

CLIMATE ↔ LAND USE

The IAI: cross-national/disciplinary teams funded for cycles of 3-5 yrs

Today...

CRN 2031 (Plata Basin LUC, PI – Jobbagy)

CRN 2094 (Climate-LUC interactions, PI – Berbery)

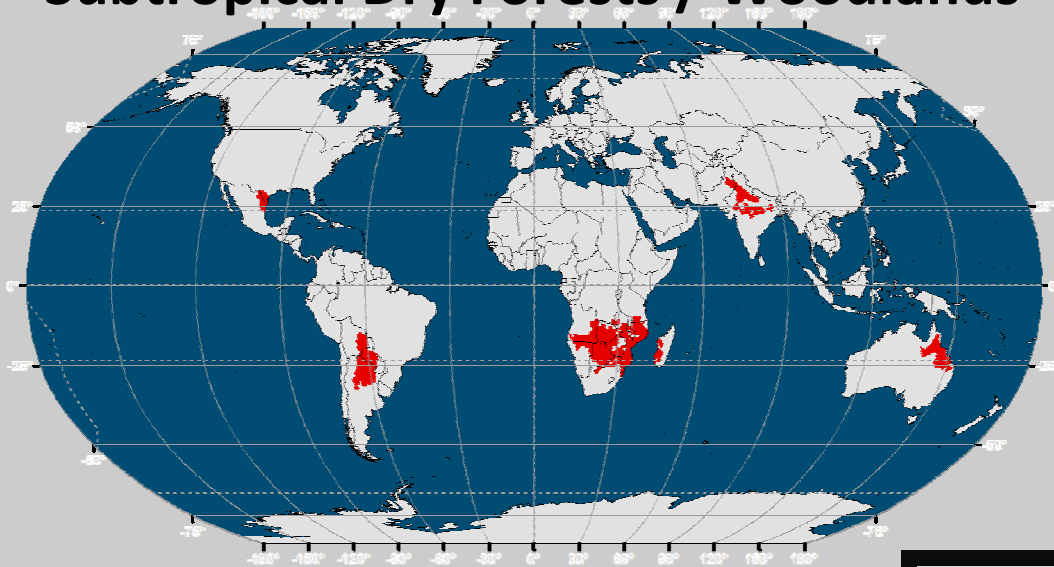
CRN 2047 (Climate-Hydro change, PI – Luckman)

CRN 2021 (Ecology of dry forest, PI – Sanchez)

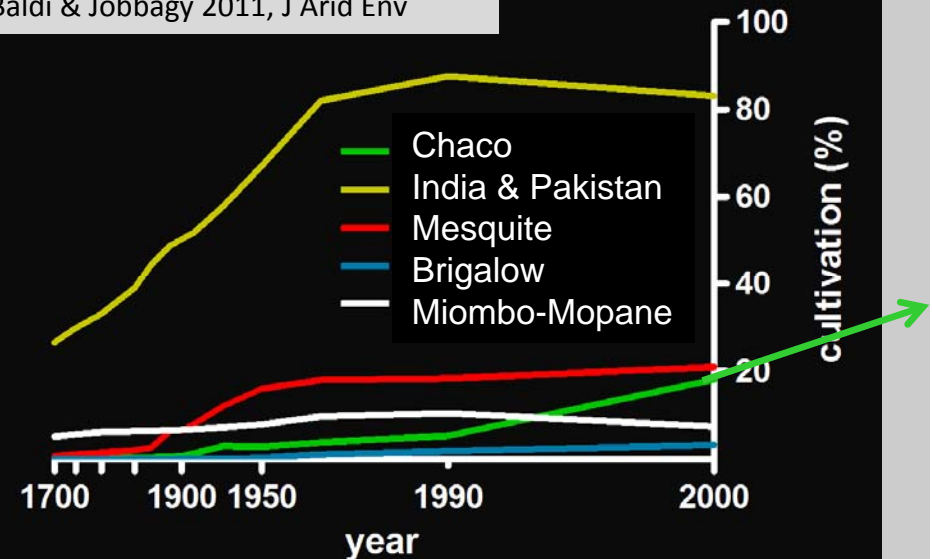


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Subtropical Dry Forests / Woodlands



Baldi & Jobbagy 2011, J Arid Env



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“South American perspective”

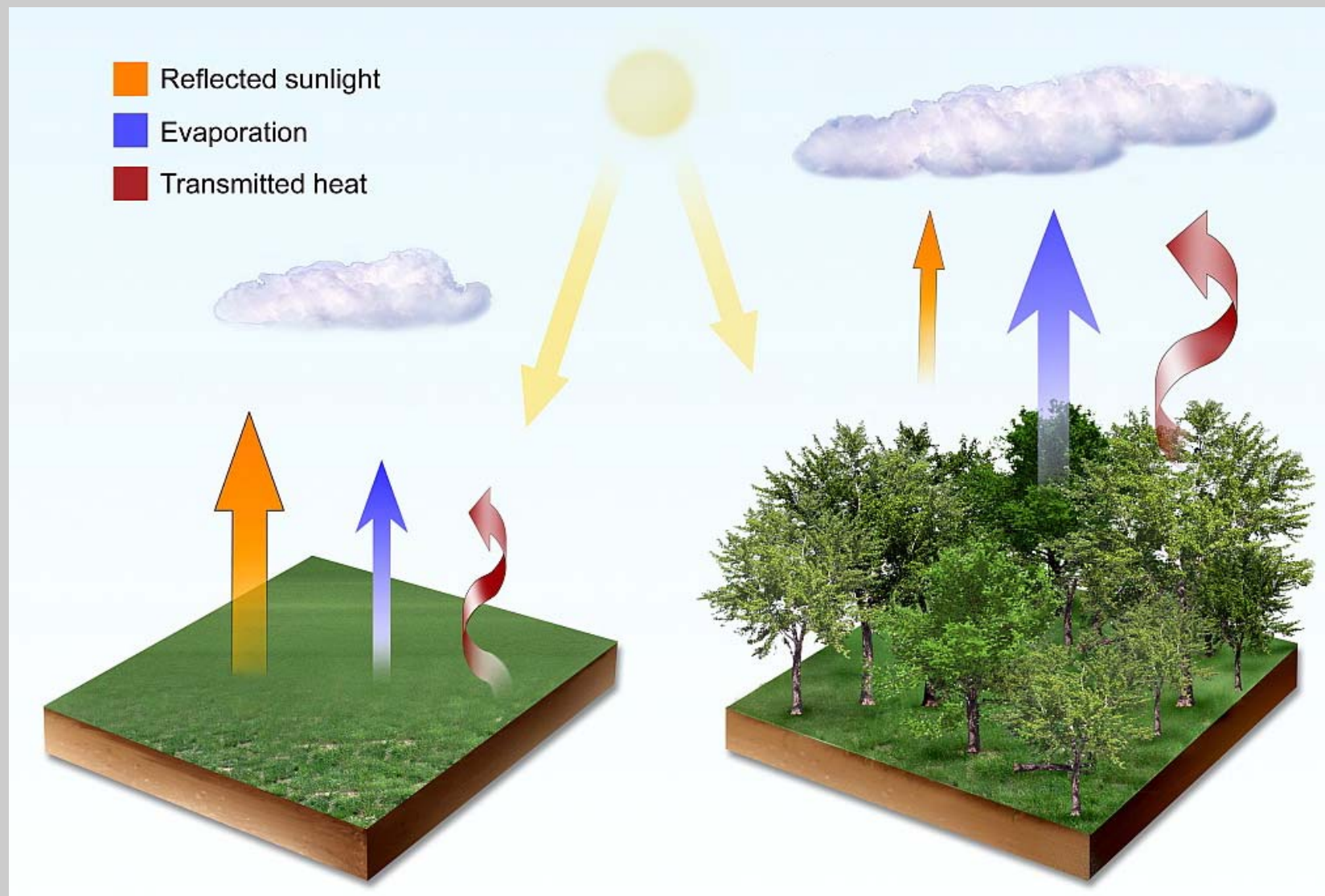
fast & widespread land use changes (not only in Amazonia)



- 1) **Regional** climate effects?
- 2) Net global **warming/cooling** effects?
- 3) Where are LUC-**albedo** effects important?

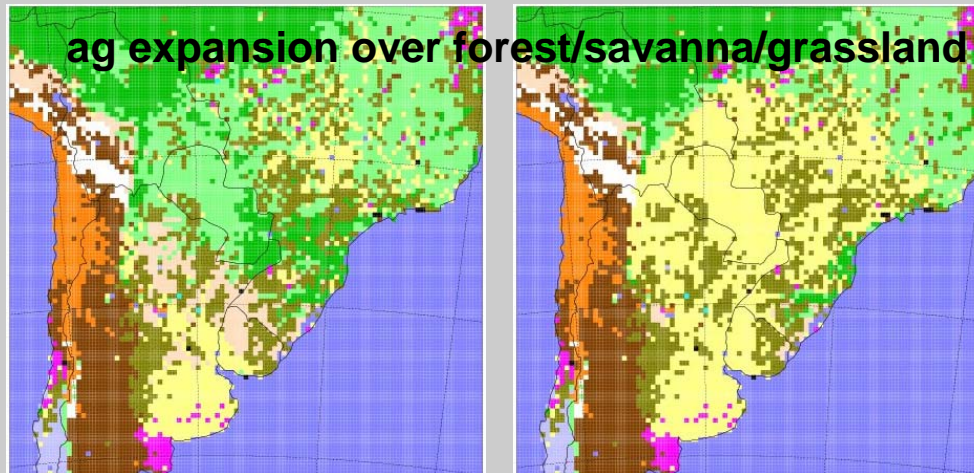


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Deforestation / Cultivation I (modeling experiment)

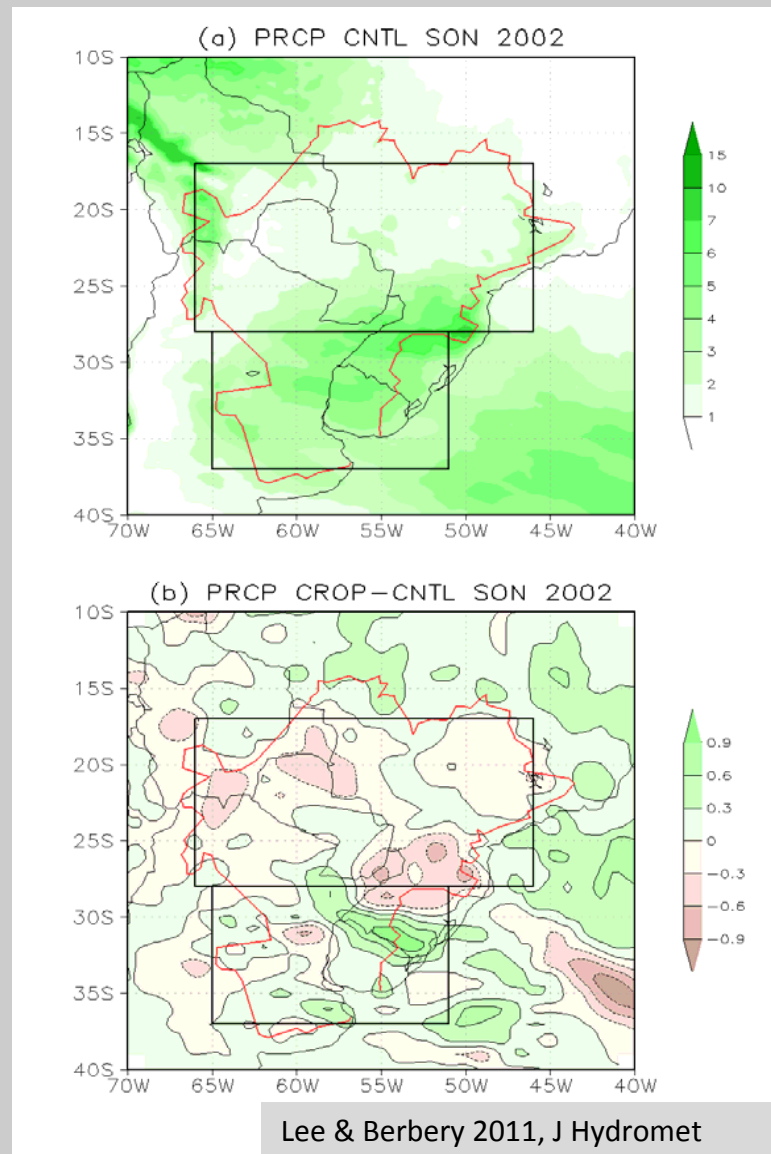


“WRF” (atm) + “Noah” (land) models whole Plata Basin, biophysical parameters from existing libraries

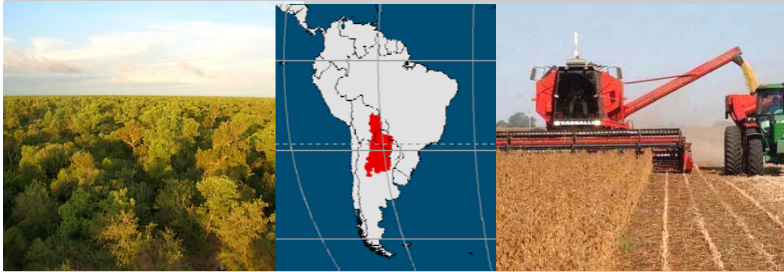
HIGH sensitivity to canopy roughness
increased moisture export out of the region

- > lower precipitation (North)
- > higher precipitation (South)
- > most intense local effect on forest → ag

Albedo increase in forests > lower temp
Albedo decrease in grass > higher temp

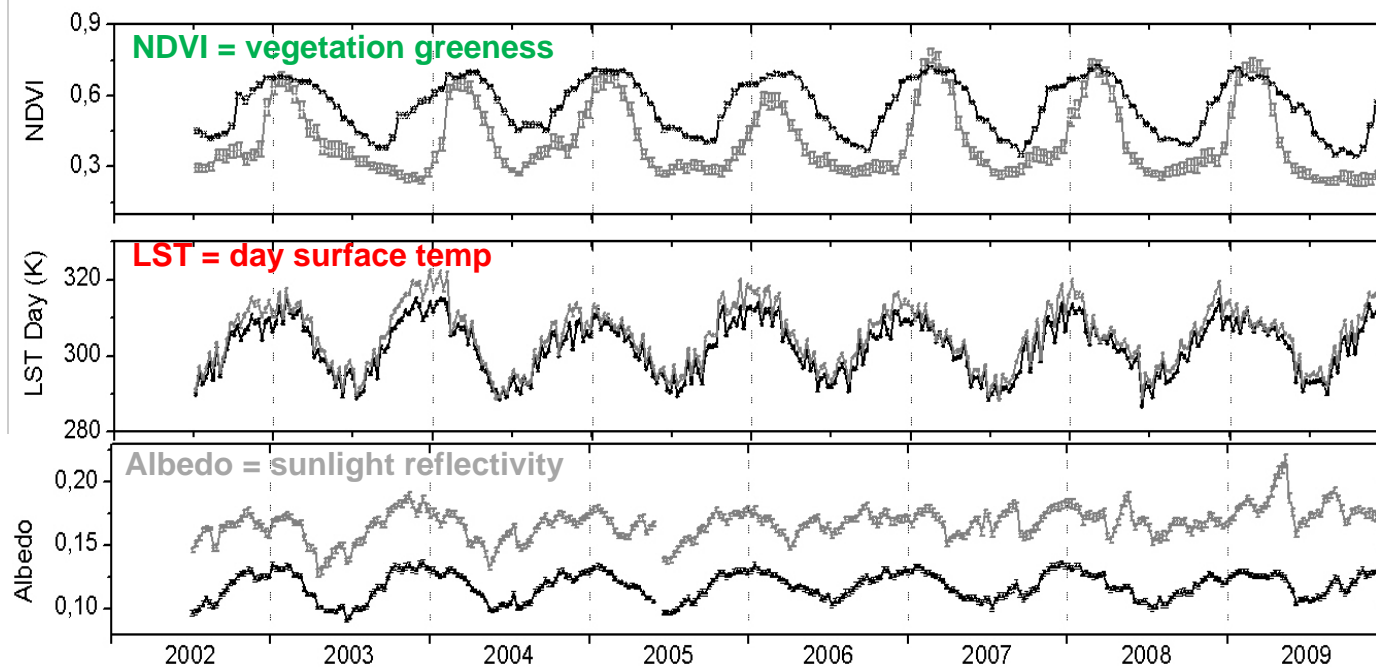


Deforestation / Cultivation II (remote sensing analysis)



MODIS, 35 forest/crop paired plots

(**NDVI**) primary productivity is lower and more variable
(**LST**) warmer surface , +5° C during the day
(**Albedo**) higher SW reflectivity, 0.17 vs. 0.12



Biophysical radiative forcing
after column radiation
model + ERA interim

-19 W/m² @ surface
-11 W/m² @ tropopause

acc. to “Betts 2000”
this is equivalent to:

-112 TnC/ha @ surface
-77 TnC/ha @ tropopause

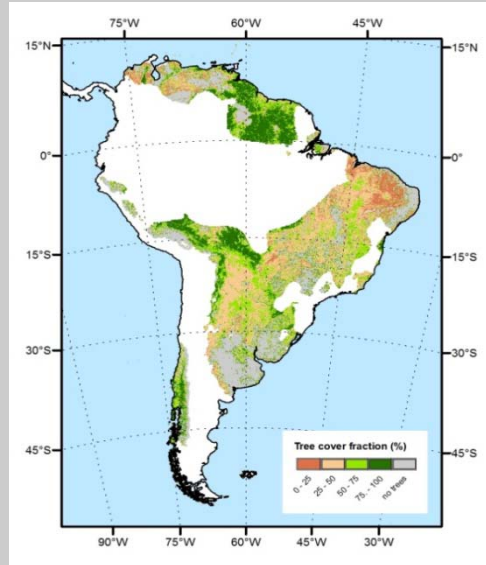
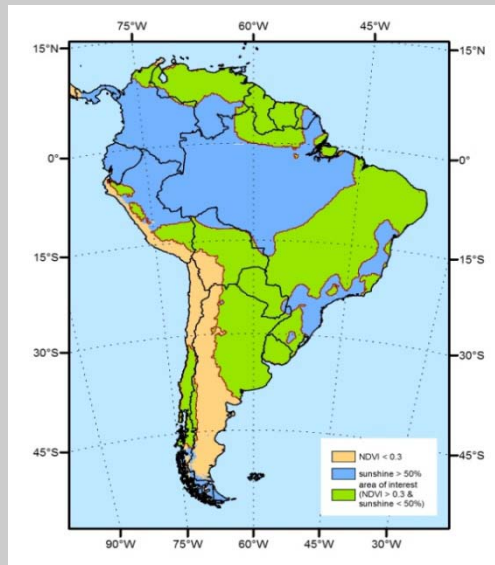
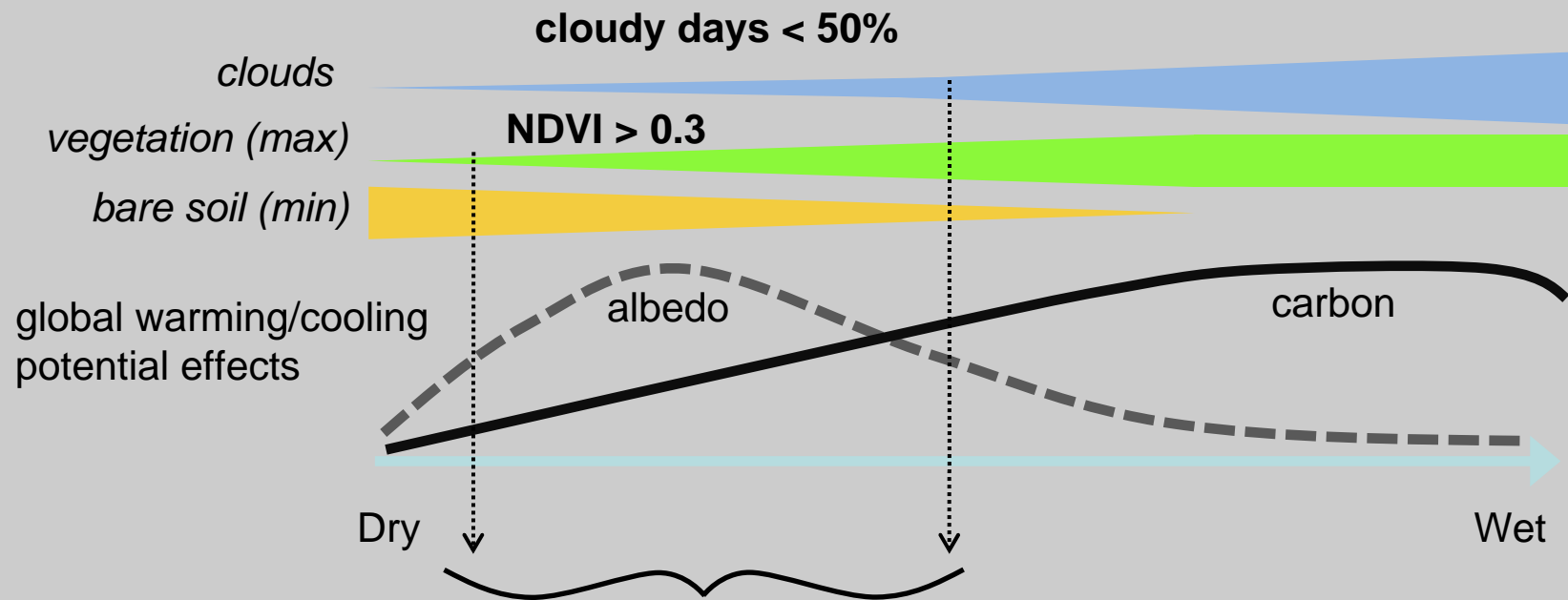
@ tropopause
90% caused by albedo
10% caused by LST

Houspanossian et al. – in prep



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LUC-Albedo global effects: important everywhere?



*llanos + caatinga + cerrado
+ chaco + pampa +
subantarctic forest*

- deforestation + crops
- no-till ag expansion
- tree planting in grasslands

Conclusion

LUC could affect **precip** patterns

- purely “abiotic” predictions **miss these effects**
- watch out for **feedbacks**

Albedo can **offset C** stock changes in semiarid+subhumid belts

- more efforts to include **cloudiness shifts**
- revise mitigation** under REDD & Afforestation in those regions

Integrating **biophysical** (albedo, evaporation, heat transfer, roughness) to **biogeochemical** effects (GHG) is critical for prediction, adaptation and mitigation



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