Geophysical Research Abstracts,
Vol. 11, EGU2009-8852, 2009
EGU General Assembly 2009

Applications of a cyclone detection and tracking algorithm

J.G. Pinto (1), U. Ulbrich (2), G.C. Leckebusch (2), T. Spangehl (2), S. Ulbrich (1), and S. Zacharias (1)

(1) Institute for Geophysics and Meteorology, University of Cologne, Germany (jpinto@meteo.uni-koeln.de), (2) Institute for Meteorology, Freie Universität Berlin, Germany

Various sensitivity studies and applications of an algorithm for the detection and tracking of synoptic scale cyclones from mean sea level pressure data are presented. Both Reanalysis and GCM data are used as input. The scheme considers the cyclone intensity (laplacian of pressure) on the first steps of cyclone intensification. The method, originally developed by Murray and Simmonds (1991) for the SH, was also adapted to NH conditions. With an appropriate setting of the relevant parameters, the algorithm is capable of automatically tracking different types of cyclones at the same time: Comparisons with hand analyses based on manual weather charts shows that both fast moving/intensifying systems as well as smaller scale cyclones (e.g. Mediterranean) can be assessed. A significant sensitivity is found to the spatial and temporal resolution of the input data. The resulting climatology of cyclone variables, e.g., cyclone track density, cyclone counts, intensification rates, propagation speeds, areas of cyclogenesis and cyclolysis, gives detailed information on typical cyclone life cycles.
Extreme cyclones are selected based on the maximum cyclone intensity (typically the 5% strongest based on the value of the laplacian of pressure), enabling e.g. a comparison of cyclone characteristics of different intensities. Transient cyclones and explosive developments are selected considering the cyclone displacement and changes of intensity over time. The analysis of the factors contributing to the intensification of cyclones (e.g. jet stream, baroclinity, latent heat) as well as the link between the cyclone tracks and the associated wind and precipitation fields, are explored. Examples of assessment studies on the impact of climate change on the different aspects of cyclone activity (e.g. number, core depth, intensity, typical paths, life-time statistics) based on transient historical and future scenario simulations with coupled AO-GCMs are presented. Special focus is given to the Eastern North Atlantic, for which an increase in the number and intensity of extreme cyclones is detected under future climate conditions.