Can the assimilation of IASI water isotopologues observations improve the quality of tropical diabatic heating?

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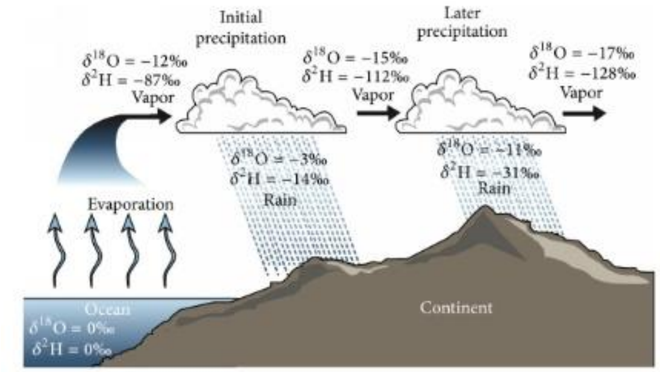
Introduction:

- Diabatic heating – major driving force of atmospheric circulation
- Heating rates from current reanalyses – show significant inconsistencies
- Water vapour isotopes are sensitive to phase changes during atmospheric circulation



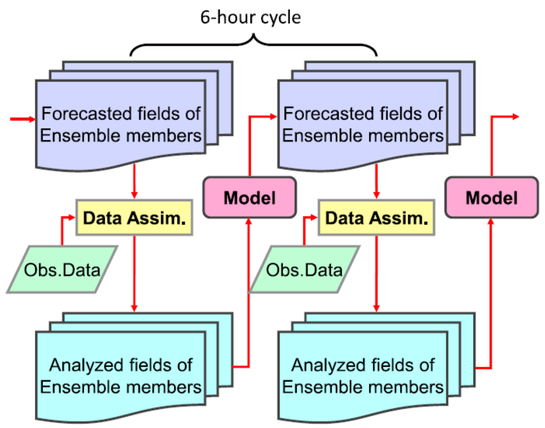
From: Xi, International Journal of Atmospheric Sciences (2014)

Reference:
Khosrawi, F., Toride, K., Yoshimura, K., Diekmann, C. J., Ertl, B., Hase, F., and Schneider, M.: Can the assimilation of water isotopologue observation improve the quality of tropical diabatic heating and precipitation?, Weather Clim. Dynam. Discuss. [preprint], https://doi.org/10.5194/wcd-2021-49, in review, 2021.

Can the assimilation of water isotopologues observations improve diabatic heating rates and thus atmospheric circulation?

Method:

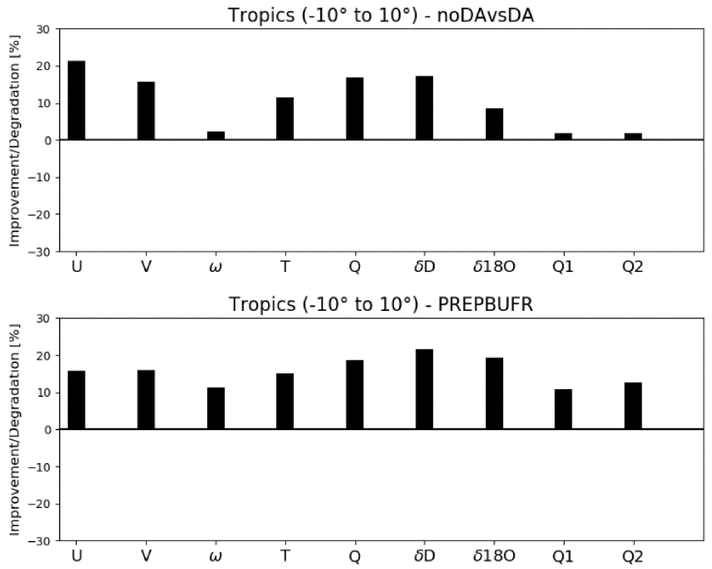
- Isotopologues observation from the Infrared Atmospheric Sounding Inteferometer (IASI) onboard Metop-A/B
- Observation Simulation Experiment (OSSE)
- Data assimilation with an Local Ensemble Transform Kalman Filter (LETKF)



From: Yoshimura et al. (2014)

Results:

- Two experiments are performed:
  1. additionally to IASI also conventional observations are assimilated (PREPBUFR)
  2. only IASI is assimilated (noDAvsDA)



Conclusion:

- In both experiments an improvement for all meteorological parameters is derived
- Isotopes alone however cannot significantly improve diabatic heating, but together with conventional observations they can!