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Vertical structure of the intensities of synoptic-scale processes over the Northern Hemisphere

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We analyze the intensities of atmospheric processes over the Northern Hemisphere. 6-hourly geopotential heights from the NCEP/NCAR reanalysis for the 54-year period from 1948-2002 were used. We considered winter season, from December to February. In order to investigate processes at different time scales band-pass filtering for different ranges from 0-2 days (ultra-high frequency variability) to more than 12 days (low-frequency variability) was applied (Gulev et al., 2002). For the band-passed time series we computed standard deviations, which were used for quantification of the intensity of the processes for given ranges. Climatological horizontal and vertical distributions of the intensity of atmospheric processes of different scales are quite different in both Atlantic and Pacific. Spatial distribution of the standard deviations for the ranges from 0-2 days to 4-6 days marks effectively the midlatitudinal storm tracks over the North Pacific and the North Atlantic sectors. Analysis shows that subsynoptic high-frequency variability is likely associated with the oceanic signals, being closely linked to the NAO mode in the Atlantic and PNA mode in the Pacific. At the same time, longer scale synoptic variability (6-9 days) exhibits close connection with the upper layer atmospheric processes diagnosed through the Polar Night Jet (PNJ) intensity. EOF analysis of vertical sectors along storm tracks shows that the identified synoptic ranges are associated with propagating patterns and atmospheric disturbances over Pacific demonstrate also vertical propagation. Possible mechanisms of the interaction between the North Pacific and North Atlantic storm tracks are discussed (Castanheira, Graf, 2003).