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Atmosphere and Ocean Research Institute
the University of Tokyo

Interannual variability of $\delta^{18}O$ in vapor in West Africa and its relation to ENSO

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on behalf of

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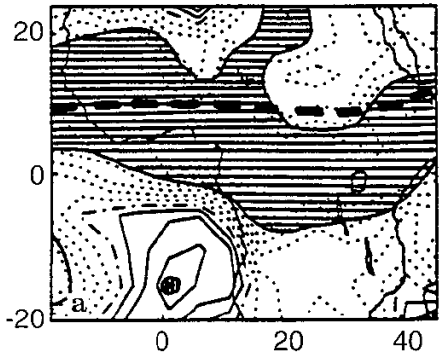
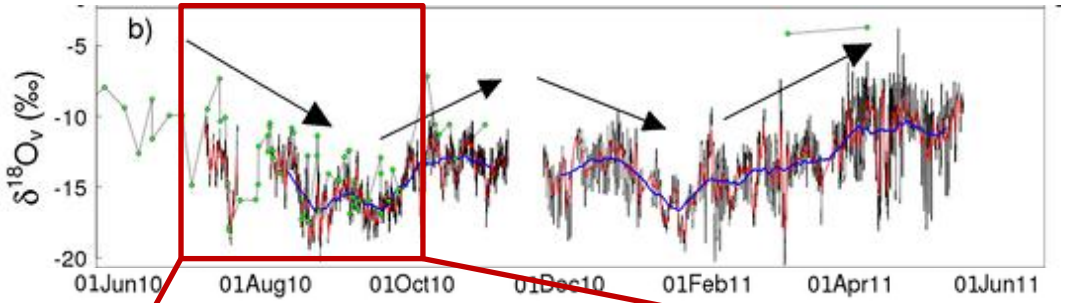
West African Monsoon and ENSO [e.g. Moron et al., 1993]



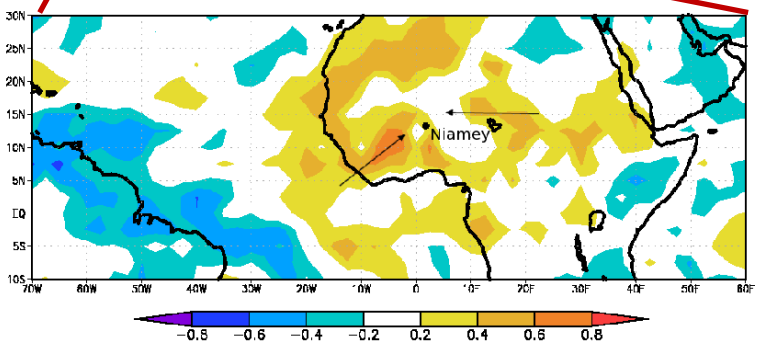
OLR differences in Jul-Aug between El Nina (1976-79-82-83-87) and La Nina (1975-81-84-85-88) events. Hatched area represents statistically significantly positive at the 10% level (Moron et al., 1993).

El Nino: weakened convective activity
La Nina: strengthened convective activity

$\delta^{18}O_v$ seasonal variability in West Africa [Tremoy et al., 2012]



Temporal evolution from June 2010 to May 2011 of d18Ov: black, red and blue lines are hourly averages, 24-h and 15-days running averages respectively.

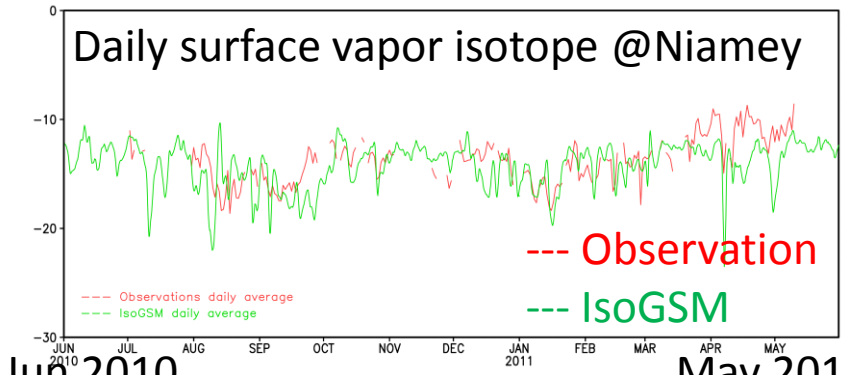


Correlation between d18Ov at Niamey and OLR averaged over 9 previous days

✓ a strong influence of integrated convective activity along the southerly monsoon flow and the westward propagation of convective systems on d18Ov

➔d18Ov ∝ ENSO?

Validation of the model & sensitivity tests



Jun 2010 May 2011

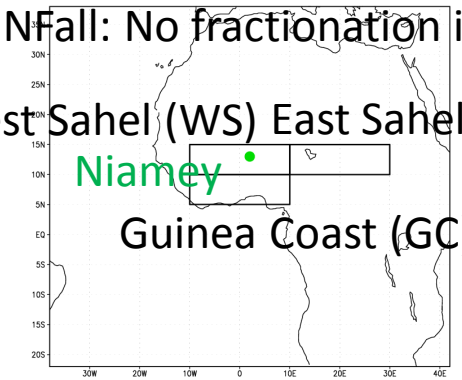
	Obs.	IsoGSM
Ave.	-13.7	-14.6
S.D.	2.16	2.13

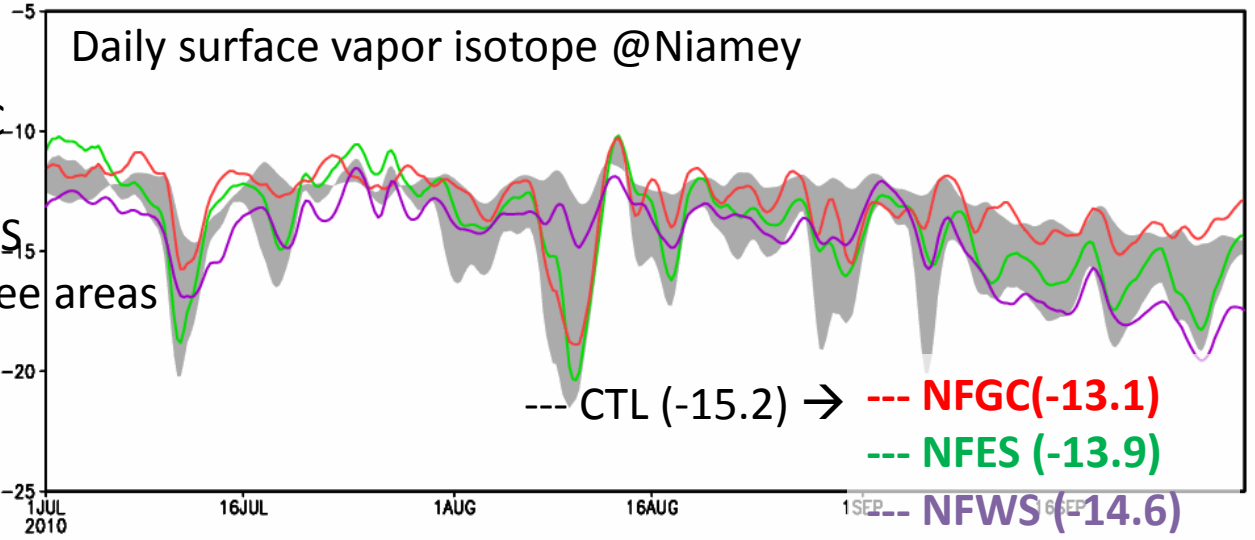
R=0.43 (>99.9%)
Slope=0.426 (obs./IsoGSM)

What deplete surface vapor isotope at Niamey in monsoon season?

Experimental Design

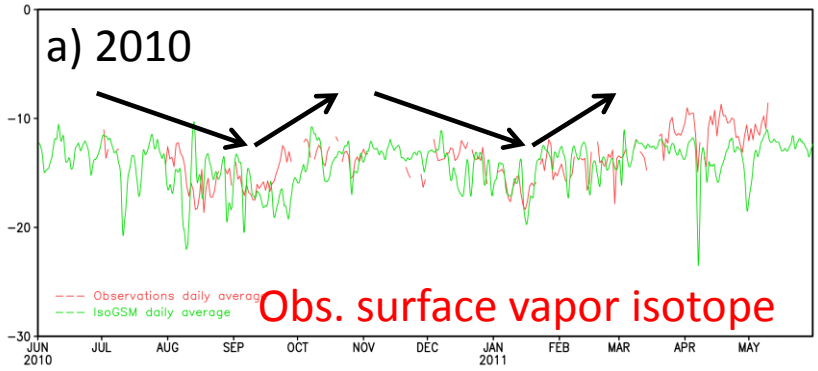
- CTL: nudged run
- NFGC: No fractionation in GC
- NFES: No fractionation in ES
- NFWS: No fractionation in WS
- NFall: No fractionation in three areas

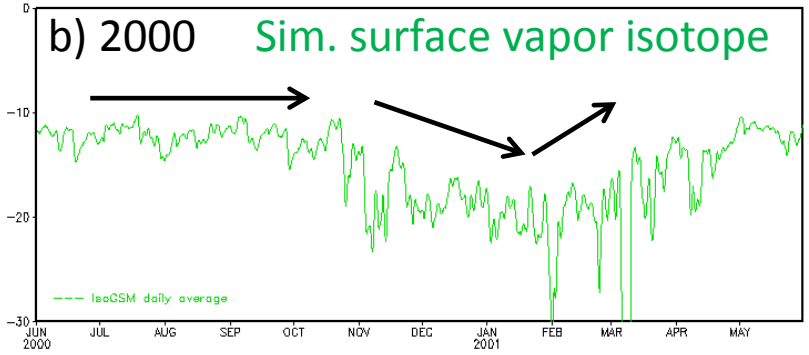




➔ **P_{GC} have large impact on $\delta^{18}O_{v,\ Niamey}$ on seasonal scale**

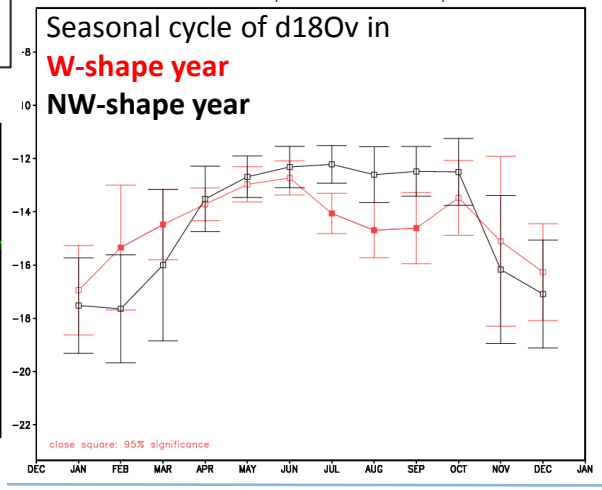
Inter-annual variability of d18Ov

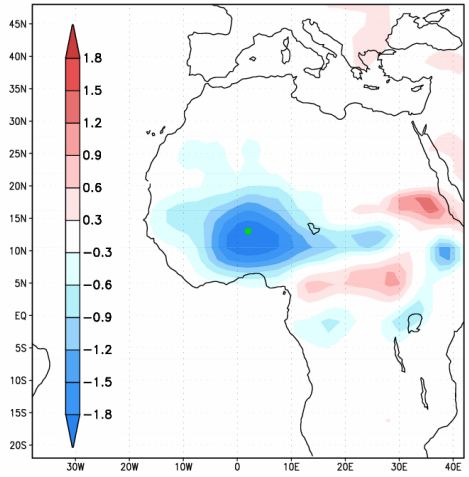




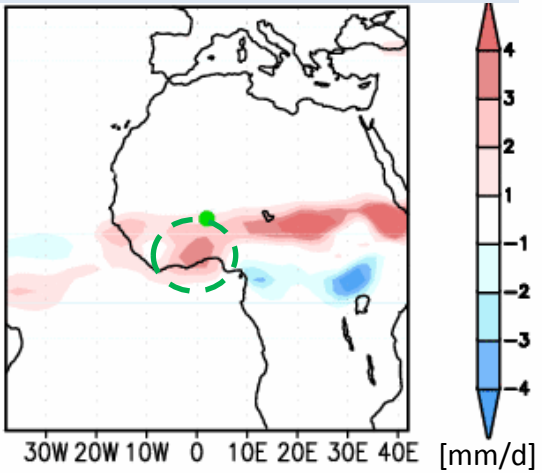
W-shape year

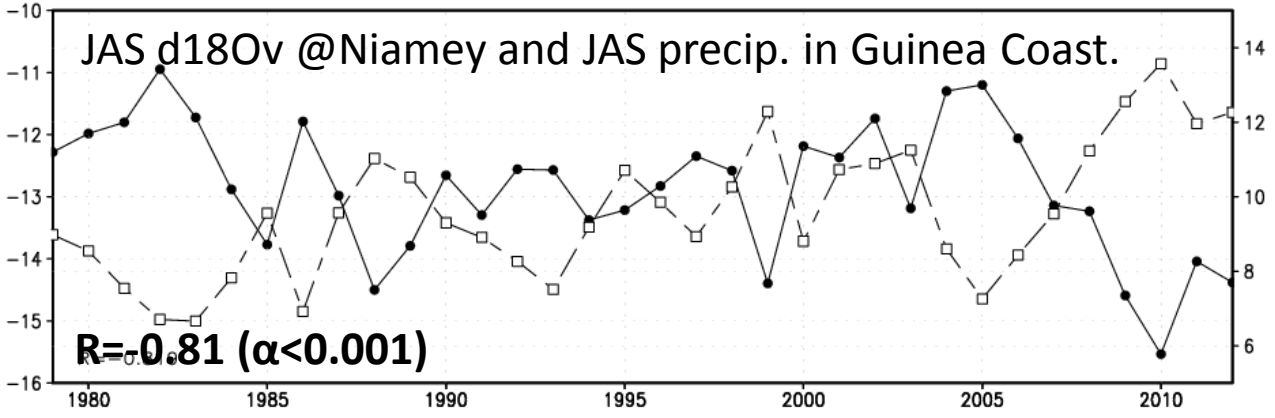
Definition; average of surface vapor isotope in Jul-Sep at Niamey is 1σ (1.1‰) less than climatological average. (1988, 1999, 2009, 2010, 2011, 2012)





JAS Precip. Diff. (W-NW)

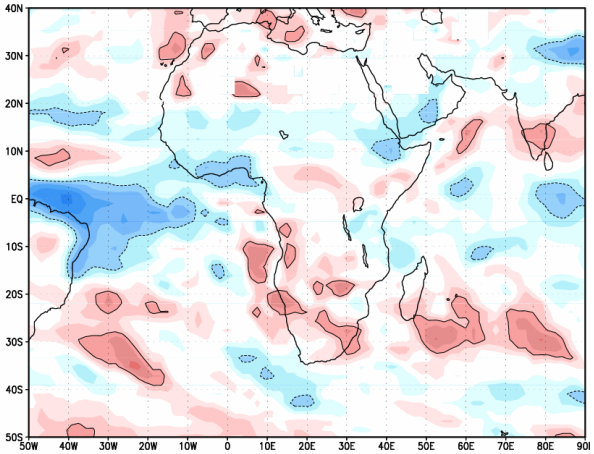




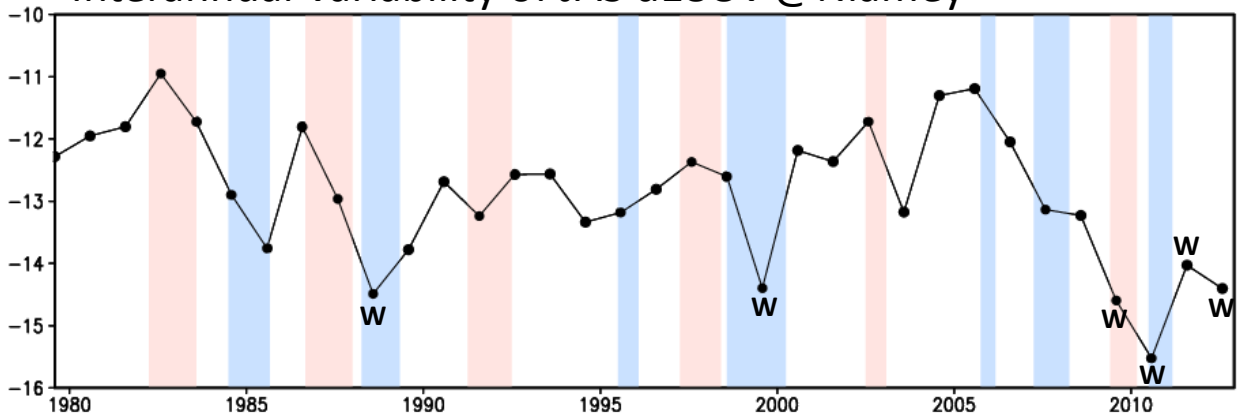
➔P_{GC} modulates $\delta^{18}O_{v,\ Niamey}$ also on interannual scale

Relation with ENSO

Precip-NINO3 correl.

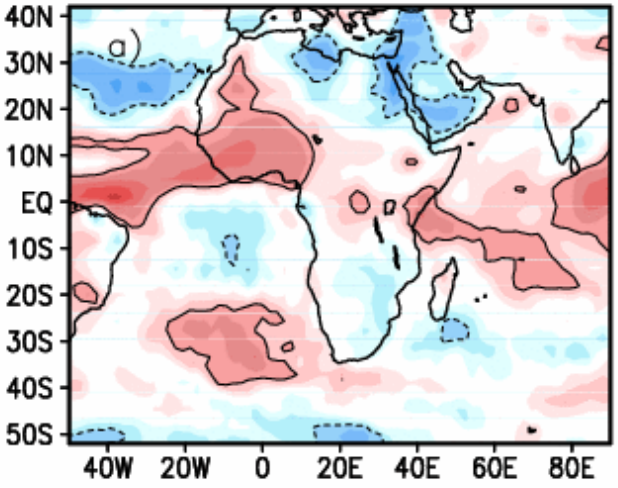


Interannual variability of JAS d18Ov @Niamey

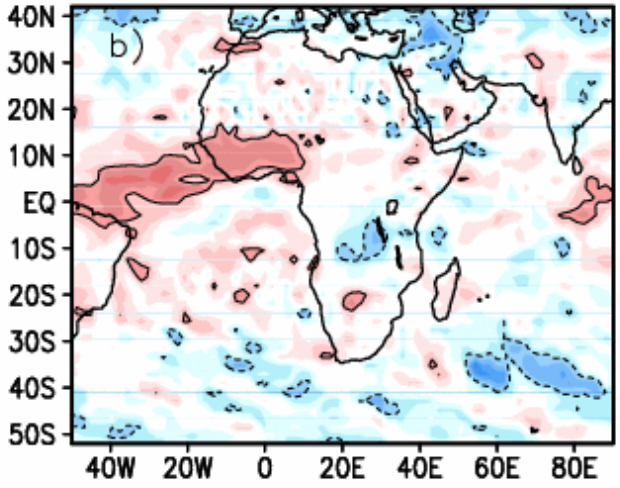


Corr. Coef. with NINO3

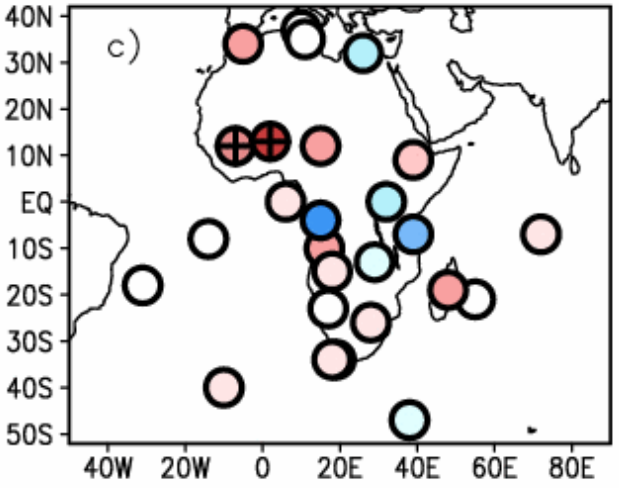
$\delta^{18}O_v$−sim.

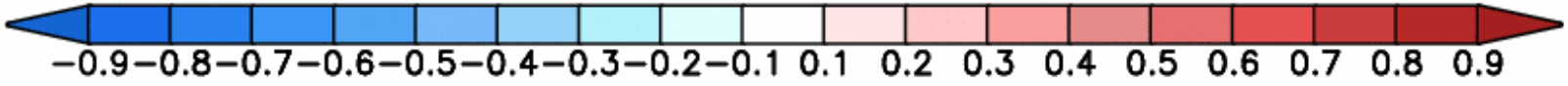


$\delta^{18}O_p$−sim.



$\delta^{18}O_p$−obs.





Thank you for your attention.

Fin.