Comments on ''Climatology of Cyclogenesis for the Southern Hemisphere''

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9 October 1995 and 16 February 1996

In a recent paper Sinclair (1995, hereafter SI) made a climatological study of cyclogenesis in the Southern Hemisphere using seven years (1980–86) of European Centre for Medium-Range Forecasts (ECMWF) data. Geostrophic vorticity at 1000 hPa is used to locate cyclones and determine their intensity. In an earlier study Gan and Rao (1991, hereafter GR91) also examined the cyclogenesis using the surface pressure charts for four hours an each day for the period January 1979–December 1988. Their study was for South America (the area enclosed by 15°–50°S and 30°–90°W). In GR91, the method used to manually identify surface cyclogenesis was that at least one closed isobar around a low pressure center should be found for an analysis of 2-hPa intervals. The purpose of this comment is to compare the results of these two studies for the South American region.

GR91 found the highest frequency in the month of May and the lowest in the month of December. Figure 2 of GR91 shows the lines of cyclogenesis frequency for the four seasons, and Fig. 3 shows the annual frequency. GR91 found two preferential centers of maximum frequency for all the seasons. The highest frequency was in winter (JJA). In South America SI also found two centers in winter (May–October). GR91 found two centers, one over the Gulf of San Matias (42.5°S, 62.5°W) and the other over Uruguay (around 31.5°S, 55°W). These two centers coincide very well with the location given by SI. GR91 found the Gulf of San Matias center to be of higher frequency than the Uruguay center during the summer (DJF); the inverse occurred during the winter. Sinclair found a well-defined center over 30°S in the winter but the center over 45°S is of the same frequency in both seasons.

As the basic physical mechanism responsible for cyclogenesis, GR91 and SI suggested baroclinic instability of westerlies and lee cyclogenesis. The relative importance of these two mechanisms for the two centers should be verified by further observational, numerical, and theoretical studies. GR91 found that the enhancement of cyclogenesis during El Niño events was due to the lowering of the Richardson number, which intensifies baroclinic instability of westerlies. As mentioned by SI, baroclinic instability modified by moisture also plays on important role in the generation of cyclones over South America. A numerical study by Bonatti and Rao (1987) indeed shows the importance of moist baroclinic instability in the generation of subsynoptic-scale cyclones over South America. The influence of the Andes Cordillera on transient disturbances was confirmed by Gan and Rao (1994). This can also be seen in Figs. 4e and 4f of SI over the center and north of Argentina where the cyclone track is northeastward because of the interaction of the cyclone with topographic features (Andes). Another common feature found by SI and GR91 is the eastward and poleward movement of cyclones.

Acknowledgments. Thanks are due to Dr. Stevenson for critically going through this comment.

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