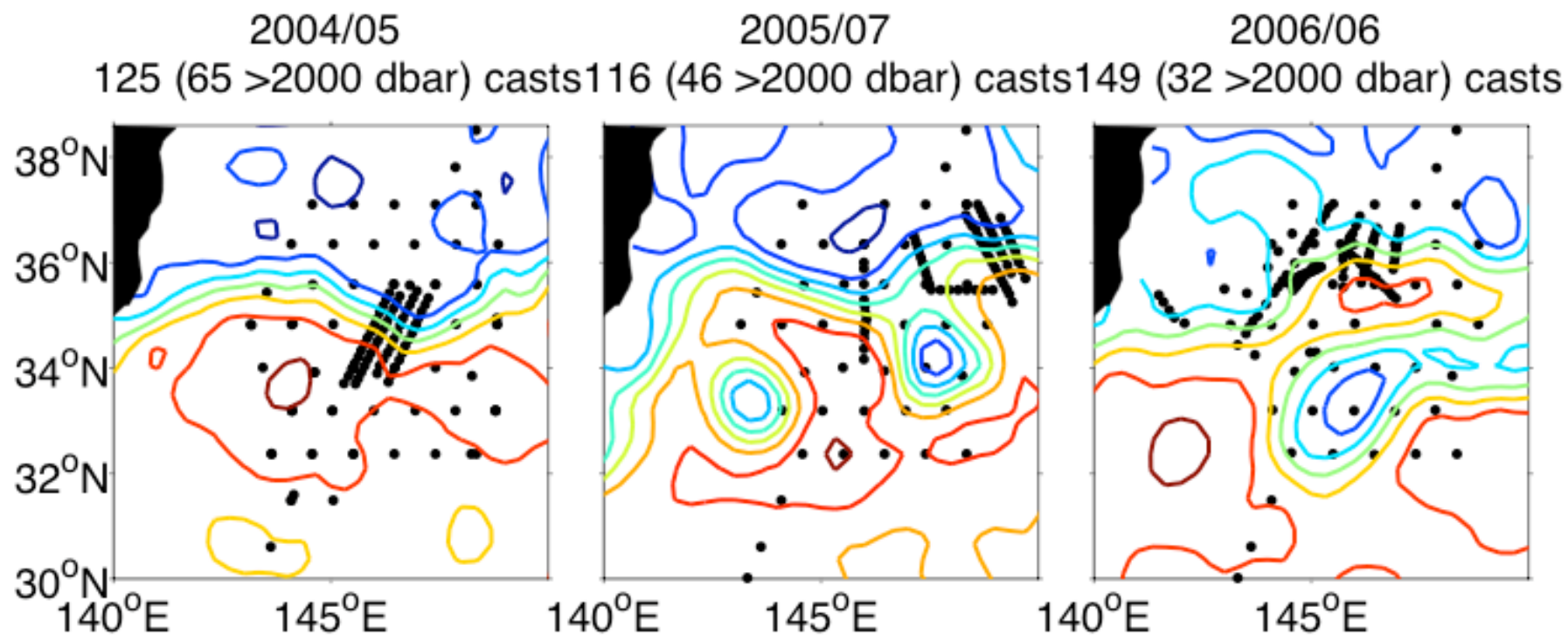


# KESS Hydrography and ADCP



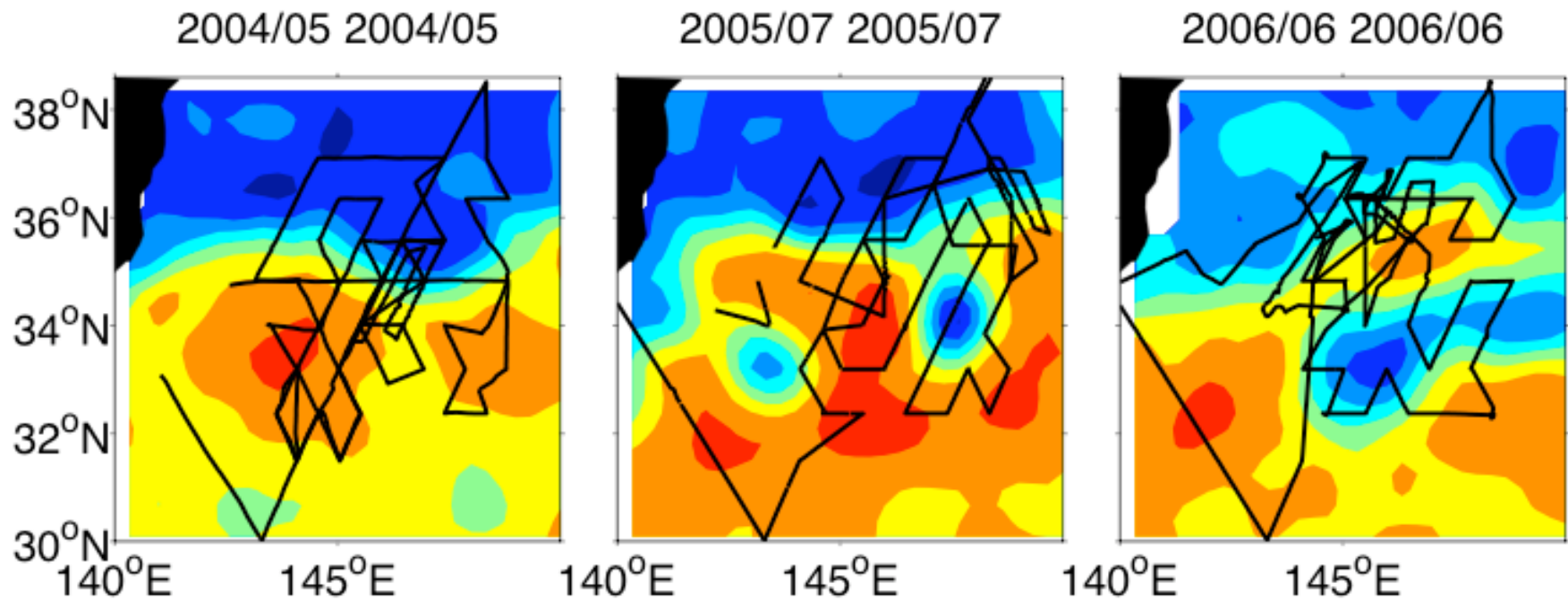
Special thanks to the ODF group Scott Hiller and Frank Delahoyde (CTD) and Jules Hummon (ADCP)

Highly resolved sections within broad-scale synoptic surveys provide excellent data sets to explore synoptic character of Kuroshio Extension.

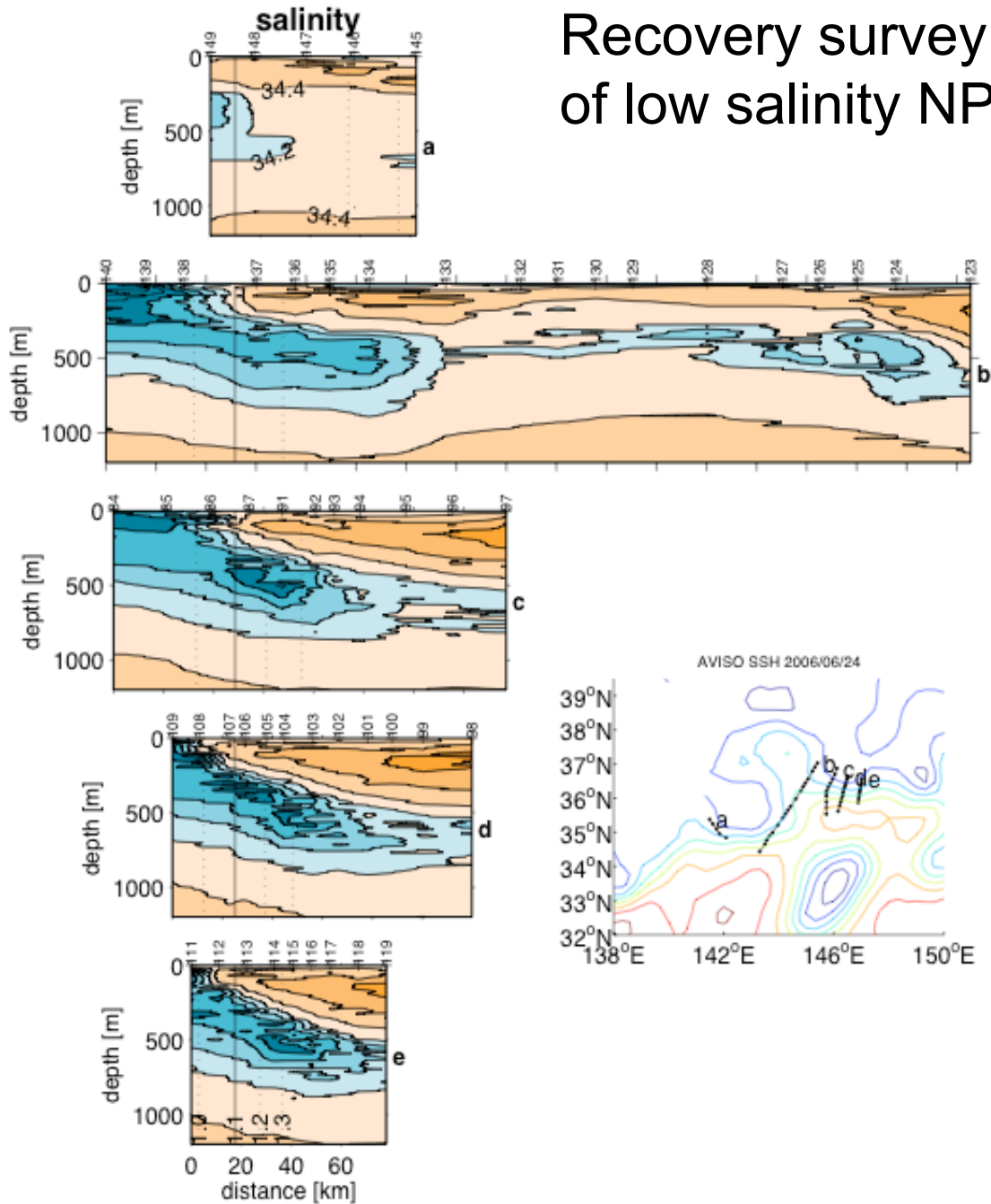


The altimeter products were produced by Ssalto/Duacs and distributed by Aviso, with support from Cnes

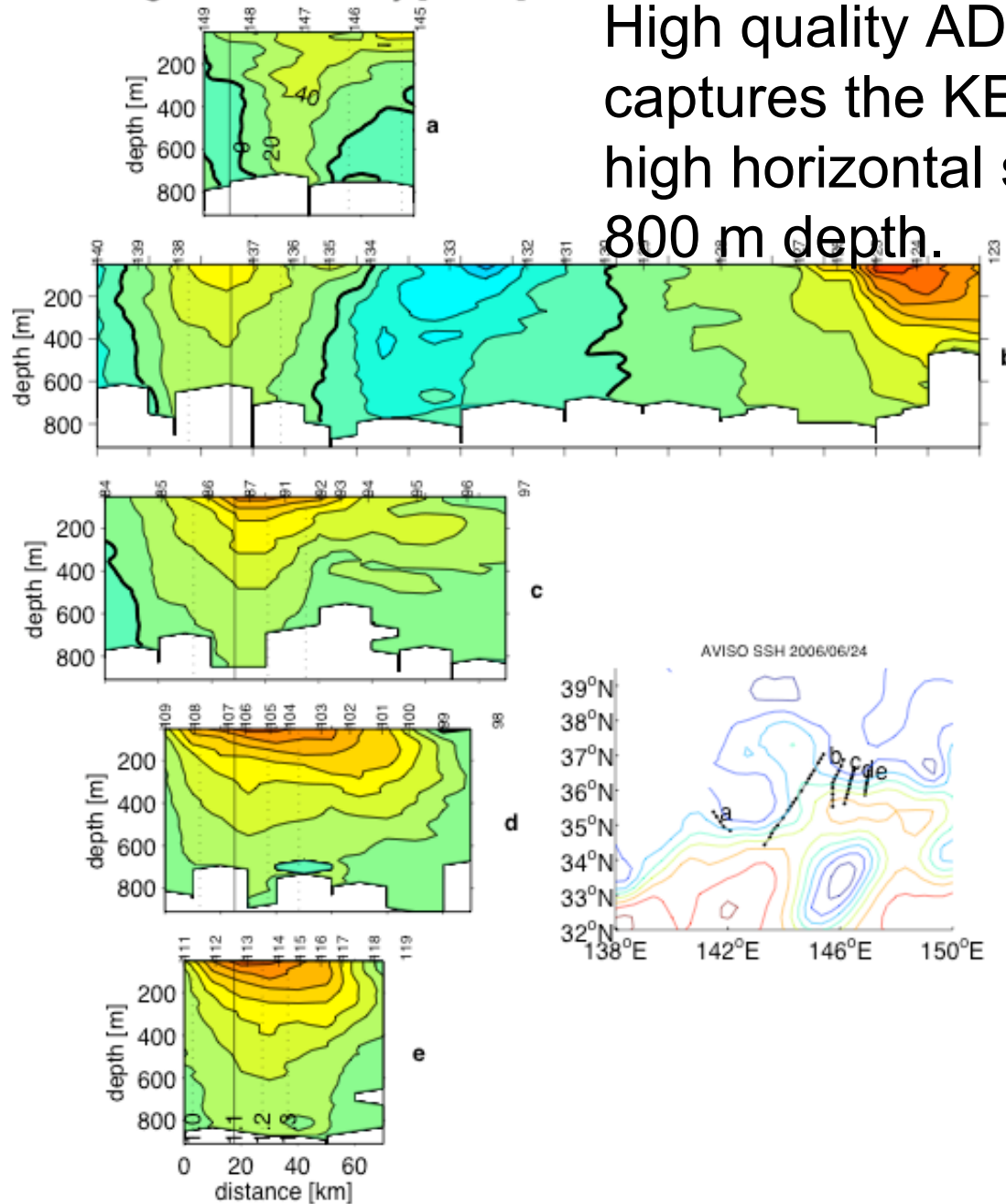
Continuous deep-reaching ADCP measurements sampled Kuroshio Extension in very different regimes.



Recovery survey shows entrainment of low salinity NPIW into the KE



along-stream velocity [ $\text{cm s}^{-1}$ ]



High quality ADCP data captures the KE structure at high horizontal scales to nearly 800 m depth.

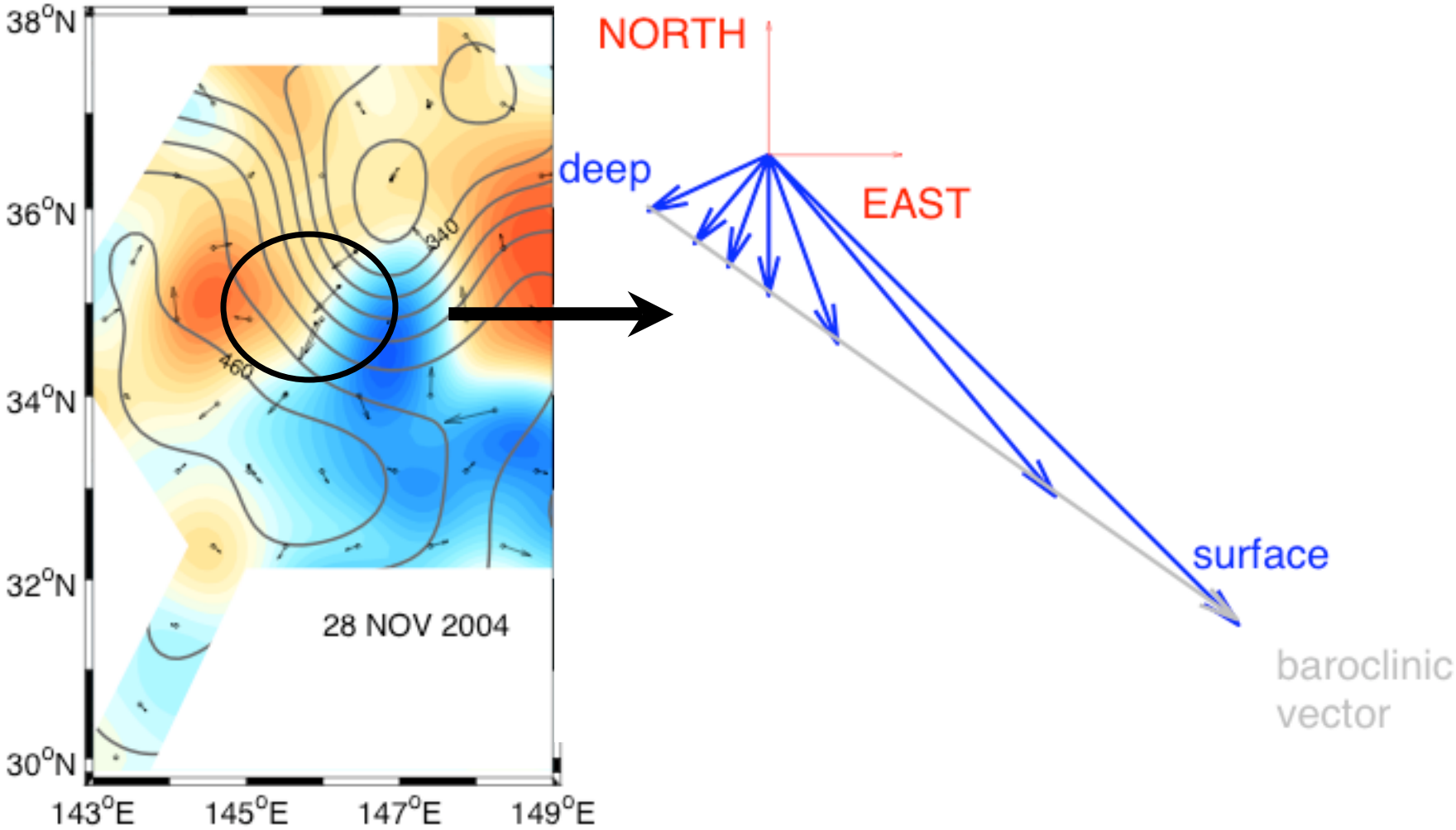
# Purpose of feature surveys

To provide case studies of cross-frontal exchange by sampling small-scale features not resolved by other KESS measurements.

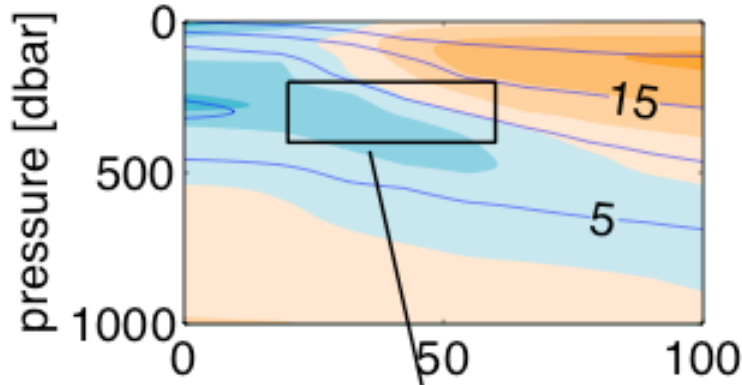
# Cross-frontal exchange

Facilitated by cross-frontal motion in steep meanders that form filaments and double-diffusively driven intrusions.

Strong barotropic currents cross the baroclinic front.

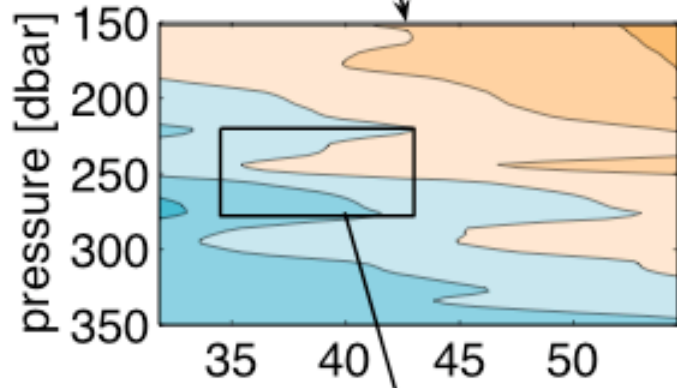


Kuroshio Extension front  
temperature (lines) salinity (filled contours) July 2005

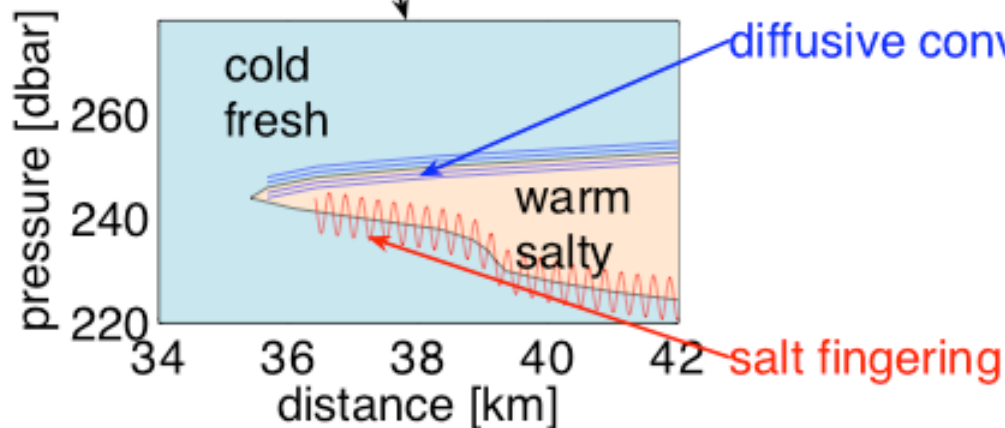


Intrusions are the vertical layering common to ocean fronts.

Intrusions are linked to lateral fluxes of heat and salt via double diffusive mixing.

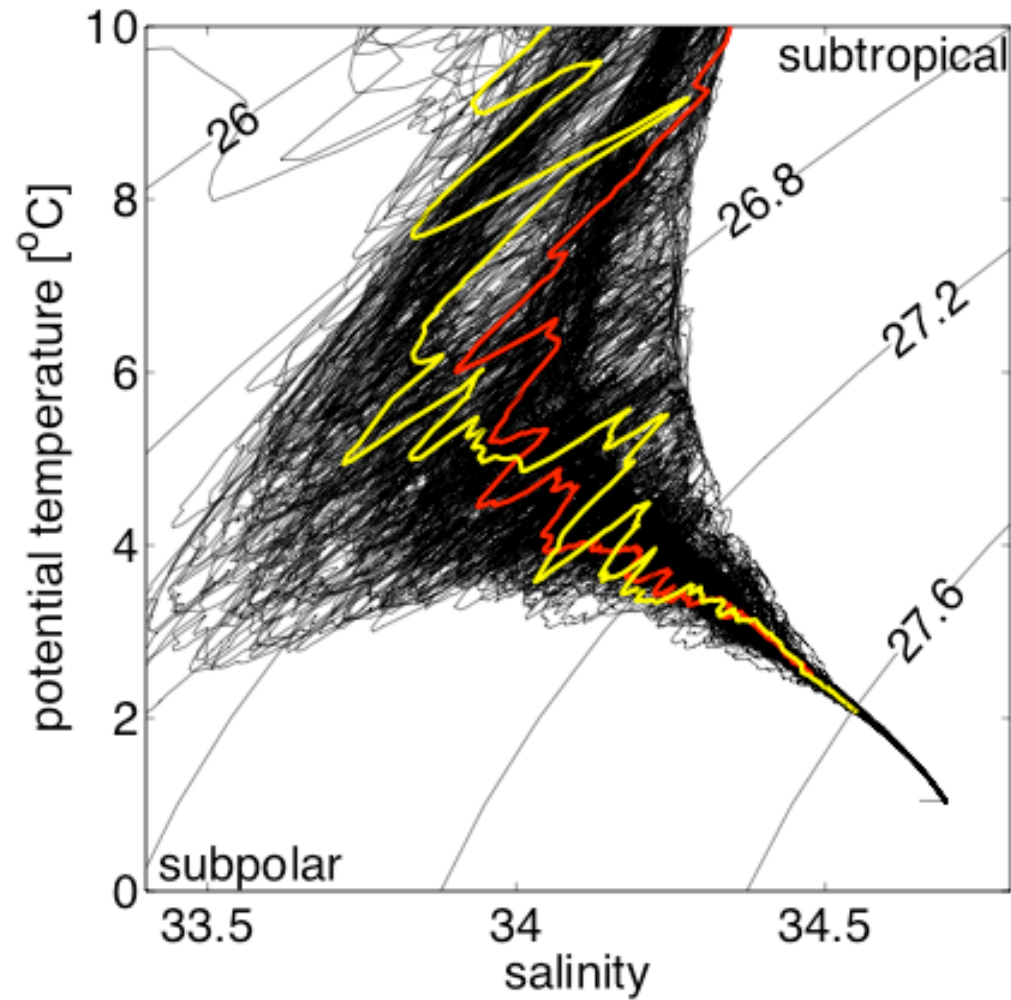


Intrusions can be self-driven but any cross-frontal sheared advection in the presence of a horizontal T/S gradient creates interleaving.



After Joyce 1977

Kuroshio Extension has extensive interleaving.



Double diffusion important for NPIW interleaving in the Kuroshio Extension.

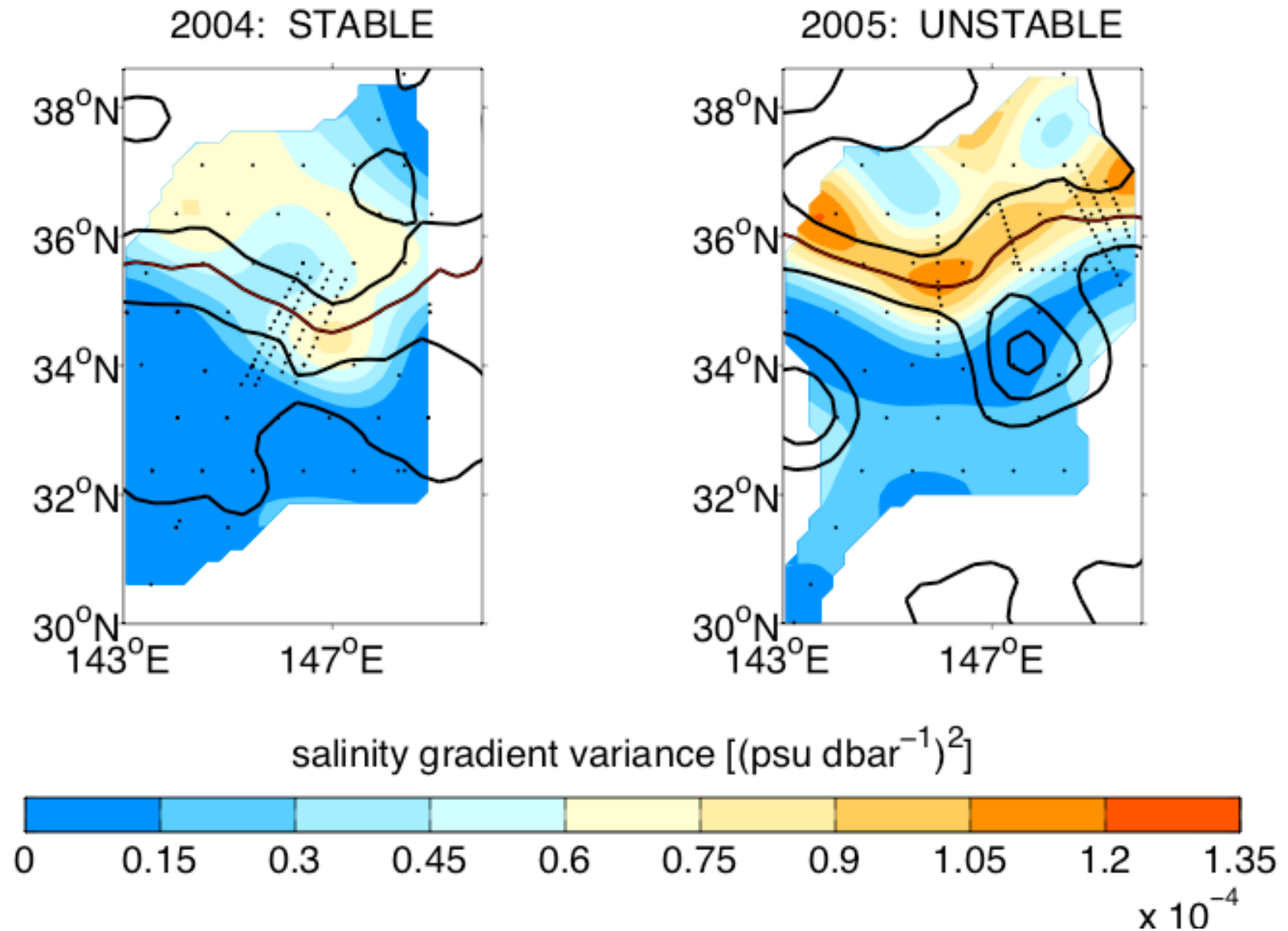
Intrusive intensity and intrusive cross-frontal fluxes are related to mesoscale circulation.

## Joyce 1977 model

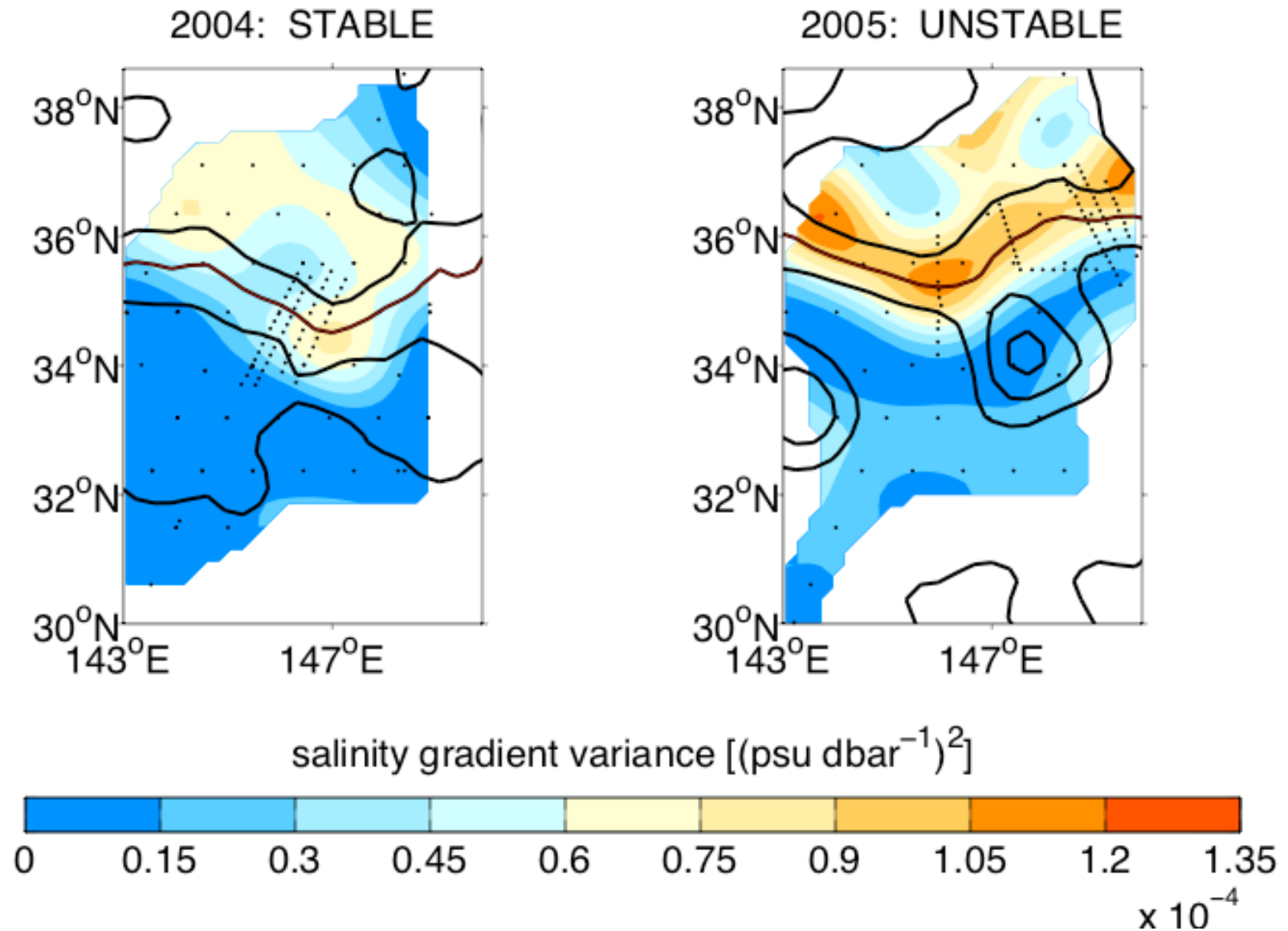
T anomalies created by cross-frontal advection are balanced by diapycnal mixing.

$$u'T' \frac{\partial \bar{T}}{\partial X} = K_T \left( \frac{\partial T'}{\partial Z} \right)^2$$

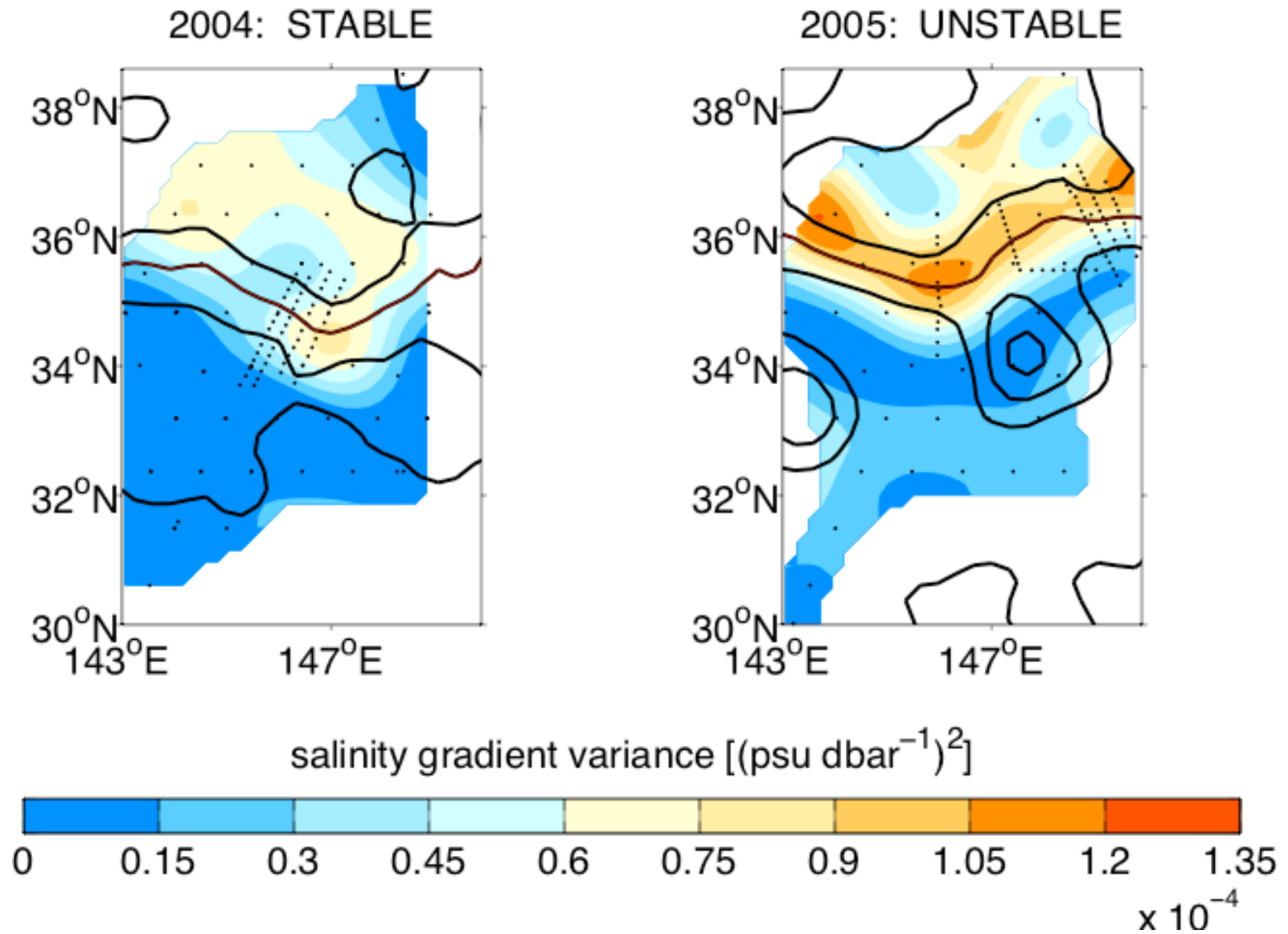
Striking difference in magnitude and distribution between the two surveys.



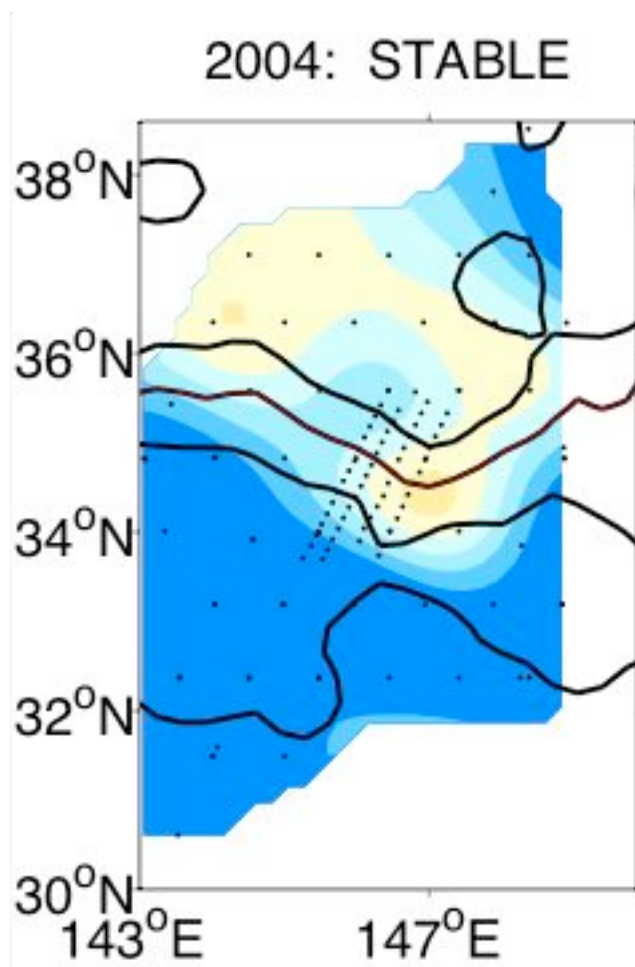
Magnitude of cross-frontal fluxes for unstable period is double that of the stable period.



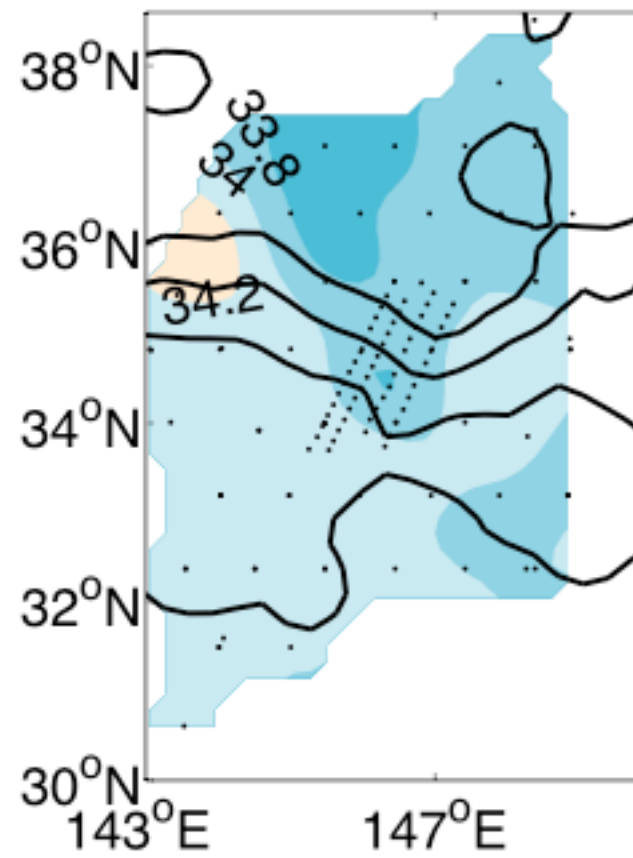
# 2004 variance maxima in the core of the Kuroshio Extension



2004 maxima coincides with a cross-frontal flux of low salinity water

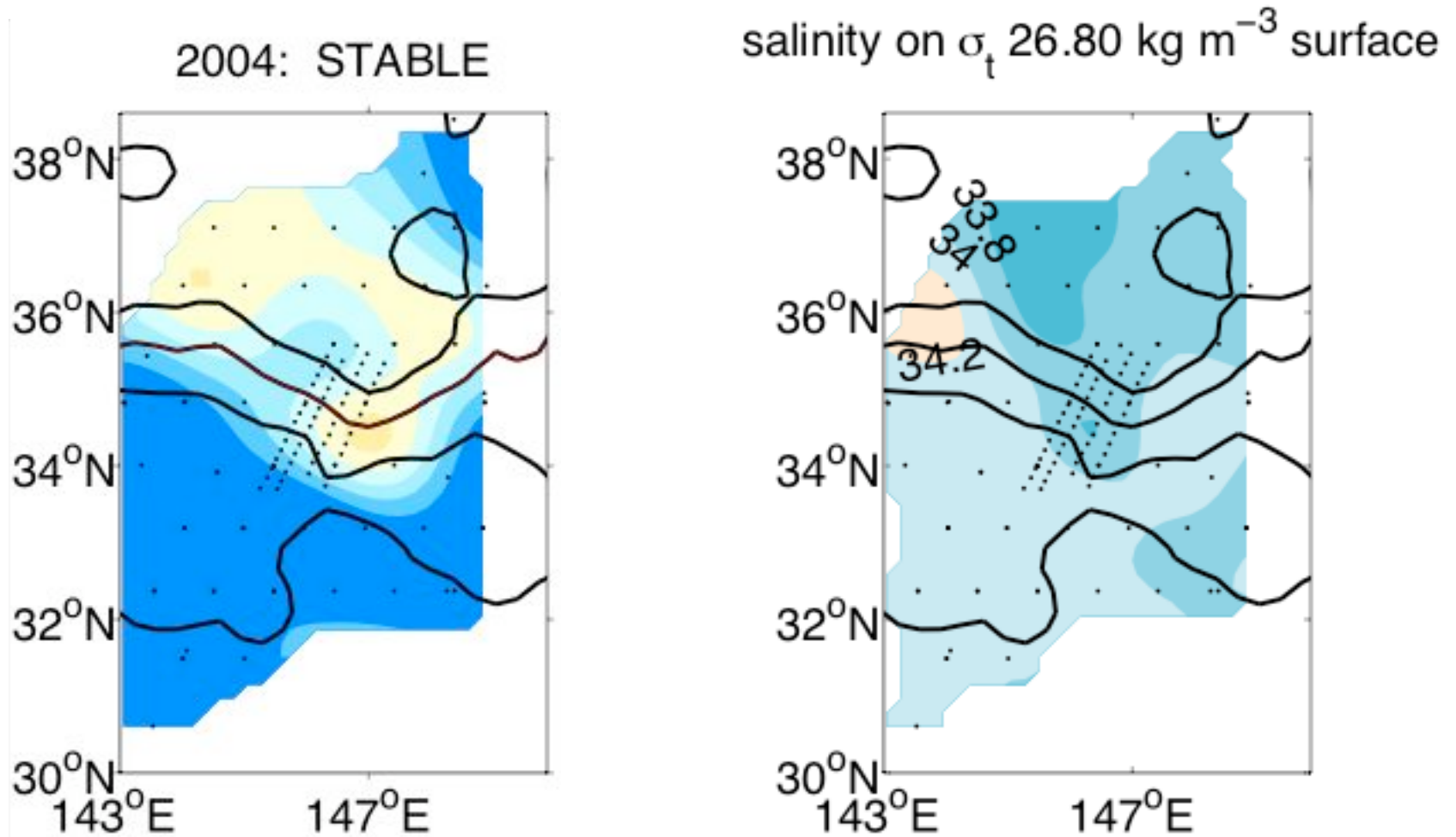


salinity on  $\sigma_t 26.80 \text{ kg m}^{-3}$  surface

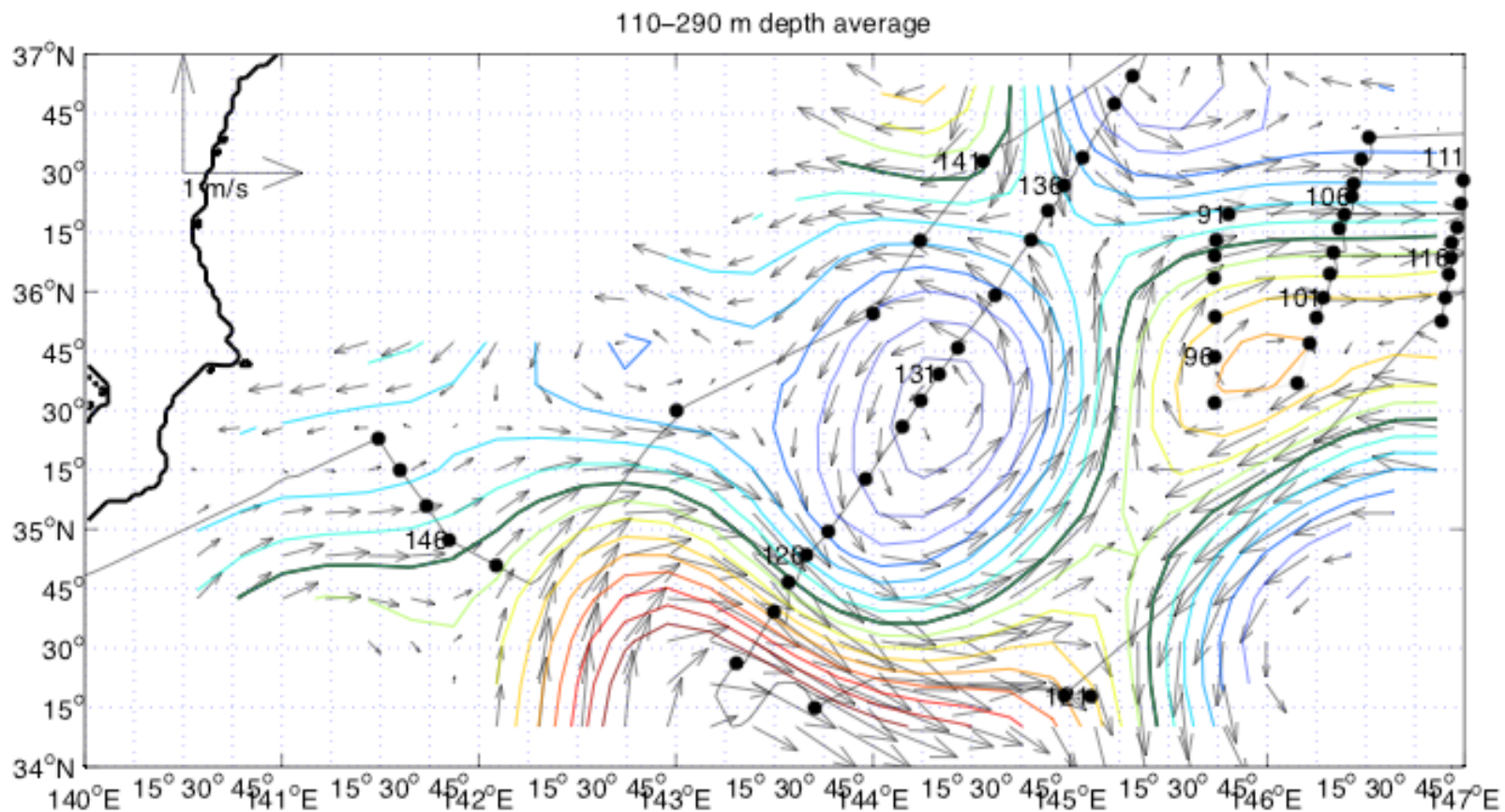


Analysis of ADCP data indicates downwelling into the meander trough.

KESS CPIES array indicates that this cross-frontal flow persists throughout the stable period.



Large-scale surveys reference with ADCP will yield synoptic picture of cross-frontal exchange.



## What are we thinking about?

- Calculate the geostrophic and ageostrophic property fluxes with the direct velocity and hydrography from feature surveys and large-scale synoptic survey
- Diagnose intrusions in context of mesoscale circulation
- Determine the mean stream-coordinate structure of the KE (cross and along stream velocities, T, S, PV).

## What did we sample?

- Trough during a stable period (2004)
- Crest during ring formation (2005)
- Trough in unstable field (2006)