

# Evaluating convective and cloud processes during MJO events using measurements of water vapor isotopic composition

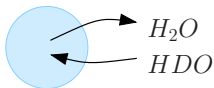
Camille Risi and Obbe Tuinenburg

LMD/IPSL/CNRS

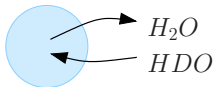
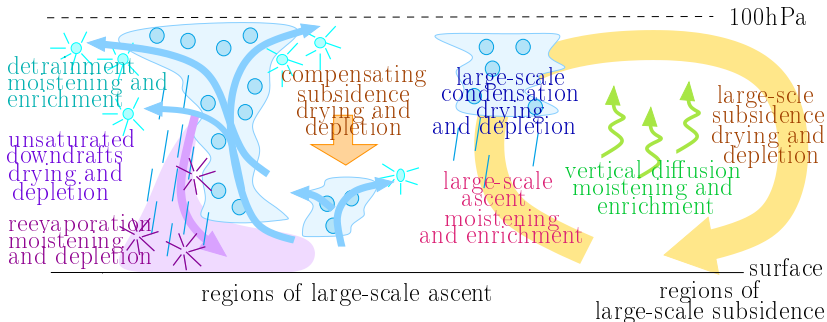
Contributors: John Worden, Jean-Lionel Lacour  
Catherine Rio, Jean-Yves Grandpeix, Sandrine Bony

Macao, October 30, 2013

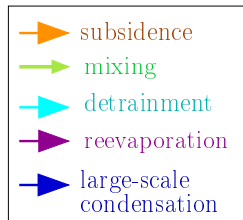
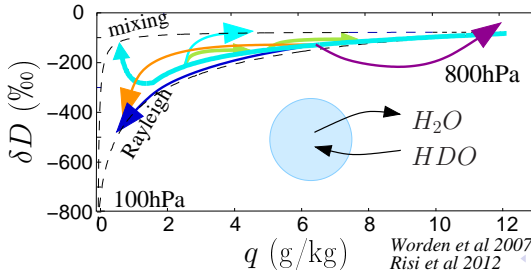
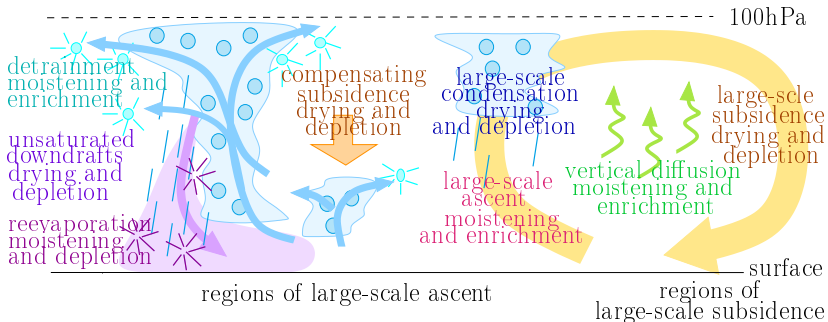
# Added value of water isotopes



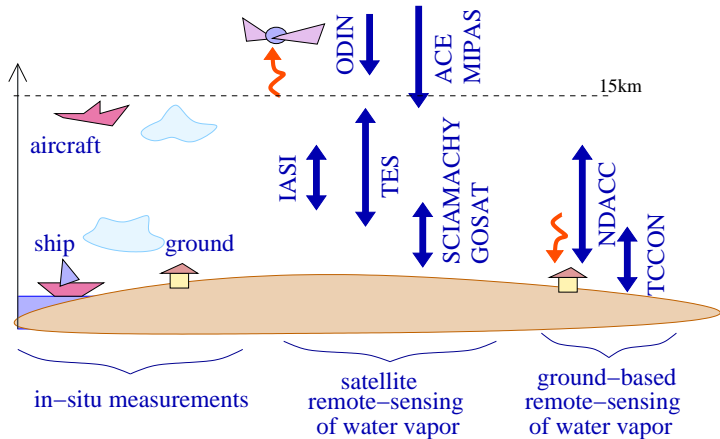
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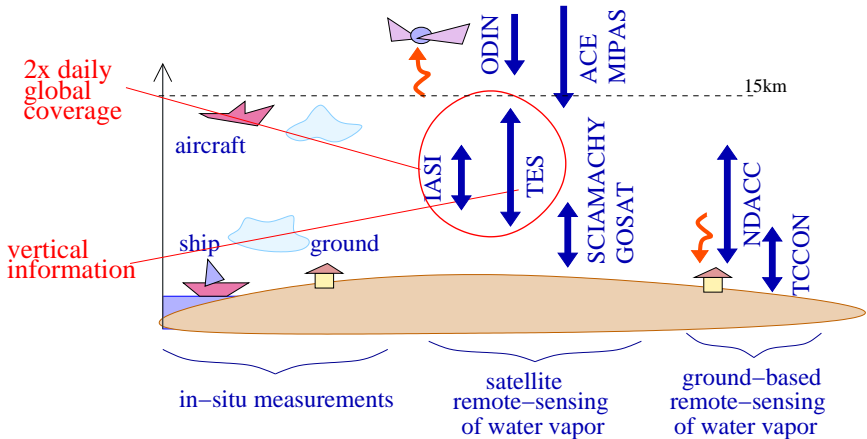
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# Water vapor isotopic measurements

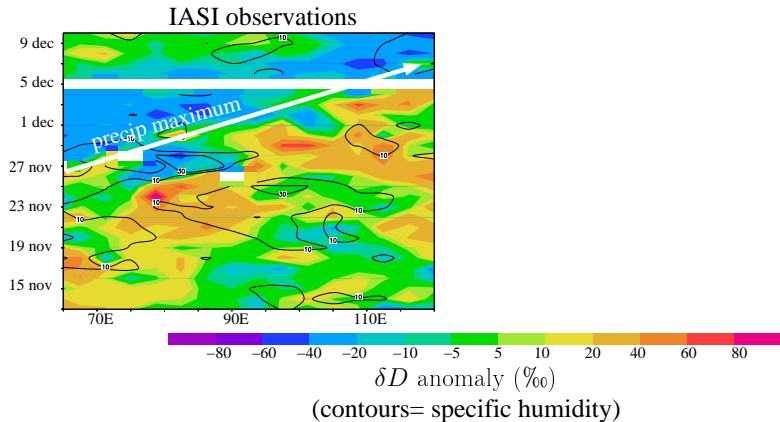


# Water vapor isotopic measurements



# Cindy Dynamo case

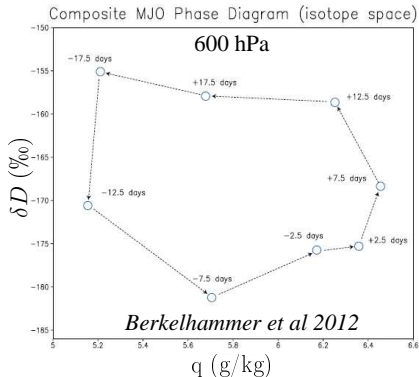
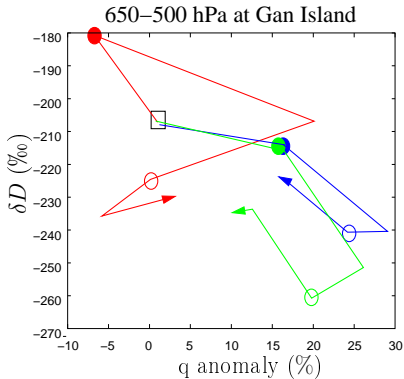
- ▶ Hovmuller diagrams at 500hPa, 10°S-10°N average





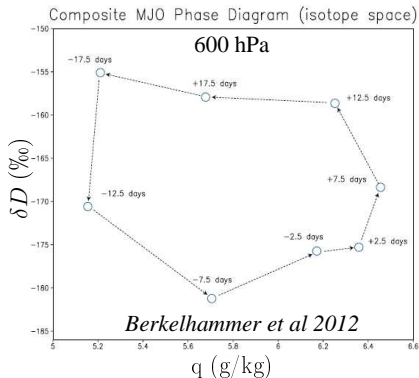
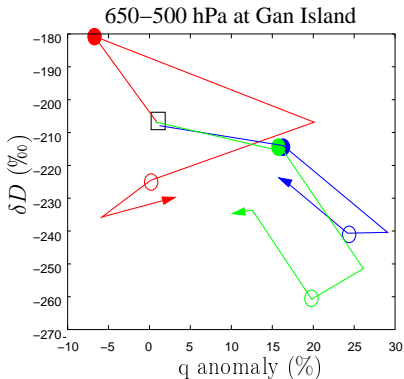


# q- $\delta D$ cycles



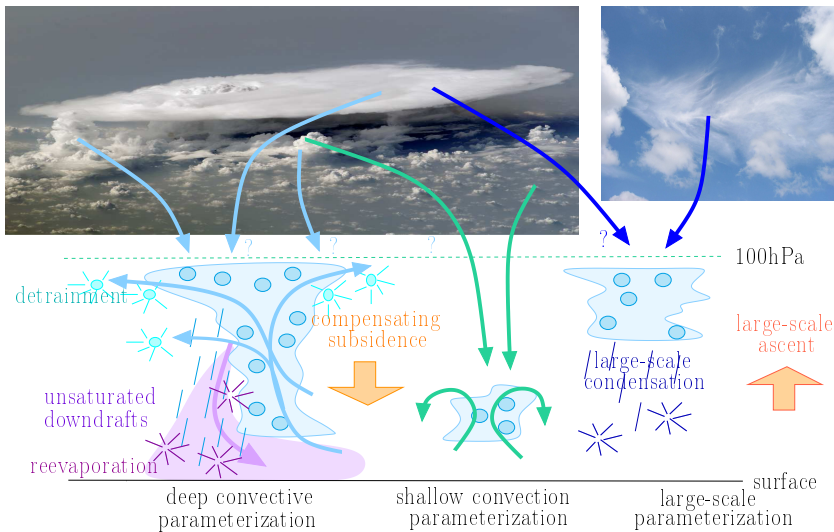


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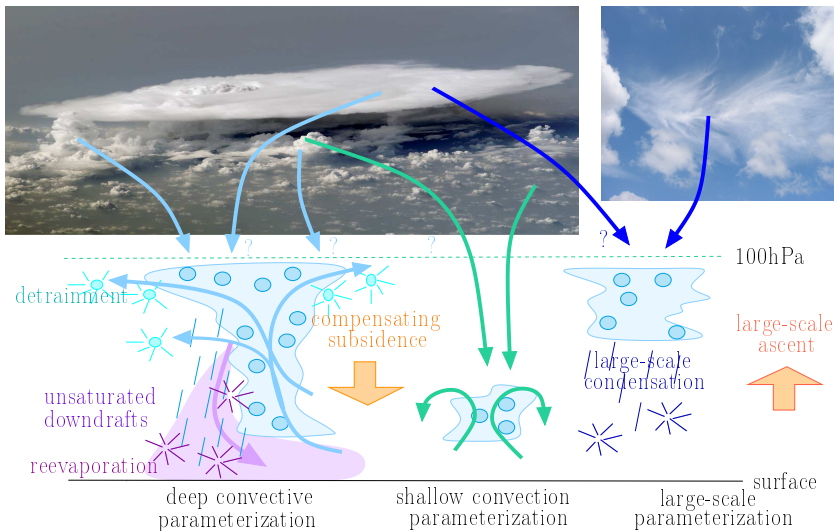


- ▶ depends on location/season? altitude? event type? physics?
- ▶ use sign/shape as a process-oriented diagnostic?

# Convection vs large-scale precip

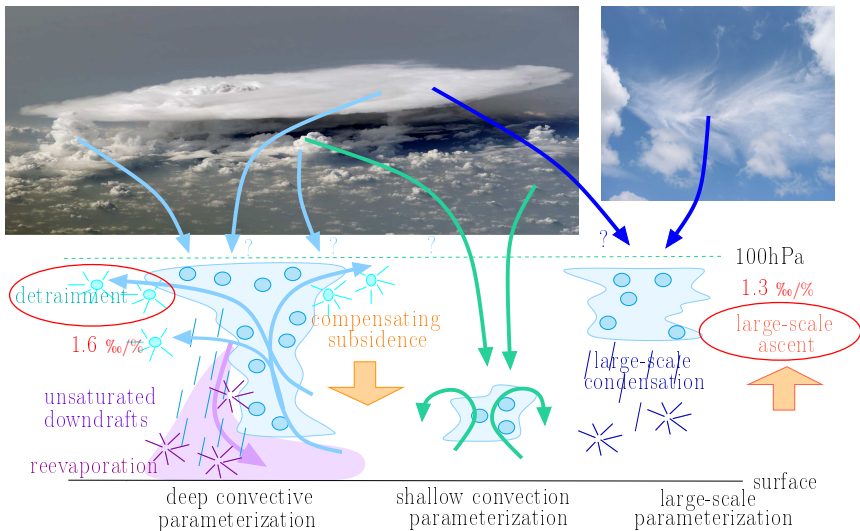


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- conv vs large-scale precip arbitrary, but affects heating rate, cloudiness, humidity transport, ISV

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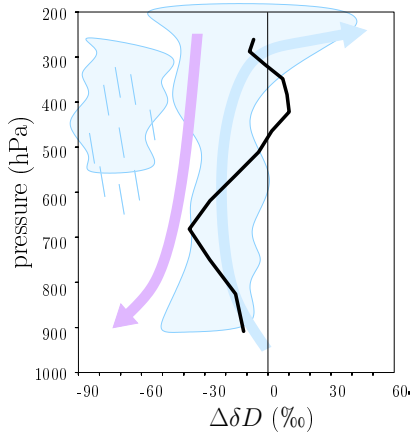


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# Sensitivity tests in LMDZ

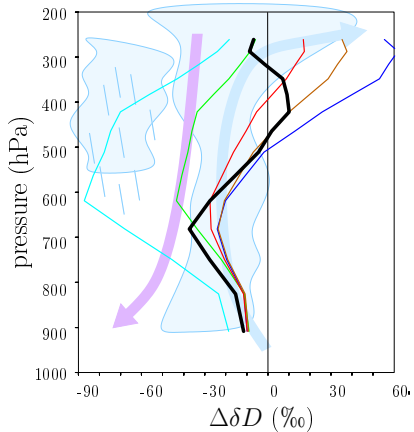
Amazon, DJF-JJA (wet-dry)



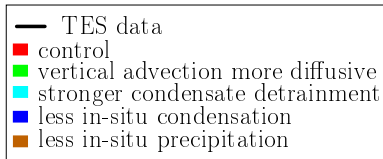
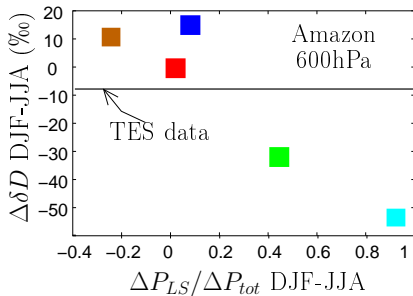
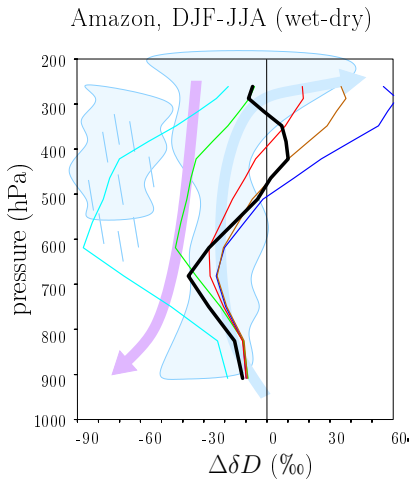


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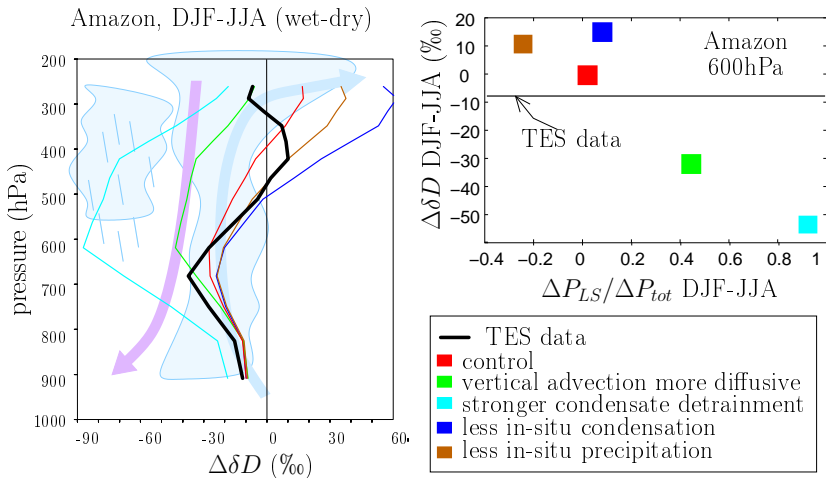
Amazon, DJF-JJA (wet-dry)



# Sensitivity tests in LMDZ



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- ▶ precipitating events deplete the tropospheric vapor all the more as it is associated with large-scale precipitation
- ⇒ use it more quantitatively to evaluate conv vs large-scale precip partitioning and underlying heating profiles

# Summary and perspectives

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- ▶  $\delta D$  informs about moistening and dehydrating processes
- ▶  $q - \delta D$  during MJO informs about relative timing of processes
- ▶  $\delta D$  depletion during precip events reflects conv vs large-scale partitioning

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## Perspectives

- ▶ lots of measurements exist but are still under-exploited
- ▶ use isotopic measurements quantitatively
- ▶ Sensitivity tests, model intercomparison (8 GCMs, 2RCMs have isotopes)
- ▶ Cindy Dynamo case study
- ▶ Comparisons with CRMs (SAM, soon WRF and MesoNH)