Abstract View

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Temporal and Spatial Scales of the Wind Field over the North Pacific and North Atlantic

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ABSTRACT

Quasi-geostrophic wind fields over the northern parts of the Pacific and Atlantic Oceans are calculated from synoptic surface pressure data for the four-year period 1973–76. Maps of mean and rms wind stress and of mean wind stress curl are given. Spectral and cross-spectral analysis reveals the dominant space and time scales of atmospheric disturbances. At periods shorter than 10 days, eastward traveling cyclones dominate the atmospheric variability. At longer time scales the atmospheric spectra are *white* in frequency and *symmetric* with respect to wavenumber, and there is no preferred direction of propagation. Differences between the spectra of pressure, wind and wind stress are discussed.

To estimate the amount of fluctuations at high wavenumbers which are not present in smoothed synoptic maps, direct wind observations from two weather stations in the North Atlantic are analyzed and compared to synoptic data. It is found that the smoothing is severe for fluctuations with a period shorter than 10 days, but is less important on longer time scales.

It is demonstrated that the most important parameters of the frequency-wavenumber spectrum of atmospheric pressure can be inferred from wind and pressure observations at a *single* weather station, provided the relationship between geostrophic and surface winds is known. The method can be utilized in areas of sparse spatial resolution (e.g., Southern Hemisphere) to infer horizontal scales and propagational characteristics of the atmospheric fields.

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