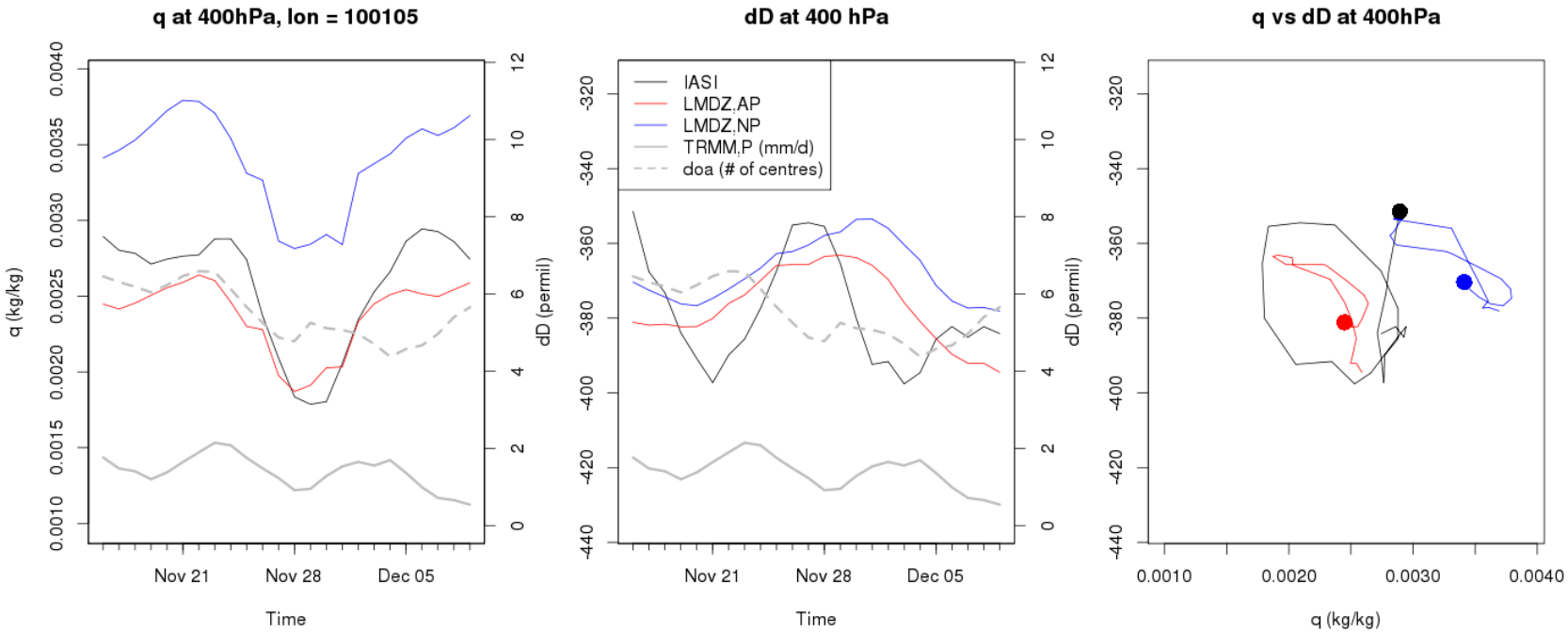


Temporal dynamics at 500 hPa (80-85E)



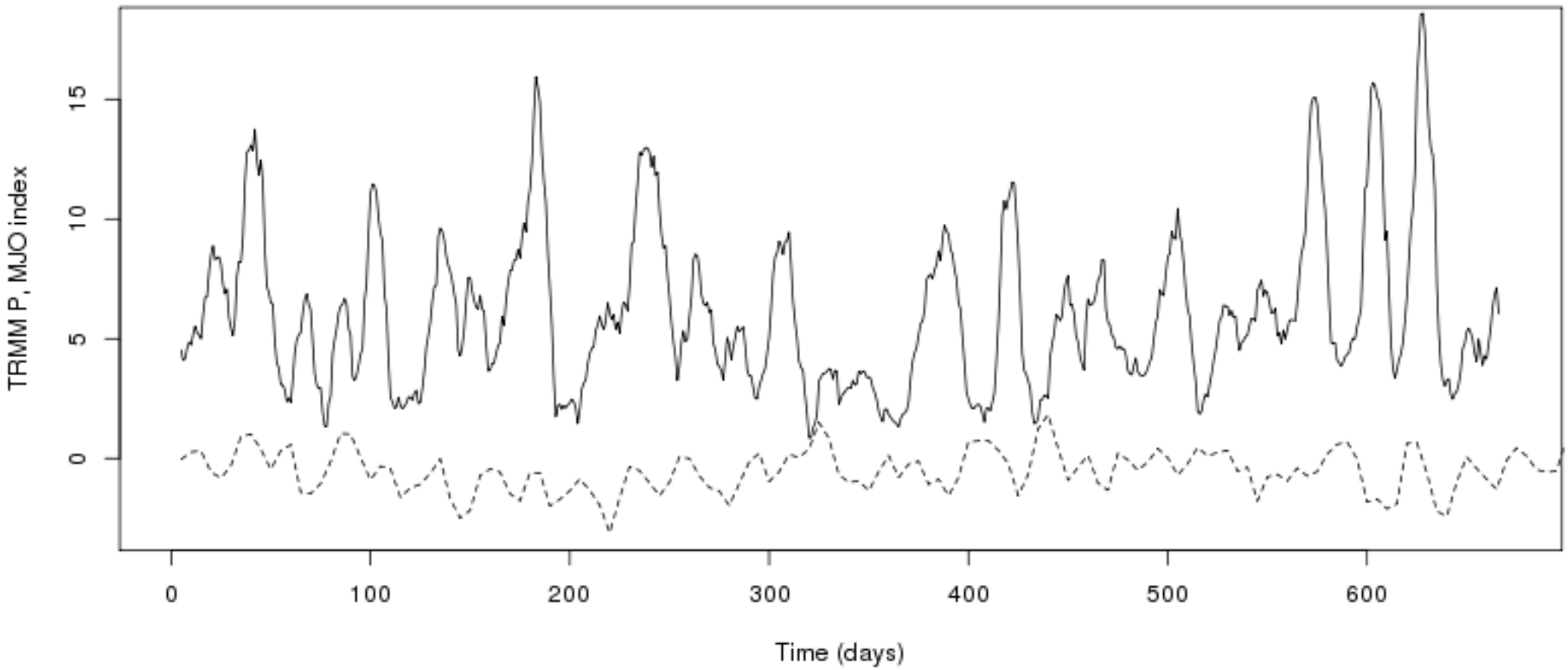
- q vs δD MJO cycle opposed to Berkelhammer (2012)
- Relate to degree of aggregation of convection and precipitation peaks. (to be done)

Temporal dynamics at 400 hPa, 100-105E



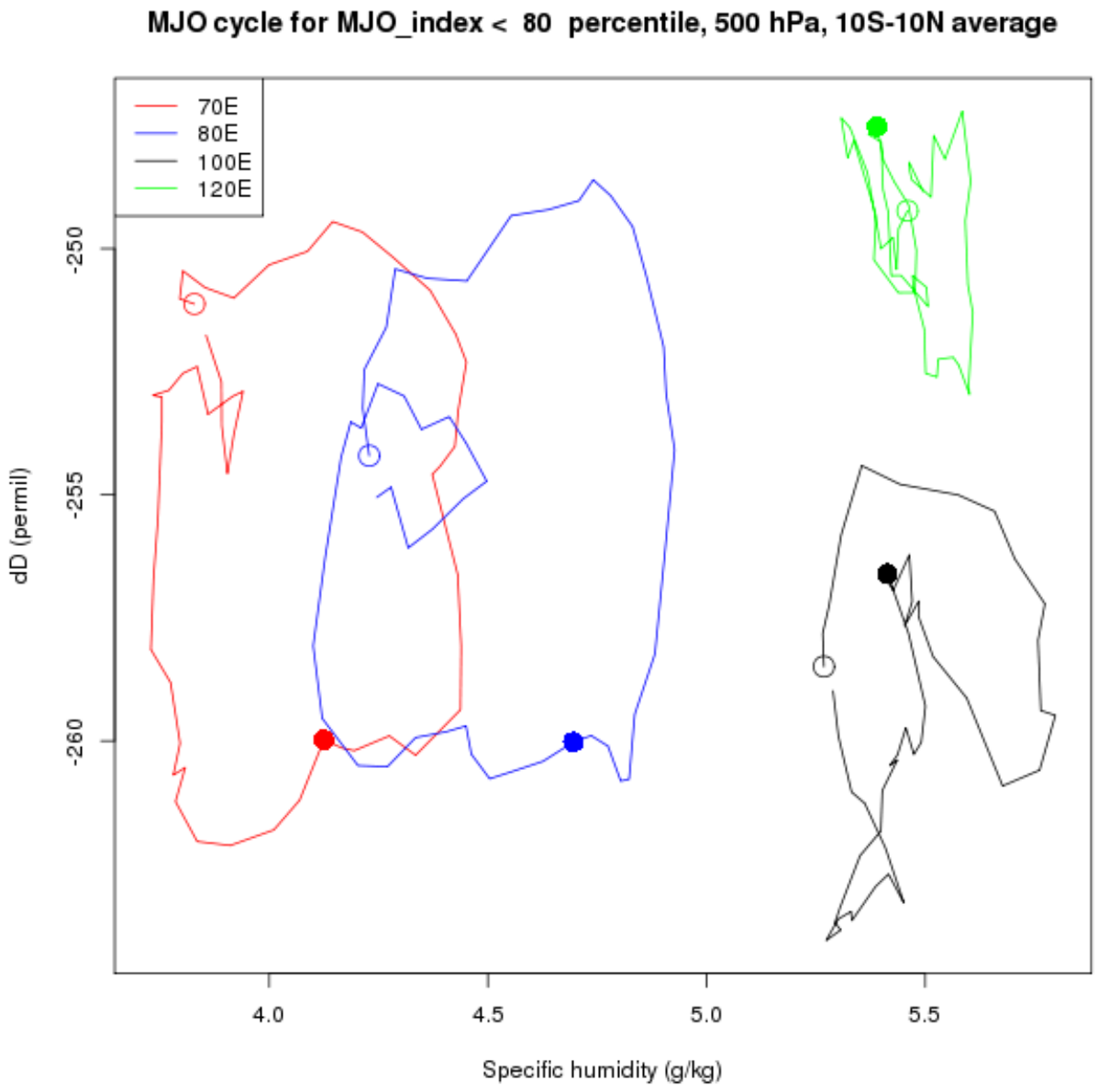
Phase shift compared to IASI δD, MJO cycle similar to Berkelhammer (2012).

How to select MJO events?

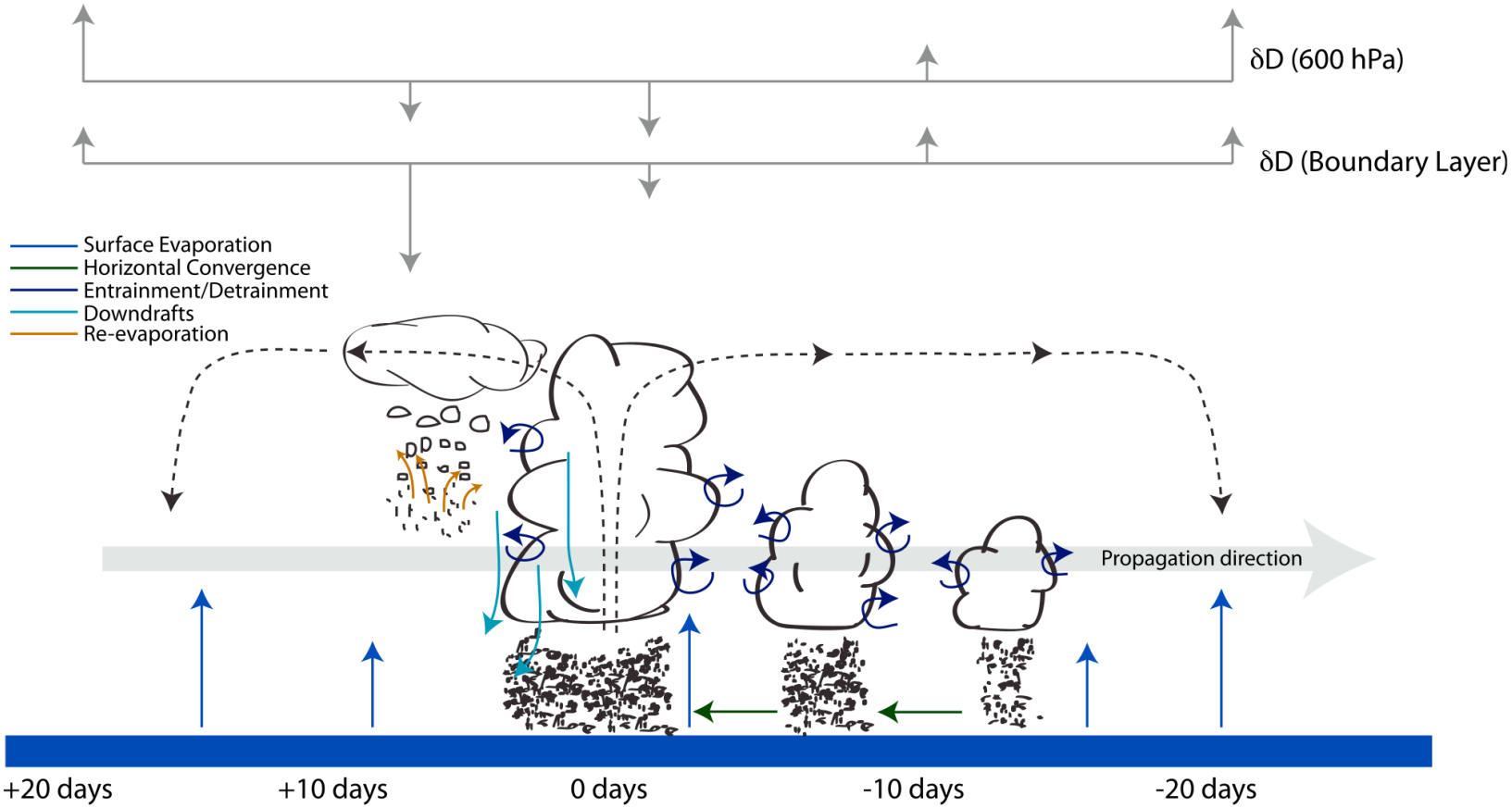


Sometimes mismatch between MJO-index and precipitation.
Take seasonality into account?

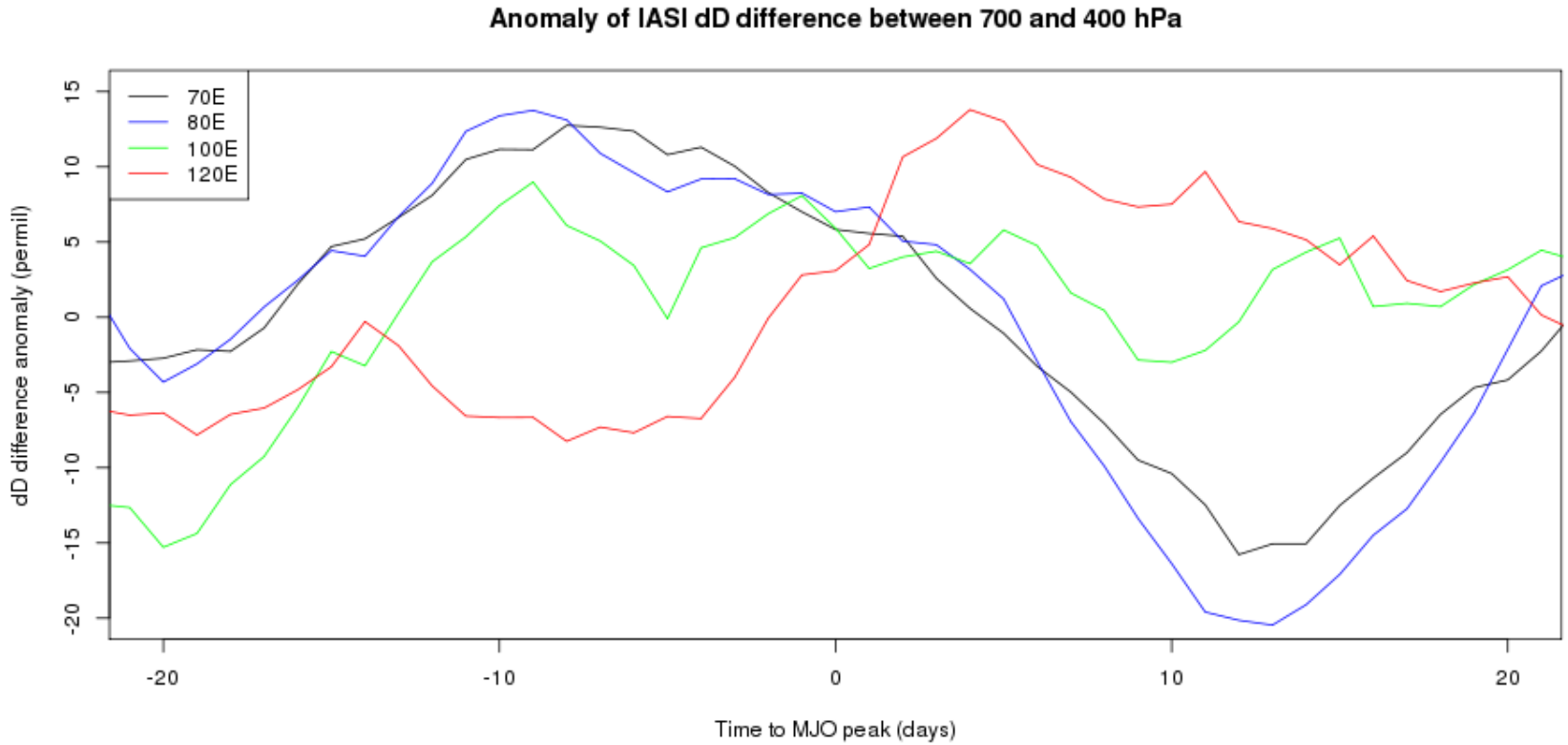
Mean MJO dynamics at 500 hPa



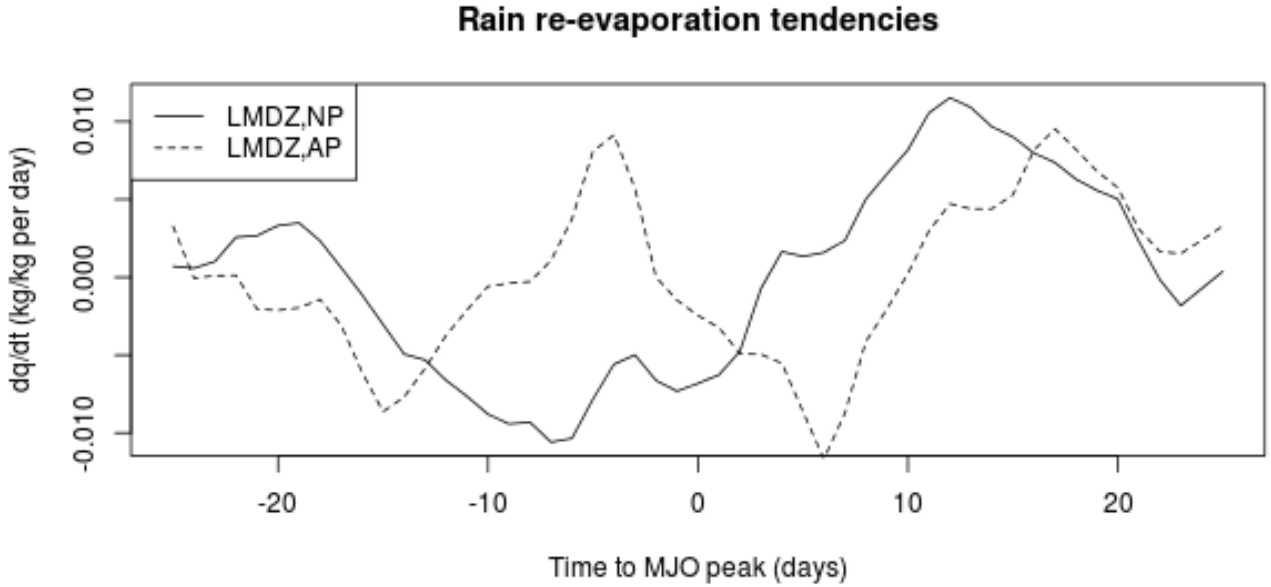
MJO moisture sources (Berkelhammer, 2012)

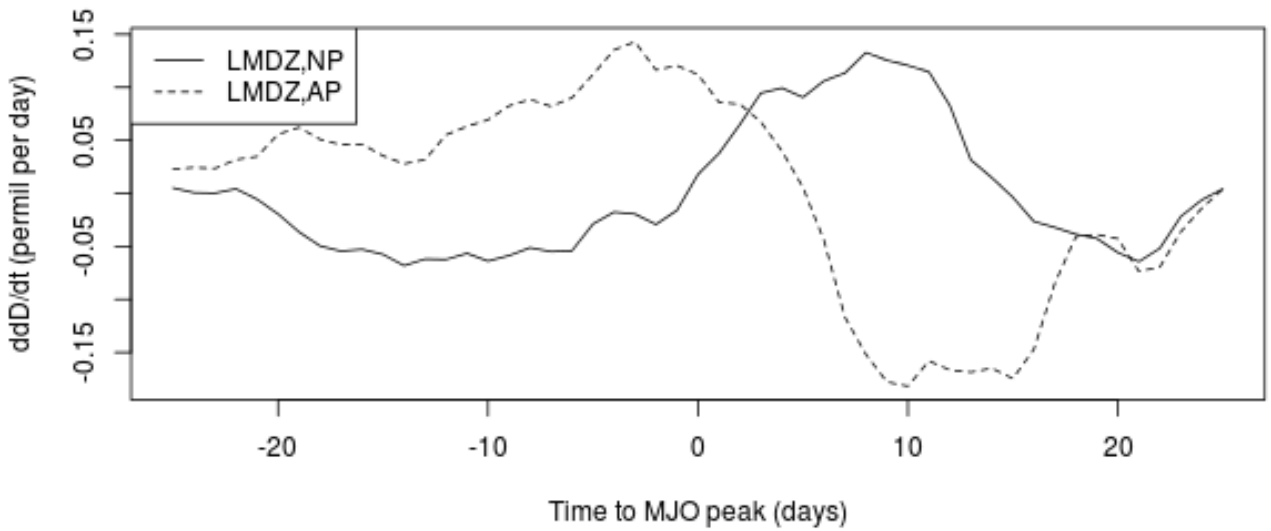


Rain re-evaporation (from data)



Rain re-evaporation LMDZ tendencies anomalies (80E)





Conclusions

- MJO q vs δD cycles are not always like Berkelhammer, 2012
- Determine relation with degree of aggregation of convection (to do)
- LMDZ bias in q, δD, but dynamics are reasonable (sometimes with phase-shift)
- Selecting MJO events is tricky (?) and be influence analysis
- Started to relate measurements to physics
- This 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.