Impacts of groundwater on the atmospheric convection in Amazon using multi-GCM simulations from I-GEM project

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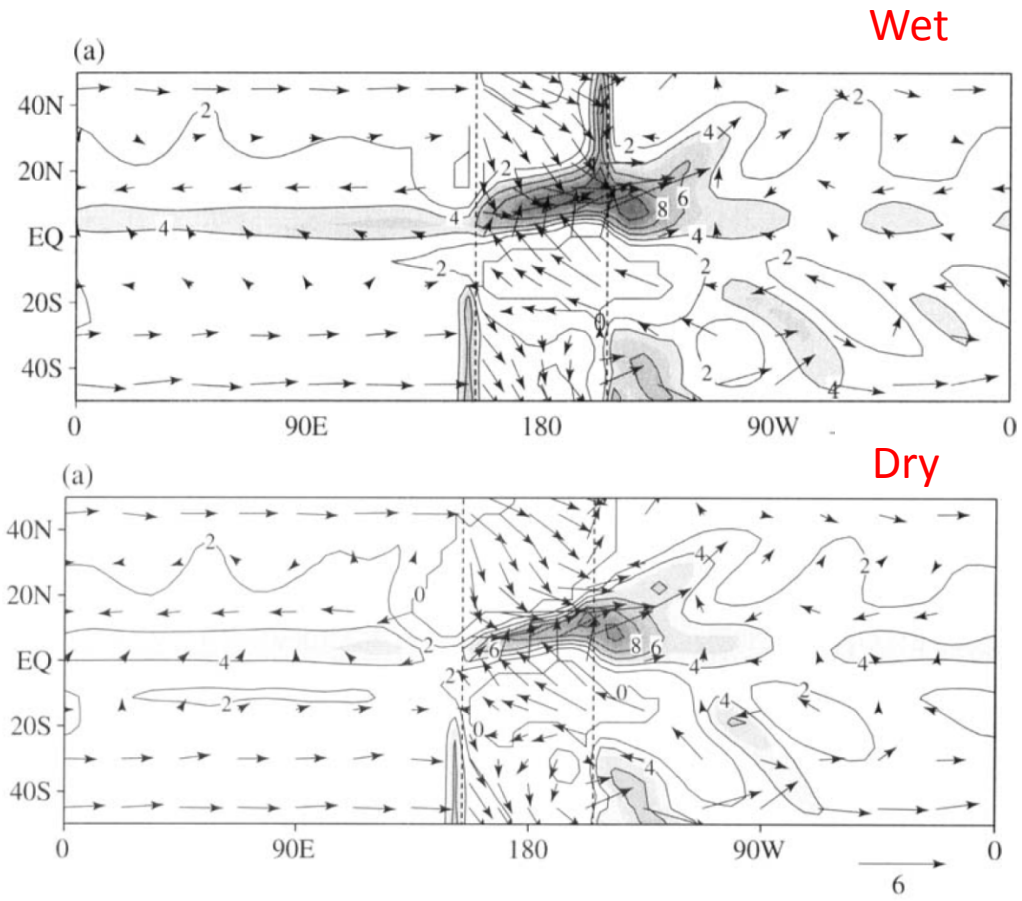
I. Motivation



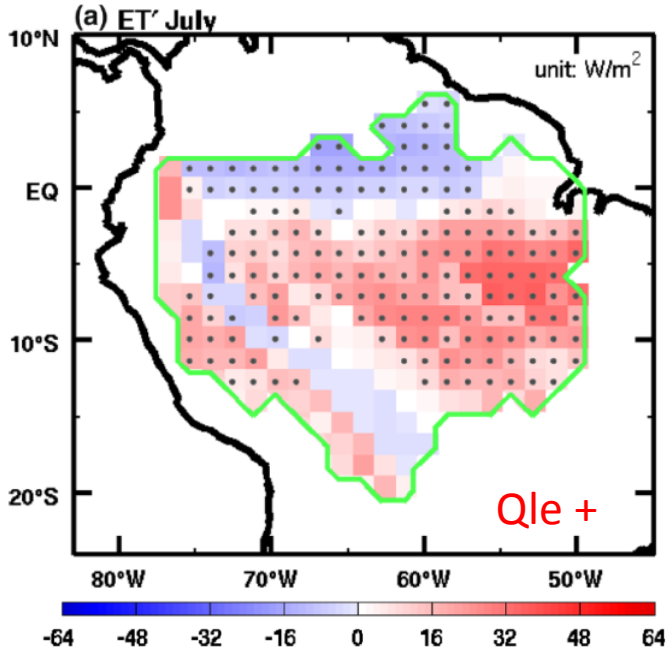
Chou et al., 2001

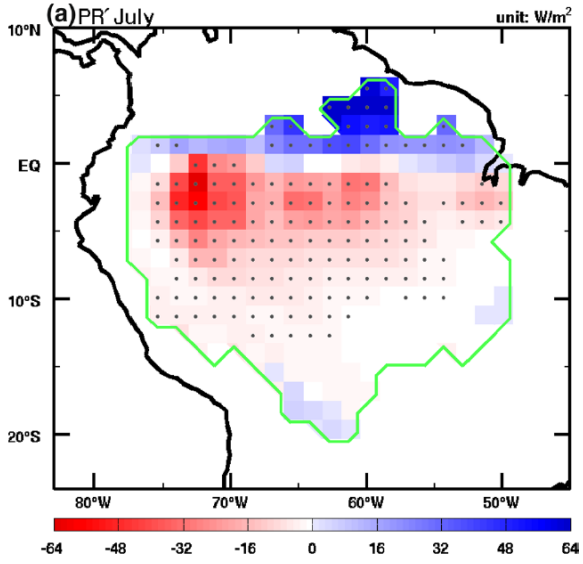
- Wetter soil moisture will tends to have more precipitation if the circulation sustained

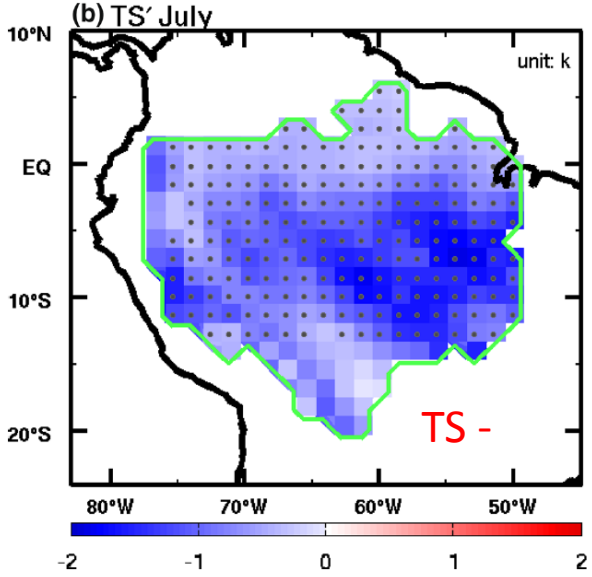
I. Motivation

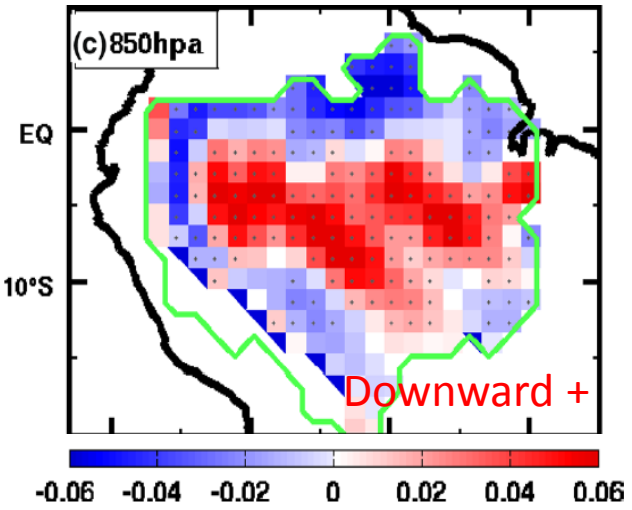
- Wetter soil can induce higher evaporation, hence will cool down surface, which will create a strong downward velocity, in the results will reduce the precipitation during dry season in Amazon river basin (ARB)

Harper et al., 2014
Lin et al., 2016







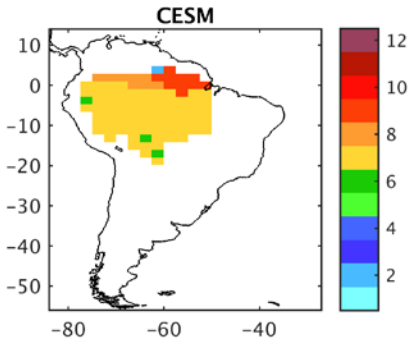


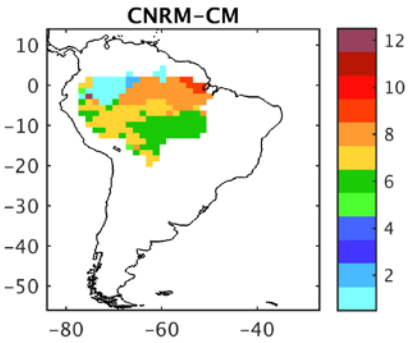
II. I-GEM experiment

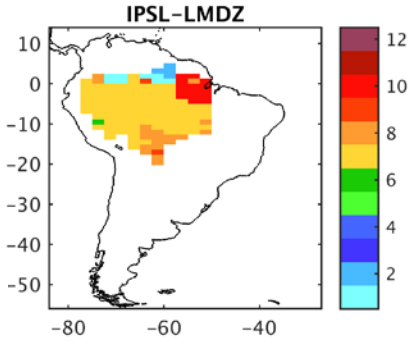
- Better understanding the impact of groundwater in different model
- Three online models have been chosen
  - CESM (AC)
  - CNRM-CM (AS)
  - IPSL-LMDZ (AO)
- On line simulation
  - 1979~2005, 5 simulations with prescribed water table depth at 1, 2, 3, 5, 8m and control run

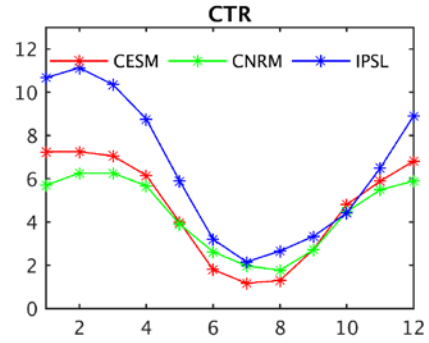
IV. Model results

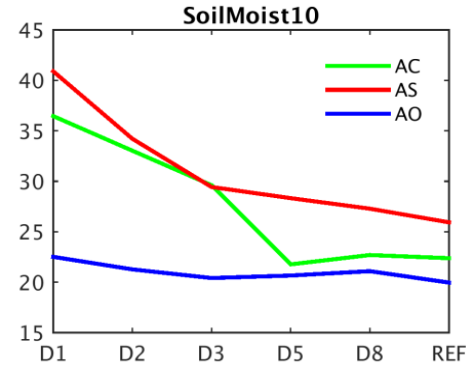
- Three models have different driest months, but all in JJA

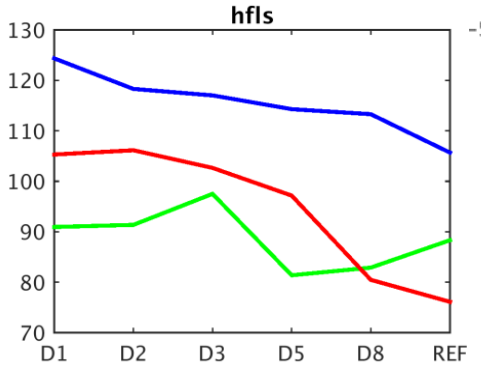


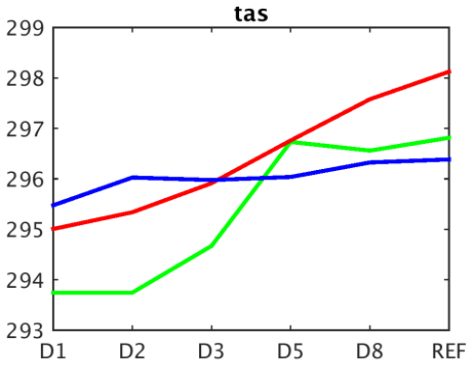


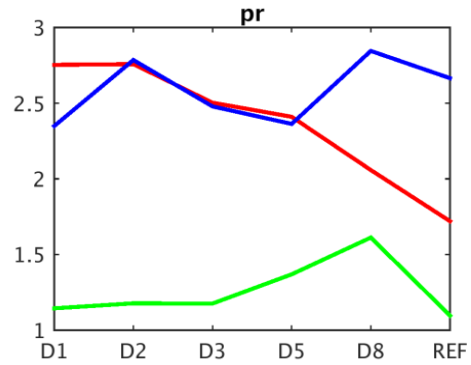








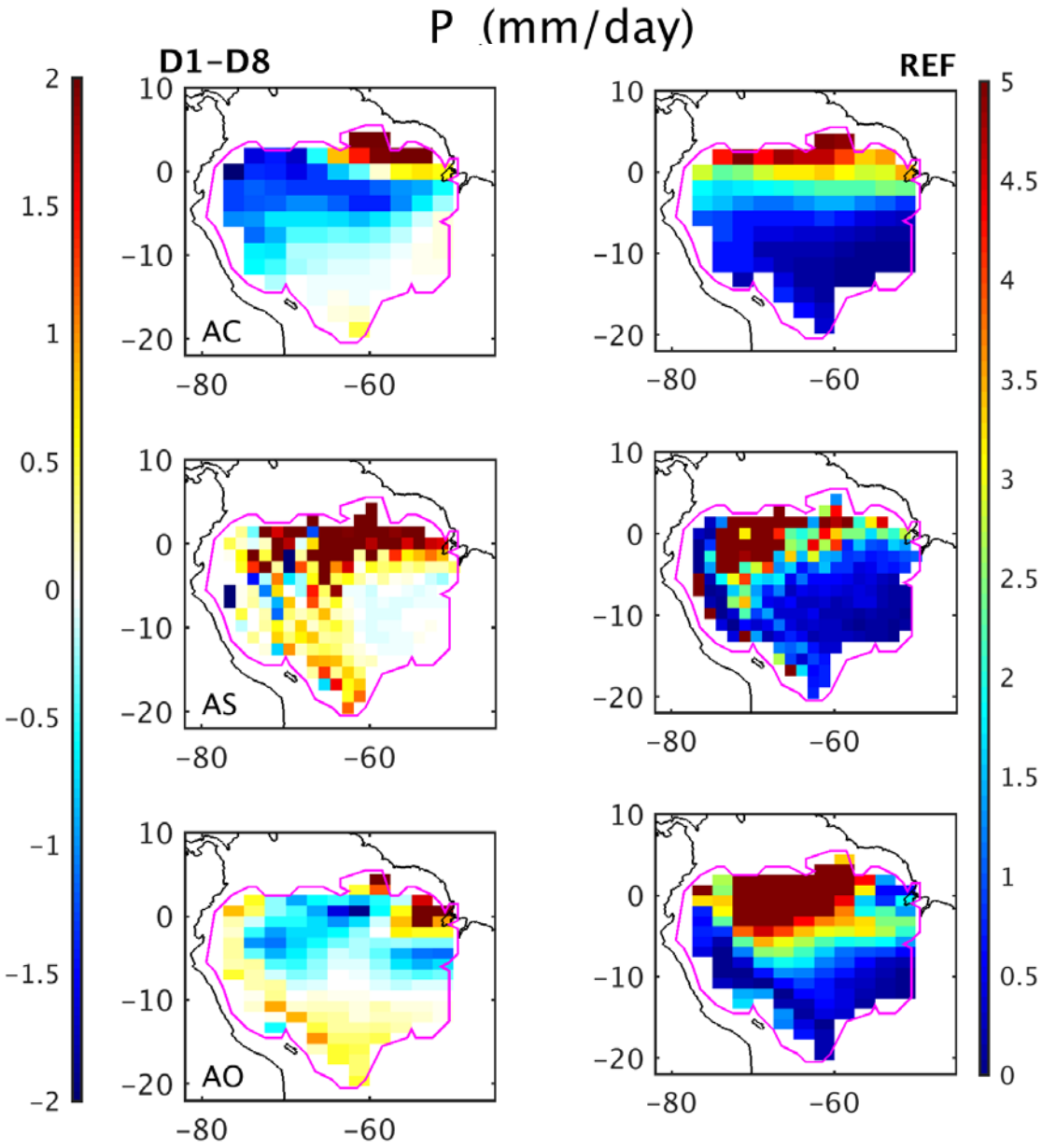




- Weird performance in latent heat in CESM
- CESM and IPSL have more precipitation in drier land

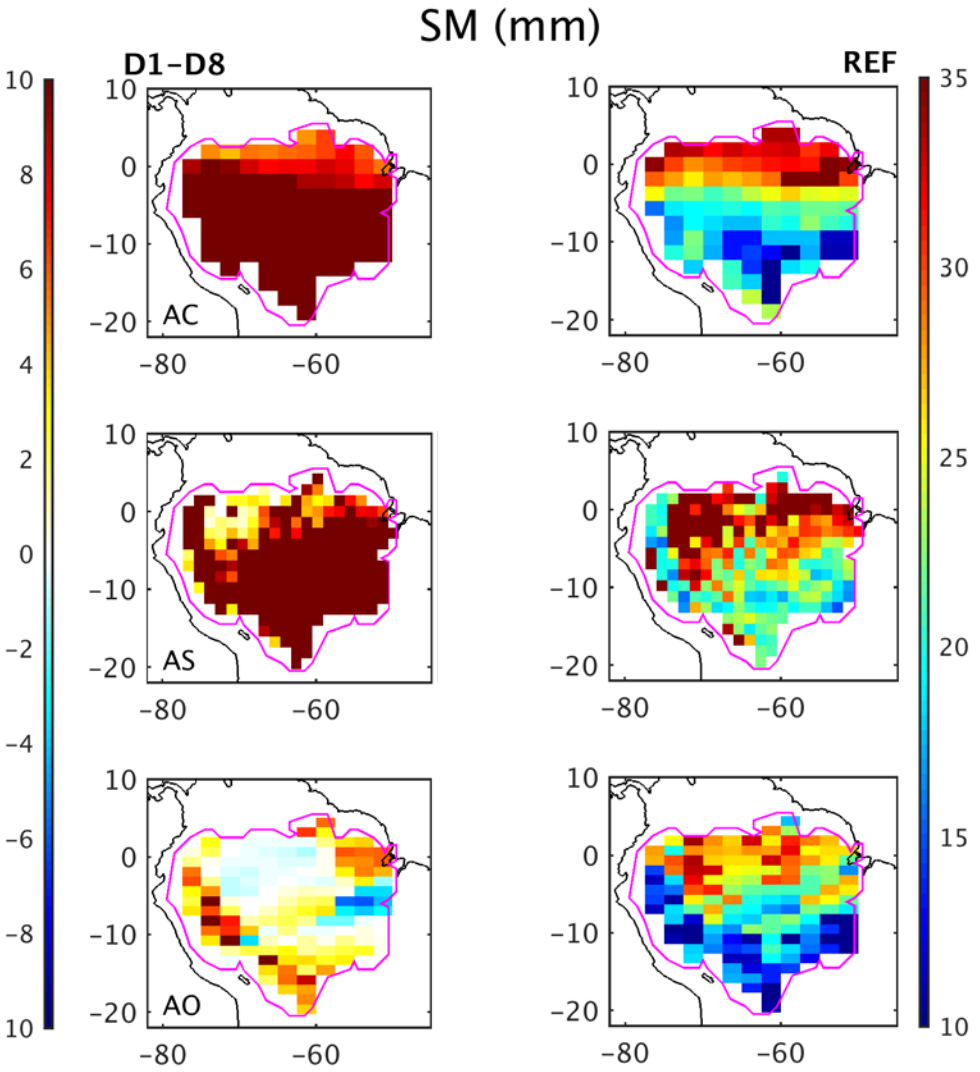
V. Discussion

- CESM has most precipitation in North hemisphere in ARB region
- CNRM and IPSL showed the smillar pattern



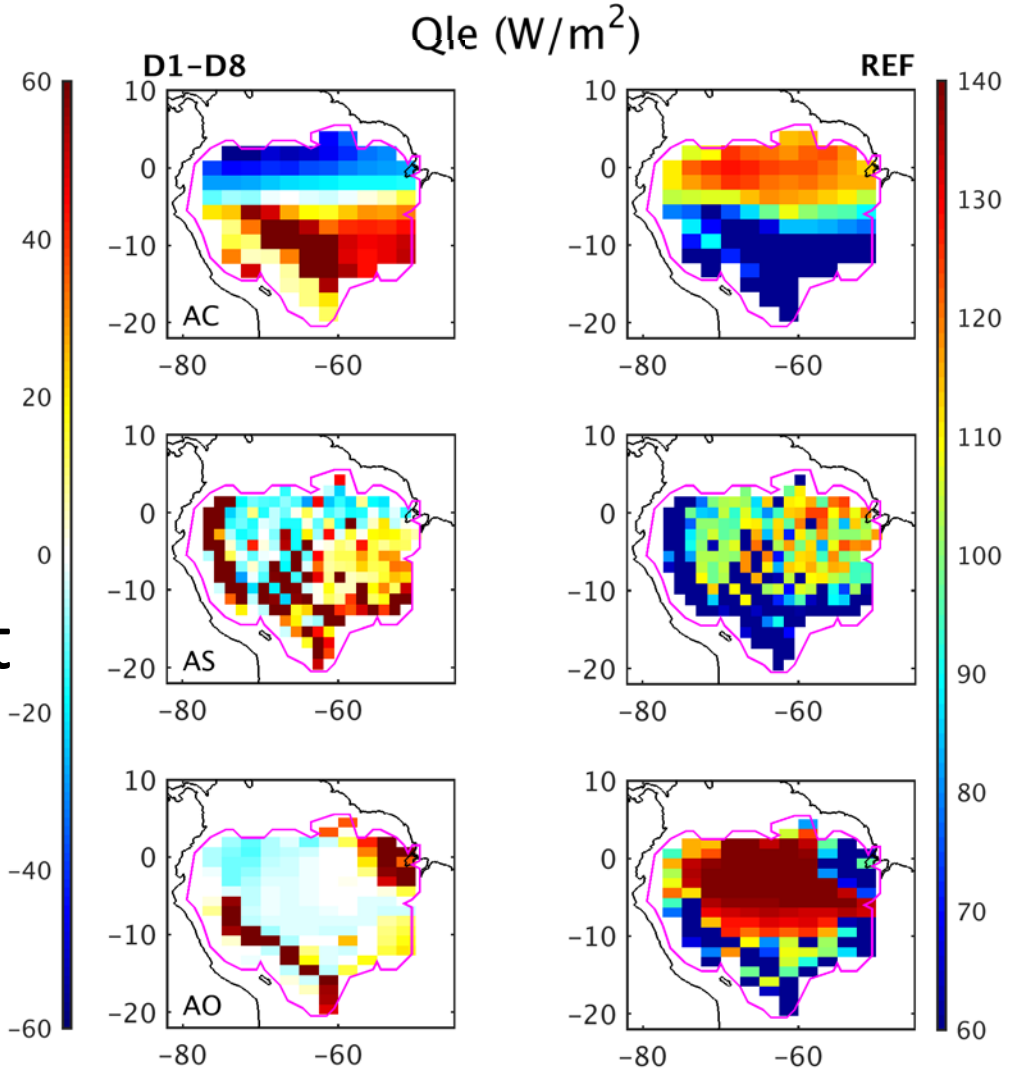
V. Discussion

- Soil Moisture indicated that both CESM and CNRM are wetter in D1 than D8
- Difference between D1 and D8 in IPSL is not significant in the middle of ARB



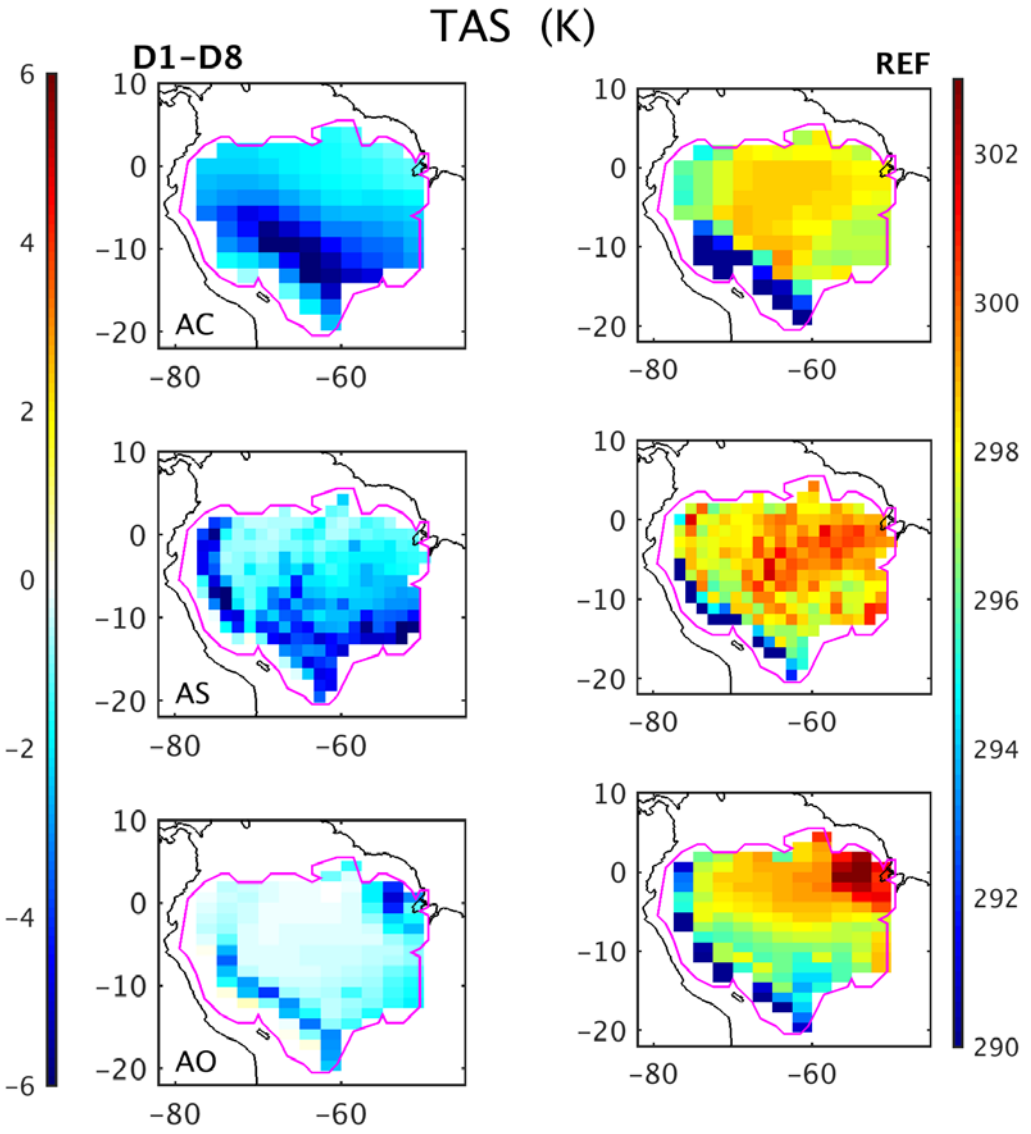
V. Discussion

- Higher soil moisture intends to have higher latent heat
- Latent heat difference in IPSL is not significant in the middle of ARB



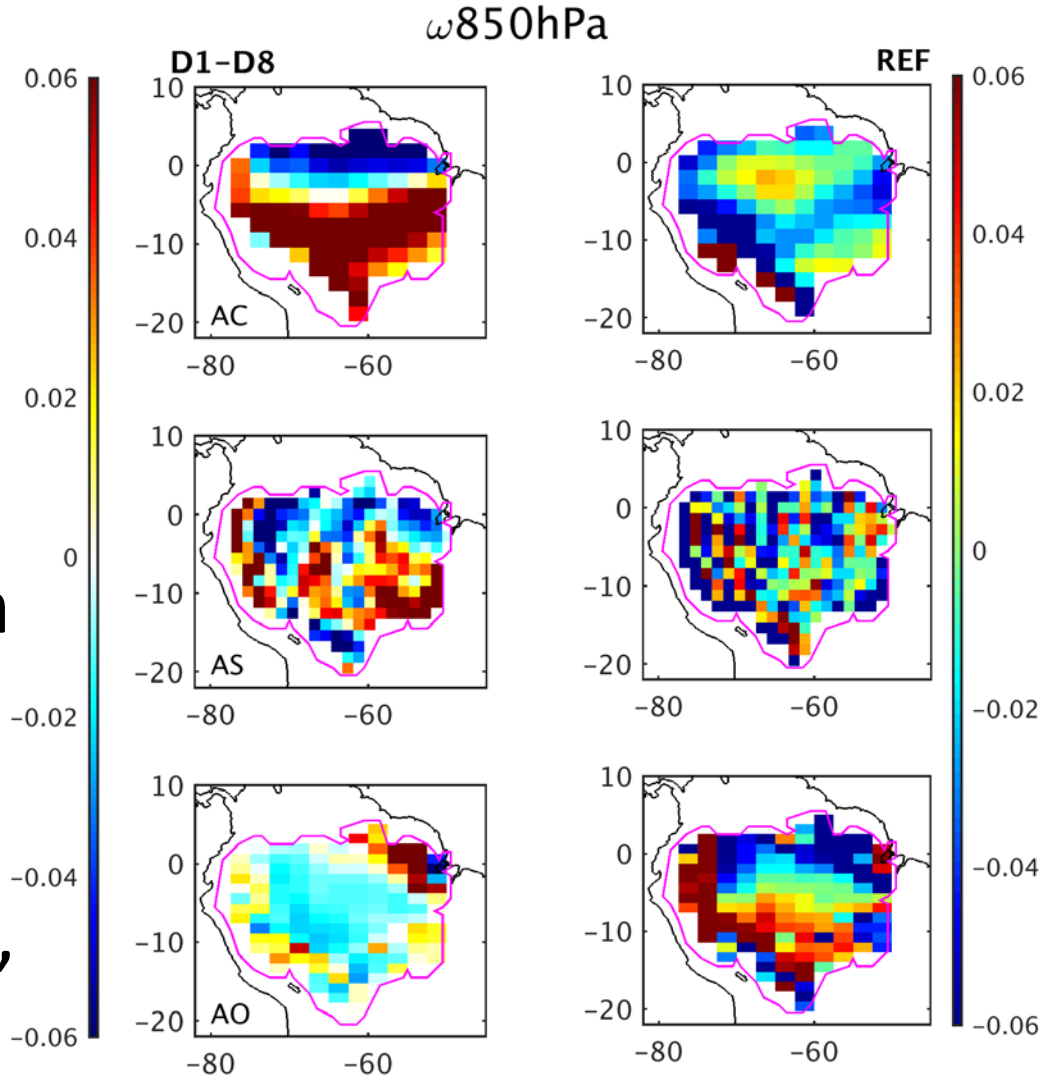
V. Discussion

- Cooling effect in directly compare with the high latent heat area



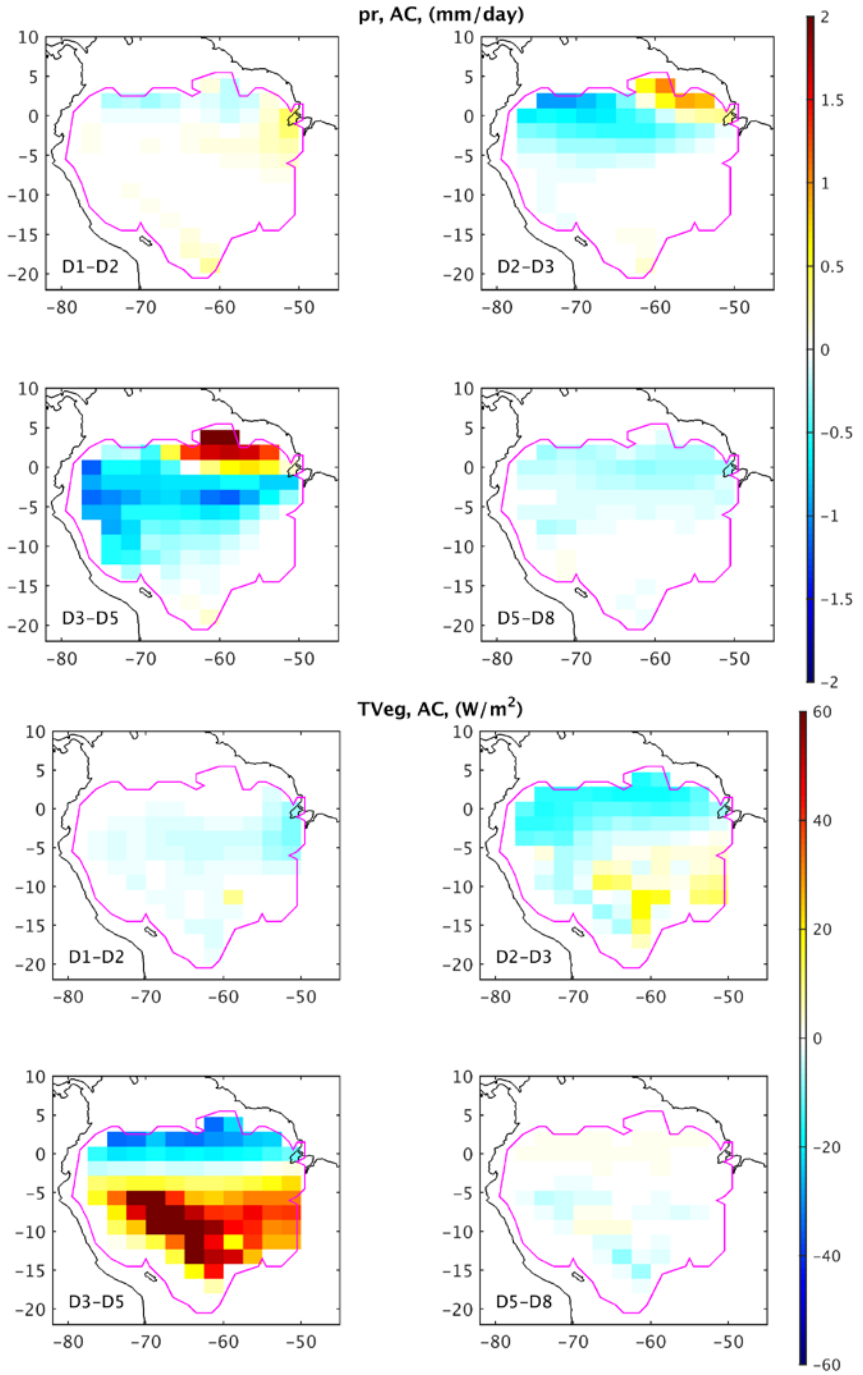
V. Discussion

- Cooling effect can enhance downward velocity in lower layer which suppress the circulation, and will lower the precipitation
- This kind of phenomenon can be seen in CESM and IPSL, but not in CNRM



V. Discussion

- Canopy evaporation and soil evaporation are monotonically increasing/decreasing in CESM, hence transpiration is dominate in the variance of latent heat
- Higher precipitation tends to reduce the transpiration which make the latent heat lower in drier experiment



VI. Conclusion

- Although the total precipitation showed a similar pattern in CESM and IPSL, however the spatial pattern are different, which may need more analysis to decompose it
- Wetter in JJA in ARB will cause a cooler surface temperature and enhance the downward velocity which reduce the circulation. This process has been confirmed in all three models, however, the strength are different
- Transpiration patterns in CESM online experiment showed a weird patterns which may also have connection to precipitation

Thank you