# Surface Ocean Wave Development under Explosive Cyclone Conditions

*Yuki Kita[1], Takuji Waseda[1], Adrean Webb

1. University of Tokyo

Ocean wave developments under explosive cyclone (EC) conditions are investigated with hindcast simulations of ocean waves in the Northwestern Pacific between 1994 and 2014. Composite analyses of the ocean wave field under EC conditions are conducted in order to obtain an overall depiction of spatio-temporal developments of ocean waves. Because of the rapid development of ECs, ocean waves beneath ECs continue to grow for about half a day after the EC begins to decay. ECs generate two areas with narrow directional spectra: on the cold side of a warm front and on the right-hand-side of the cyclone center, relative to the propagating direction. In comparison, typhoons usually generate just one area with a sharp peak. This research successfully provides a schematic diagram which illustrates the ocean wave development under an EC condition with atmospheric system (Fig. 1). This EC feature is derived from the existence of atmospheric fronts, which produce a complex wind system for the ECs. In one case study, spectral analysis of wave spectra from an EC in January 2013 indicates that the warm front plays a critical role in generating the distinctive ocean wave system in the warm and cold zones along the warm front, both of which have a narrow spectrum in direction and frequency. In contrast, ocean waves on the left-hand-side and in the backward area relative to the propagation direction are composed of swell and wind-wave systems propagating in different directions. Ocean wave disasters under ECs are proved to show dissimilar features from typhoons and should provide substantial information to maritime disaster risk management.

Keywords: Surface Ocean Wave, Explosive Cyclone, Northwestern Pacific

 

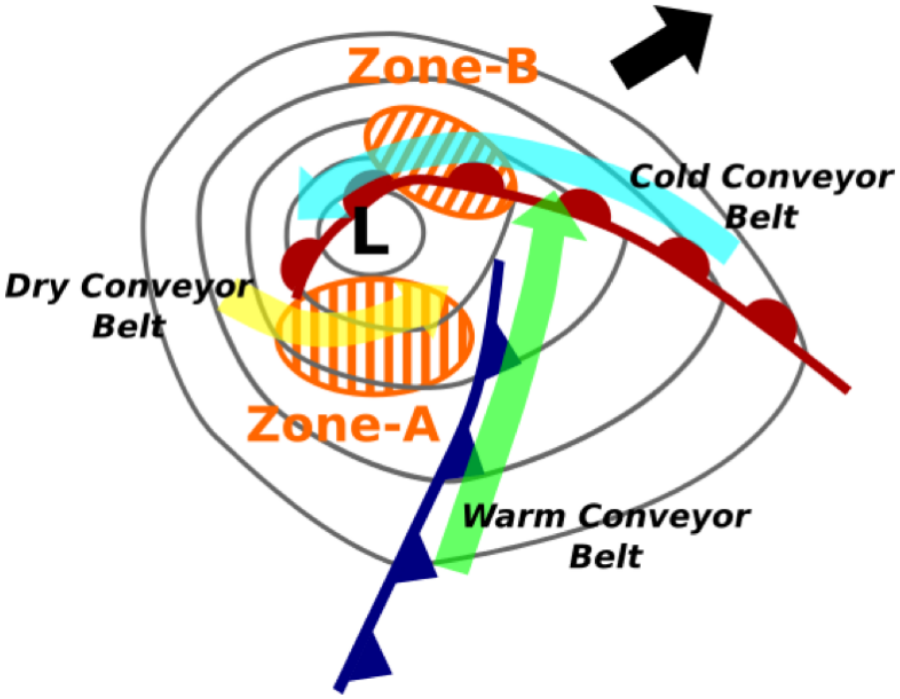


Fig. 1 The conceptual diagram of ocean waves under EC conditions at the most mature development stage. Gray contour represents SLP, red line with hemicycles does the warm front, and blue line with triangles does the cold front. Black arrow stands for the propagating direction, and the other arrows are air flows specific to extratropical cyclones. The orange stripe areas have ocean waves with narrow-band spectra in direction and frequency.

 