Moisture origin and transport processes in Colombia, Northern South America

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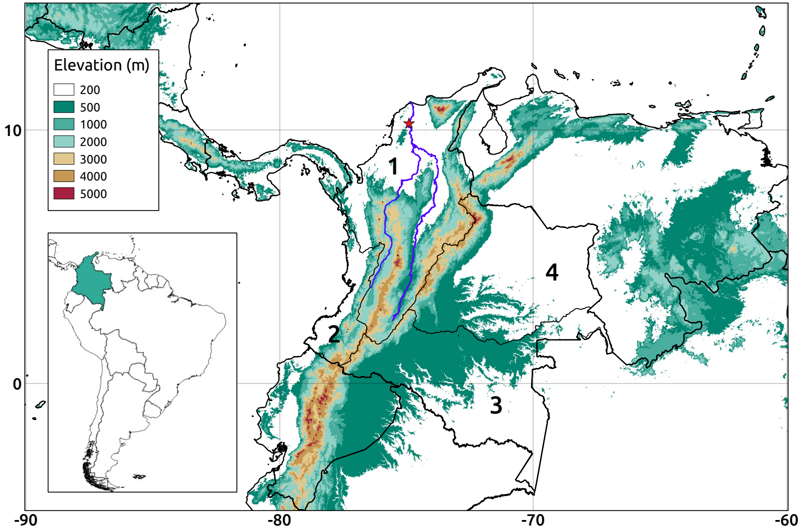
Outline

Moisture origin and transport processes in Colombia, Northern South America

- Spatio-temporal variability of regional moisture fluxes and precipitation regimes
- Identification of regional moisture sources and their intra-annual variability

Study area: Northern South America (Colombia)



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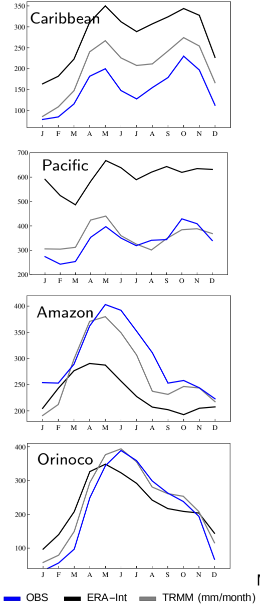
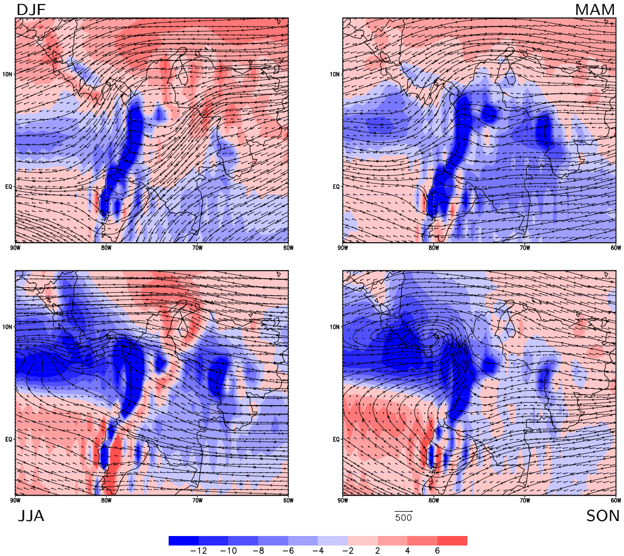
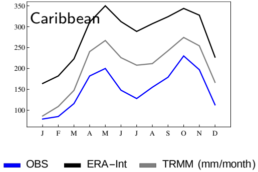
Regional rainfall and atmospheric moisture

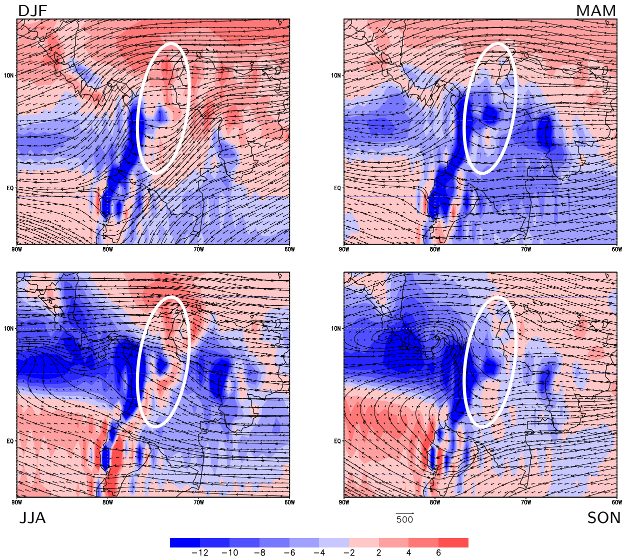




Moisture Flux Divergence (mm/day) in background. Vertical water vapor flux vector (kg/m/s).

Regional rainfall and atmospheric moisture





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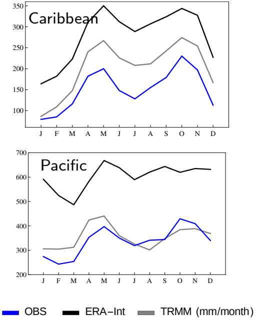

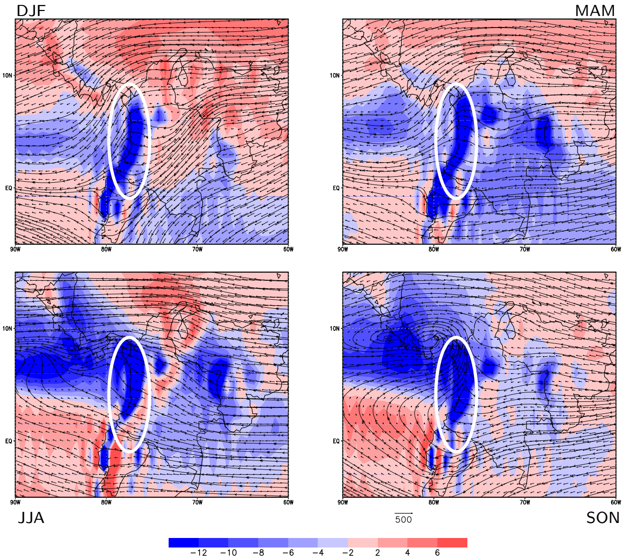

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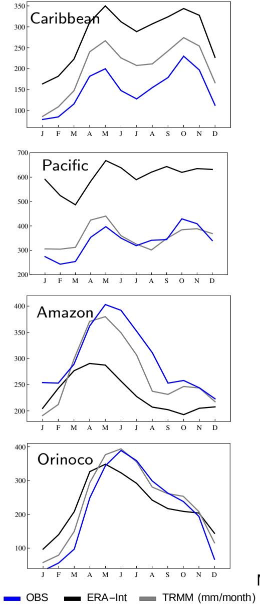
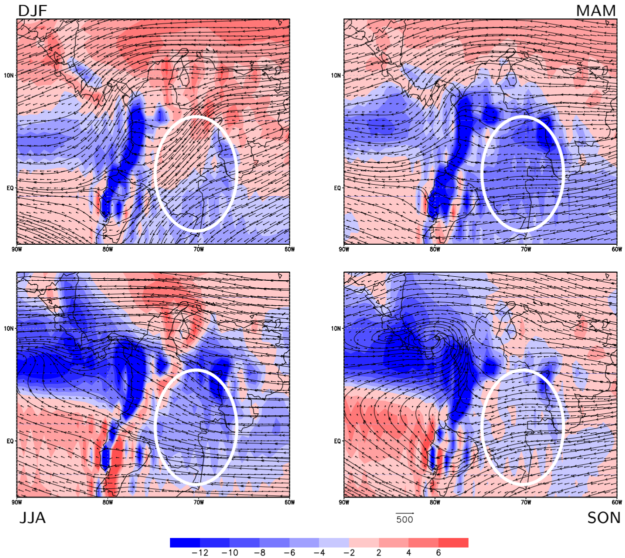
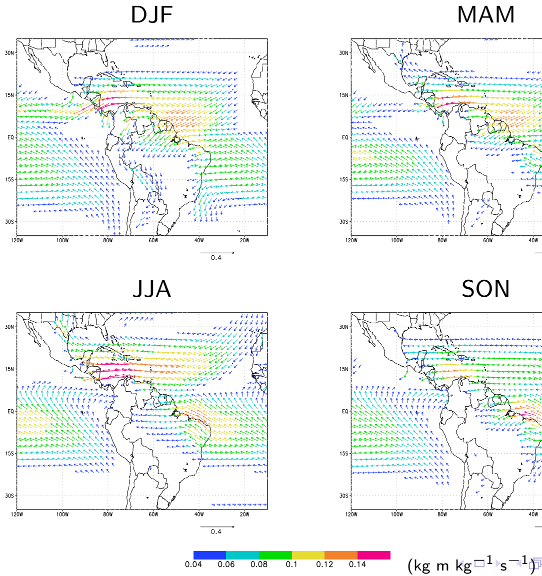




Moisture Flux Divergence (mm/day) in background. Vertical water vapor flux vector (kg/m/s).

Outline

Seasonality of low level Transport mechanisms



Outline

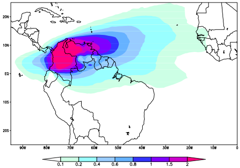
Identifying regional moisture sources (1980 - 2005)

Target region: the Colombian inter-Andean region, the Caribbean low-lands and the Pacific Basin (NOSA)

DRM

Dynamic Recycling Model

Dominguez et al. (2006)

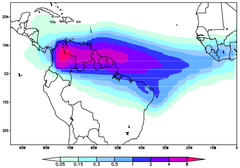


ERA-Interim

QIBT

Quasi-isentropic back-trajectory

Dirmeyer and Brubaker (2007)

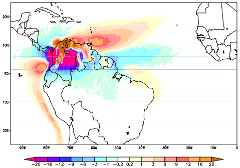


NCEP/DOE

FLEXPART

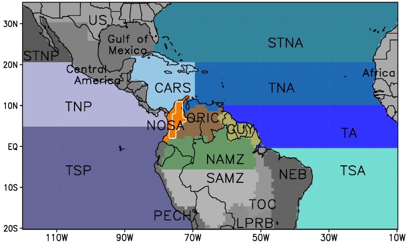
Particle dispersion model

Stohl and James (2004)



ERA-Interim

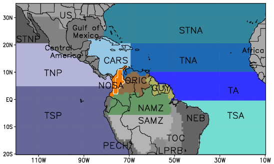
Summary of annual moisture contributions to NOSA

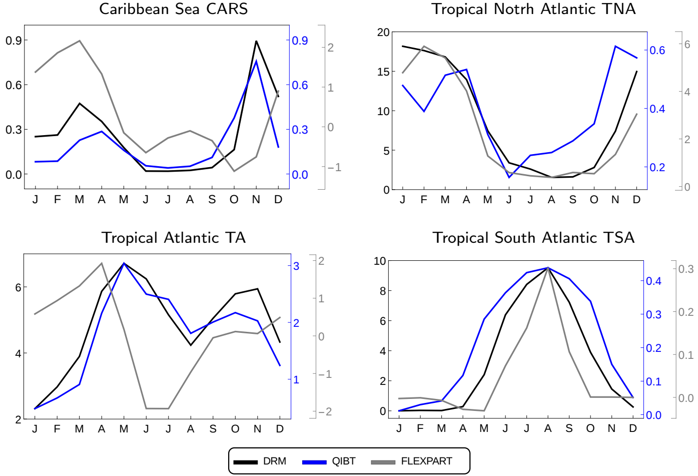


The oceanic regions were delimited using the climatological source map generated by the FLEXPART model. The terrestrial source regions correspond to the main hydrographic units within the continent.

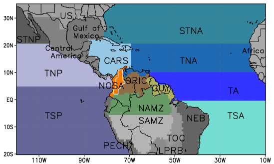
Source	Region	DRM Precip. water (%)	QIBT Evapora. source (%)	FLEXPART Diagnostic precipitation (%)
Atlantic	TNA	23.42	8.86	14.98
	TA	12.10	36.05	5.86
	TSA	8.17	5.41	0.19
	STNA	4.68	0.09	1.66
	CARS	0.68	1.60	2.86
	G.Mexico	0.02	0.03	-
	Total	49.07	52.04	25.55
Pacific	TSP	2.00	0.34	28.79
	TNP	0.64	0.42	7.69
	STNP	0.00	0.10	-
	Total	2.64	0.86	36.48
Terrestrial	ORIC	12.80	18.02	11.54
	NAMZ	7.50	5.78	7.54
	SAMZ	0.53	0.26	1.54
	NOSA	9.61	8.08	17.32
	Total	30.44	32.46	37.94
Others		17.84	14.64	-

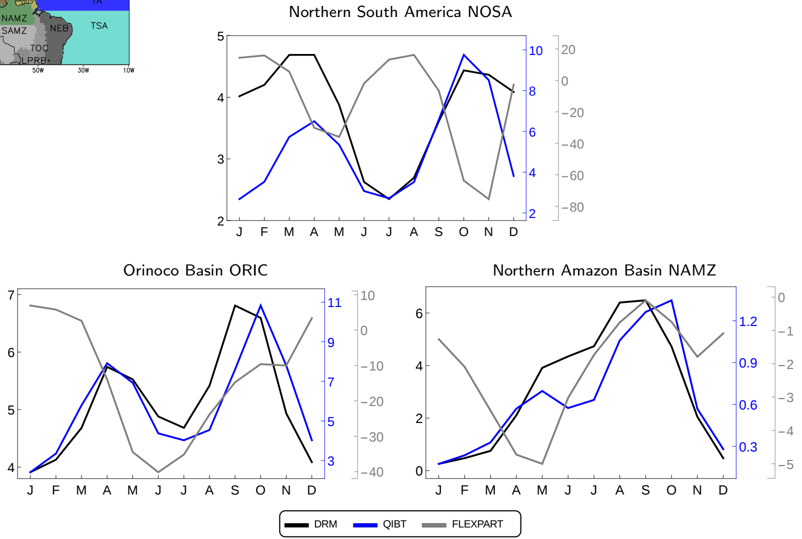
Atlantic sources (mm/month)

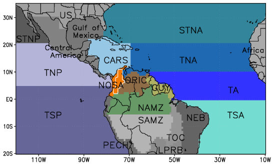




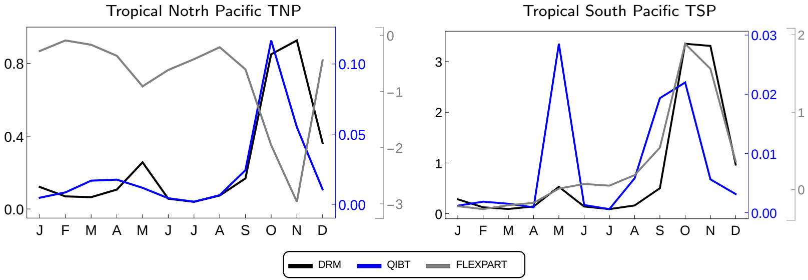
Terrestrial sources (mm/month)





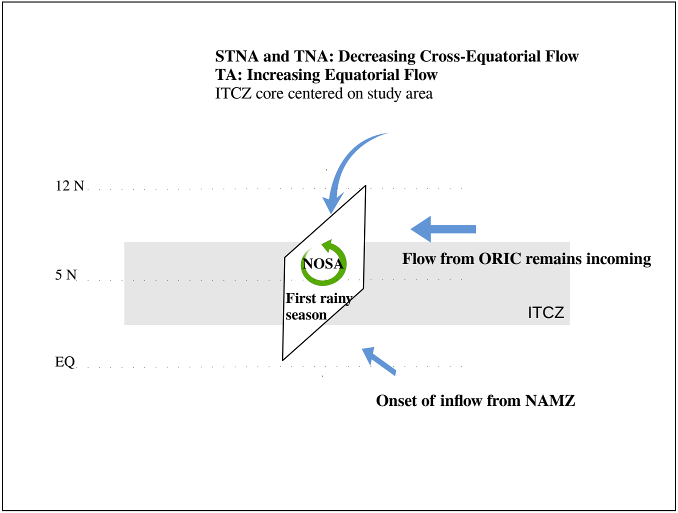


Pacific sources (mm/month)

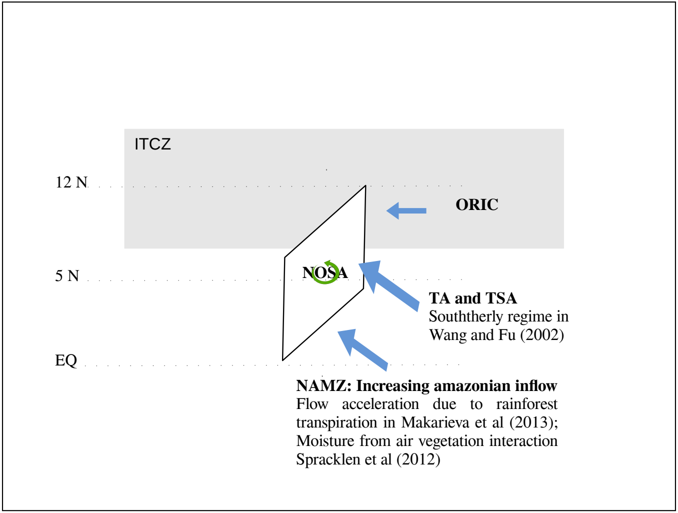


The moisture contribution from the Pacific ocean is significant only during the season of westerly low level jet system, from October to December (CHOCO jet, Poveda and Mesa 2000).

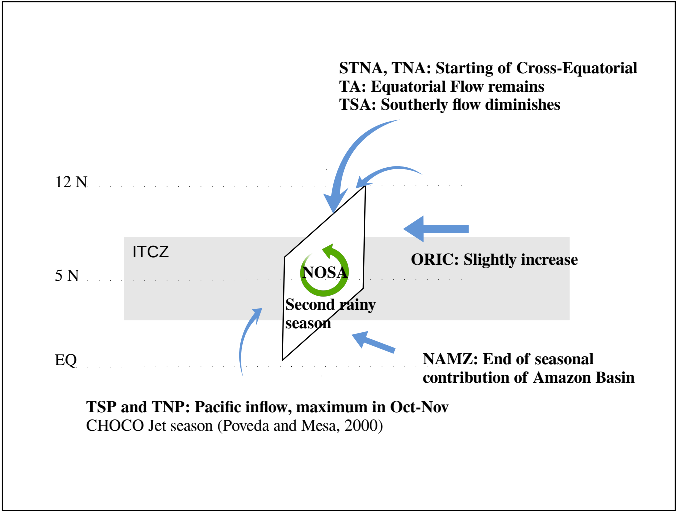
Qualitative summary of the seasonal progression of moisture sources over NOSA: MAM



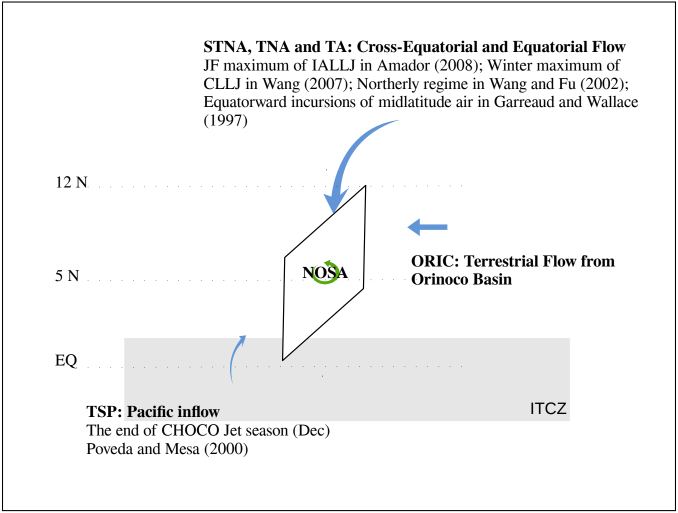
Qualitative summary of the seasonal progression of moisture sources over NOSA: JJA



Qualitative summary of the seasonal progression of moisture sources over NOSA: SON



Qualitative summary of the seasonal progression of moisture sources over NOSA: DJF



Outline

Concluding remarks

- The annual cycle of precipitation in each Colombian basin is driven by the interaction of the ITCZ with topography, and is reflected in the spatial patterns of moisture flux convergence.
- Three different methodologies to evaluate atmospheric moisture sources indicate that marine sources are the most important contributions for Colombia, with a predominance of the Atlantic Ocean and a significant contribution from the Tropical Pacific only during the CHOCO-jet season (SOND).
- Terrestrial sources also play an important role in moisture transference from surrounding areas highlighting the regional sensitivity to surface processes. This could potentially have implications related to changes in vegetation and land cover uses that directly affect transpiration processes and moisture transference.