

Characteristics of the kinetic energy spectrum of NICAM in the arctic

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In this study, characteristics of the energy spectrum in the zonal wavenumber domain are examined for the cloud resolving global model NICAM. A series of numerical experiments are conducted for NICAM with various horizontal resolutions from 224 km (glevel-5) to 7.0 km (glevel-10) using the T2K-Tsukuba System and 3.5 km (glevel-11) using the Earth Simulator (ES). The energy spectra of most of horizontal resolutions obey k^{-3} power law in synoptic and sub-synoptic scales (wavenumbers $k = 5$ to 30).

However, the energy slope for glevel-5 becomes much steeper around zonal wavenumber $k=10$. Nastrom et al. (1985) explained that the energy spectrum near the tropopause at wavelengths below 400 km appears to follow the $k^{-5/3}$ power. This scale corresponds to about $k=70$ near 45 °deg N.

It is found that the energy spectra for $k > 30$ for glevel-10 and 11 follow the $k^{-5/3}$ power law.

These results agree quite well with the observational studies.

It is also found that the kinetic energy of the vertical wind is white noise spectrum.

