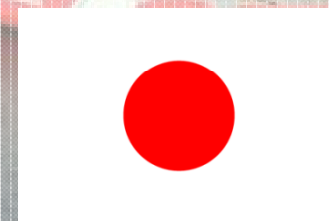
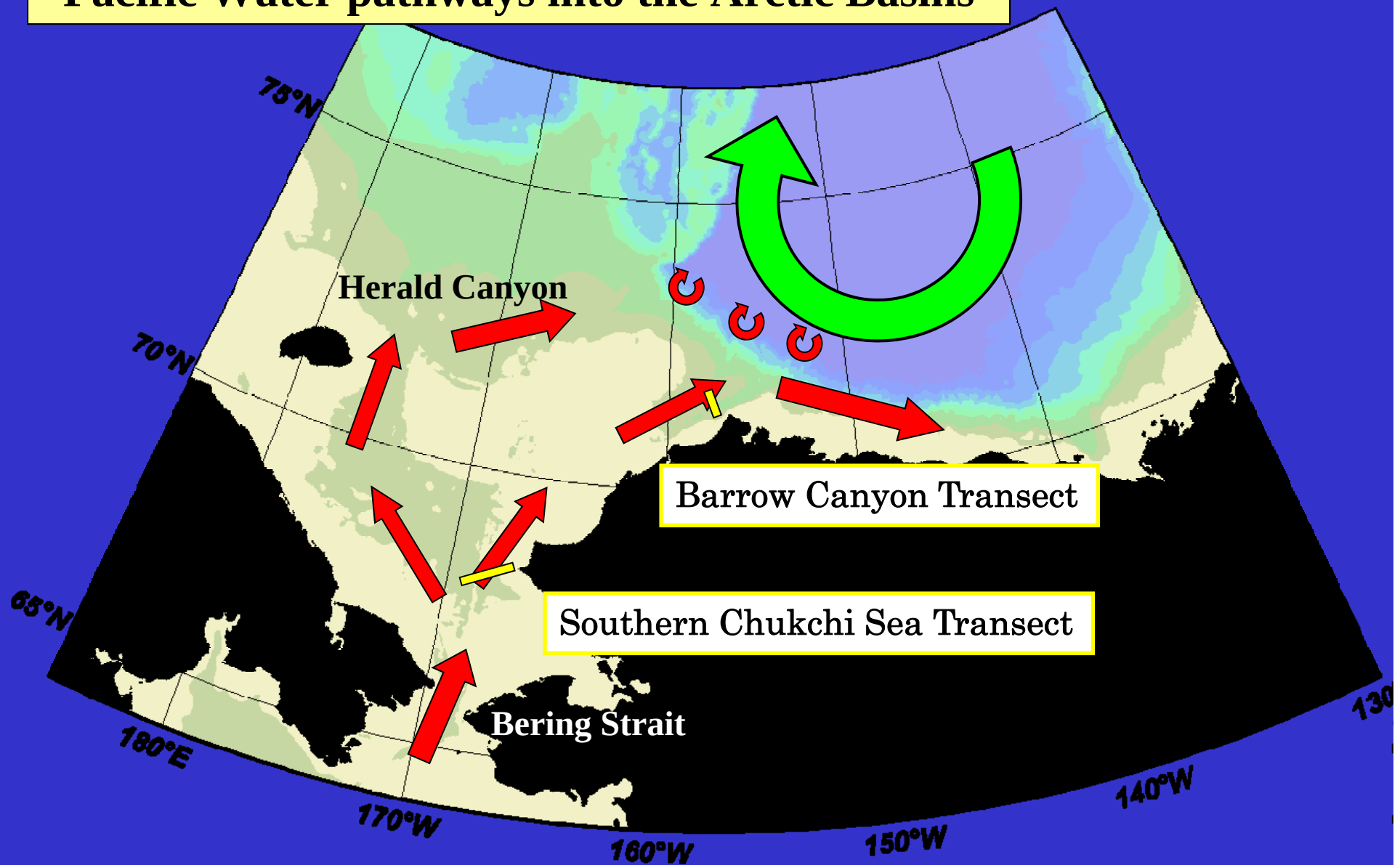


Seasonal variation of water masses in the Chukchi Sea : results of DBO pilot study in 2010

Motoyo Itoh (JAMSTEC), Kevin Arrigo (Stanford),
Svein Vagle (IOS), Jianfeng He (PRIC),
Carin Ashjian (WHOI) and Robert Pickart (WHOI)



Pacific Water pathways into the Arctic Basins

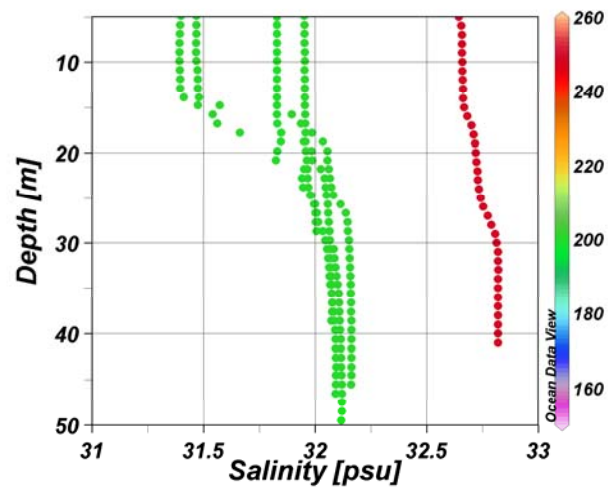
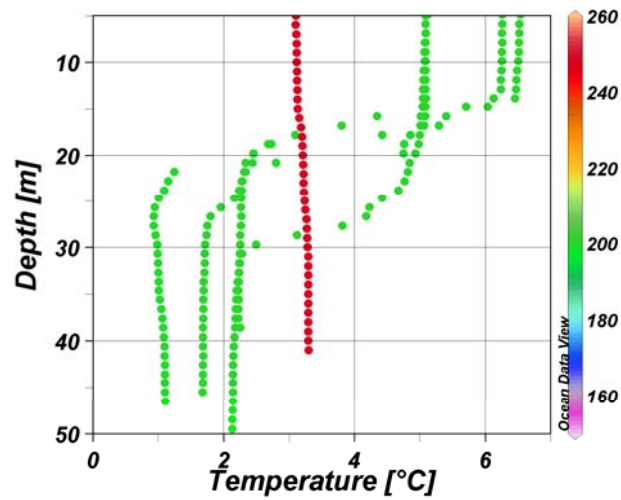
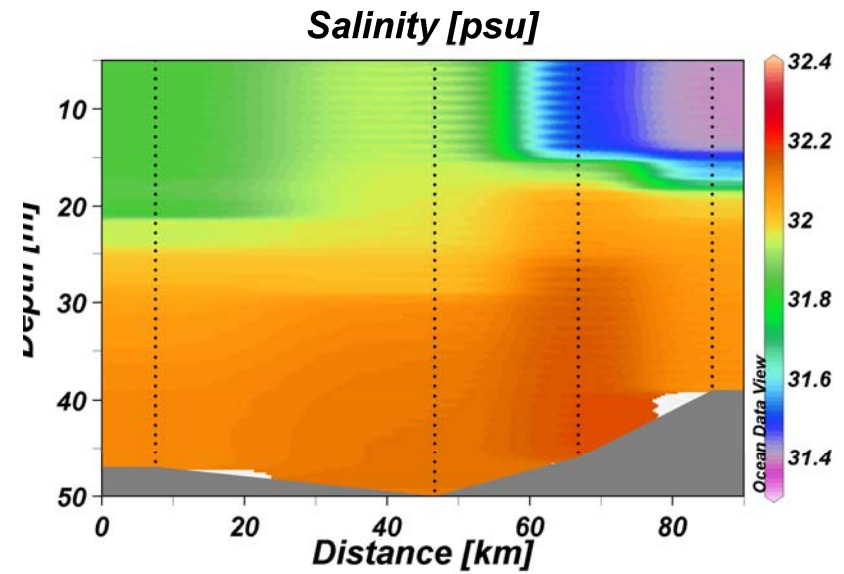
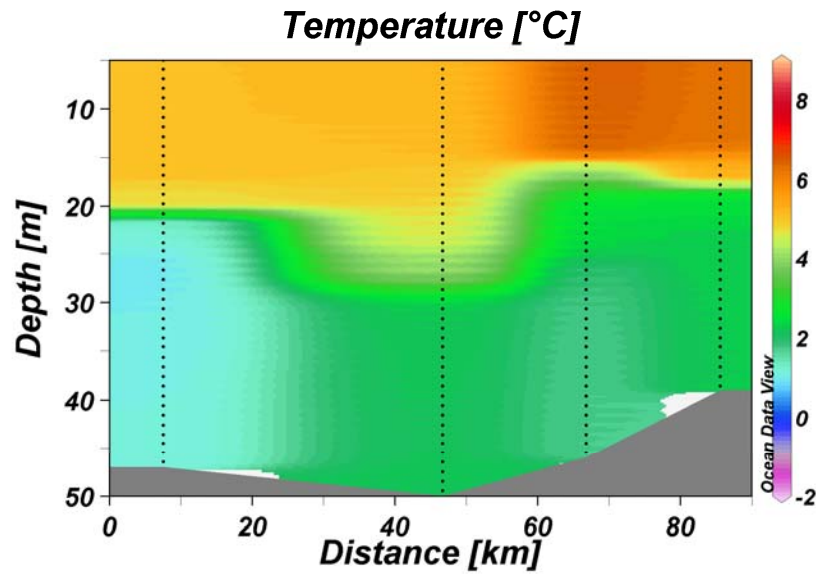


Pacific Water transports heat, fresh water and nutrient into the Arctic basins.

Southern Chukchi Sea Transect

- Healy, US (July)
- SWL, Canada (July)
- Mirai (hotspot station only), Japan (Sep)

Temperature and Salinity section in July by SWL

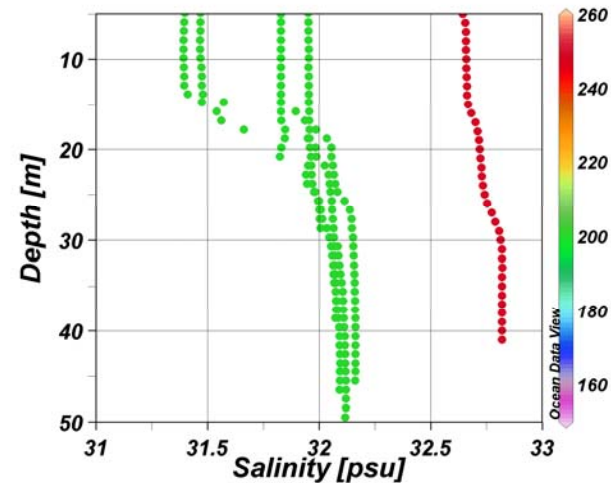
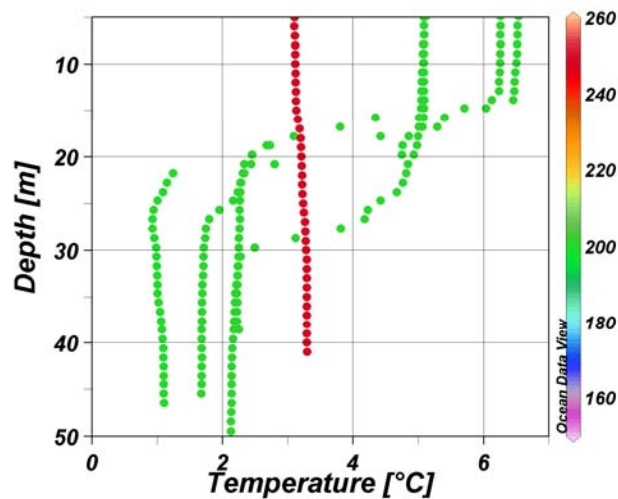
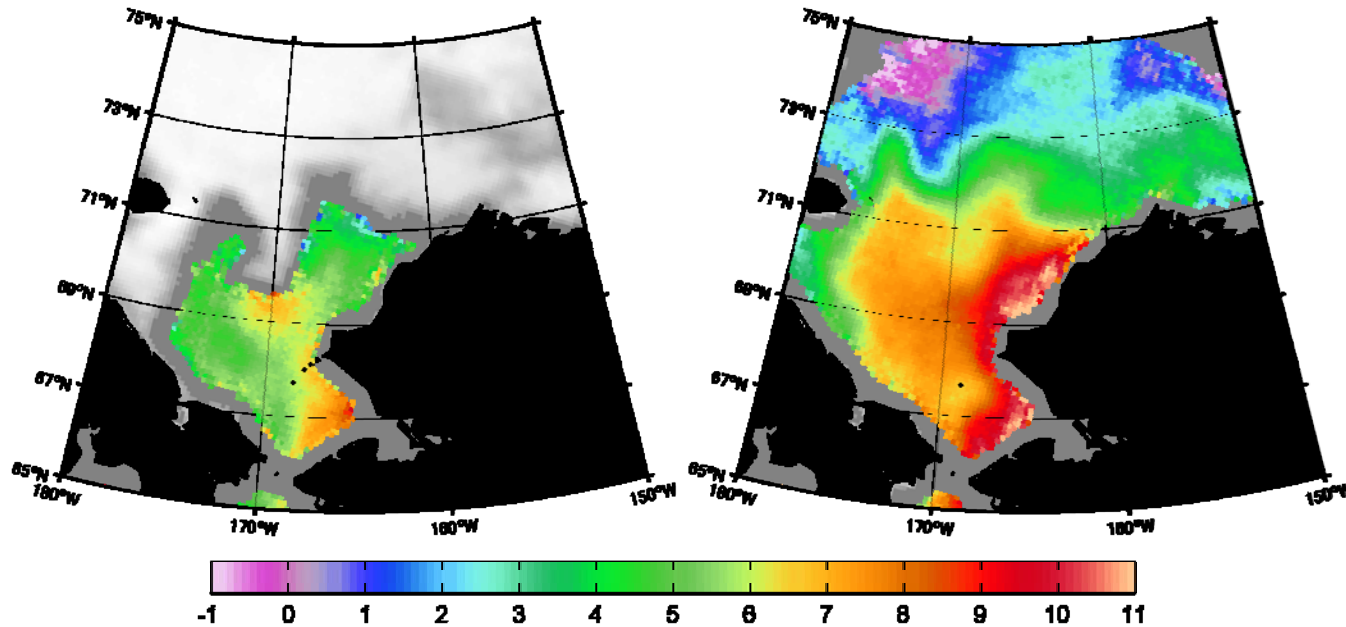


SWL (19 July)
Mirai (2 Sep)

Surface Temperature (AMSR-E weekly)

SWL (July 16-21)

Mirai (Sep 2-9)



SWL (19 July)

Mirai (2 Sep)

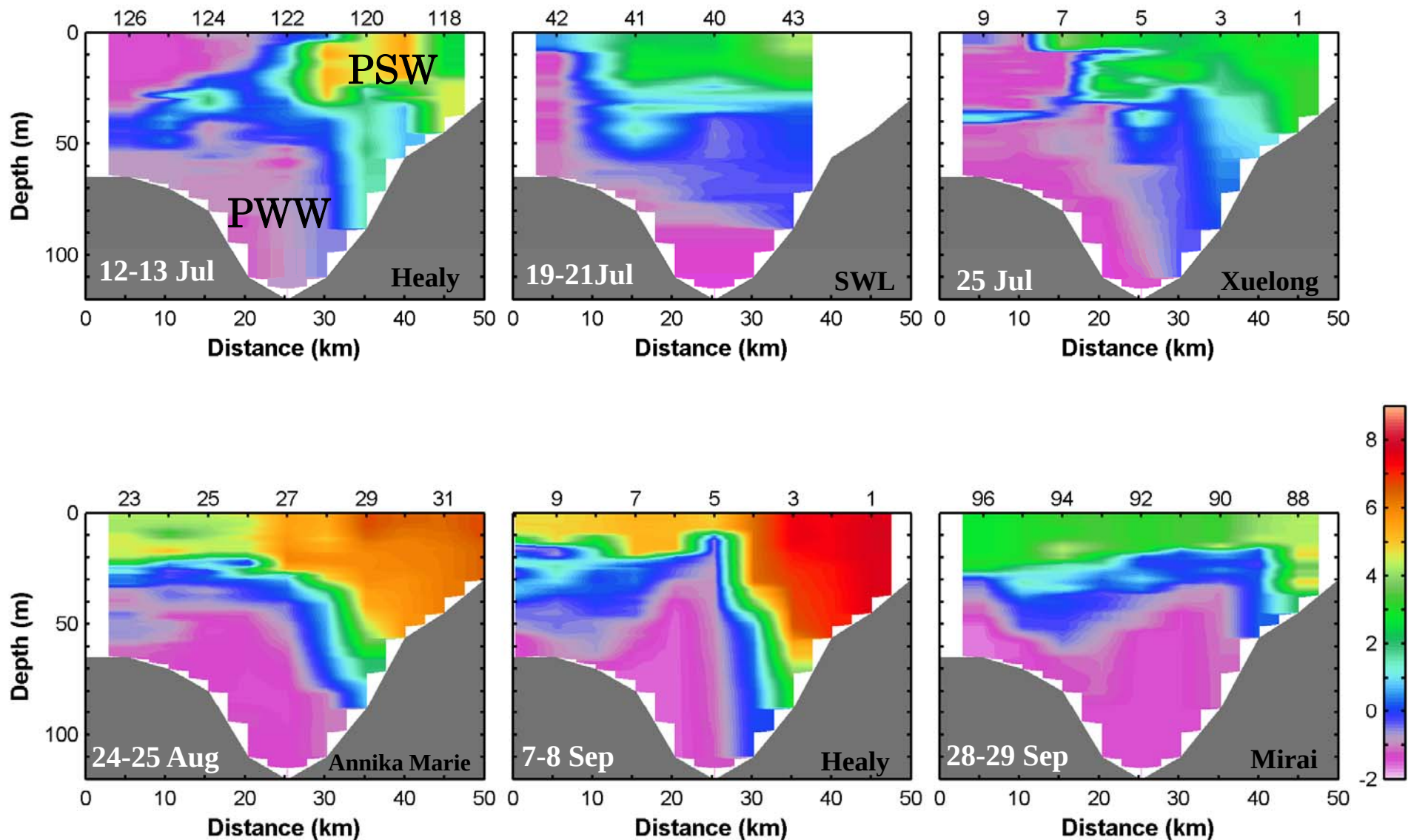
Barrow Canyon Transect

- Healy, US (July 12-13)
- SWL, Canada (July 19-21)
- Xuelong, China (July 25)
- Annika Marie, US (Aug 24-25)
- Healy, US (Sep 7-8)
- Mirai, Japan (Sep 28-29)

6 cruises by 4 nations

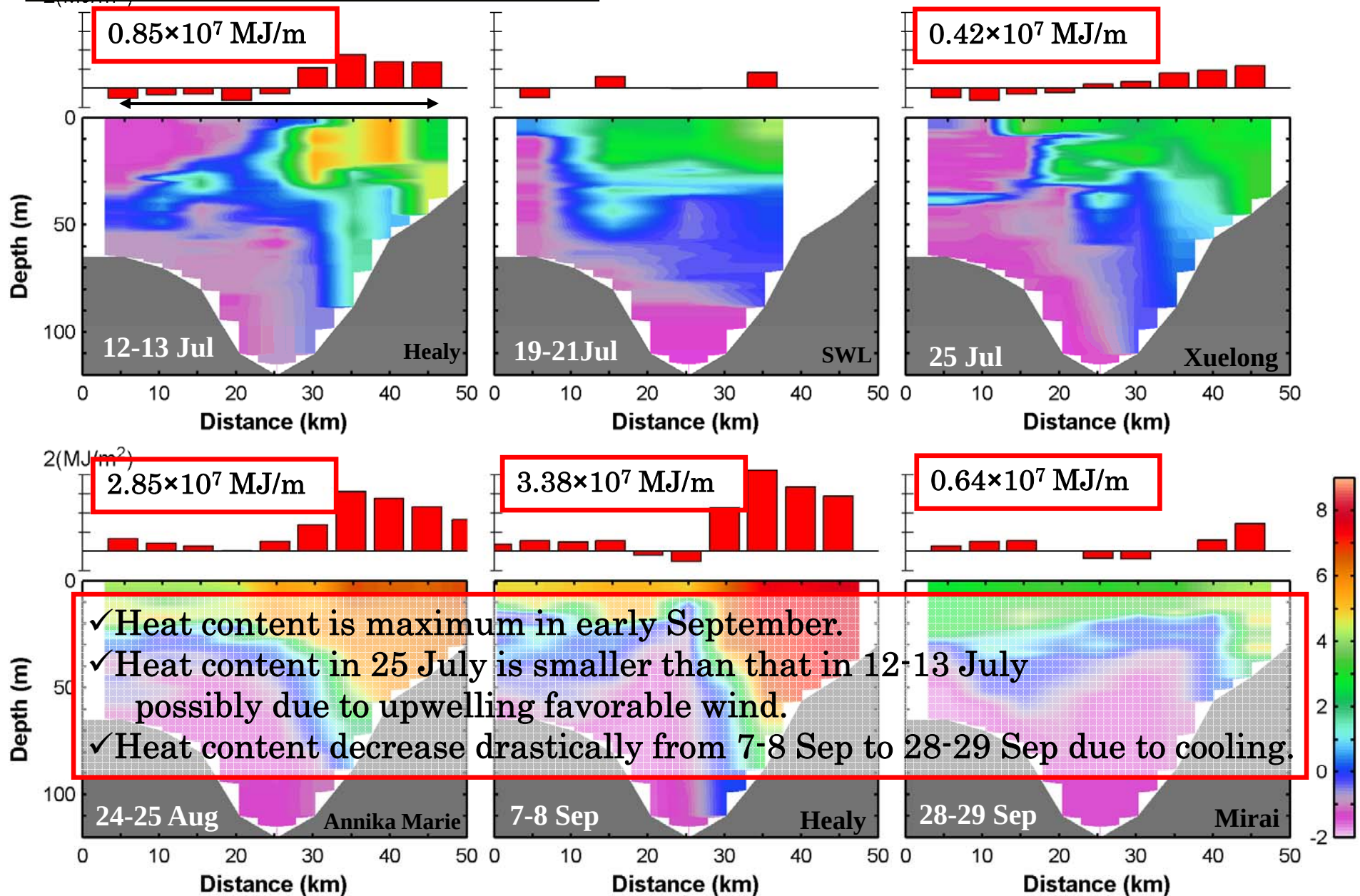
Temperature Sections

PSW: Pacific Summer Water
PWW: Pacific Winter Water

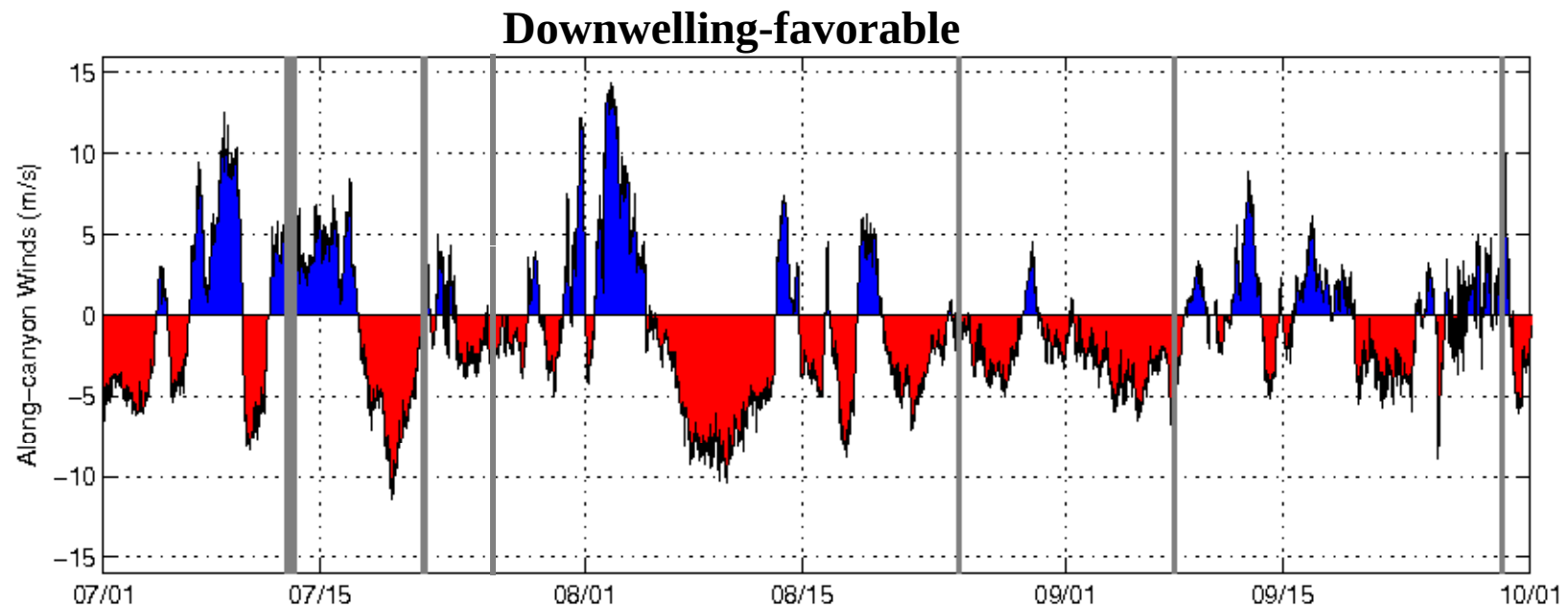


Heat Content

$$\int T \, dz$$



Along-canyon winds Summer 2010



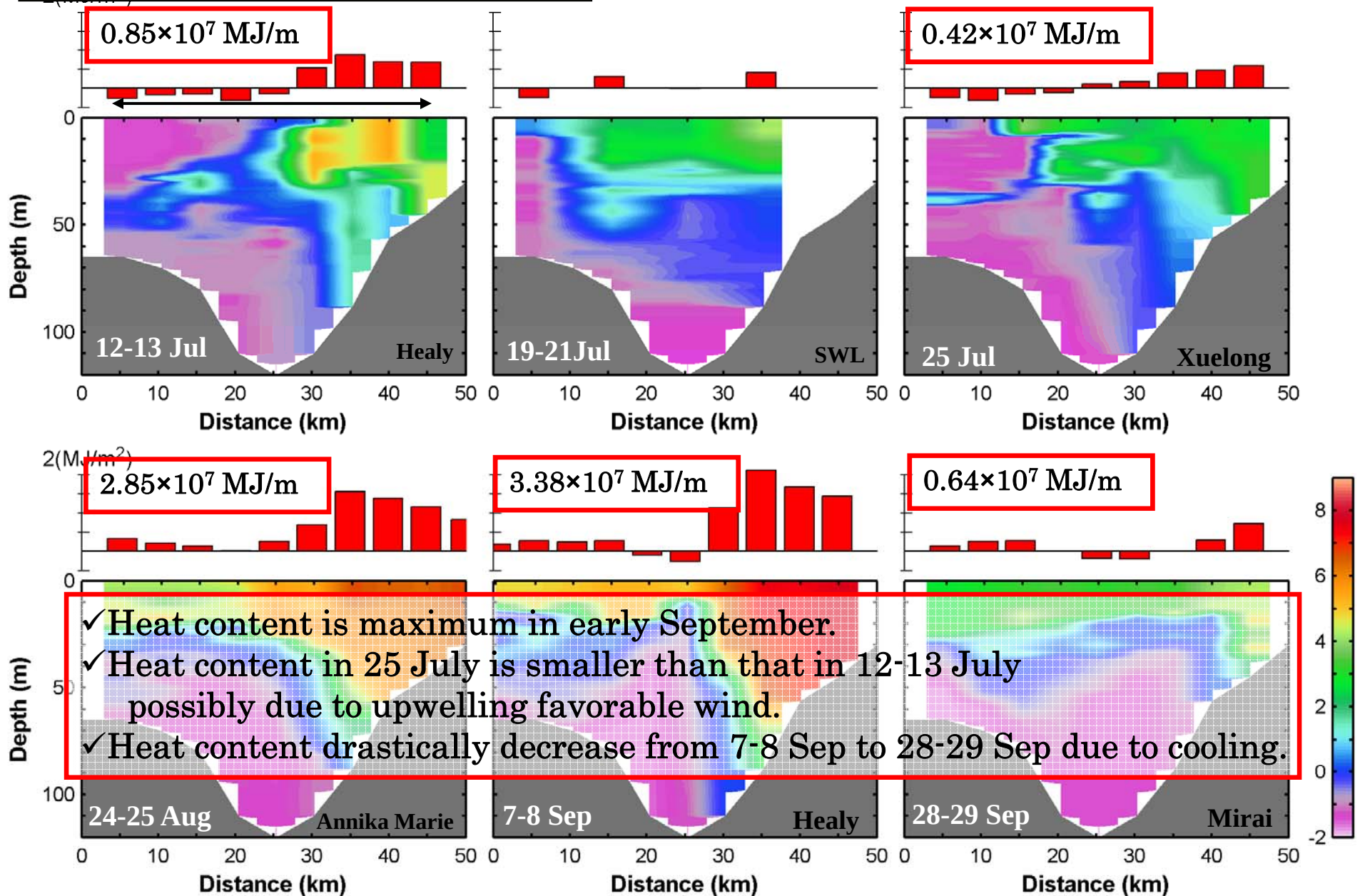
Upwelling-favorable

Healy July SWL Xuelong ANNIKA MARIE Healy Sep MIRAI

Courtesy R. Pickart

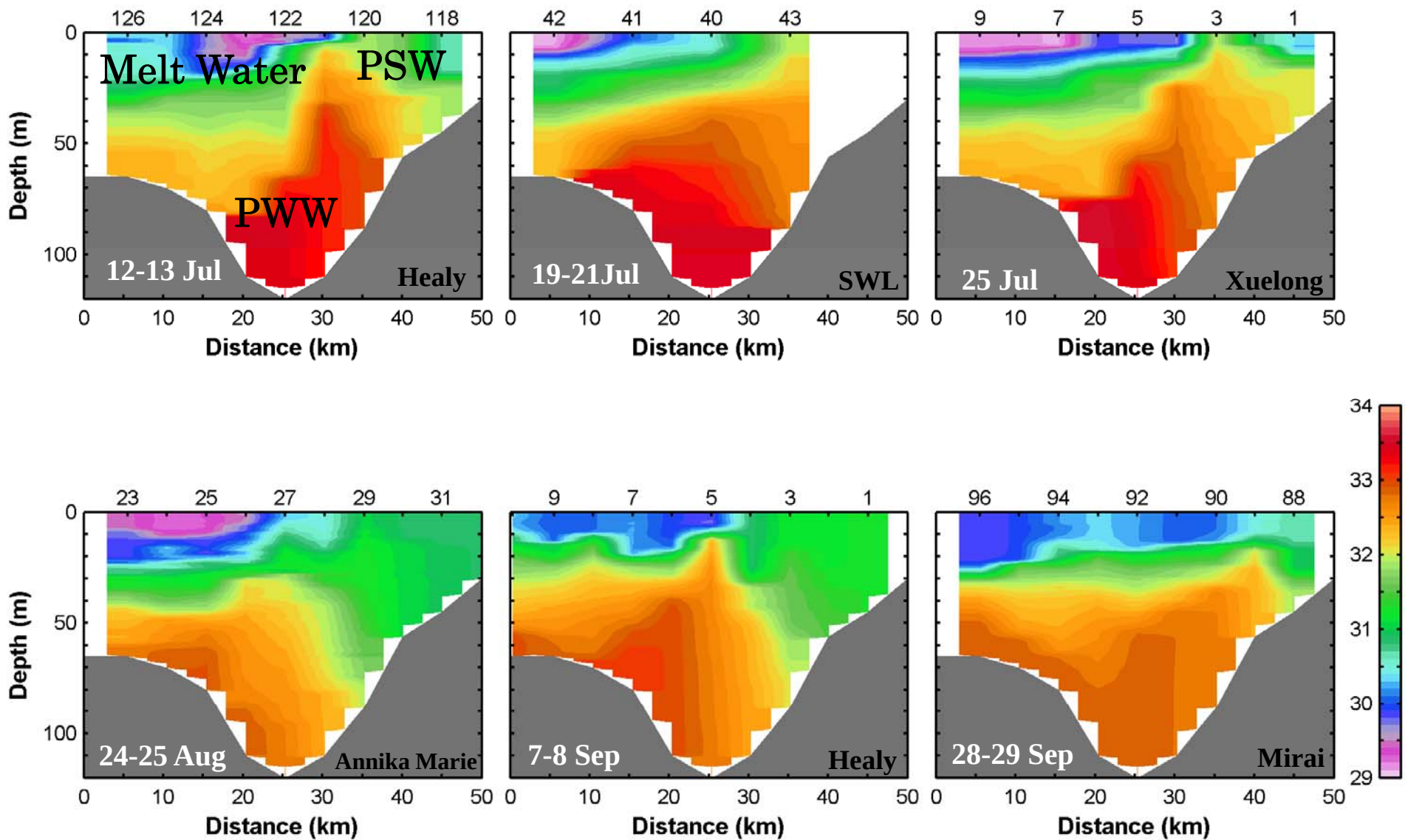
Heat Content

$$\int T \, dz$$



Salinity Sections

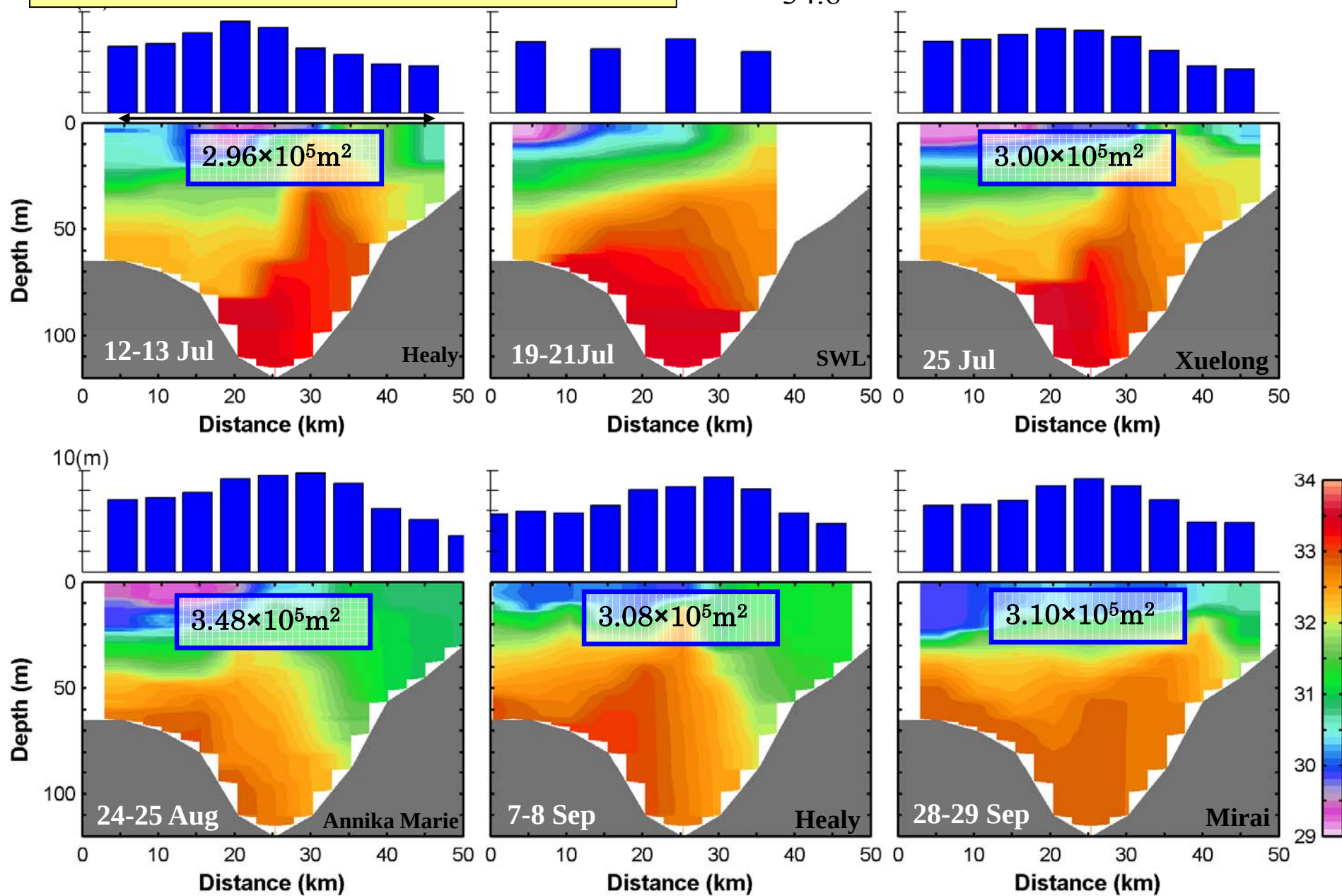
PSW: Pacific Summer Water
PWW: Pacific Winter Water



Fresh Water Content

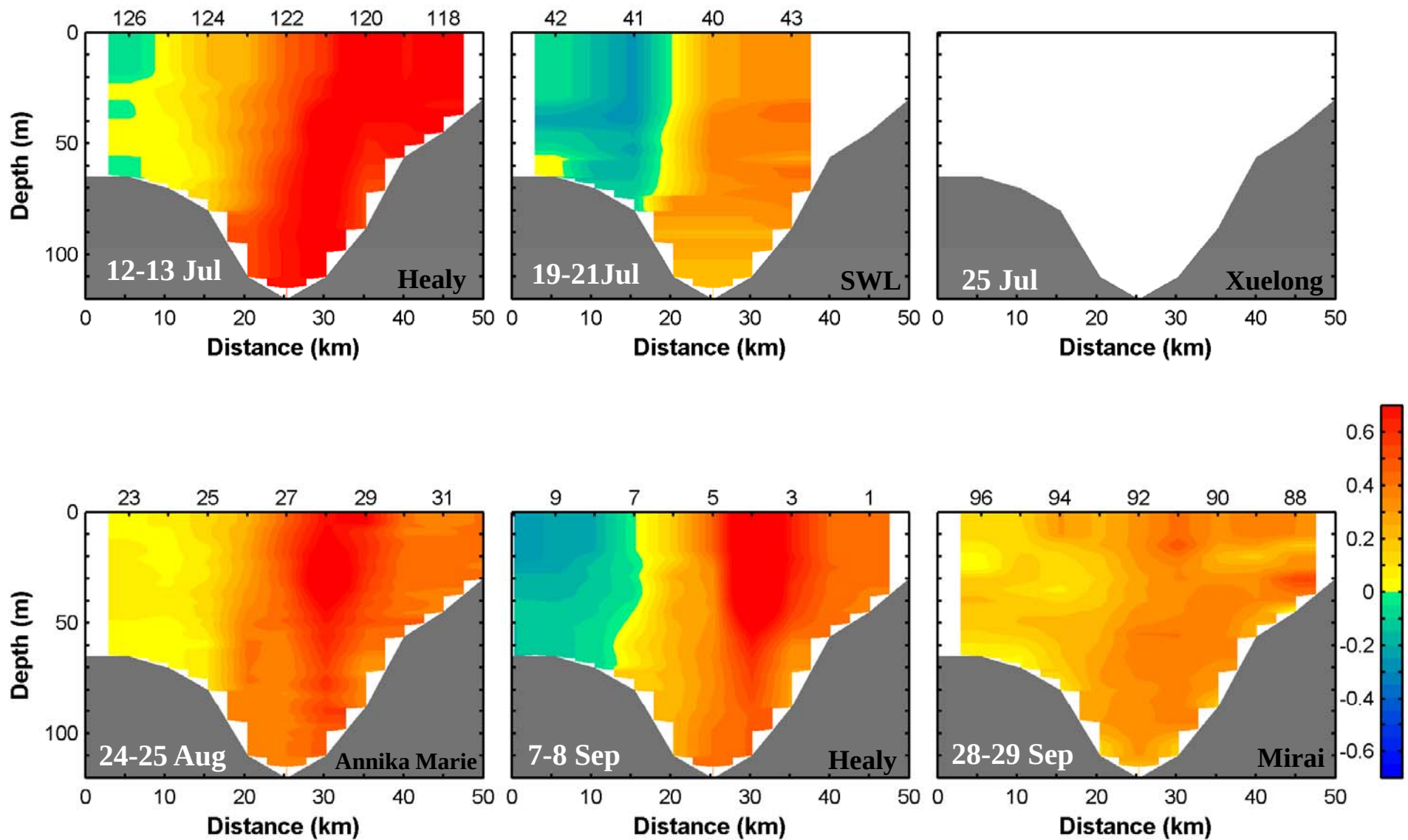
$$\int \frac{34.8 - S(z)}{34.8} dz$$

e.g. Proshutinsky et al., 2008

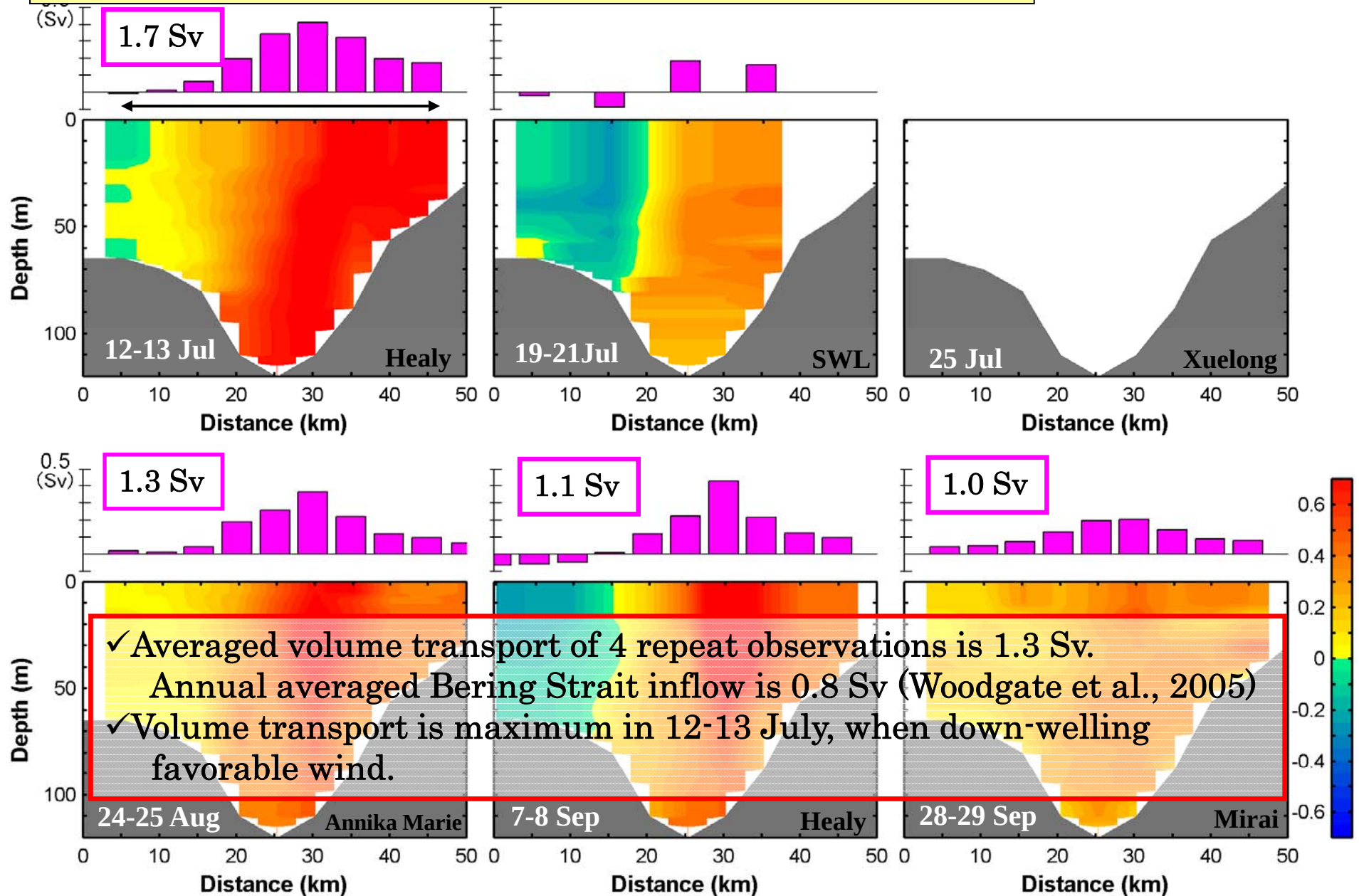


Velocity Section

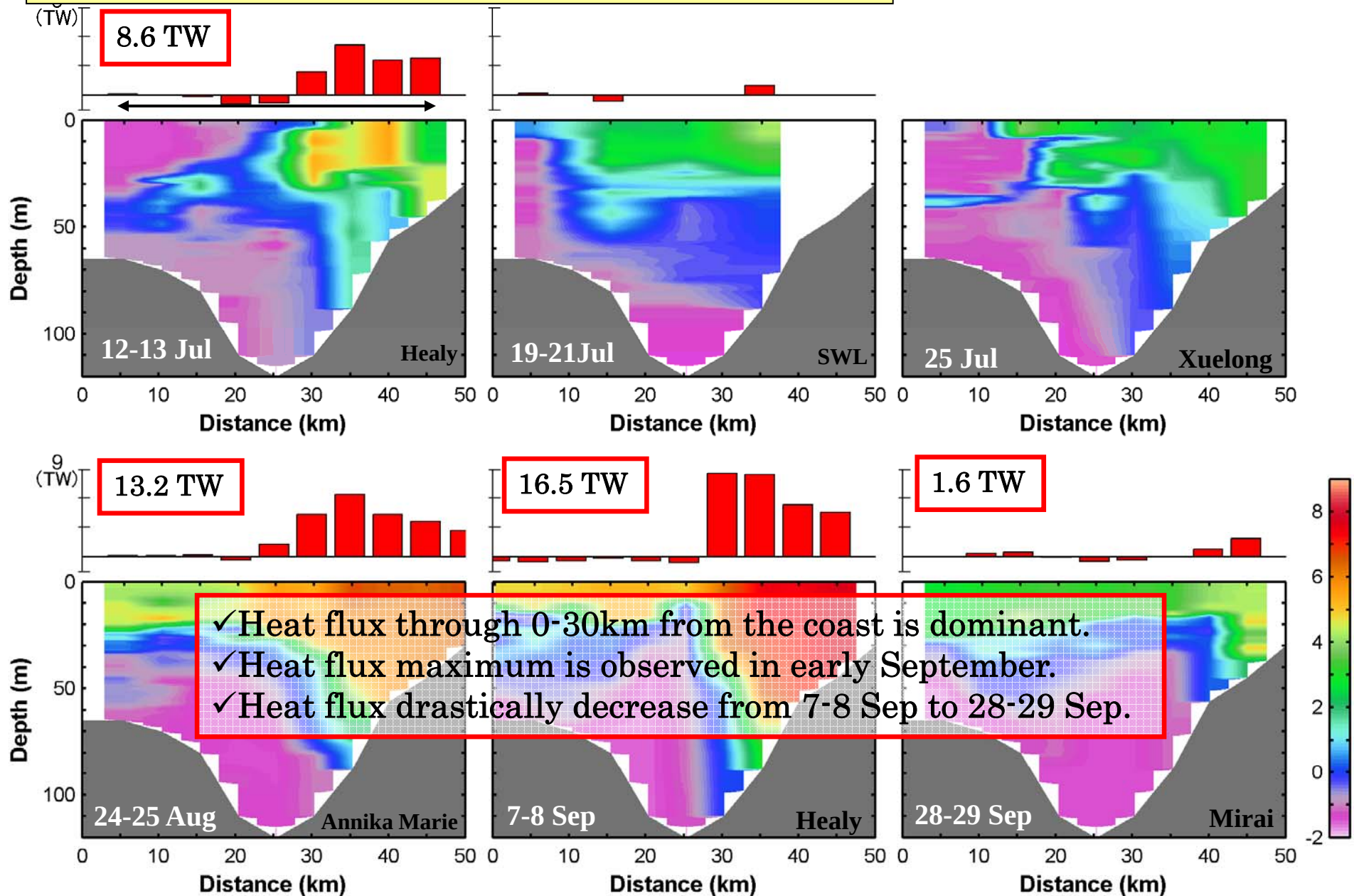
Positive: downwelling
Negative: upwelling



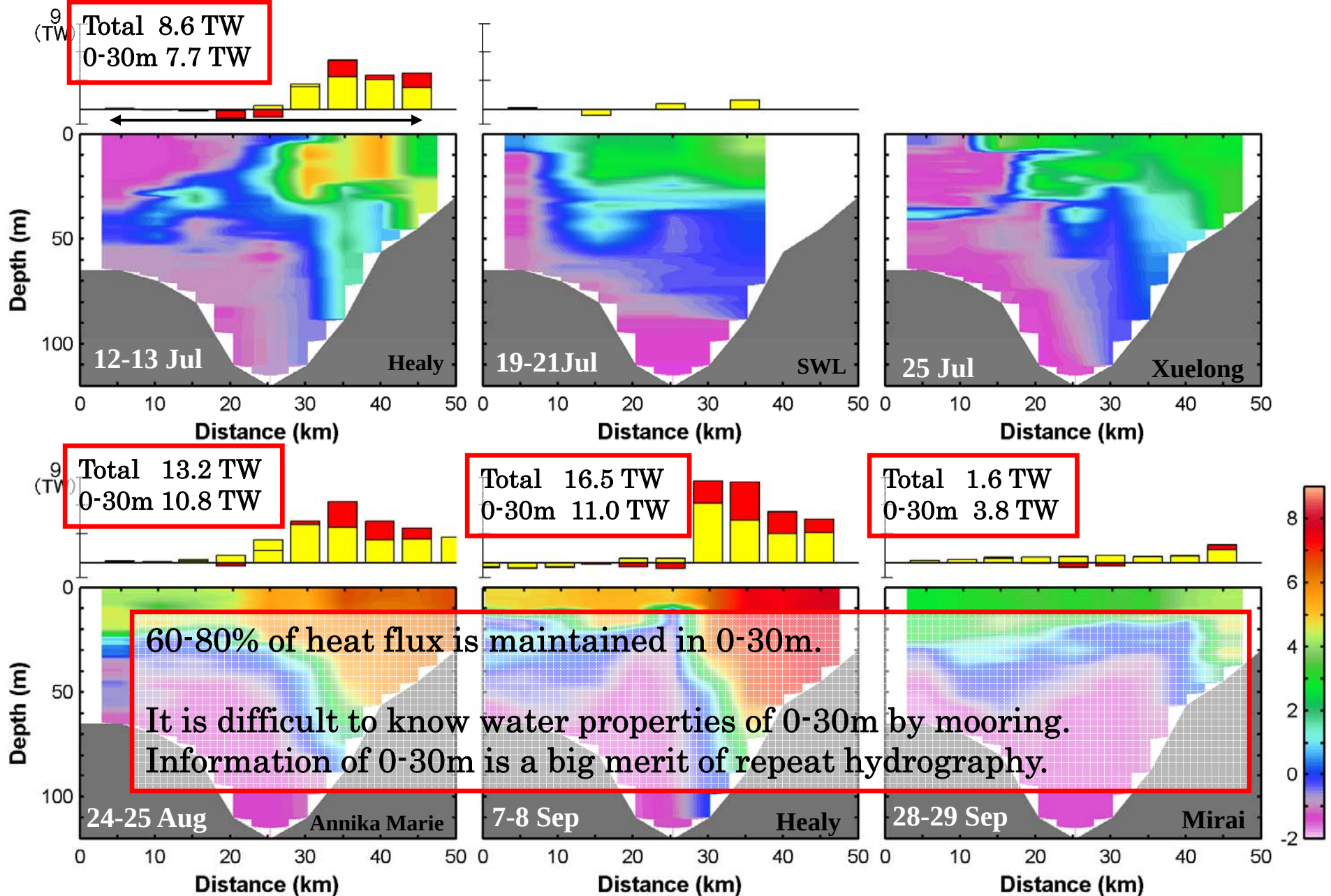
Volume transport through the canyon



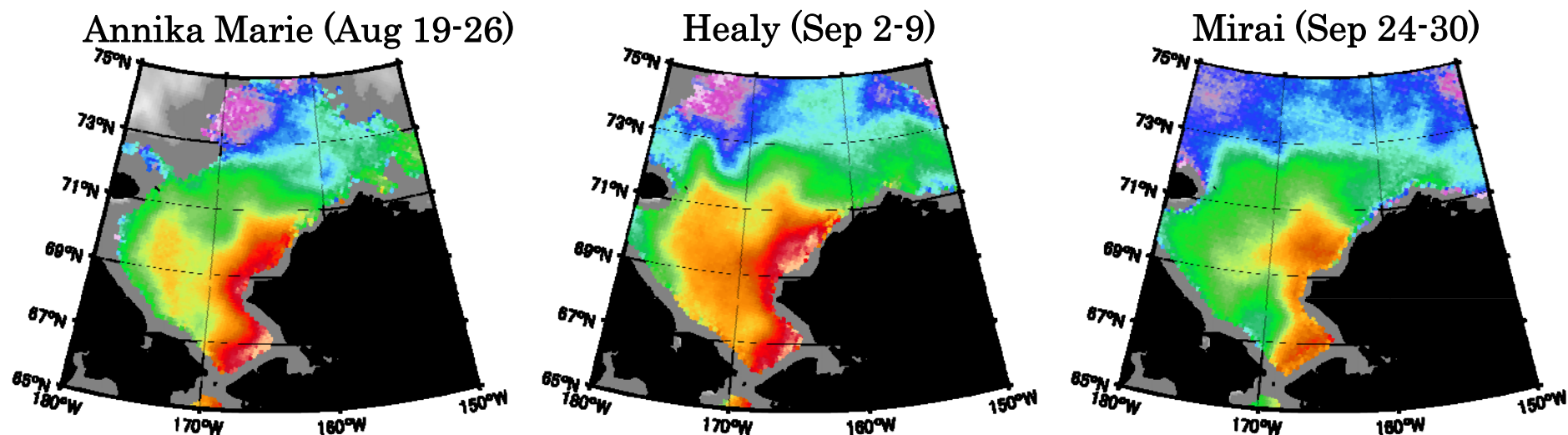
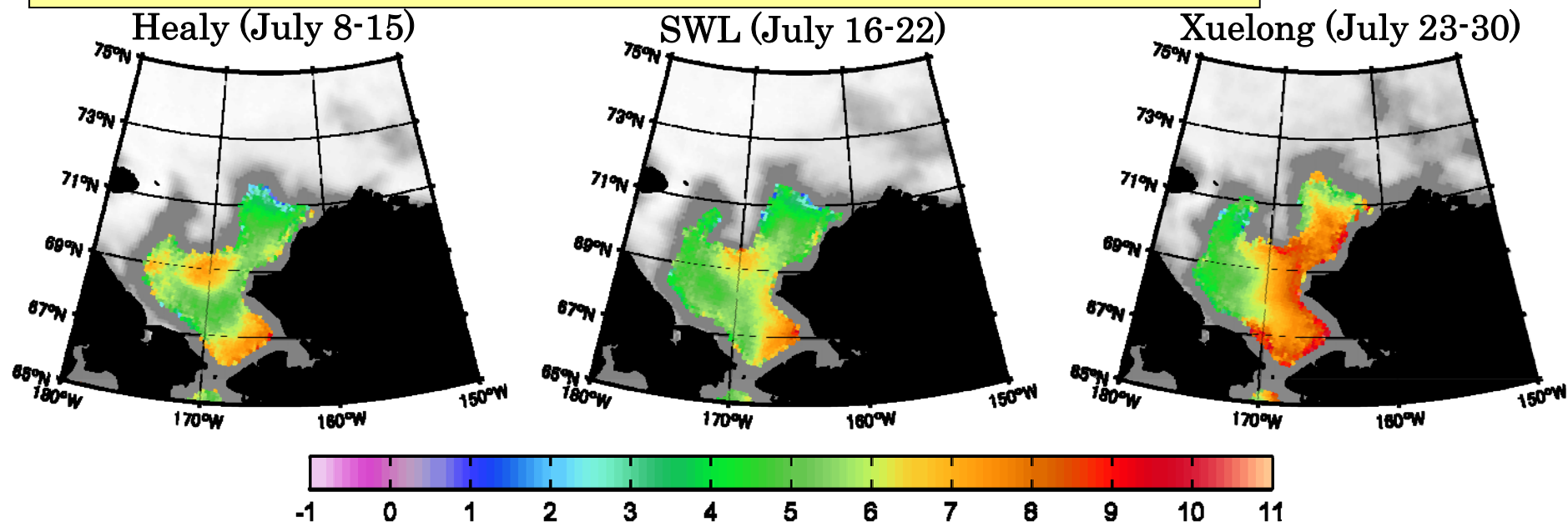
Heat Flux through the canyon



Heat Flux through the canyon



Surface Temperature (AMSR-E weekly)



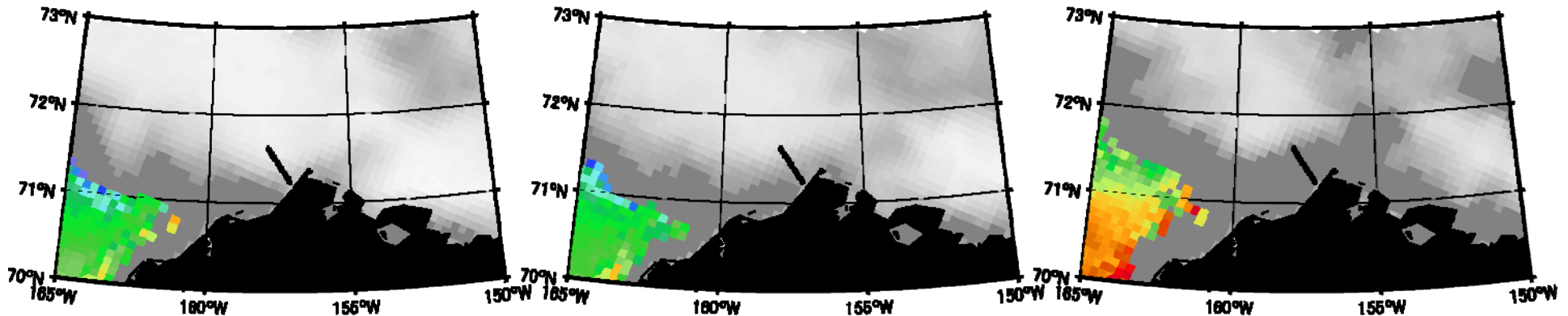
Surface Temperature (AMSR-E weekly)

Resolution 12km

Healy (July 8-15)

SWL (July 16-22)

Xuelong (July 23-30)

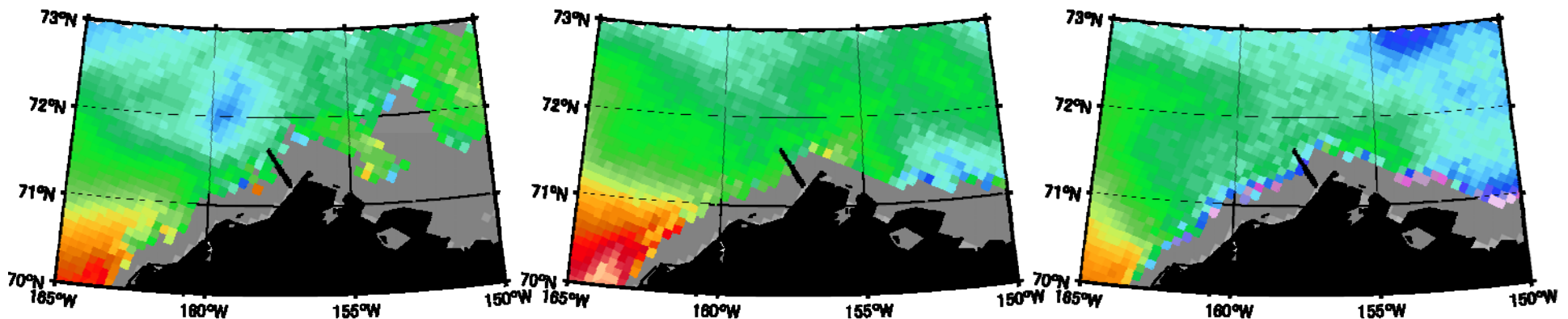


Surface temperature derived from Microwave Satellite is too coarse to capture warm Pacific Summer Water plume through the canyon.

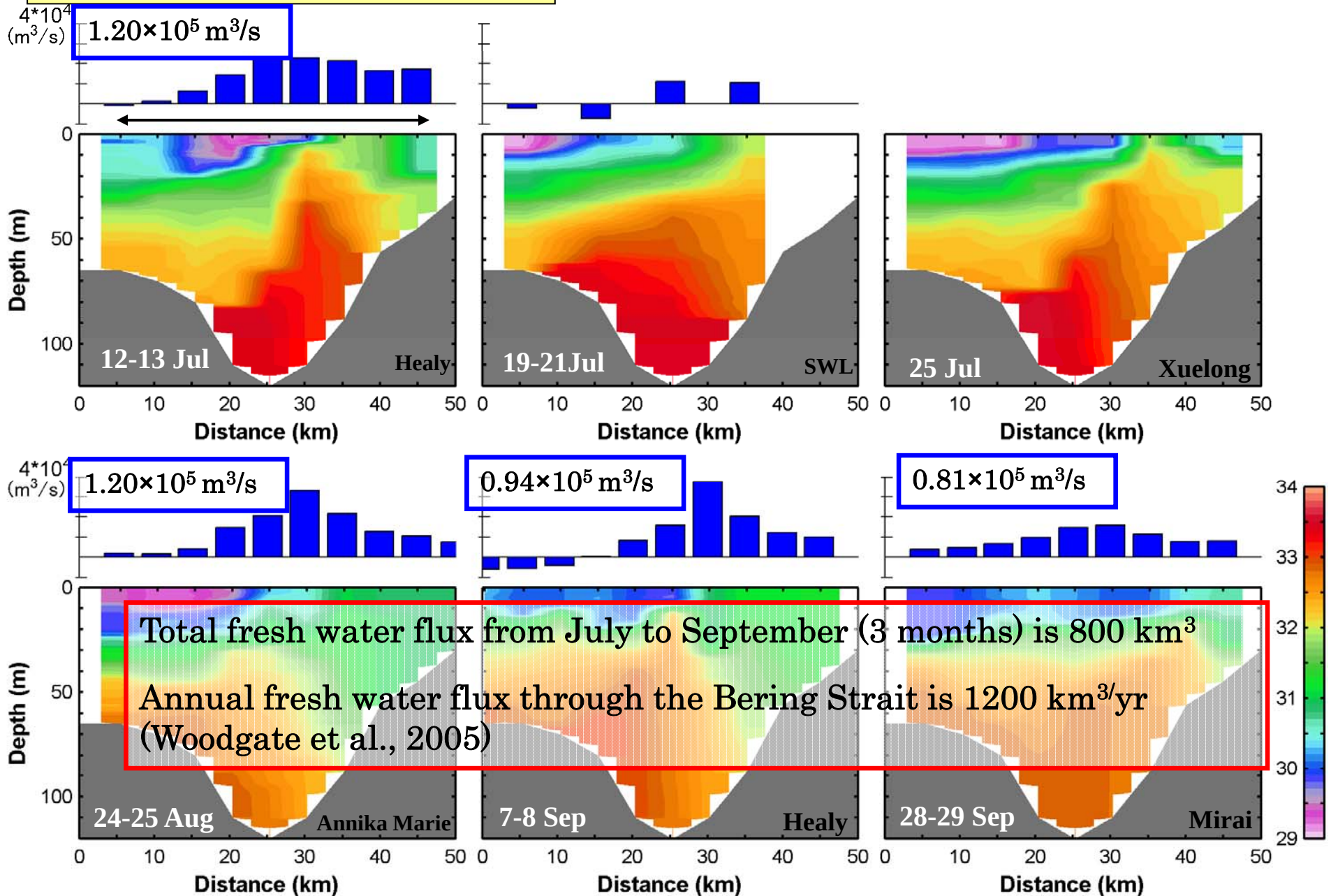
Annika Marie (Aug 19-26)

Healy (Sep 2-9)

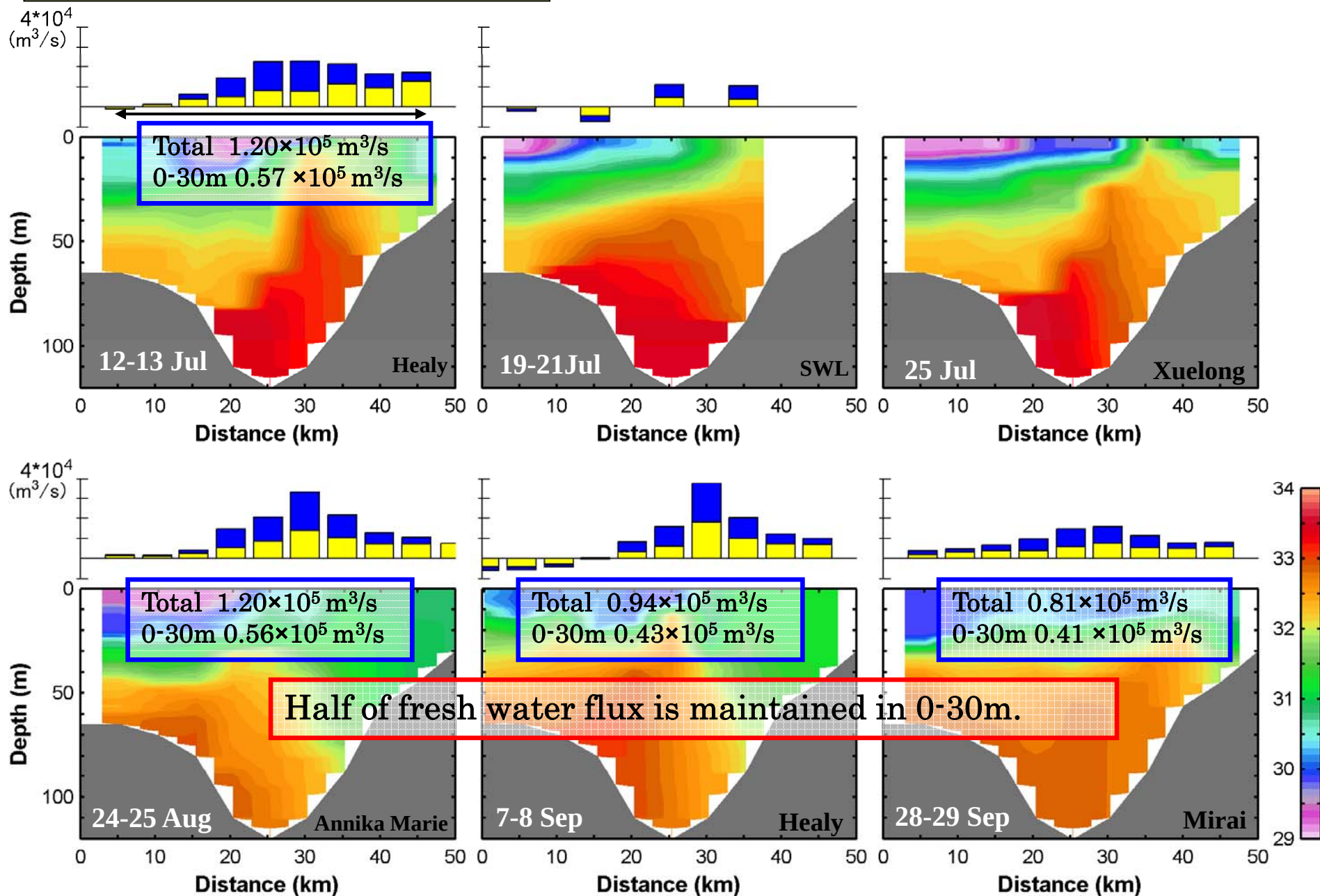
Mirai (Sep 24-30)



Fresh Water Flux

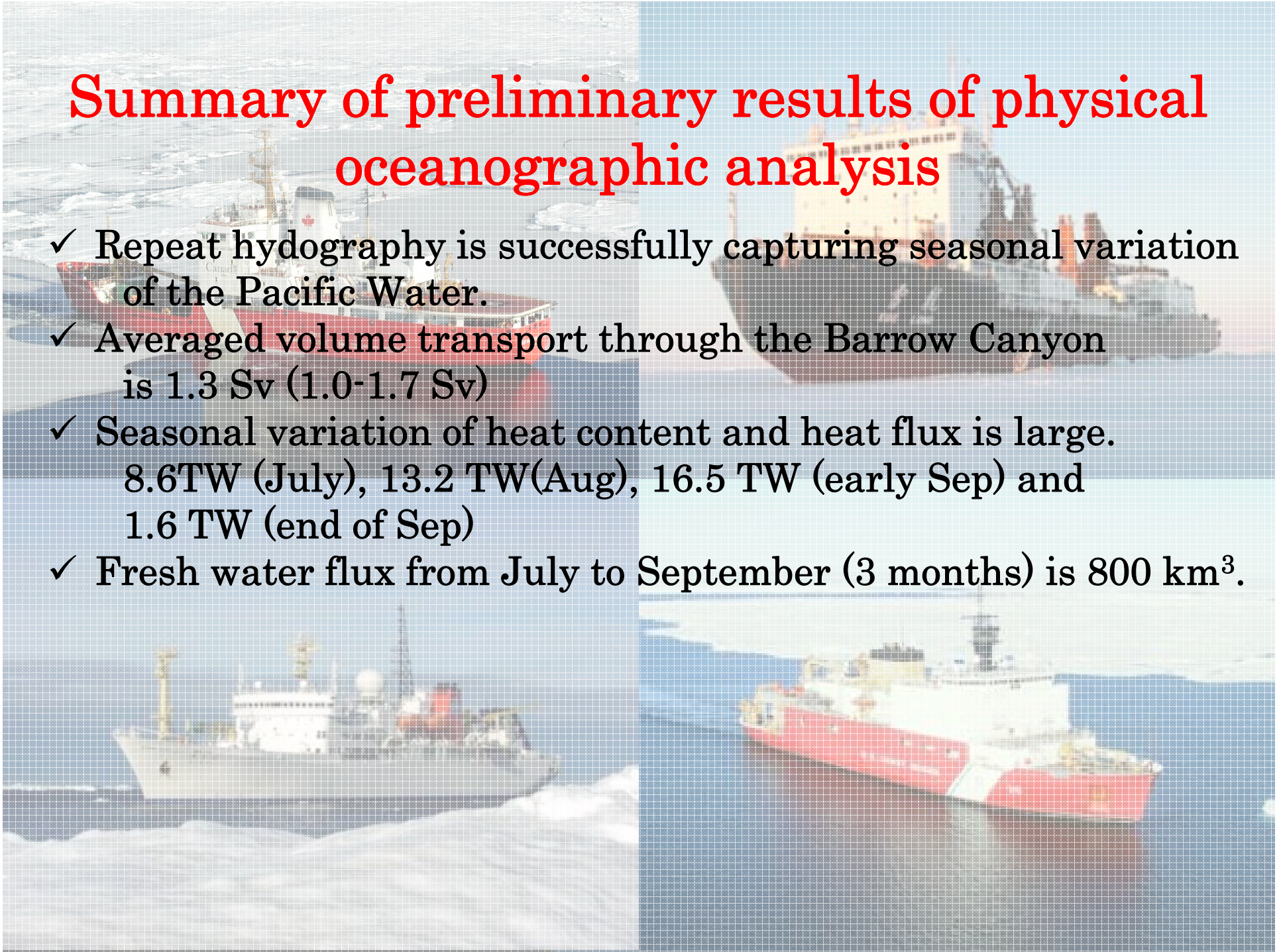


Fresh Water Flux



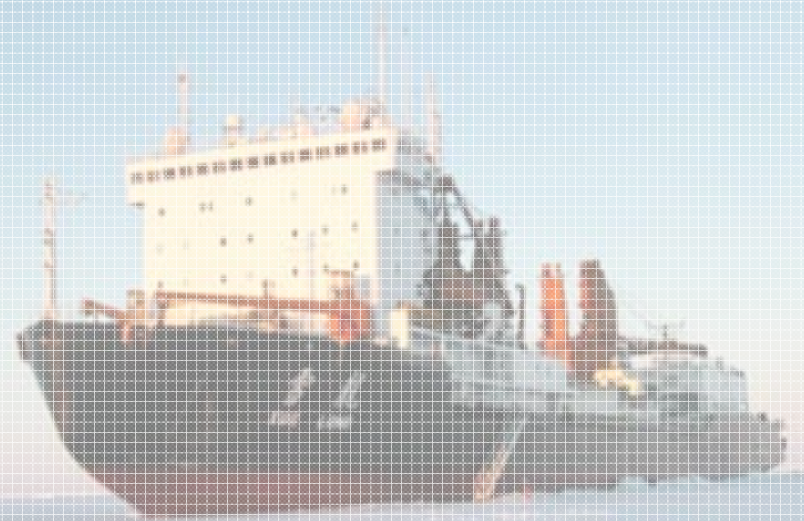
Summary of preliminary results of physical oceanographic analysis

- ✓ Repeat hydrography is successfully capturing seasonal variation of the Pacific Water.
- ✓ Averaged volume transport through the Barrow Canyon is 1.3 Sv (1.0-1.7 Sv)
- ✓ Seasonal variation of heat content and heat flux is large. 8.6TW (July), 13.2 TW(Aug), 16.5 TW (early Sep) and 1.6 TW (end of Sep)
- ✓ Fresh water flux from July to September (3 months) is 800 km³.



Repeat Hydrography

- ✓ High resolution
(vertically and horizontally)
- ✓ Information of 0-30m
- ✓ Seasonal variation
(summer, autumn)



Repeat Hydrography

The diagram features three colored ovals: a red oval for 'Repeat Hydrography' at the top left, a yellow oval for 'Mooring Station' at the top right, and a green oval for 'Satellite observation' at the bottom center. They are interconnected by teal double-headed arrows. The background is a collage of four images: top-left shows a red ship in icy water; top-right shows a large white ship; bottom-left shows a white ship in icy water; bottom-right shows a red and white ship. The entire diagram is overlaid on a grid pattern.

- ✓ High resolution
(vertically and horizontally)
- ✓ Information of 0-30m
- ✓ Seasonal variation
(summer, autumn)

Mooring Station

- ✓ Seasonal variation
(including winter)
- ✓ Long term monitoring

Satellite observation

- ✓ Overview of whole Chukchi Sea

