Title: Global Lightning Studies
Investigators: Steven J. Goodman, Pat Wright, Hugh Christian, Richard Blakeslee, Dennis Buechler, Greg Scharfen
Significant Accomplishments in the Past Year:

1. Global Studies

Focus and Progress

We are analyzing the global lightning signatures from the DMSP Optical Linescan System (OLS) imagery archived at the National Snow and Ice Data Center. Transition to analysis of the digital archive as it becomes available and compare annual, interannual, and seasonal variations with other global data sets (e.g., precipitation, SSM/I microwave signatures of ice, diabatic heating, global and regional synoptic patterns).

An initial survey of the quality of the existing film archive has been completed and lightning signatures have been digitized for the summer months of 1986-1987. Initiation of the digital archival process at the AFGWC is still being worked.

Plans

The film archive will continue to be digitized to produce the global lightning data base from 1973-Present. Plans are underway to archive digital OLS data over Central Florida during the CaPE field program, if the AFGWC archive is not yet begun, in order to permit OLS validation with ground based total lightning measurements near Cape Canaveral, intercomparisons with other data sets, and to have a developmental data set to build a prototype digital data analysis ystem at NSIDC and MSFC.

2. Process Studies

Focus and Progress

This research focuses on the relationships between 1) global and regional lightning activity and rainfall, and 2) storm electrical development and environment. Remote sensing data sets obtained from field programs conducted in the tropics and U.S. are used in conjunction with satellite/radar/ lightning data to develop and improve precipitation estimation algorithms , and to provide a better understanding of the co-evolving electrical, microphysical and dynamical structure of storms. This knowledge strengthens the utility of NASA's lighting mapper and lightning imaging sensors for GOES, EOS-A1, and TRMM.

Plans

Analysis of tropical and U.S. data sets continuing. A clustering and sensor fusion algorithm was developed for assigning lightning activity to its parent storm/system and has proved useful in objectively studying lightning and rainfall production by these storms. A five-year lightning/rainfall climatology has been assembled for the Tennessee Vallley and is being examined. Satellite/radar/lightning data sets are to be acquired and examined from different climatological regions. Intercomparisons with other rainfall estimates (VIS, IR, SSM/I) have begun. U.S. rainfall estimates from the WSI radar network will be used for algorithm validation and intercomparison.

Publications:

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Goodman, S. J., D. E. Buechler, and P. D. Wright, 1991. Lighting-rainfall relationships. To be submitted to J. Appl. Meteor.

Goodman, S. J., and K. R. Knupp, 1991. Tornadogenesis via squall line and supercell interaction revisited: The 15 November 1989 Huntsville, AL tornado. Presented at Tornado Symposium III, Norman, OK, April 2-5.

Wright, P. D., and S. J. Goodman, 1991. A multiparameter radar examination of a mesoscale convective system. Preprints, 25th Conf. on Radar Meteorology, Paris, France, June 24-28.