Air-Ocean Factors throughout the Formation and Intensification of Typhoon Malakas during the Impact of Typhoons on the Pacific (ITOP) Field Program

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The ocean environment of the Philippine Sea is defined by warm sea-surface temperatures and a deep thermocline that contributes to high ocean heat content. Immediately poleward of this region, approximately along 20^{o}N the southern eddy zone defines the boundary between the high ocean heat content region of the Philippine Sea and the water of the subtropical North Pacific. The southern eddy zone contains a variety of warm and cold ocean eddies that vary in space and time.

During The Impact of Typhoons on the Pacific (ITOP) program, Typhoon (TY) Fanapi and Supertyphoon (STY) Megi formed and intensified in the favorable environment of the Philippine Sea. However, TY Malakas formed at the very equatorward edge of the southern eddy zone. Following formation, Malakas underwent periods in which it intensified at various rates while moving poleward through the eddy zone. A series of four aircraft missions were conducted during the formation and intensification of TY Malakas. During each flight, dropsondes and airborne expendable bathythermographs (AXBTs) were deployed in tandem to define the air-ocean characteristics of the eddy zone through which Malakas was moving. In particular, one flight was designed to conduct a series of race-track legs throughout the right-rear quadrant of the storm and over a well-defined cold ocean eddy.

In this presentation, dropsonsde and AXBT data are examined in conjunction with analyzed atmospheric and ocean model data to define the relative contributions of atmosphere and ocean factors during the formation and intensification of TY Malakas. Environmental influences on storm intensification are defined using a high-resolution WRF simulation. All available data obtained during the ITOP aircraft missions are continuously assimilated throughout the poleward movement and variations in intensity of TY Malakas. The ensemble-based data assimilation is used to examine the relative predictability of the intensification of Malakas as it moved through the southern eddy zone under varying vertical wind shear and interactions with an upper-level midlatitude trough. Finally, variability among ensemble members during intensification of Malakas as a tropical cyclone is related to variability in the recurvature and downstream flow patterns over the North Pacific.