Impact of oceanic scale-interactions on the seasonal modulation of ocean dynamics in the Northwestern Pacific

Hideharu Sasaki (JAMSTEC), Patrice Klein (IFREMER),
Bo Qiu (University of Hawaii), and Yoshikazu Sasai (JAMSTEC)

Abstract

A realistic North Pacific simulation at high-resolution (1/30 degree in the horizontal and 100 vertical levels) highlights an efficient energy pathway, involving winter frontal instabilities at submesoscale set up by large-scale atmospheric forcings: these instabilities, through an inverse kinetic energy cascade, lead to a significant seasonal modulation of the kinetic energy over a broad scale range including submesoscales and mesoscales. The kinetic energy within the scale band of 10-200km is doubled in winter relatively to summer. This suggests a significant seasonal modulation of dispersion and transport of heat and tracers triggered by atmospheric forcings through this energy pathway. Monitoring such seasonal modulation is a major challenge because of the lack of high-resolution observations on a global scale. However the resulting meso/submesoscale field has been found to be statistically in geostrophic equilibrium at all seasons. This means that such modulation can be diagnosed, using the geostrophic approximation, from SSH data from the future SWOT and COMPIRA wide-swath altimeter missions.