

ATS/CIRA Colloquium

Atmospheric Science 50th Anniversary Speaker

Gudrun Magnusdottir

CSU ATS Ph.D. 1989

Visiting CSU ATS from the Dept. of Earth Science, Univ. of California, Irvine

East Pacific ITCZ variability over three decades of satellite data

Hosted by Wayne Schubert and Thomas Birner

Thursday, September 1, 2011

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

The intertropical convergence zone (ITCZ) is one of the most recognizable aspects of the global circulation as seen from space yet we are hard pressed to come up with a clear definition of the ITCZ as seen in instantaneous cloud fields. For detecting this feature, we are guided by the principle of continuity in space and time, and reconciling more than one meteorological field. I will describe collaborative work at UC Irvine involving meteorologists, computer scientists and statisticians to automate the detection of the ITCZ (and other rather narrow convection zones) in new spatiotemporal statistical models.

We developed and validated a Markov random field (MRF) statistical model for detecting the east Pacific ITCZ in instantaneous satellite data from May through October. The model uses satellite data at a given location as well as information from its neighboring points (in time and space) to decide whether the given point is classified as ITCZ or non-ITCZ. IR images of the region have been archived every 3 hours since 1980 and are inter-calibrated specifically for climate research.

The statistical model automates the detection of the envelope of convection that satellite meteorologists have long taken to characterize the instantaneous ITCZ. This allows for analysis of the entire archive of IR images for the location and extent of ITCZ. One may then go back to the original IR field to determine the distribution of cloud height (and clear sky) within the ITCZ.

The method has given us a new view of ITCZ evolution through the seasonal and diurnal cycles. The ITCZ is quite variable on interannual time scales and highly correlated with ENSO variability. When we removed the ENSO signal, interannual variability remained high, but the location and area of the resulting ITCZ labels has not changed significantly over the 30 yr period.

Relevant papers already published:

Caroline L. Bain, Jorge De Paz, Jason Kramer, Gudrun Magnusdottir, Padhraic Smyth, Hal Stern, Chia-chi Wang, 2011: Detecting the ITCZ in Instantaneous Satellite Data using Spatiotemporal Statistical Modeling: ITCZ Climatology in the East Pacific. *J. of Climate*, **24**, 216–230.

C. L. Bain, G. Magnusdottir, P. Smyth, and H. Stern. J., 2010: Diurnal cycle of the Intertropical Convergence Zone in the east Pacific. *J. Geophys. Res.*, 115, D23116, [doi:10.1029/2010JD014835](https://doi.org/10.1029/2010JD014835), 2010

Kenneth R. Knapp, Steve Ansari, Caroline L. Bain, Mark A. Bourassa, Michael J. Dickinson, Chris Funk, Chip N. Helms, Christopher C. Hennon, Christopher D. Holmes, George J. Huffman, James P. Kossin, Hai-Tien Lee, Alexander Loew, Gudrun Magnusdottir, 2011: Globally Gridded Satellite Observations for Climate Studies. *BAMS*, **92**, 893–907