Session: B2 Oral presentation

Extra-tropical cyclone activity in the ensemble of 20th Century Reanalysis (20CRv2)

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In this study, an objective cyclone identification/tracking algorithm is applied to the 6-hourly SLP fields of each of the 56 runs of the 20th Century Reanalysis (20CR) for 1871-2008 (138 years), and to the ensemble mean 6-hourly SLP fields, to infer extra-tropical cyclone activity and historical trends therein. The analysis is done for the northern and southern hemispheres (NH and SH), separately. The presentation includes ensemble mean and spread of cyclone counts (or track counts) and intensity. An assessment of temporal homogeneity and trend of the 20CR cyclone activity is also carried out. The identified discontinuities are accounted for in the estimates of climatic trends in cyclone activity. The main conclusions are: (1) The ensemble mean 6-hourly fields are not suitable for identifying/tracking cyclones, especially for periods/areas that have much fewer observations to constrain the simulation. (2) In terms of cyclone activity, the 20CR is comparable to the NCEP-NCAR and ERA40 reanalyses, especially over oceanic areas, although it uses surface pressure data only. Over lands, it shows weaker cyclone activity than the NCEP-NCAR reanalysis. (3) For the North Atlantic and Europe, the 20CR shows homogeneous representation of cyclone activity since the late 19th century. For the Southern Hemisphere (SH), it is more homogeneous than the ERA40 or NCEP-NCAR reanalysis for the recent half century. The 20CR contains discontinuities in data sparse regions/periods, such as the Canadian Arctic, Siberia, and the SH. The discontinuities are mainly in the earlier periods (before the mid-1950s). (4) After accounting for the discontinuities, cyclone activity trends are characterized by increases in hemispheric cyclone count & mean intensity in both hemispheres, with regional and seasonal differences. In the Northern Hemisphere (NH), the increases are mainly in high latitude North Atlantic, Northern Europe, and mid-latitude North Pacific, with decreases in high latitude North Pacific. In the Mediterranean, cyclone activity seems to have decreased in summer, with an increase in winter cyclone intensity. In North America, cyclone activity seems to have decreased in winter, but increased in summer. The SH increases are mainly in the southern Indian Ocean-Atlantic, with decreases in the southern Pacific sector.