

ATS/CIRA Colloquium

Dargan Frierson

Visiting CSU ATS from the University of Washington

Why is the ITCZ in the Northern Hemisphere? And why might it have shifted southward in the late 20th century?

Hosted by Walter Hannah

Thursday, January 31, 2013

**ATS room 101; Discussion will begin at 3:30pm
Refreshments will be served at 3:00pm in the weather lab**

The Northern Hemispheric maximum of the tropical rainfall is usually thought to be caused by properties of tropical landmasses, such as the size and shape of continents. However, a variety of recent studies have established that conditions even well outside the tropics also affect tropical circulation and rainfall. Using this new understanding, we demonstrate that the meridional overturning circulation of the oceans is instead the cause of the peak of zonal mean rainfall north of the equator, by causing a cross-equatorial ocean heat transport that heats the NH atmosphere more than the SH. We use satellite observations of the Earth's energy budget and atmospheric reanalyses to study tropical rainfall using a global energetic framework. Global climate model simulations even without continents show a pronounced peak of precipitation in the NH when the observed OHT is added.

Using the same energetic framework, we claim that a southward shift of precipitation seen in models and observations in the late 20th century was in part due to sulfate aerosol emissions, which kept the NH from warming as much during that period. We additionally study the mean state biases of GCMs with the same framework, and show that a large fraction of the double ITCZ problem can be attributed to a lack of low cloud coverage over the Southern Ocean, which produces an excessively warm SH and an ITCZ that maximizes too much in the SH.

Link to colloquium videos and announcement page: <http://www.atmos.colostate.edu/dept/colloquia.php>