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Global changes in extreme wind waves, marine storminess and cyclone activity

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We used in our analysis the longest time series of visual wave observations from the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) archive of marine meteorological variables, covering the period form 1885 to 2007. Data were subject of the precise quality control and homogenization. For the whole Northern Hemisphere and several regions of the Southern Hemisphere we estimated secular changes in mean sea, swell and significant wave height as well as tendencies in extreme wave parameters. These were estimated from both IVD (initial value distribution) and POT (peak over threshold) methods using both VOS and long-term model wave hindcasts for minimization of sampling errors. While mean wave height demonstrates upward tendencies in the Northern Hemisphere mid latitudes (up to 8 cm/decade) over the whole 20th century, changes in extreme waves experience strong interdecadal variability in the first half of the century and start to grow only in 1950. During the last two decades (1990-2007) extreme significant wave height shows a light decrease compared to 1970s and 1980s. The observed changes are considered in a view of the contribution of wind sea and swell in the variability of significant wave height. Variations in different wave components were associated with the changes in cyclone activity which was quantifies using numerical storm tracking of long-term reanalysis products. For the last 4 decades we also performed the analysis of variability and change in wind wave periods and directions and associated changes in the locations of storm trajectories and cyclone composites.