

The atmospheric circulation anomalies associated with the formation of marine heatwaves in the Northeast Pacific

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1. Objectives

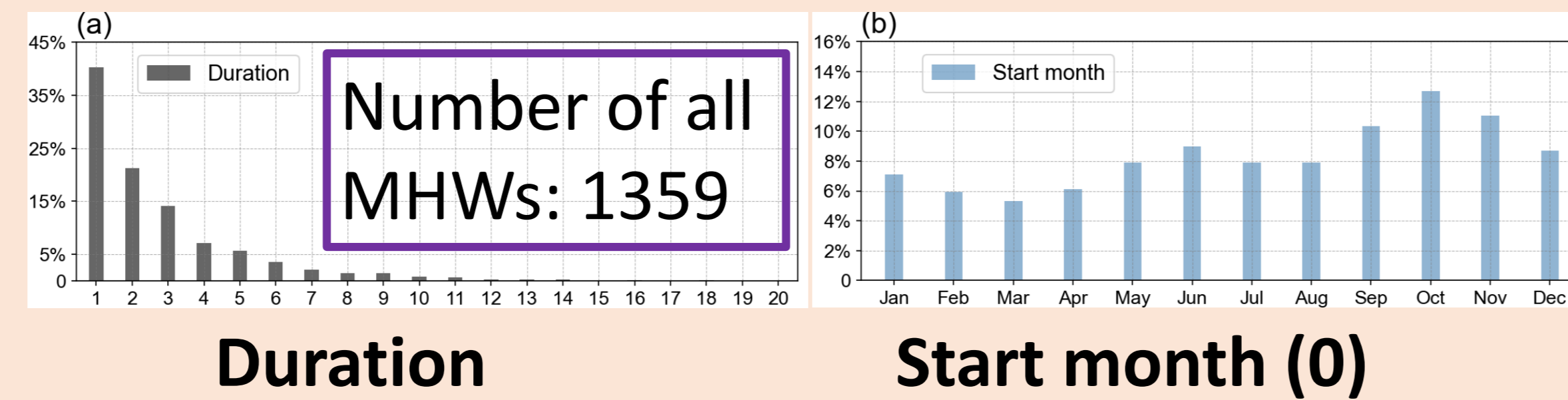
- Marine heatwaves (MHWs) are anomalously warm SST events, which can exert substantial impacts on ecosystem and economy
- Using observation and CMIP6 data, this study investigates the atmospheric circulation anomalies associated with the formation of MHWs in the Northeast Pacific (NEP), further diagnosis of the heat budget is performed to illustrate the processes of MHW formation and maintenance

2. Data & Method

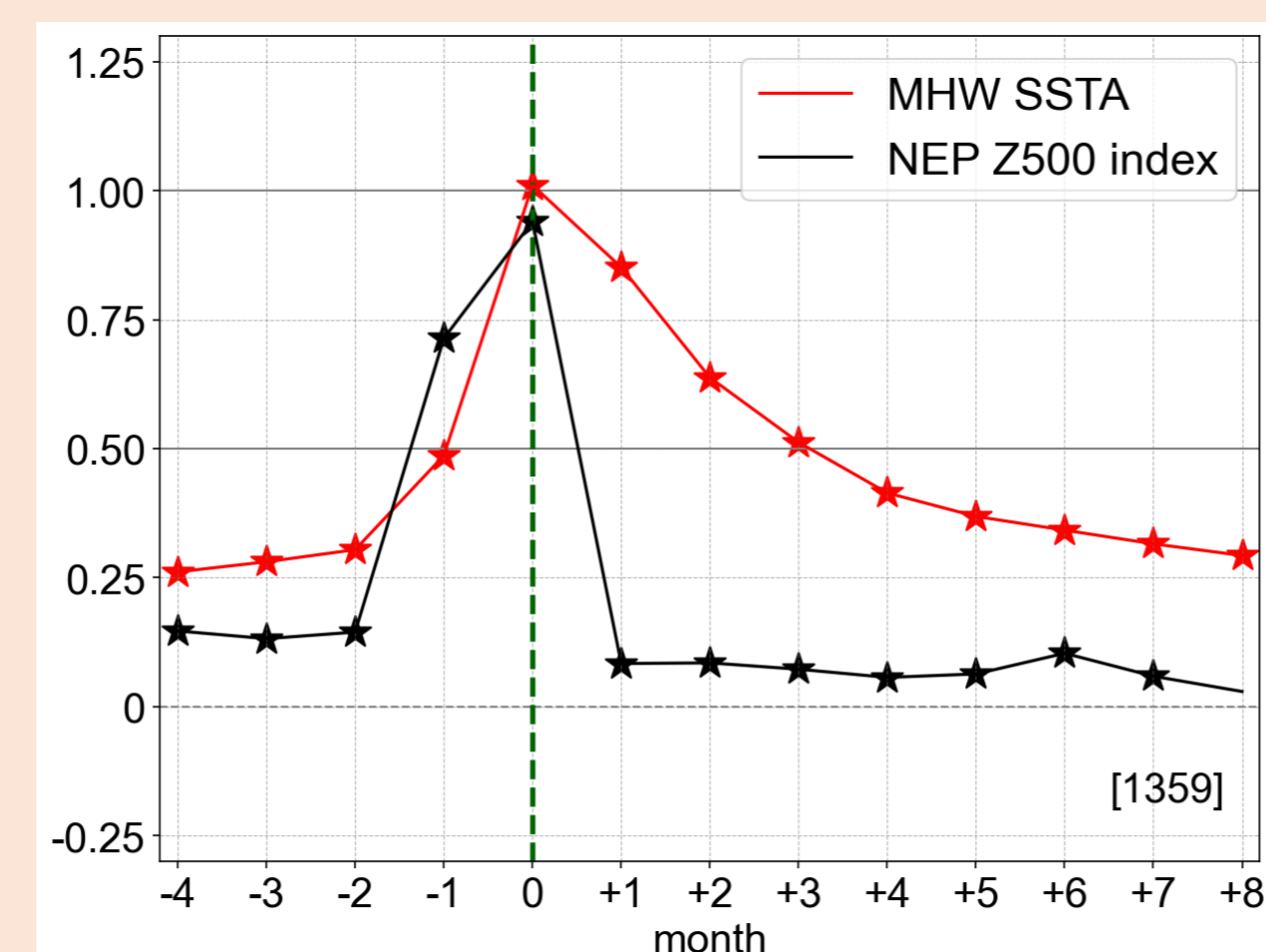
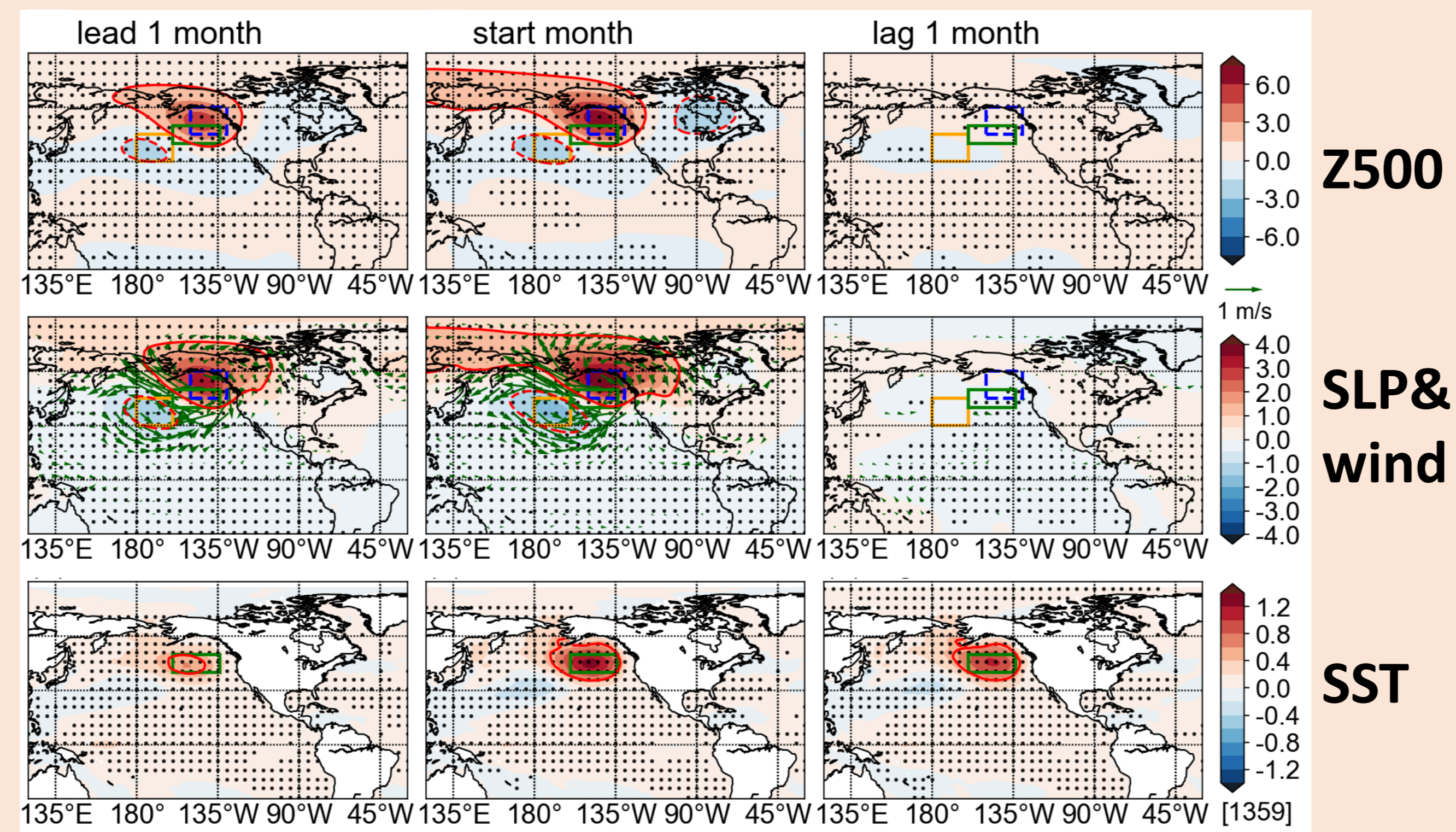
- CMIP6 Monthly historical scenario data for 17 models (1850 – 2014)
- Quadratic linear trend is removed
- Blob index: normalized SSTA of MHW area (135° – 160°W, 40° – 50°N)
- MHW: blob index ≥ 1.0
- NEP Z500 index: normalized Z500 (500 hPa geopotential height) difference of NEP area (NE: 130° – 150°W, 45° – 60°N; WS: 160° – 180°W, 30° – 45°N)

3. Results

3.1. MHW Overview



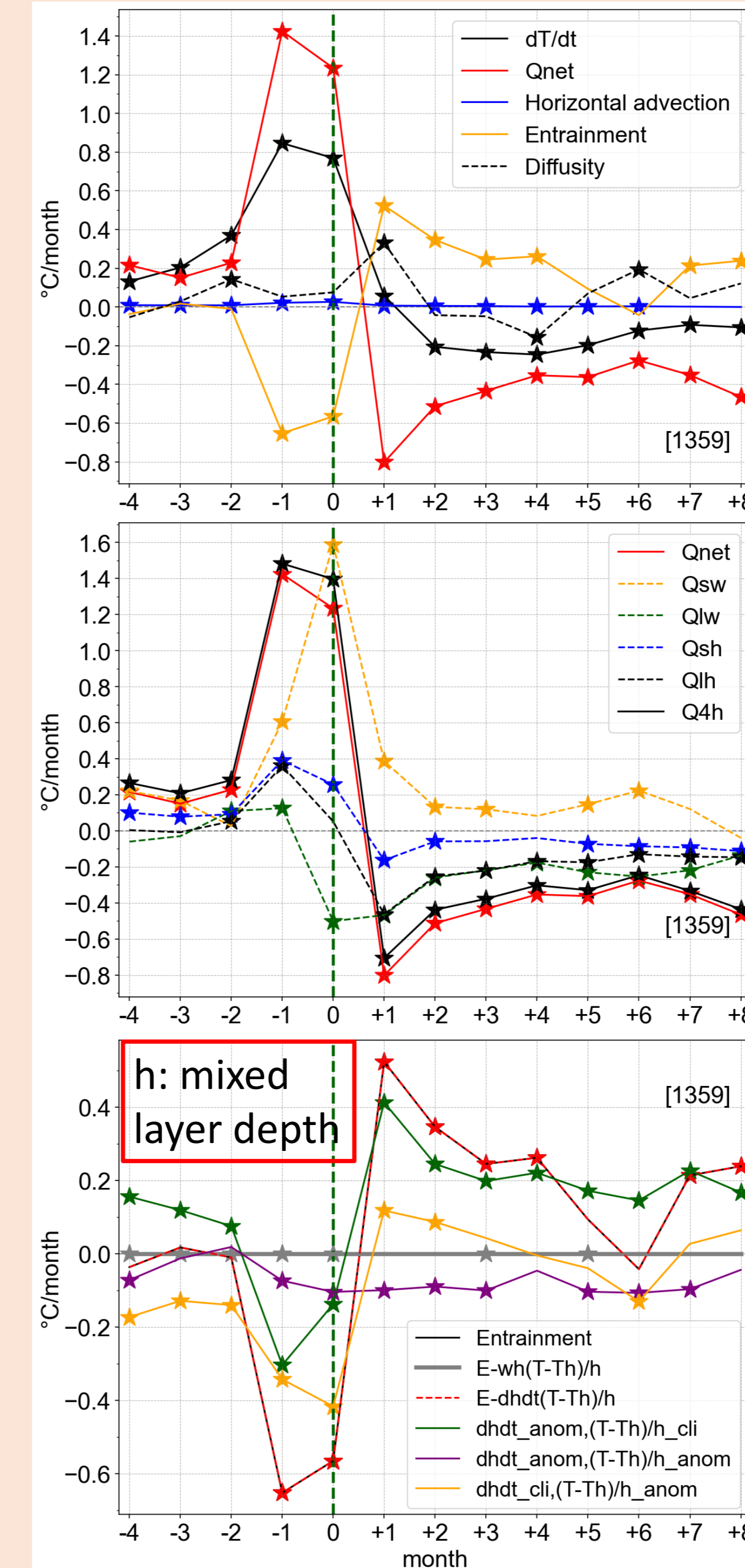
3.2. Features of atmospheric circulation & SST anomalies



Change of MHW SSTA & NEP Z500 index

Start month of MHW:
Dipole atmospheric circulation in the NEP area (NE+, WS-)

3.3. Diagnosis of heat budget



Formation:
Net heat fluxes
(→Shortwave)

Maintenance:
Entrainment
(→dhdt)

4. Conclusions

- The MHWs can be triggered by a pair of anticyclonic and cyclonic anomalies located in the northeast and southwest Northeast Pacific
- Such dipolar atmospheric circulation provides positive net heat fluxes, especially short-wave radiation flux, which is conducive to the formation of MHWs
- Entrainment of oceanic process can maintain MHWs, by the change of mixed layer depth over time
- Above model results are in agreement with the observed results (not shown)

➤ Further study is ongoing

