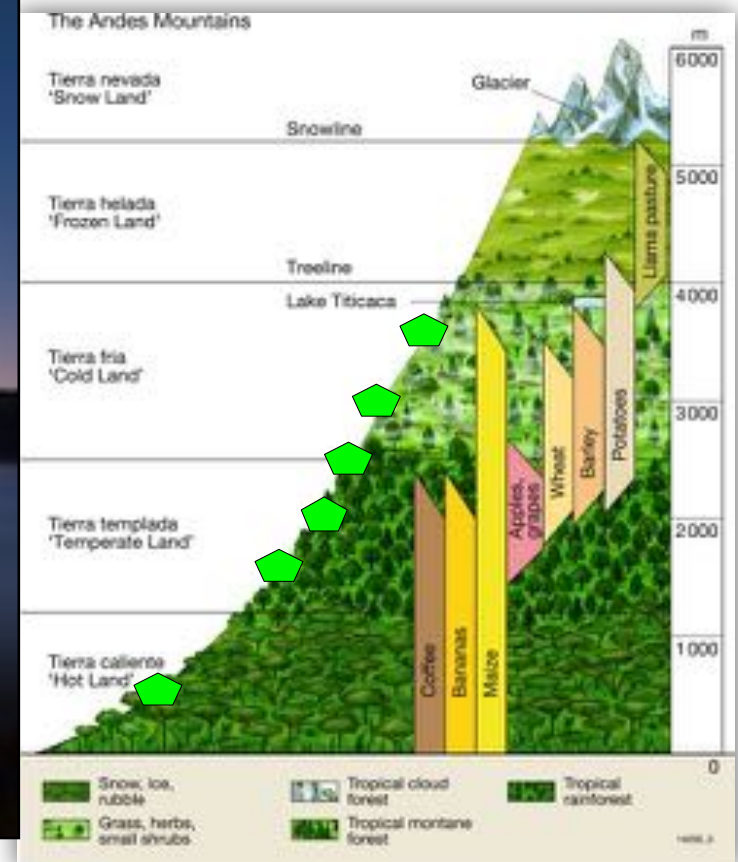


Pathways of Sustainability: Orographic Precipitation-Vegetation Interactions in the Tropical Andes as Hydrometeorological Services

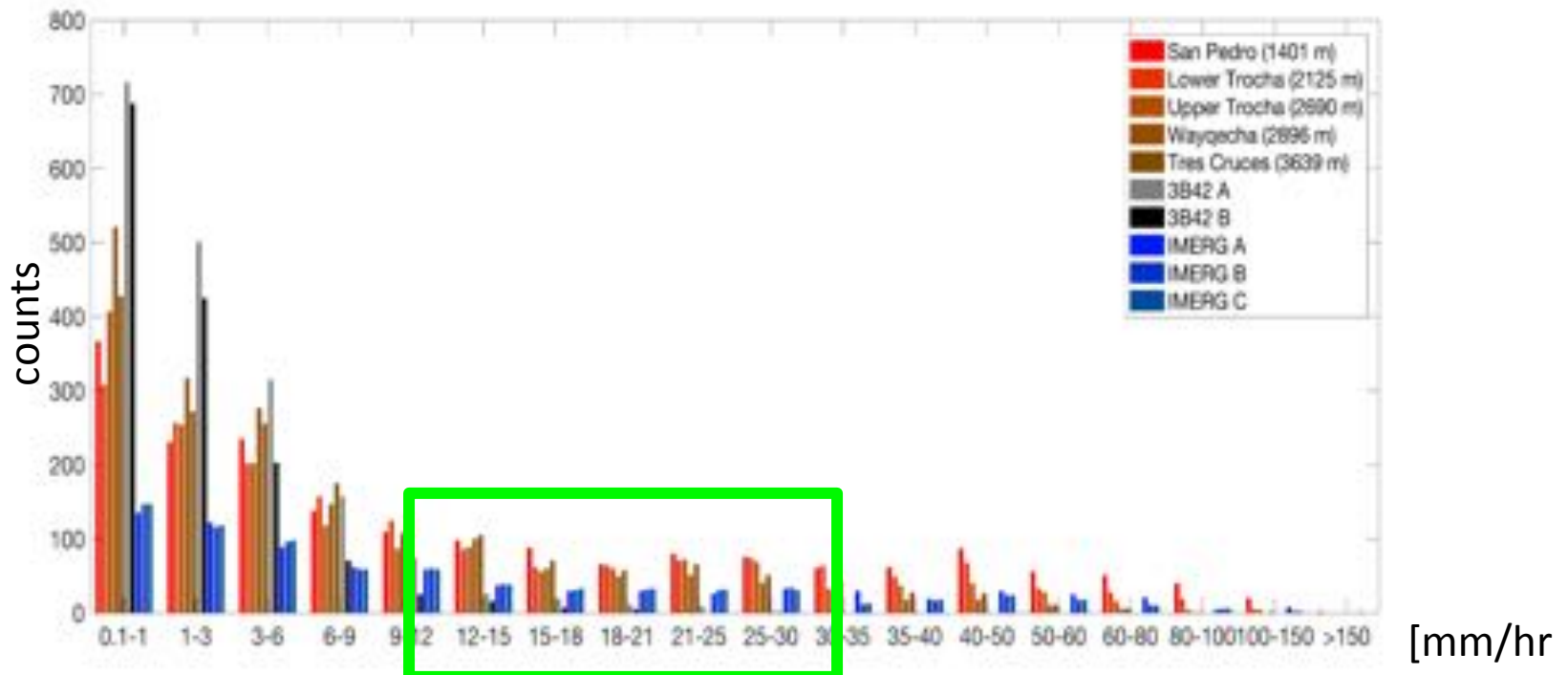




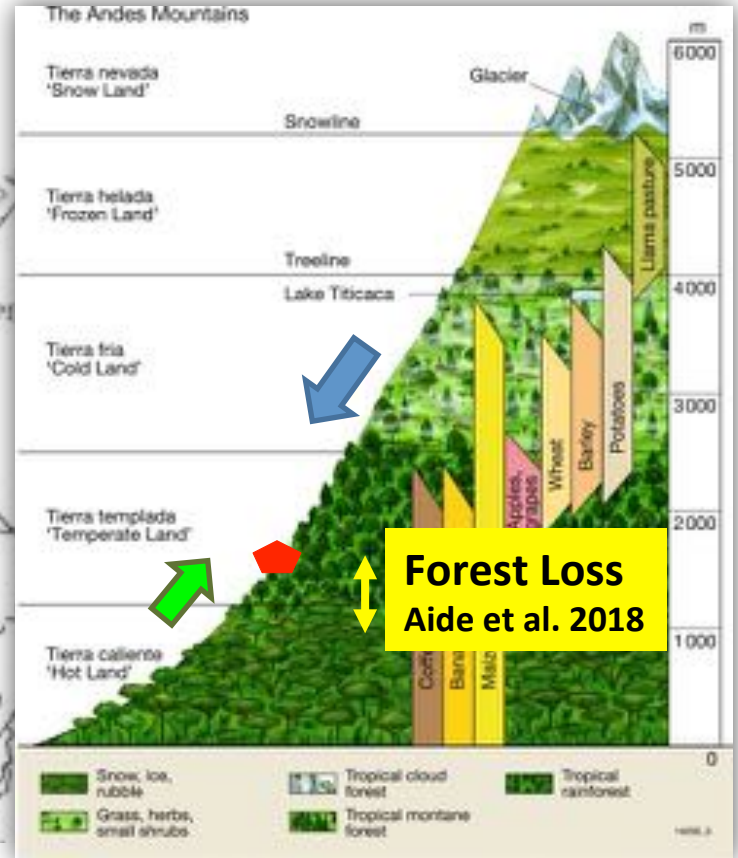
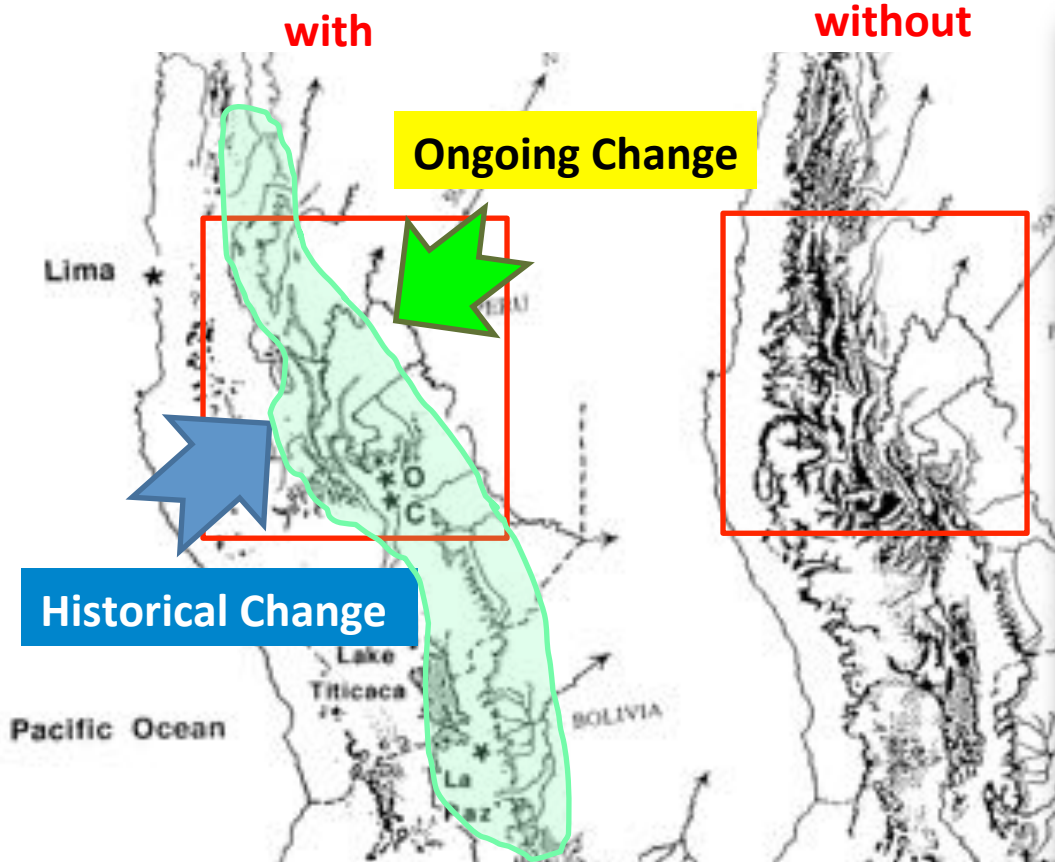
Above
Canopy
Raingauges



Kosñipata Valley Raingauge Transect – Orographic Envelope



Anthropogenic Land-Use Land-Cover Change



MOUNTAIN RESEARCH AND DEVELOPMENT, VOL. 18, No. 2, 1998, pp. 159-172

TRACING 4,000 YEARS OF ENVIRONMENTAL HISTORY
IN THE CUZCO AREA, PERU, FROM THE POLLEN RECORD

A. J. CHEPSTOW-LUSTY¹, K. D. BENNETT¹, J. FJELDSÅ², A. KENDALL³, W. GALLIANO⁴, AND A. TUPAYACHI HERRERA⁴

□ Land-Atmosphere Interactions in Mountainous Regions

ET-P Feedback

➤ LOCAL vs REMOTE Moisture Sources

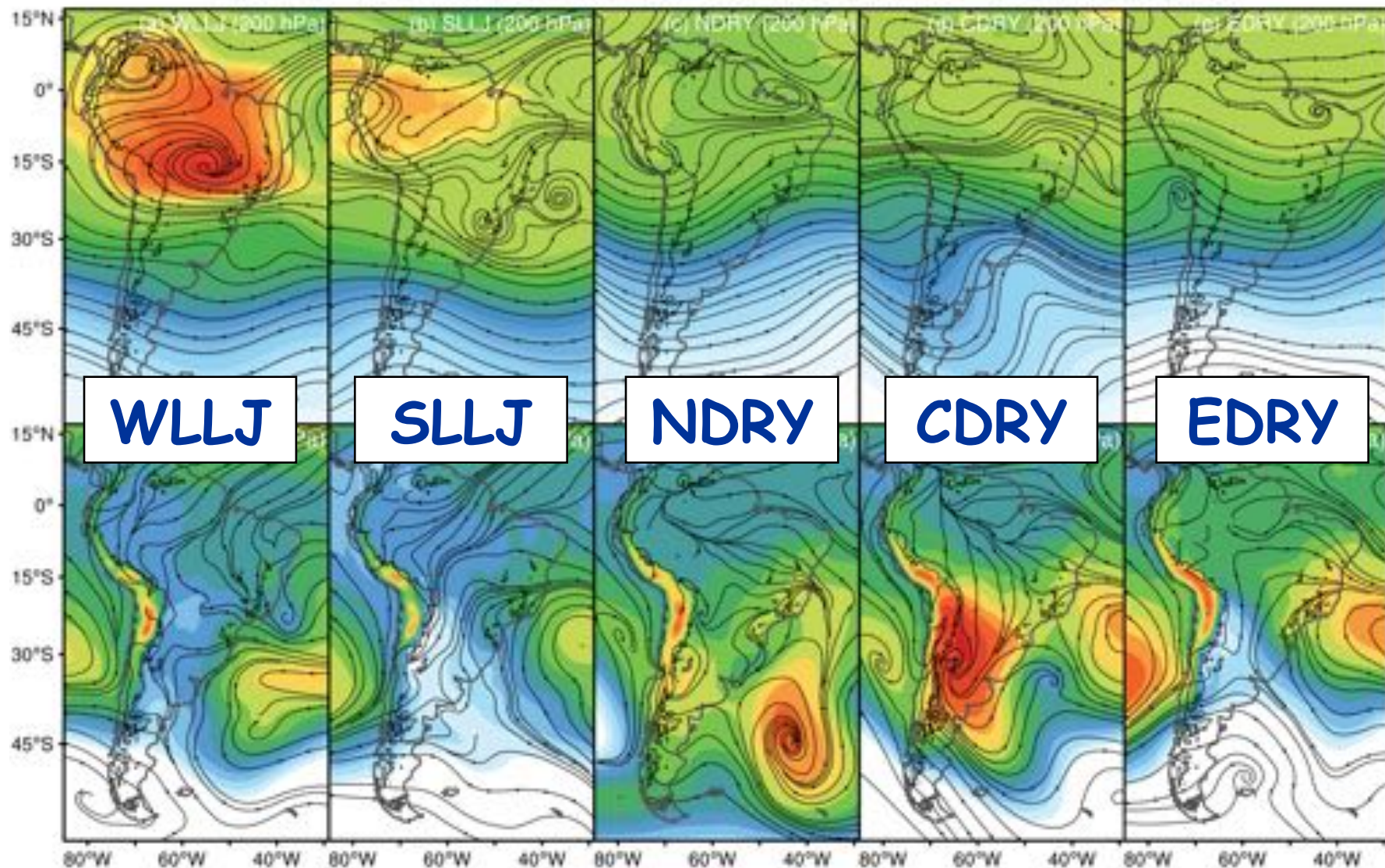
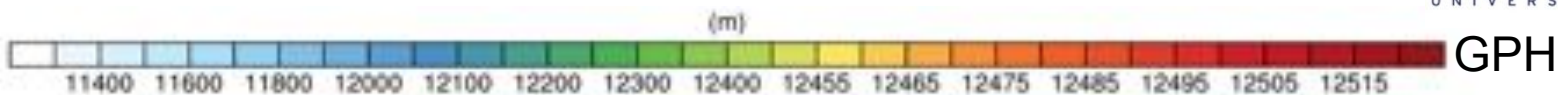
Central Andes^a and the Amazon River Basin^b

Sun and Barros, 2015a, JAS

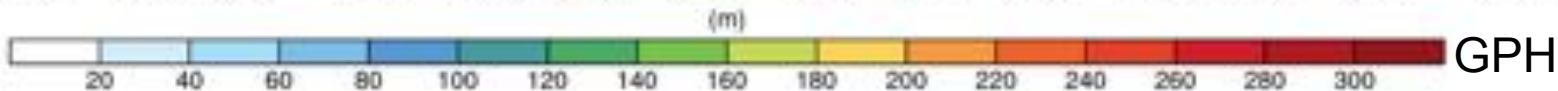
Sun and Barros, 2015b, QJRMS

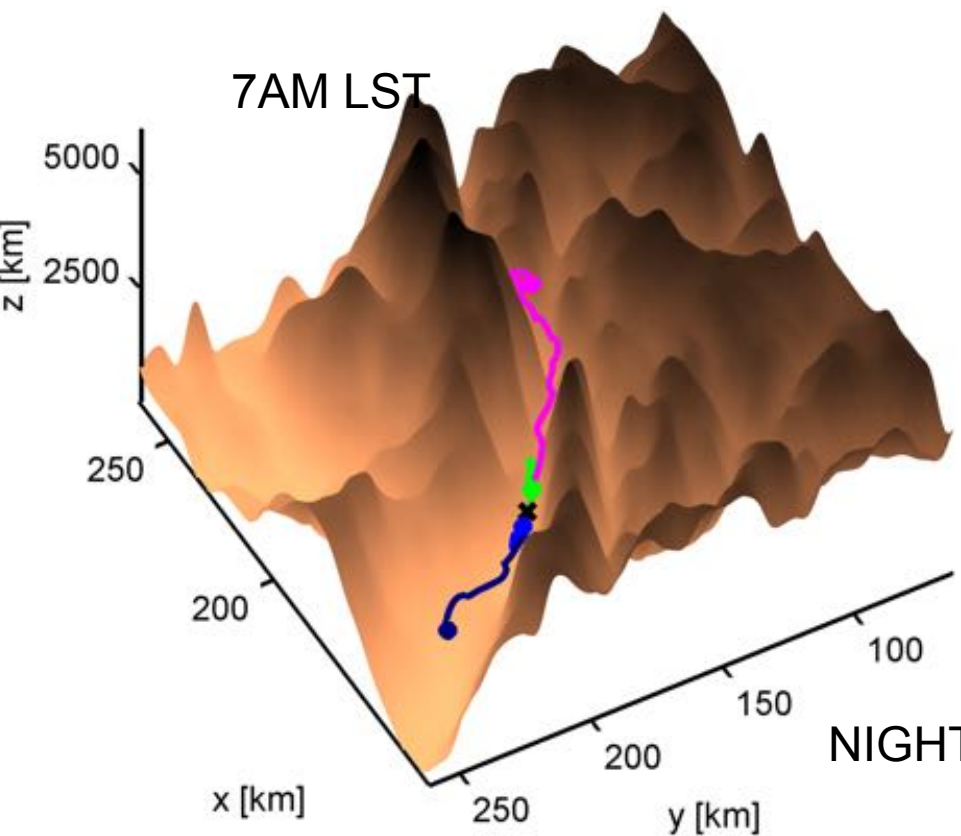
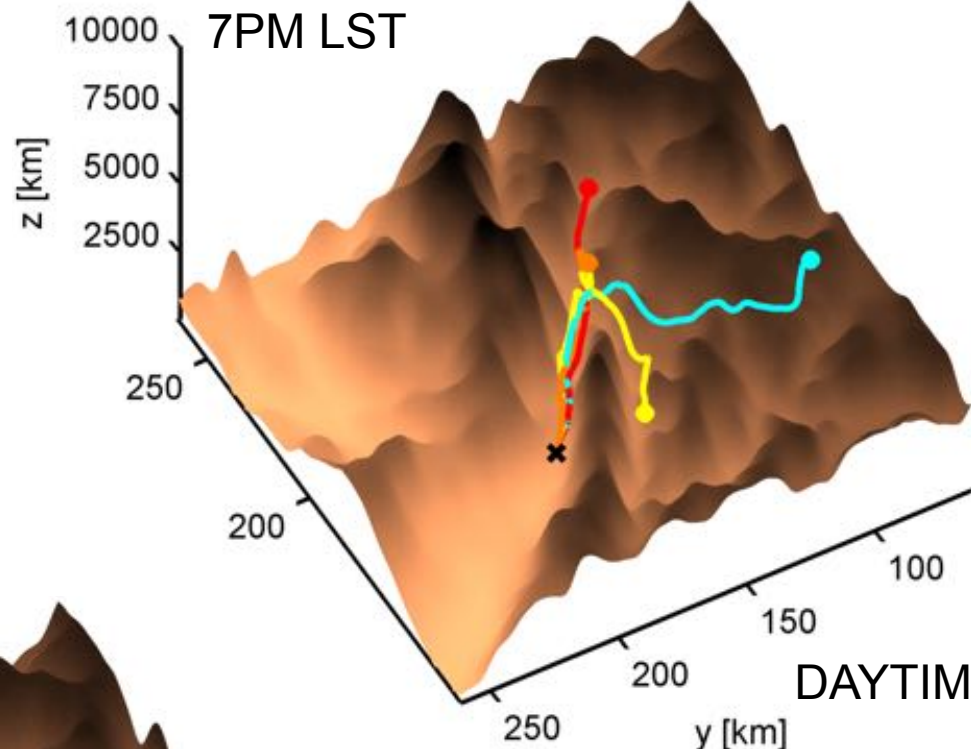
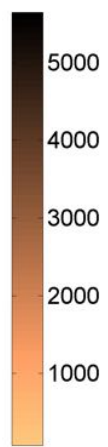
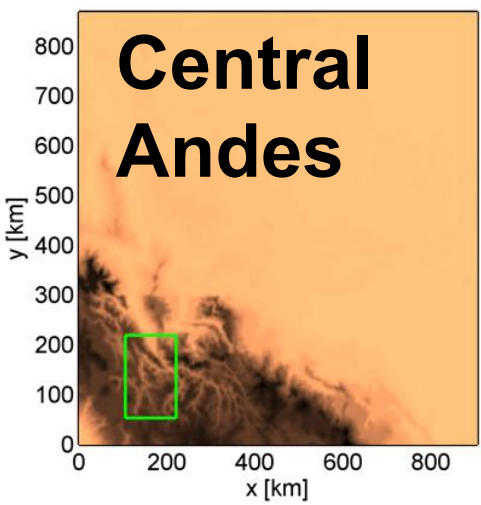
Illustrative Regimes (SALLJEX)

200hPa



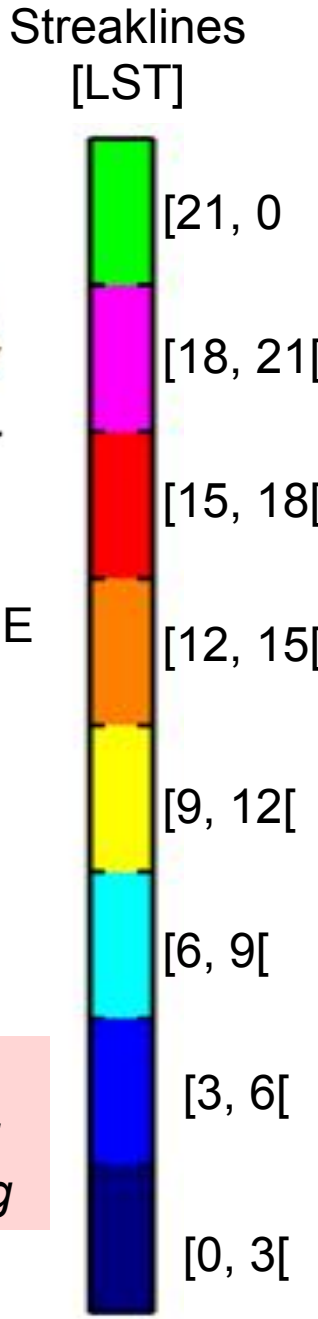
1000hPa



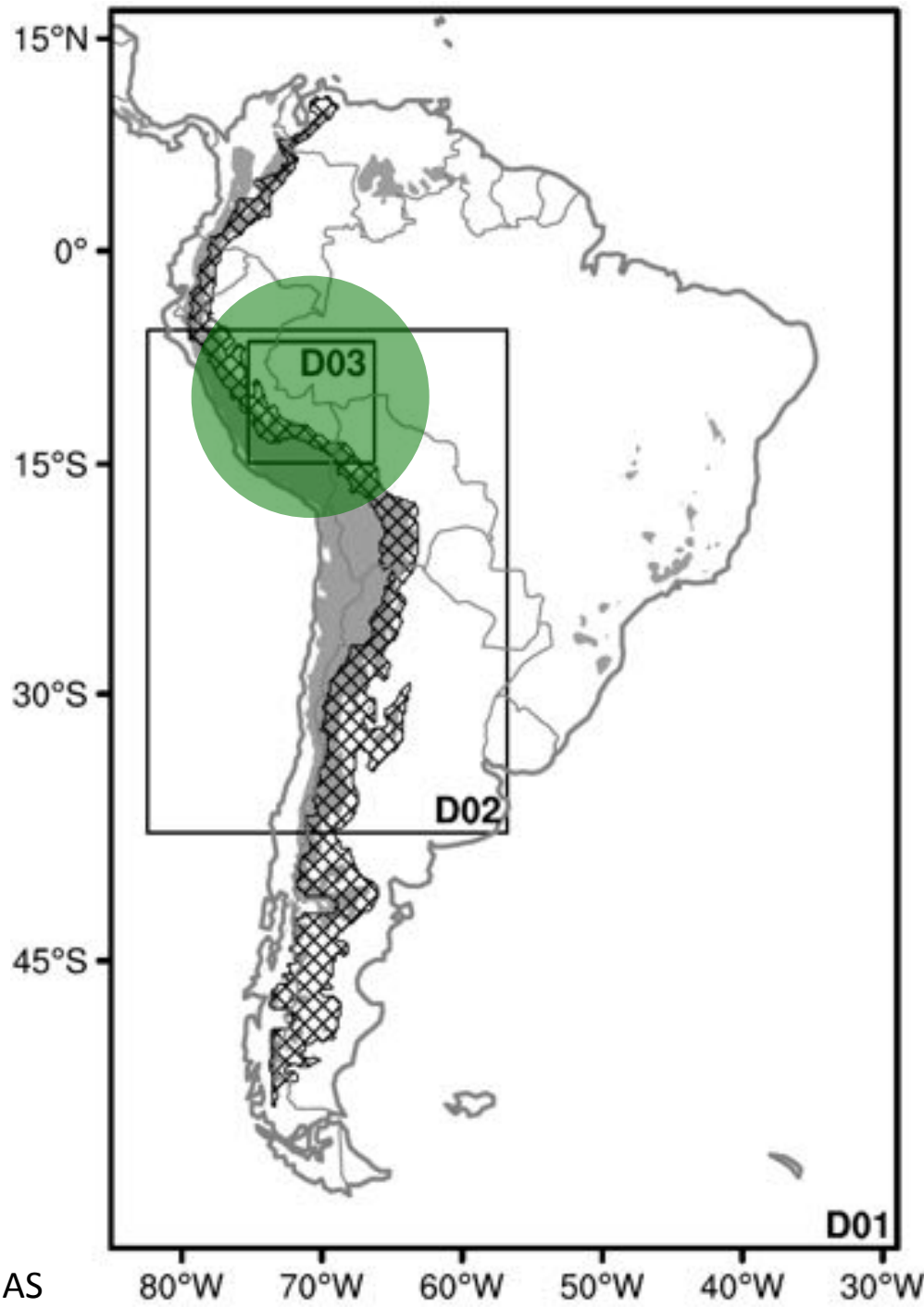


**Diurnal Cycle
WLLJ**

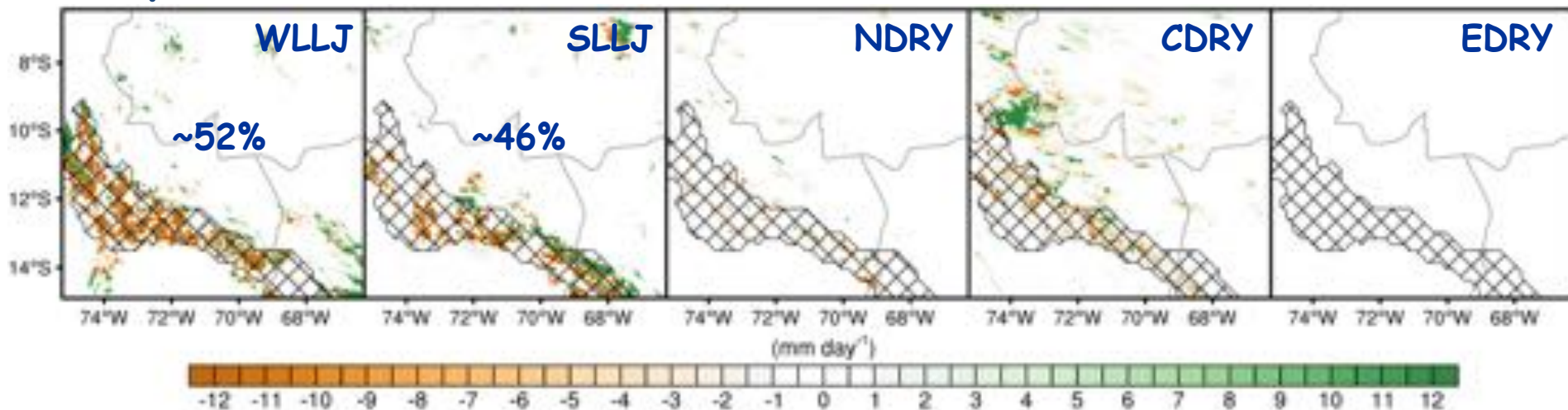
upslope flows in the Inner mountain region: afternoon and evening



1) ET removal Eastern Andes

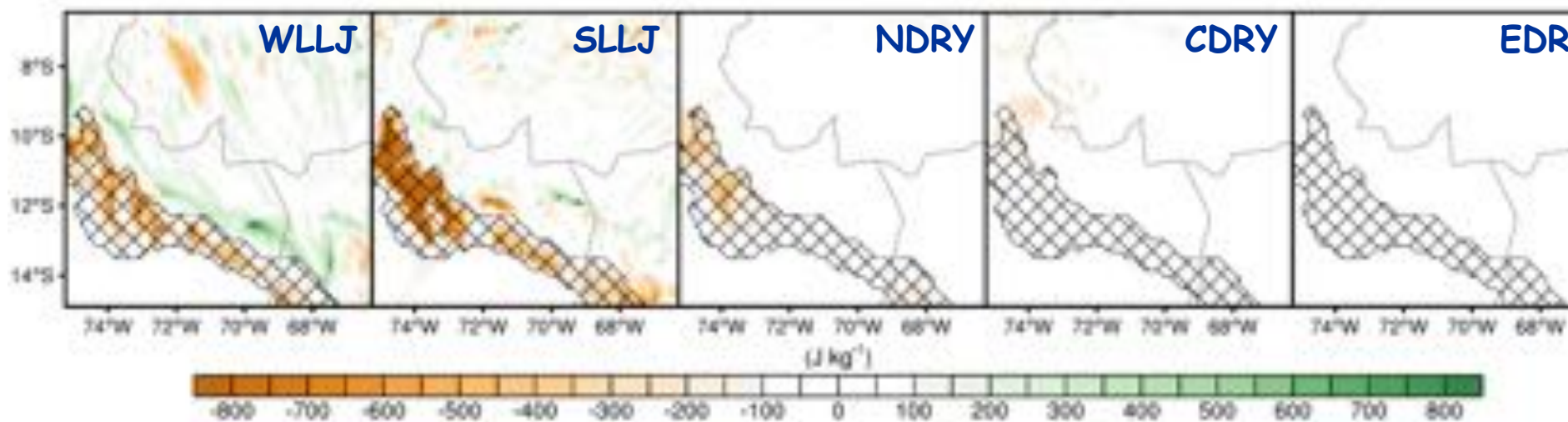


Precipitation



Sensitivity is higher for “rain producing “ scenarios
..... Positive feedback

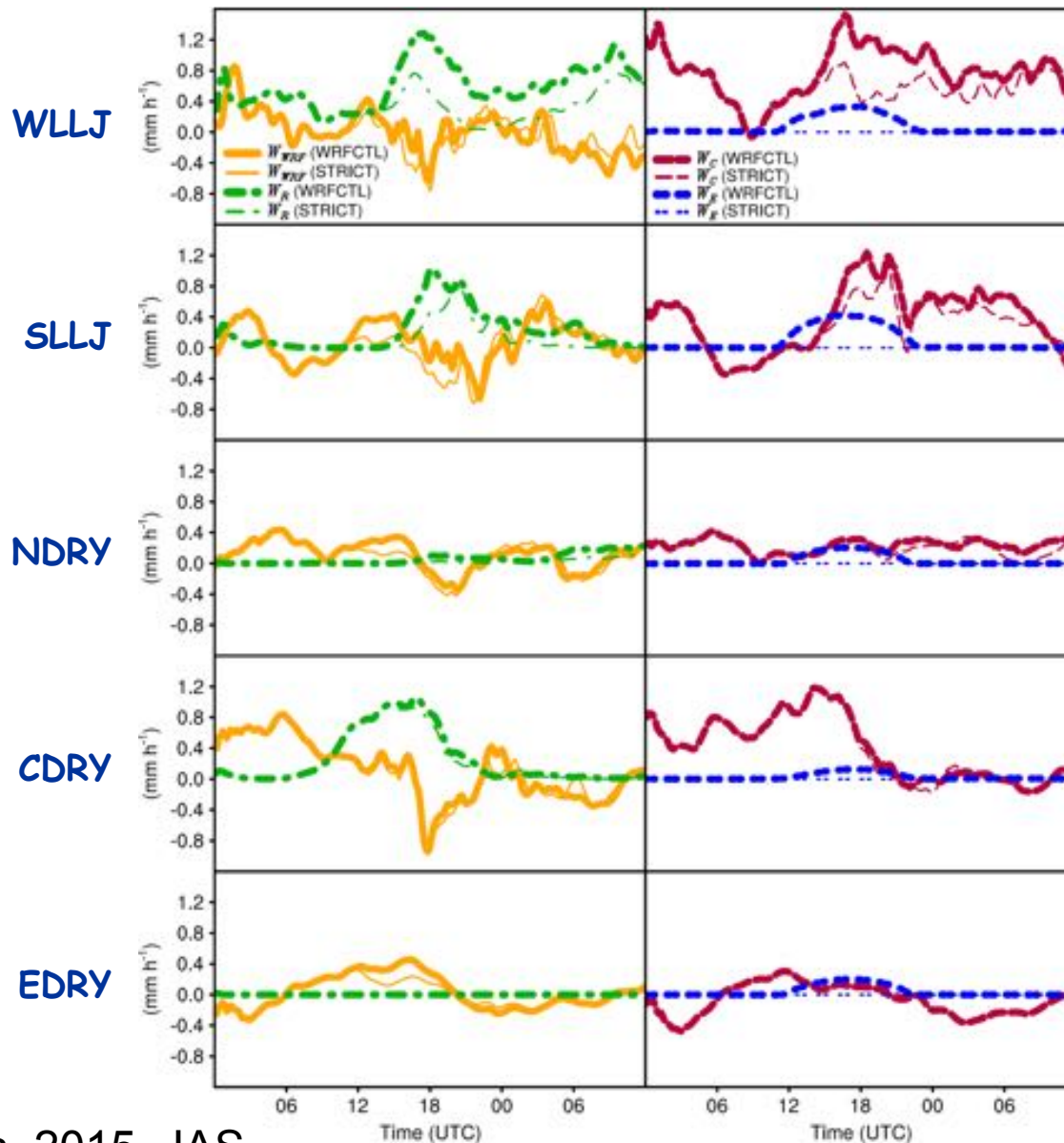
$$w_s \sim \sqrt{2CAPE}$$

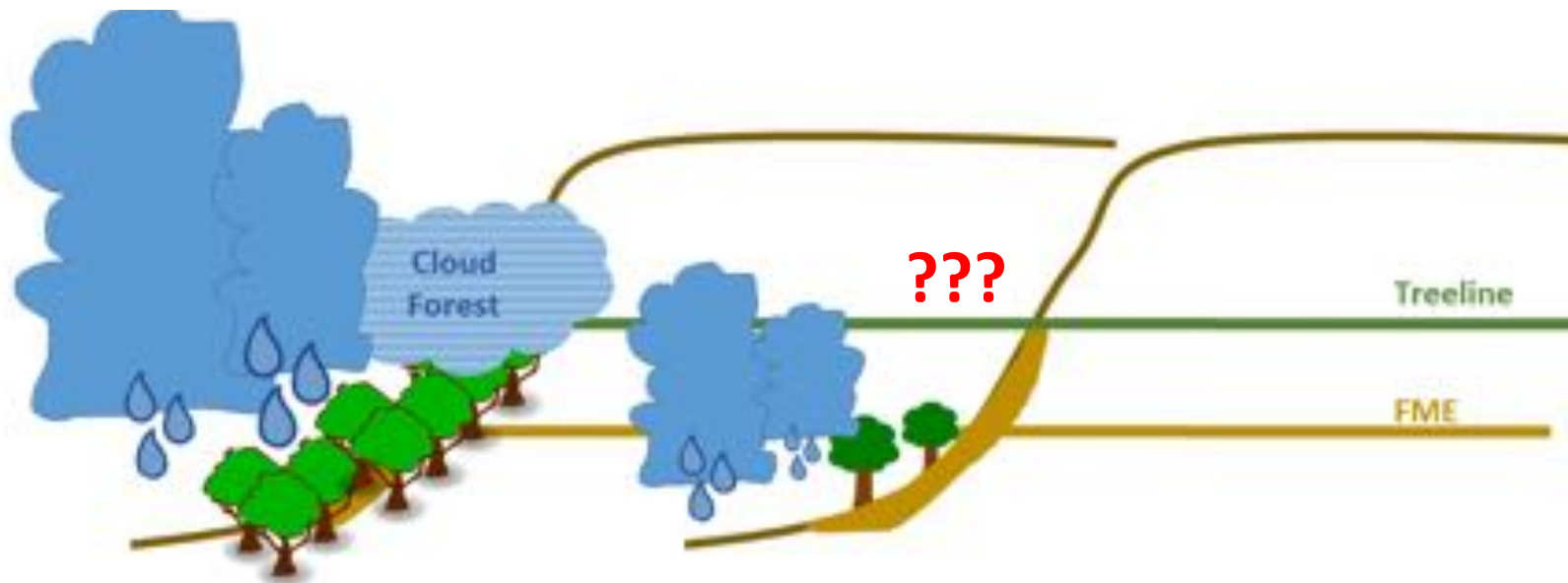


CAPE

Moisture budget

$$\frac{\partial W}{\partial t} + P = E - \nabla \cdot \frac{1}{g} \int_0^{p_s} q \mathbf{v}_H dp$$



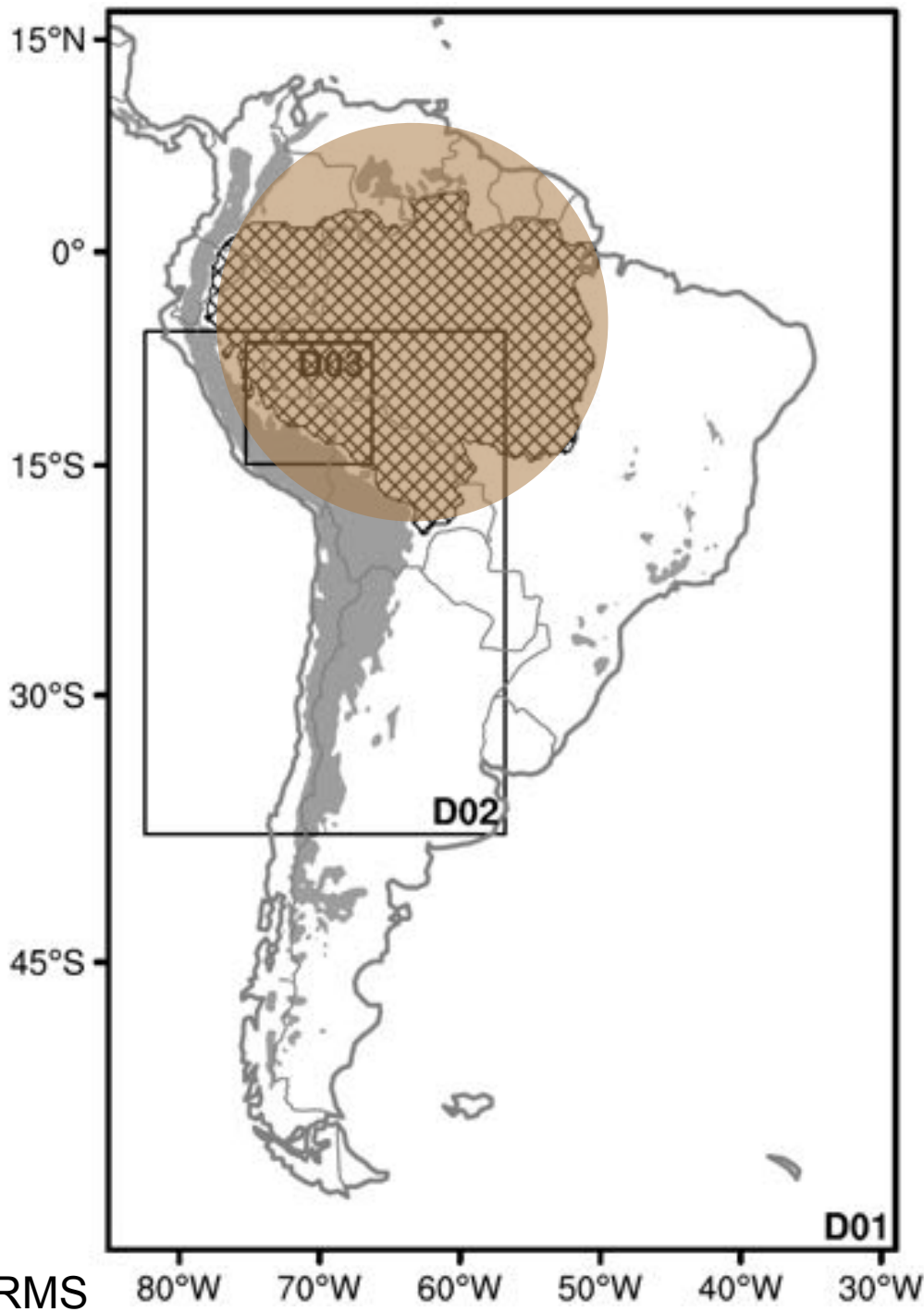


Reduced Upslope Moisture Convergence
(Alpine Pumping)

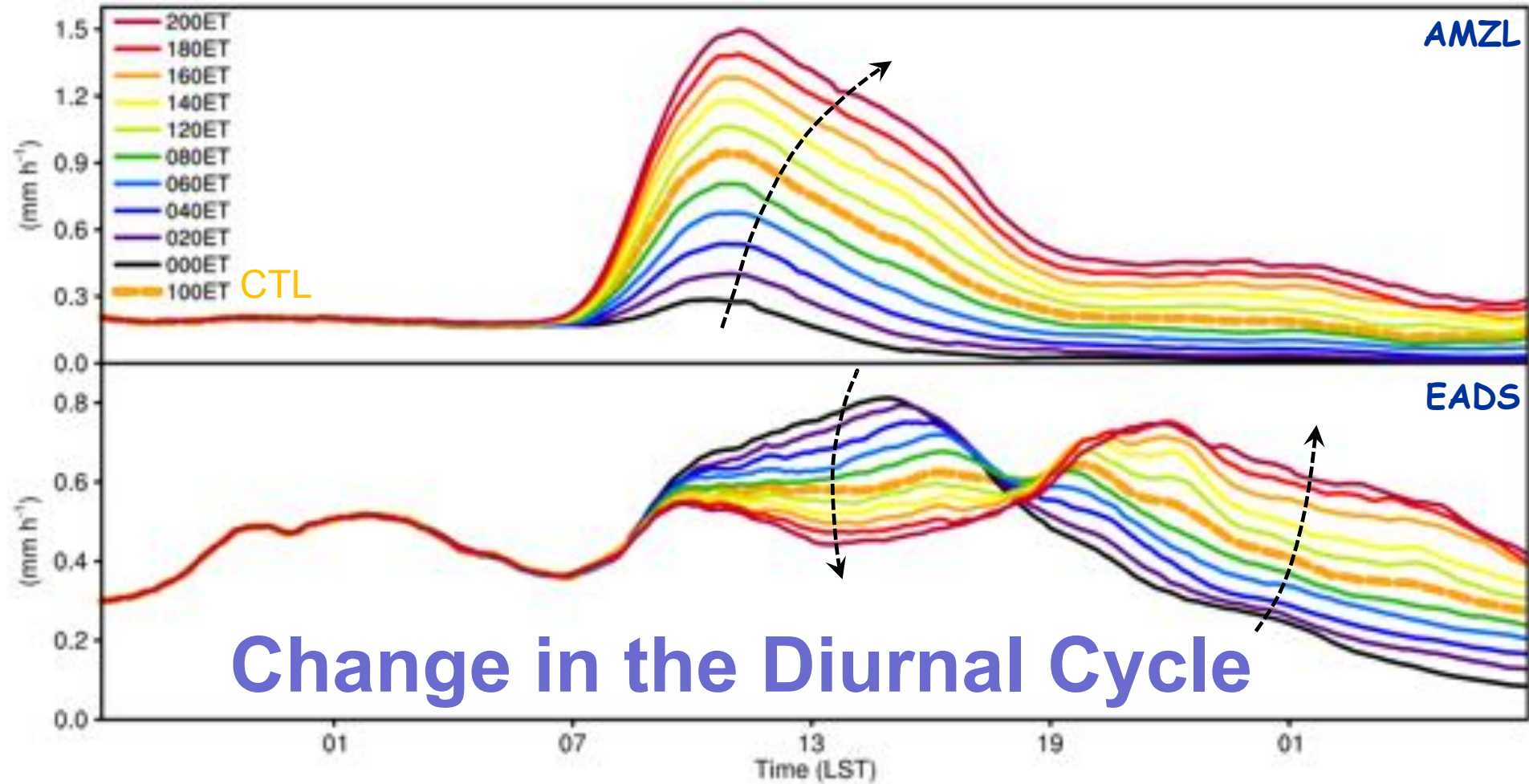


Squeeze of Orographic Freshwater Harvesting Zone

2) ET Removal Amazon



AMZL → EADS Precipitation Feedback



Amazon dams *planned and under construction*



□ Land-Atmosphere Interactions

□ Precipitation – Vegetation Interactions

➤ LOCAL vs REMOTE

Boundary Layer vs Regional vs Large-Scale Controls

Central Andes and the Amazon River Basin

➤ Revising the notion of “River Basin” and “Upstream”

Implications for Water Resources & Environmental Governance



➤ Challenges and Opportunities