

Shallow and Deep Current Variability in the Kuroshio Extension

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Mid-experiment cruise during June-July 2005

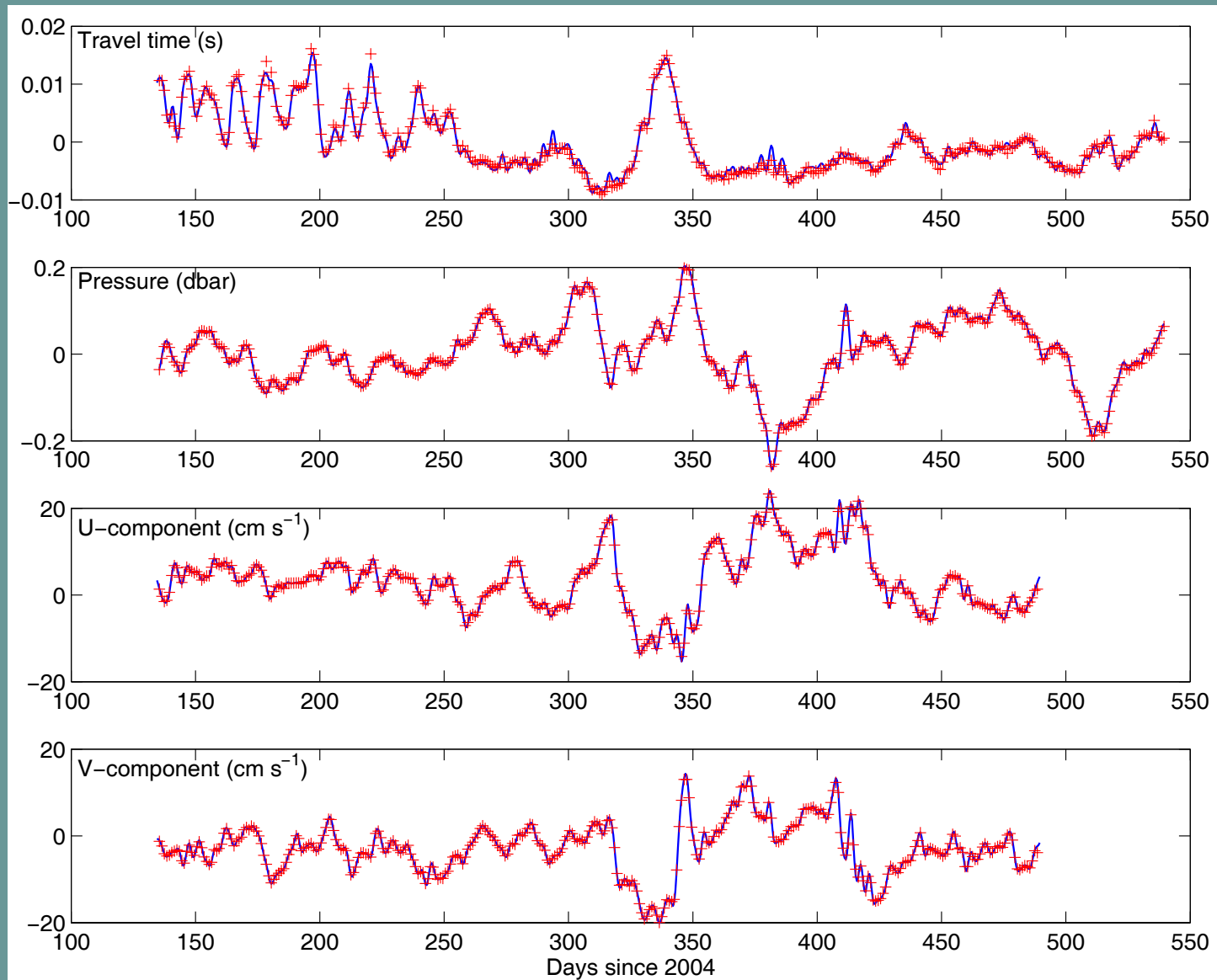


One year of daily measurements of travel time, pressure, and current were telemetered from the CPIES to the ship.

The CPIES remained on the sea floor for recovery in 2006.

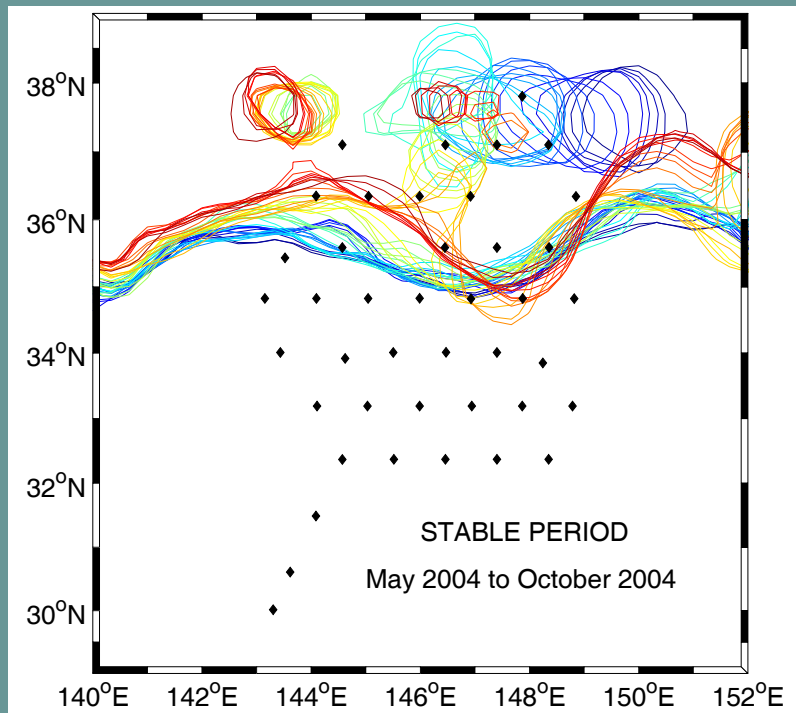


Comparison of Telemetered and Recovered Data

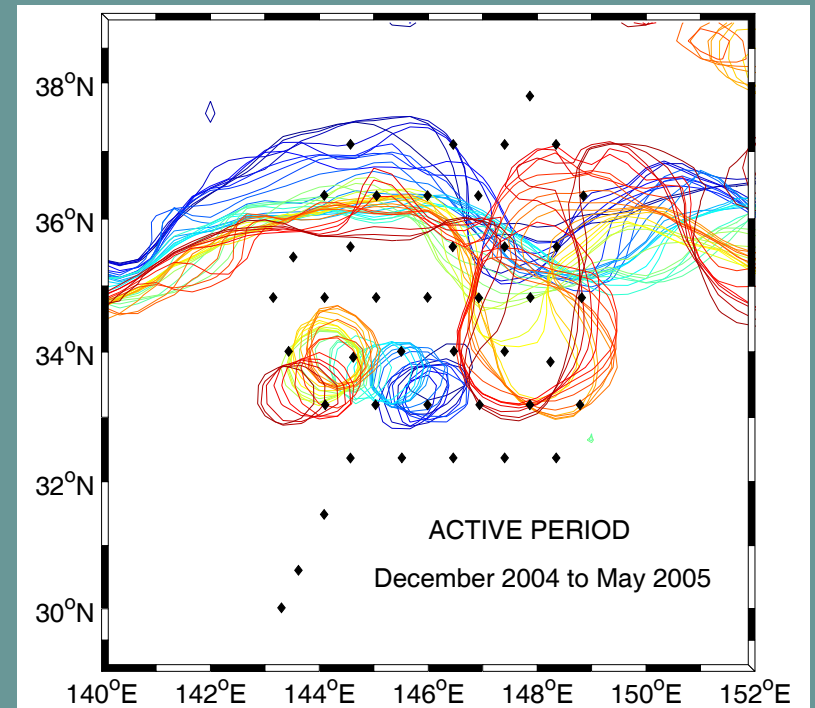


KE alternates between relatively stable and vigorous meandering intervals on decadal time scales

Transition between these two states occurred in Fall 2004



Two nearly stationary meanders and a westward-propagating warm core ring

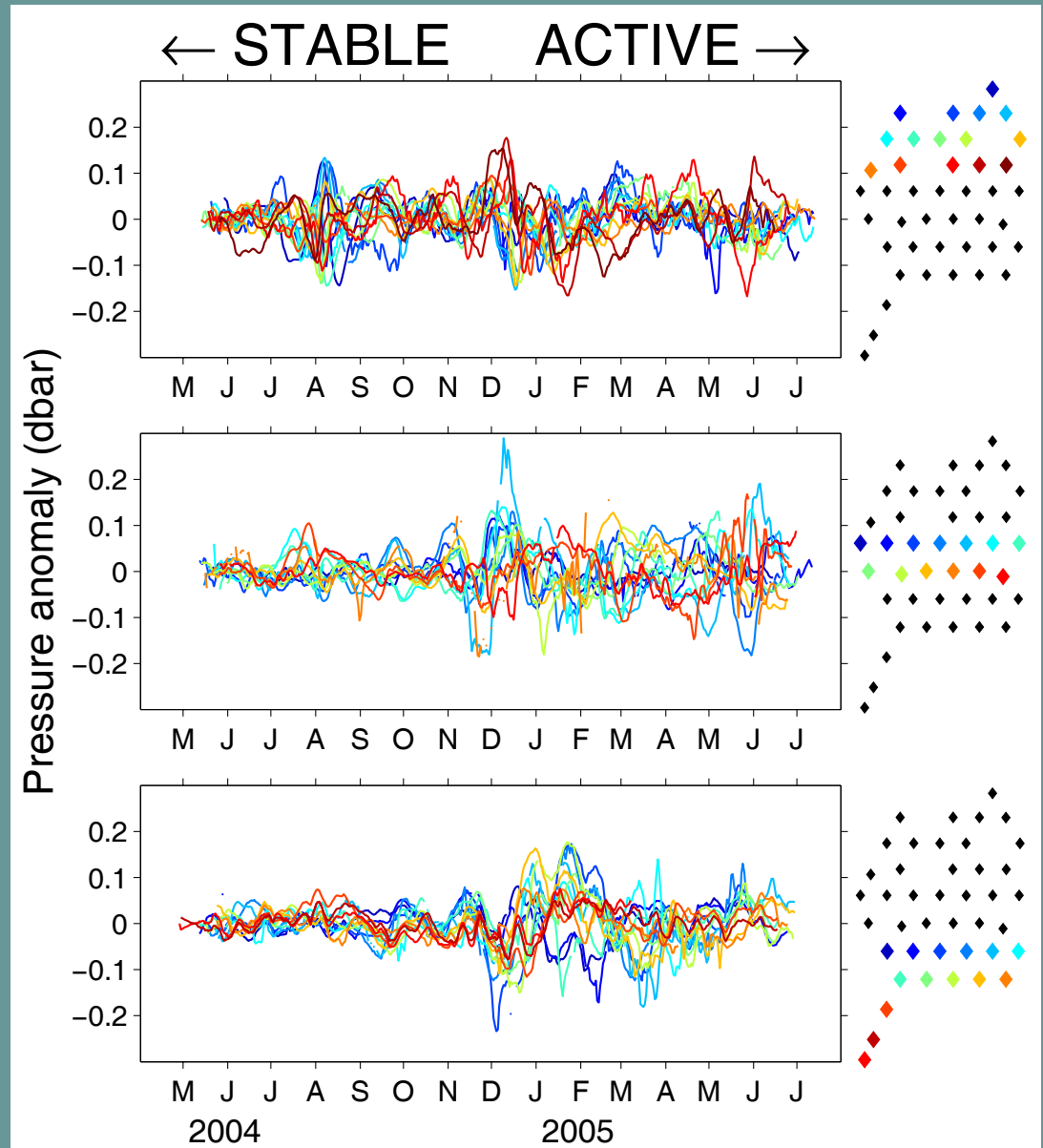


A steep trough develops and a cold core ring forms.

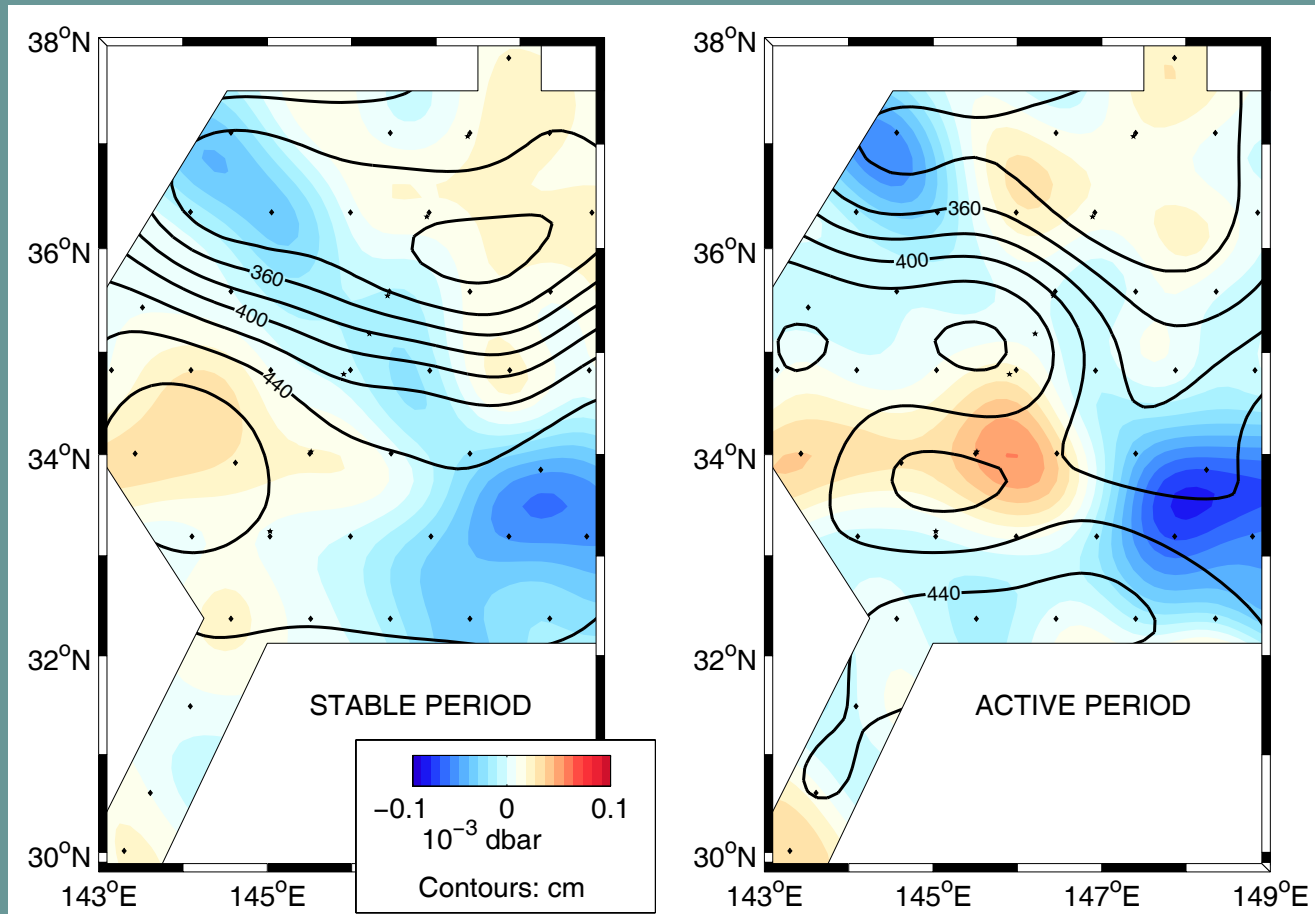
Activity in the Deep Level Also Changed

Bottom pressure fluctuations remain relatively constant across the northern part of the array

But they transitioned from weak fluctuations to strong fluctuations in the middle and southern regions



UPPER AND DEEP MEAN STREAMFUNCTIONS



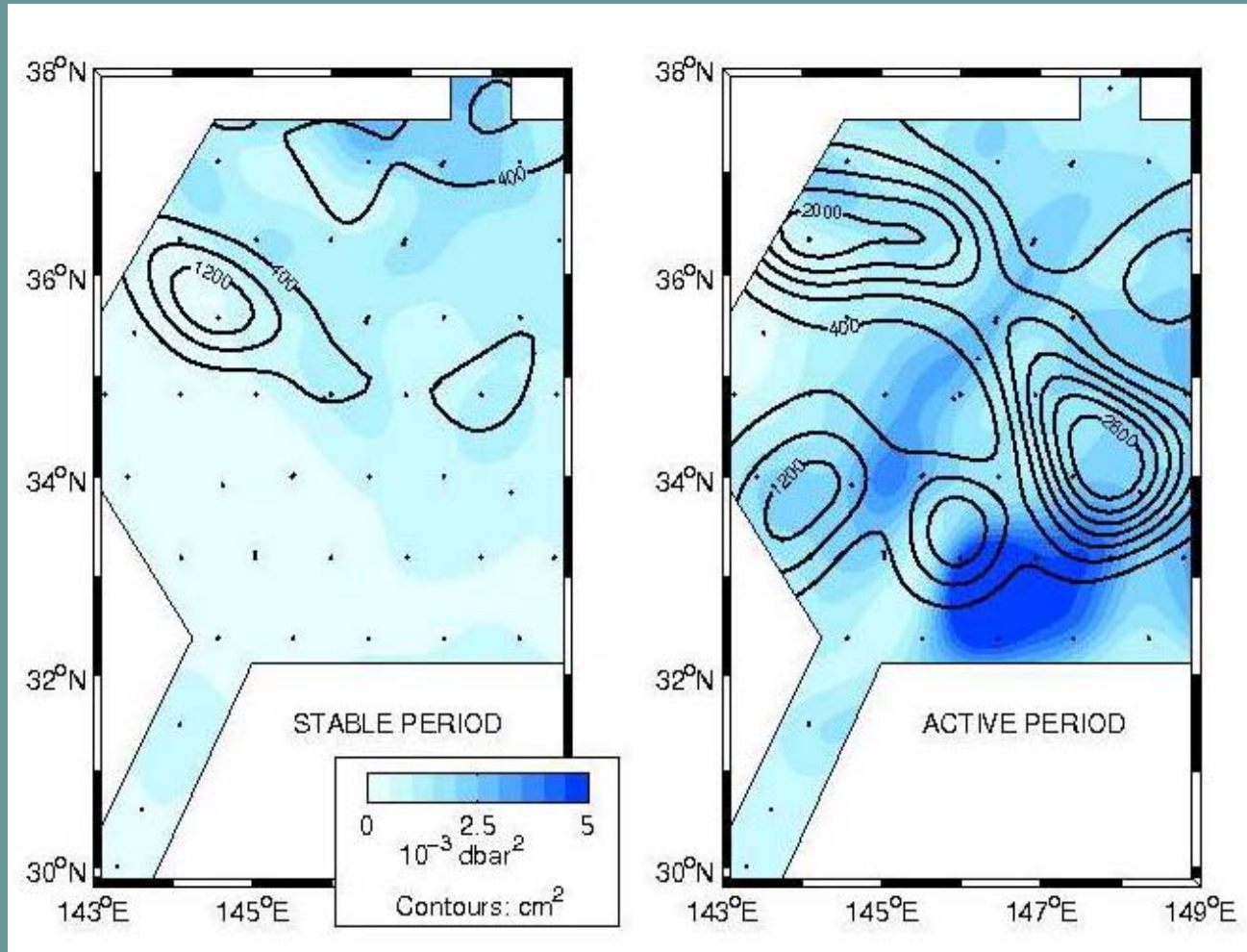
Weak meander trough in well-defined mean KE front.

Anticyclonic circulation under the southern recirculation gyre.

Weaker lateral gradients across the mean front. Both a meander trough and CCR are evident.

Deep features are intensified during active period.

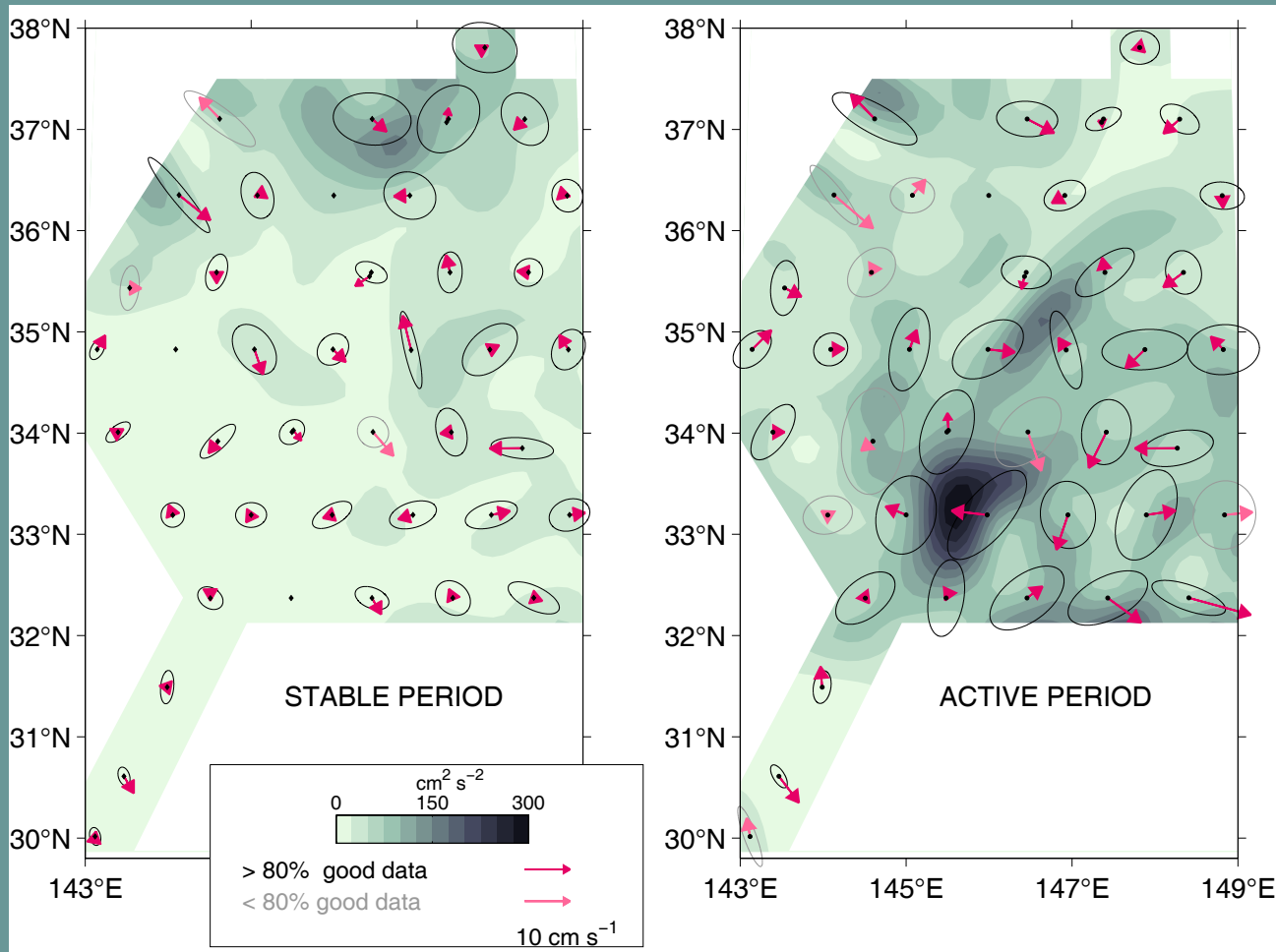
UPPER AND DEEP STREAMFUNCTION VARIANCE



High variance restricted to the KE frontal region and under the WCR.

Higher variance everywhere, but largest under the upper layer trough and CCR.

MEAN DEEP CURRENTS, ELLIPSES AND EKE



Weak variability in deep currents, largest in the north beneath the WCR.

Large variability more than twice that of the STABLE period.

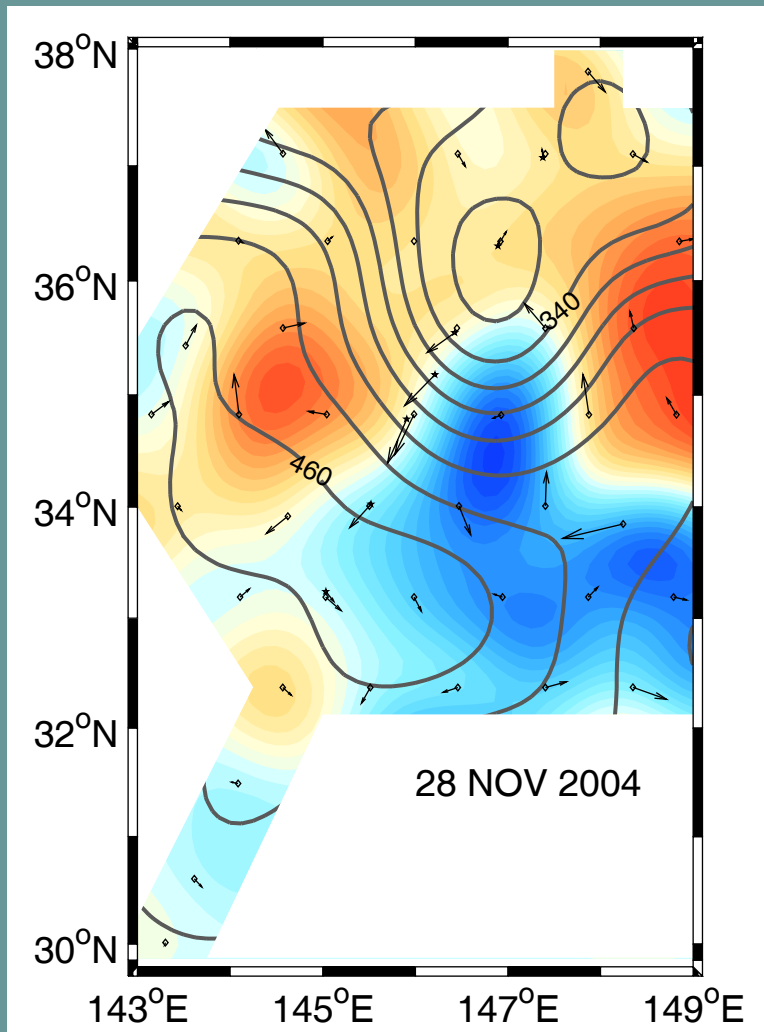
JET INTERACTION WITH DEEP EDDIES

Meander trough steepens during December 2004 and pinches off a cold core ring.

Deep cyclones (C) and anti-cyclones (AC) move from northeast to southwest.

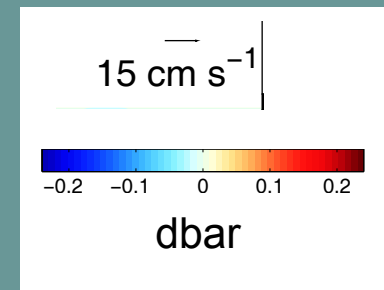
Upper and deep layers interact and jointly intensify.

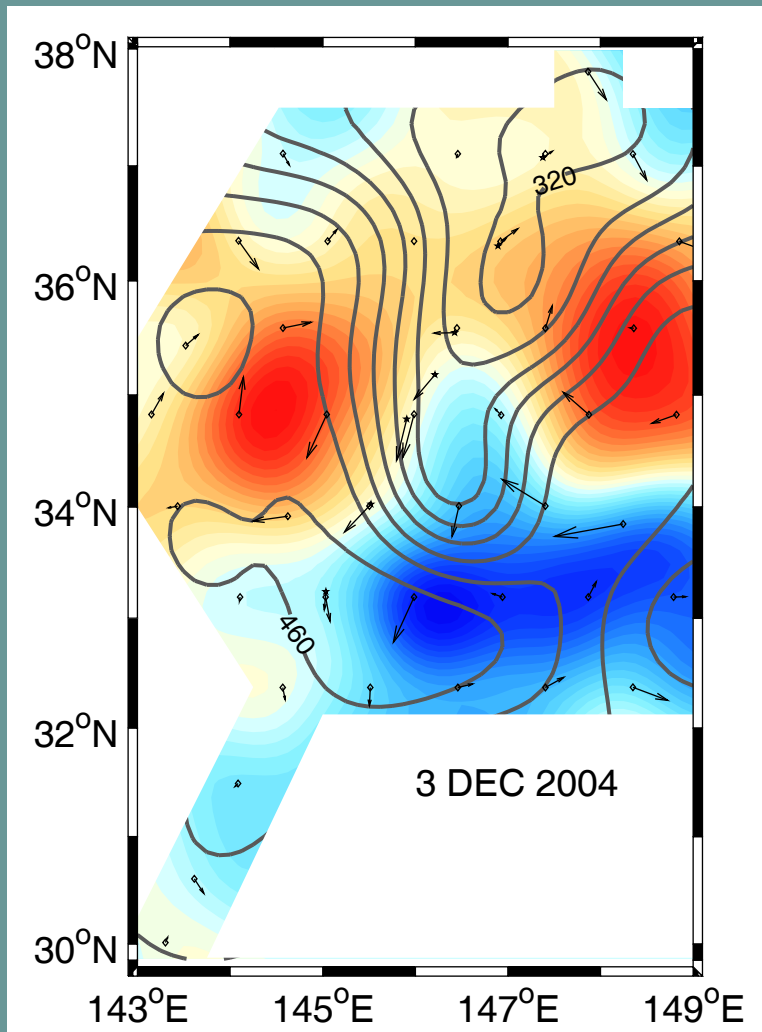
Deep eddies play an important role in the pinch-off process.



Pair of deep ACs (red) under meander crests; deep C (blue) under trough.

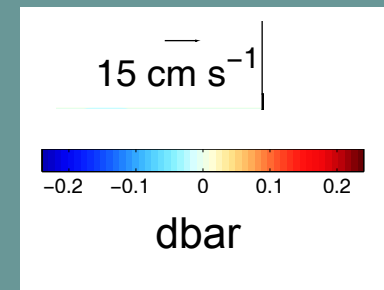
Strong deep barotropic currents near trough cross the baroclinic front.

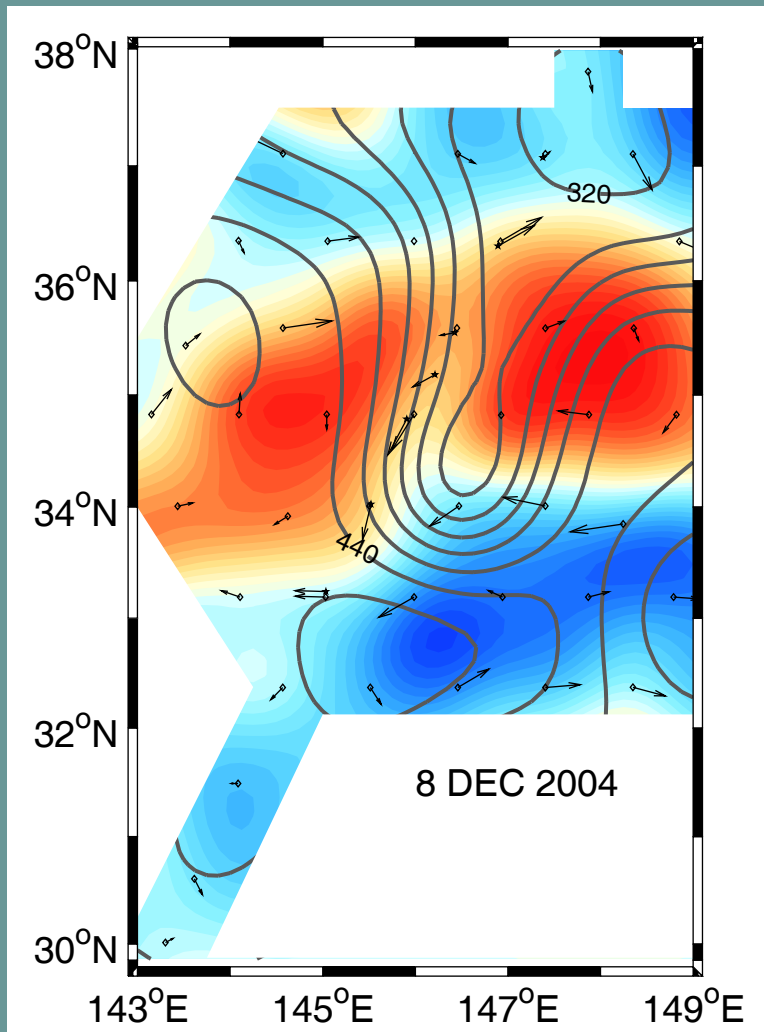




Upper trough steepens. Deep pressure cells intensify and translate to the south and west.

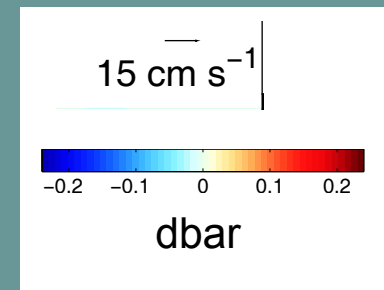
Deep currents tend to constrict the neck of the trough.

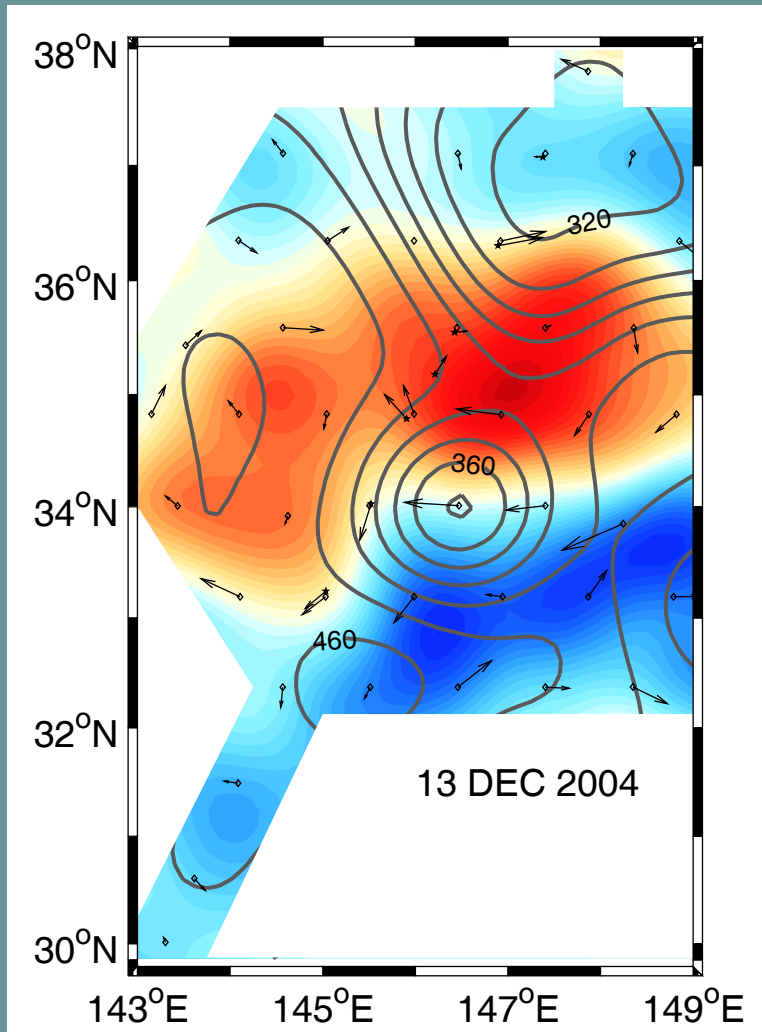




Trough steepens further; its axis rotates to NE/SW.

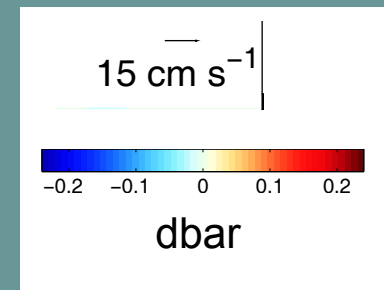
Deep pressure cell moves westward and strong cross-frontal exchange occurs along neck.

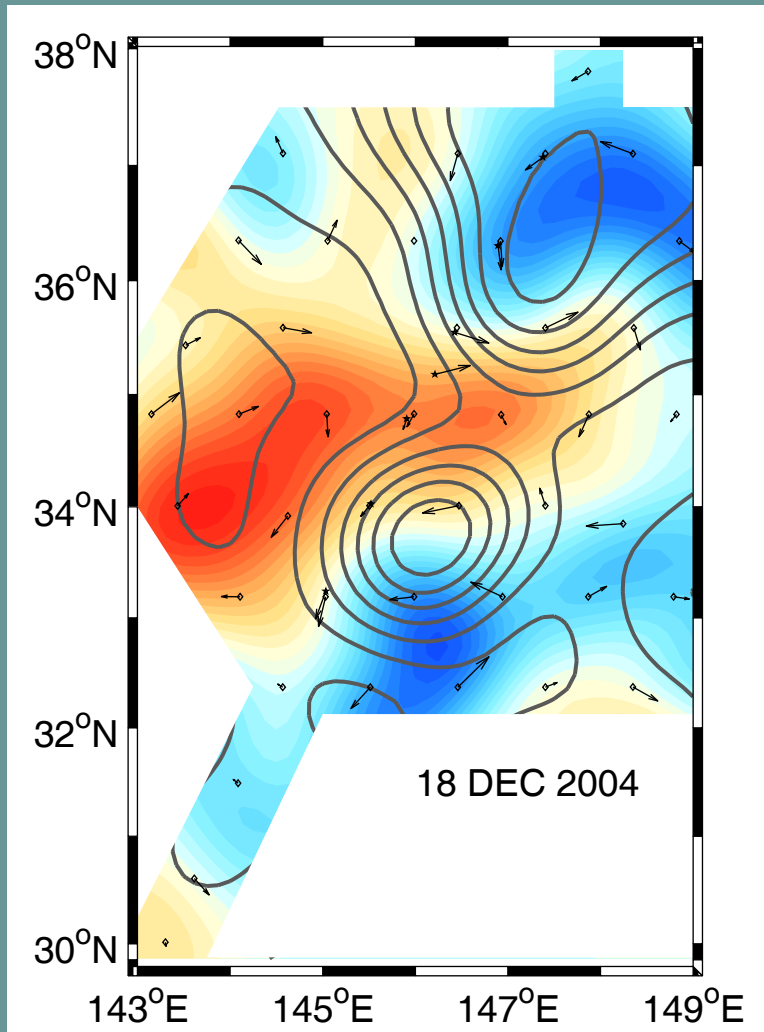




Strong deep AC centered under neck – strengthens from stretching.

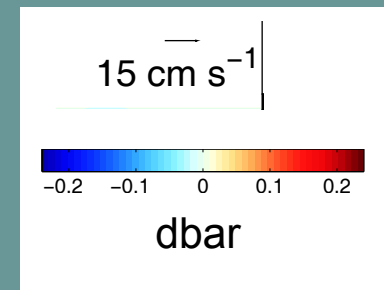
Barotropic currents (20-30 cm/s) assist upper pinch-off. Deep currents under the ring are not aligned with the upper flow.

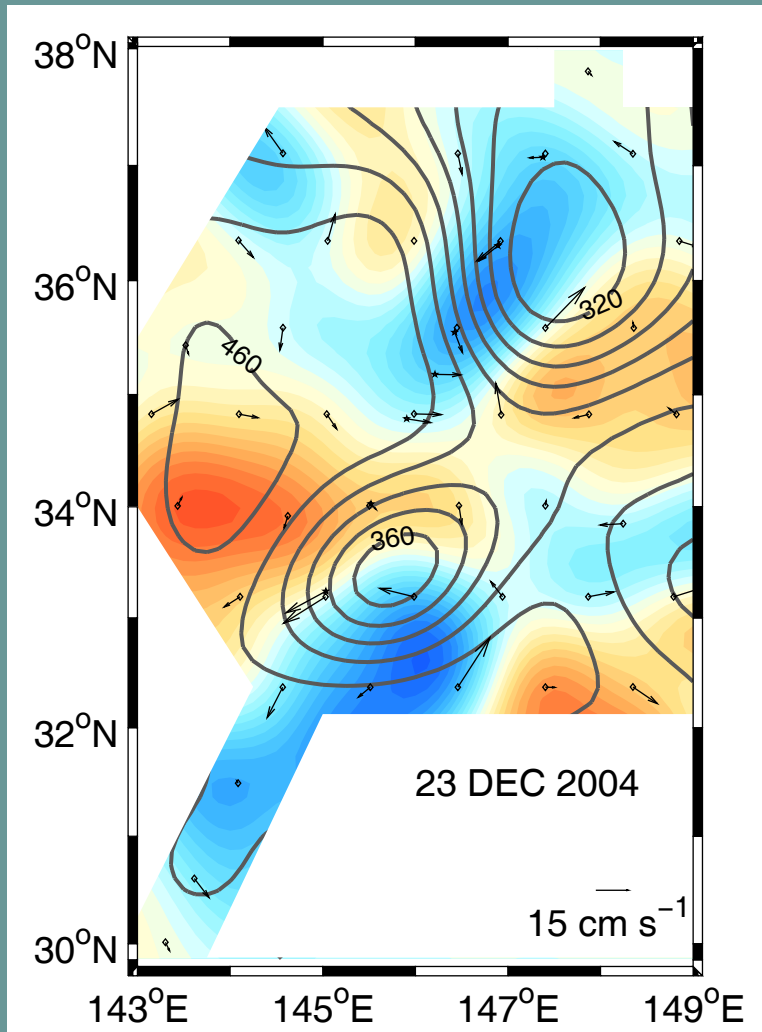




CCR pinch-off is nearly complete.

Deep currents under KE trough are nearly aligned with upper front.





Complex, but weaker deep eddy features continue to translate WSW;

Deep currents (10-25 cm/s) are not aligned with any upper features.

