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Tracking Southern Hemisphere extratropical cyclones using different algorithms

Natalia Tilinina (1), Irina Rudeva (1), Sergey Gulev (1), Ian Simmonds (2), and Kevin Keay (2)

(1) Sea Atmosphere Interaction and Climate Laboratory, P.P. Shirshov Institute of Oceanology, Moscow, Russia, tilinina@sail.msk.ru, (2) School of Earth Science, University of Melbourne, Australia

We attempt to estimate strengths and weaknesses of the two cyclone tracking algorithms – of the University of Melbourne (UM) and of IORAS (SAIL). The UM scheme is using geostrophic vorticity for tracking cyclones and SAIL tracking is based on sea level pressure. Furthermore, there are many other conceptual differences in the algorithm performance. The SAIL scheme was applied to the NCEP-NCAR reanalysis output for the Southern Hemisphere (1948-2009), the period of intercomparison with the results based on UM scheme was 1990-1999. During time period 1990-1999 the UM scheme identifies 45% more cyclones than the SAIL scheme. The UM tracking output consists of all cyclones which are found by the SAIL scheme and also many short-living vortices, which do not have their imprints in the pressure fields. Many of these vortices are not characterized by the minimum central pressure and the closed isobar – the two major characteristics of cyclone – and require the extension of cyclone definition to be considered as cyclones.

Spatial distribution of cyclone counts over Southern Hemisphere clearly shows the two main storm tracks: the Southern (close to the Antarctic) represented by deep and moderate cyclones with minimum central pressure typically lower than 965 hPa and the Northern track primarily associated with the shallow cyclones (central pressure is typically higher than 980hPa). Using the time series of the number of cyclones derived from the SAIL tracking we estimated linear trends in the cyclones counts. The number of deep cyclones (<960 hPa) growths during 1948-2009 by 0,8 cyclones per year, while the number of shallow cyclones (>980 hPa) decreases by 1,3 cyclones per year. Changes in a number of deep cyclones are significantly correlated with the Southern Oscillation Index (e.g. 0,57 in the autumn).