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# Relationship between precipitation and moisture flux changes in the SRES A2 scenario for the South American Monsoon region.

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We have investigated the sensitivity of annual cycle of precipitation associated with the South American Monsoon (SAMS) to anthropogenic changes in radiative forcing. In particular, we are interested in examining how potential future changes in precipitation are related to changes in moisture transport in the region.

Model simulations conducted for IPCC fourth Assessment report (AR4) from six coupled climate models were analyzed. The models are: NCAR Parallel Climate Model (PMC1), NCAR Community Climate System Model (CCSM3), The Max Planck Institute ECHAM5 model, the Hadley Centre HadCM3 model, The GFDL model and the French IPSL model. Climate of the 20 Century (20Cm3) experiments and the IPCC Special Report on Emission Scenarios (SRES) A2 scenario for future climate change were examined.

The period 1970-2000 was analyzed and compared against observations as a verification of the models. Analysis of future climate was performed by computing the difference between the 2070-2100 and 1970-2000 periods.

From these analyses we conclude that, there continues to be spread between the models and biases in the annual cycle of precipitation, particularly in the Amazon region. Still, some coherent patterns can be identified. All models show increased precipitation over Southeast South America (SESA); this is in agreement with observations of the last 25 years (Liebmann et al., 2004). The models also suggest a shift toward less rainfall in the early season (or longer-lasting dry season) of SAMS and more in the late season, predicting a larger amplitude of the annual cycle. In the Amazon region,

most models simulate a spurious semi-annual cycle, low amplitude and delayed rains. 5 out of 6 models suggest increased precipitation during the middle/late rainy season (DJFM) which is primary season in the models. The Hadley Center model, HadCM3, constitutes the large exception to this pattern, predicting drying in the Amazon as well as in the Monsoon region.

With respect to the moisture changes, models indicate more moisture transport into the Amazon, Monsoon and SESA regions particularly during austral summer (Dec-Mar), associated with more moisture convergence and more precipitation. In spring there is less agreement among the models; more moisture influx is seen in the Monsoon region in most models, but a few models show less moisture convergence, associated with less precipitation at this time.

In summary models suggest a wetter spring in Southeast and a drier spring in the Monsoon region. These differences in spring could imply a southward shift in the South Atlantic Convergence Zone during early season (OND), and is perhaps related to the simulated strengthening of the Atlantic subtropical high. Moisture flux convergence changes seen here are consistent with this hypothesis.