Byrd Polar Research Center
Spring 2009 Seminar Series

"The evolution of the tropics and the modulation of convection"

Presented by

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12:00 p.m.
Room 136 Scott Hall (West Campus)
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ABSTRACT: During the last 40 years, the area of the ocean where sea-surface temperature (SST) > 28°C has increased by 70%. IPCC models suggest that this area may double once again in the next 100 years. Reconstructions of past climates suggest that there was little or no part of the ocean where SST > 28°C during the last glacial maximum (LGM). These estimates are troublesome and pose a series of dilemmas. Traditionally it has been thought that there were set SST thresholds that defined where there would be organized convection, the genesis of tropical cyclones and the existence of severe cyclones. For example, would there have been no tropical cyclones during the LGM? Can we expect deep convection and intense tropical cyclones over all of the tropics in a warming world?

We approach a solution to the dilemma by constructing estimates of total atmospheric heating in the present climate. Two major regimes are found: broad regions of cooling and regions of heating, the former dominated by cooling to space and the latter by the release of latent heat associated with deep convection. We find that irrespective of the magnitude of the background SST the area of deep convection remains the same. We show that in the SST range occurring in the past and expected in the future that the sensitivity to cooling and heating to SST is almost balanced. Thus we define a new phenomenon, the "dynamic warm pool", which has a constant size but a heating that exponentially increases with SST.

We use this new paradigm to understand why tropical cyclones have increased intensity but not in number and the state of the tropics during the LGM and with global warming. Finally, the investigation has hinted that there is a slow decadal oscillation between heating over land and heating over the ocean. We speculate on the causes and consequences of this "monsoonal mode".

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EVERYONE IS WELCOME TO ATTEND!!