

Environmental effects on forage and longline fishery performance for albacore tuna in the American Samoa EEZ

Réka Domokos

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Ecosystems and Oceanography Division
Pacific Islands Fisheries Science Center,
National Marine Fisheries Service, NOAA



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Background

- **Motivation**
 - exponential growth of fishery targeting albacore
 - Seasonal and interannual variability in albacore CPUE
- **Previous results* suggest**
 - seasonally and interannually varying South Equatorial Counter Current (SECC) has significant effects on fishery performance for albacore
 - distribution of albacore forage (micronekton) plays an important role

*Domokos et al., 2007



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Objectives

- Investigate the characteristics of the SECC
- Investigate the effects of the SECC in the American Samoa EEZ on
 - the environment
 - Micronekton (albacore forage) composition, distribution, and biomass
 - albacore CPUE



NOAA Ship Oscar Elton Sette

In situ data

- **Micronekton:**
 - Simrad EK60 (38 & 120 kHz) acoustic system
 - midwater trawl samples
- **Environment:**
 - ADCP (75 kHz)
 - CTD (T, S, DO, Chl)

Satellite data

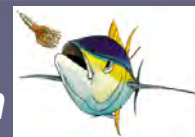
- AVISO altimetry (SLA & $\bar{u}_g$)
- SeaWiFS ocean color (Chl-a)

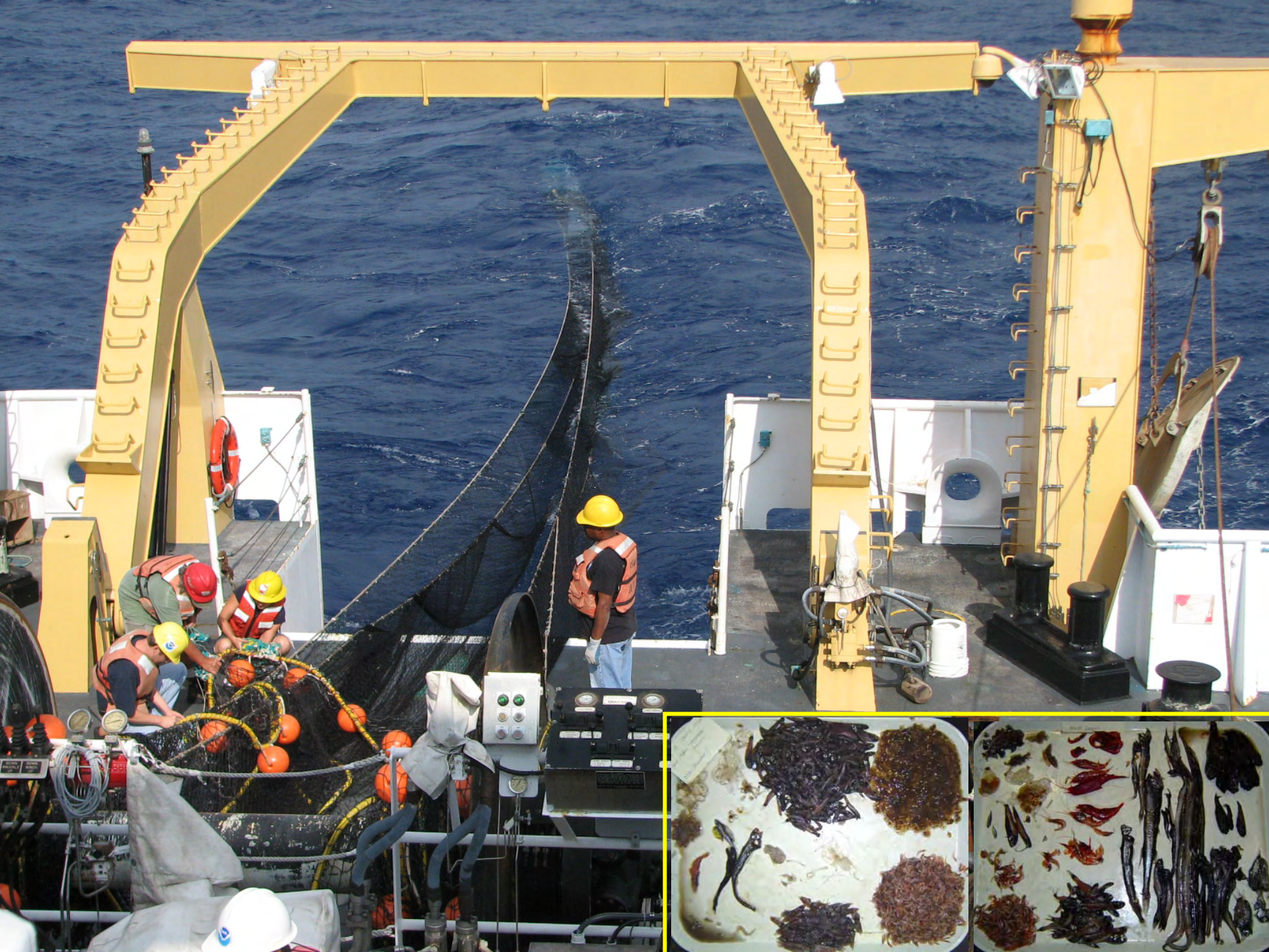




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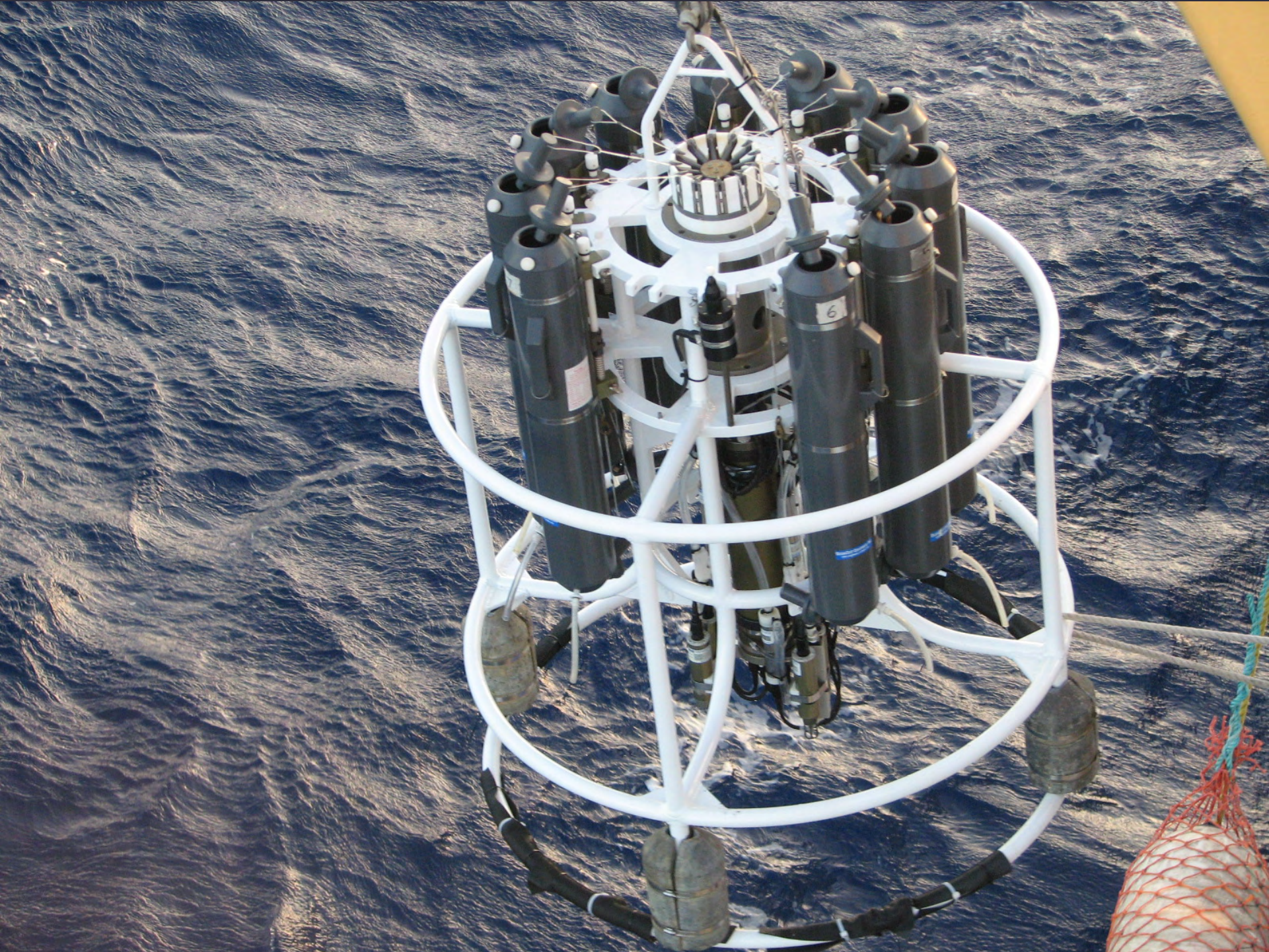




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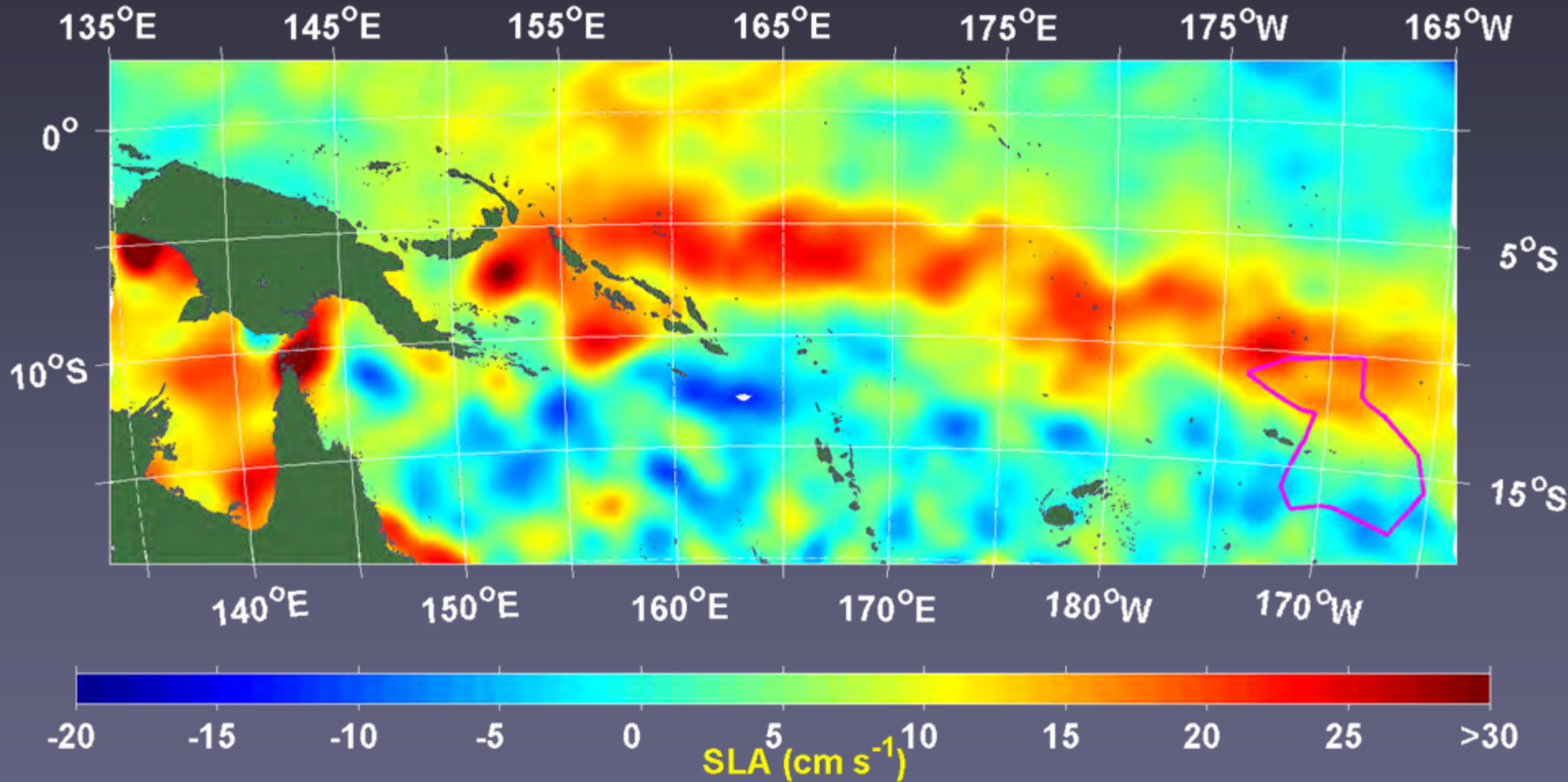
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2007 Apr



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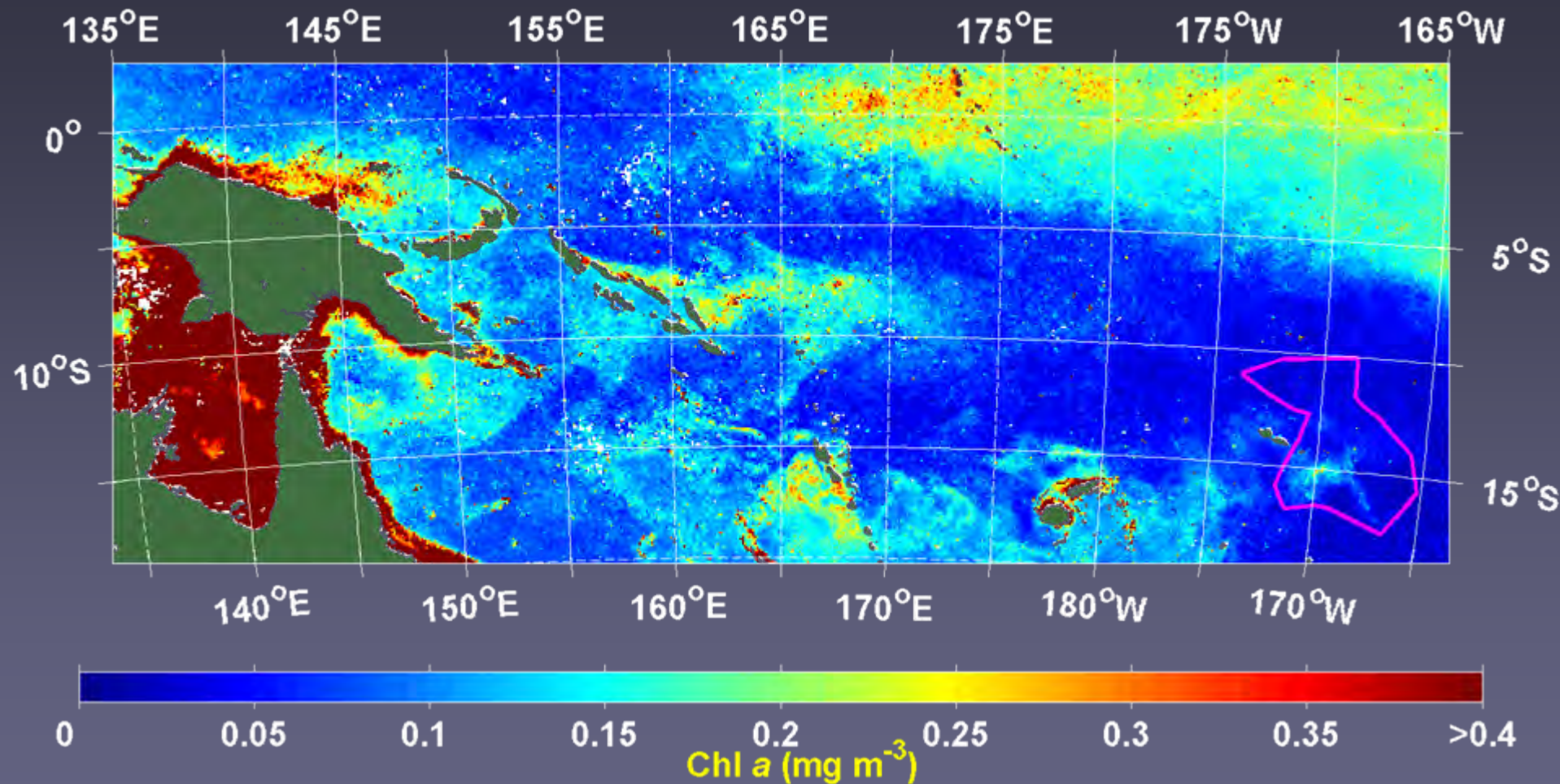
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2007 Apr

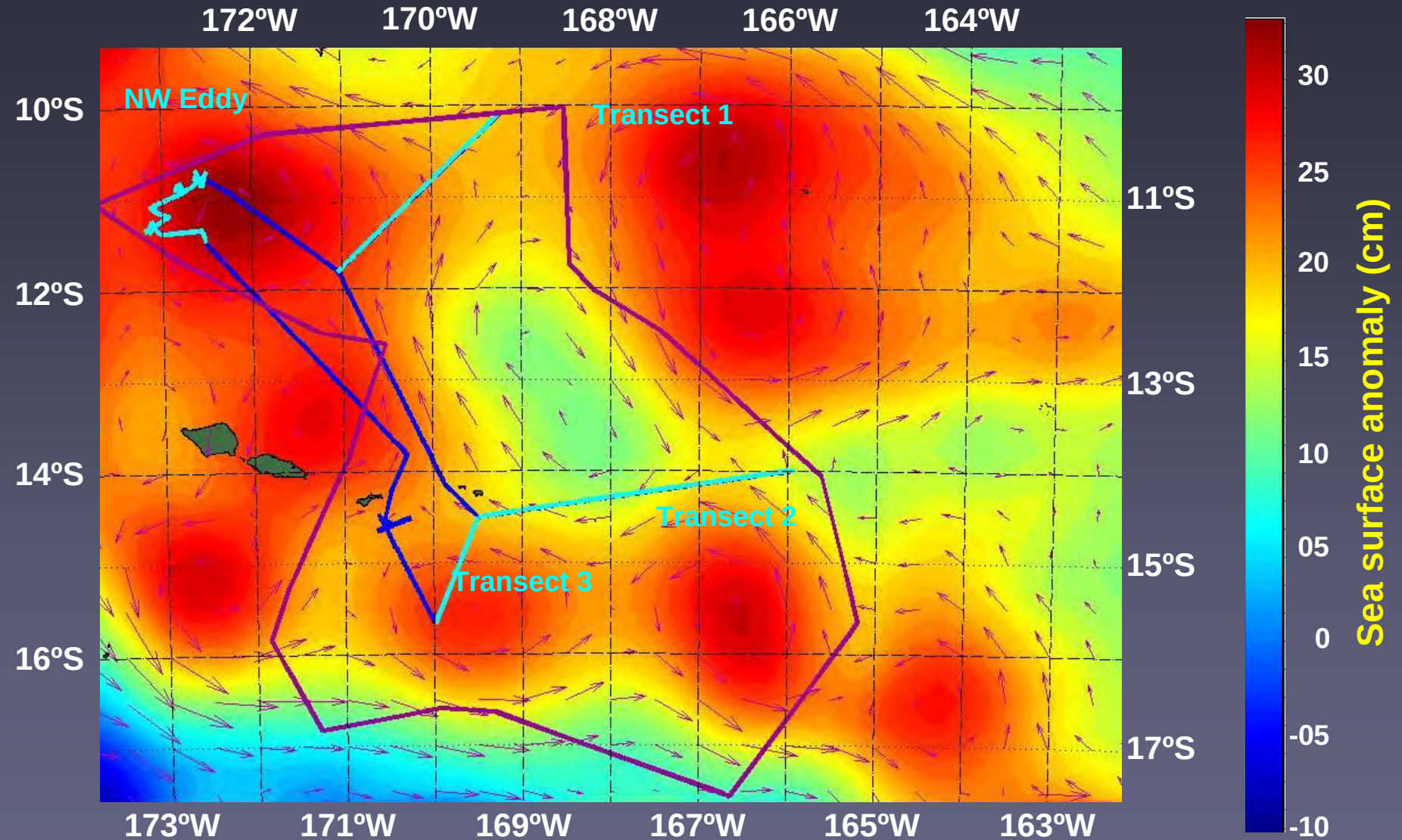


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Strength of SECC and # of anticyclonic eddies: $r^2 = 0.67$, $p = 0.009$
Strength of SECC and strength of anticyclonic eddies: $r^2 = 0.74$, $p = 10^{-4}$

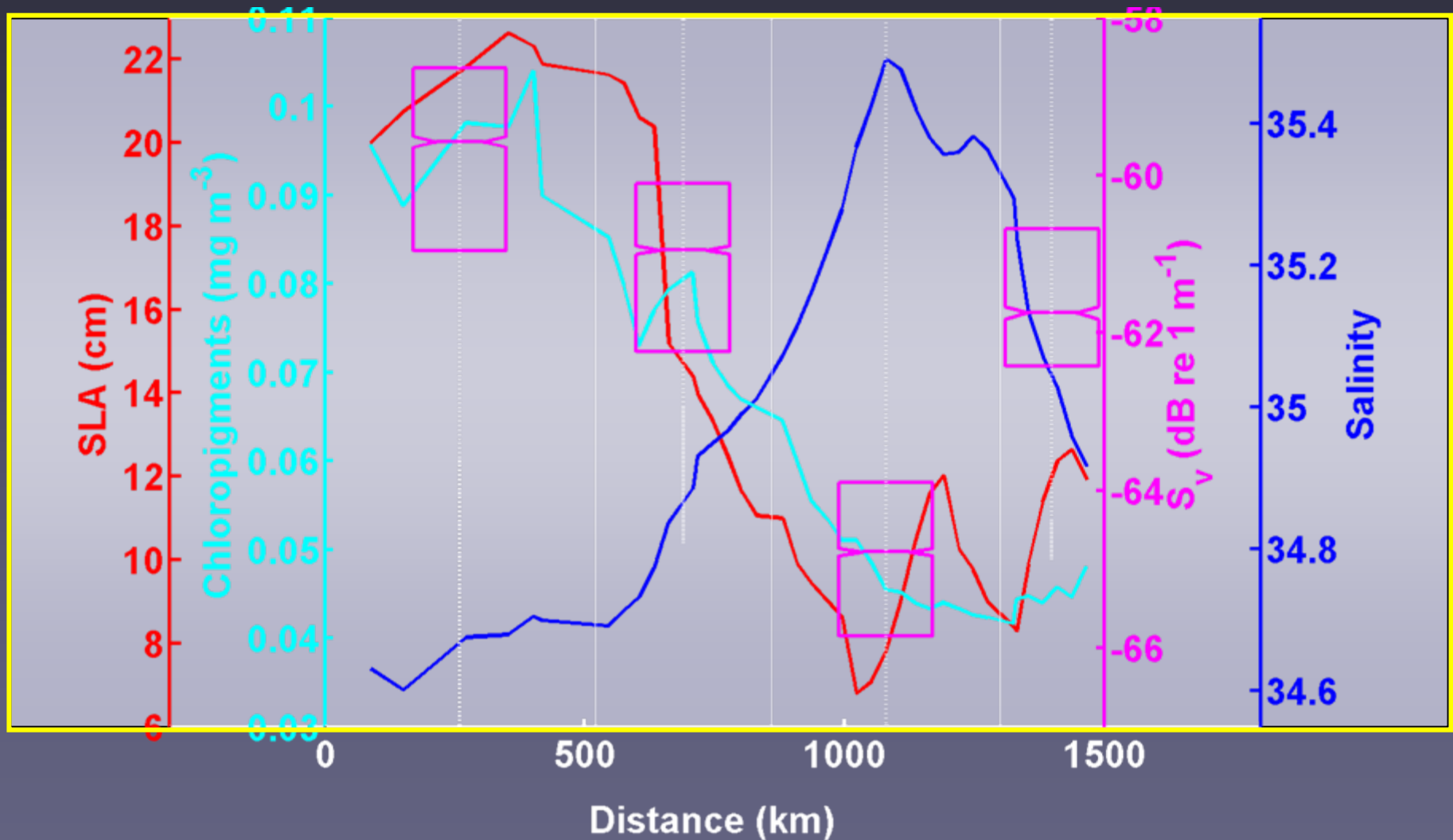


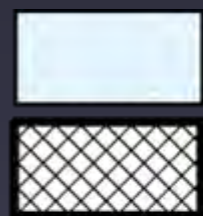
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NW Eddy TR1 TR2 TR3





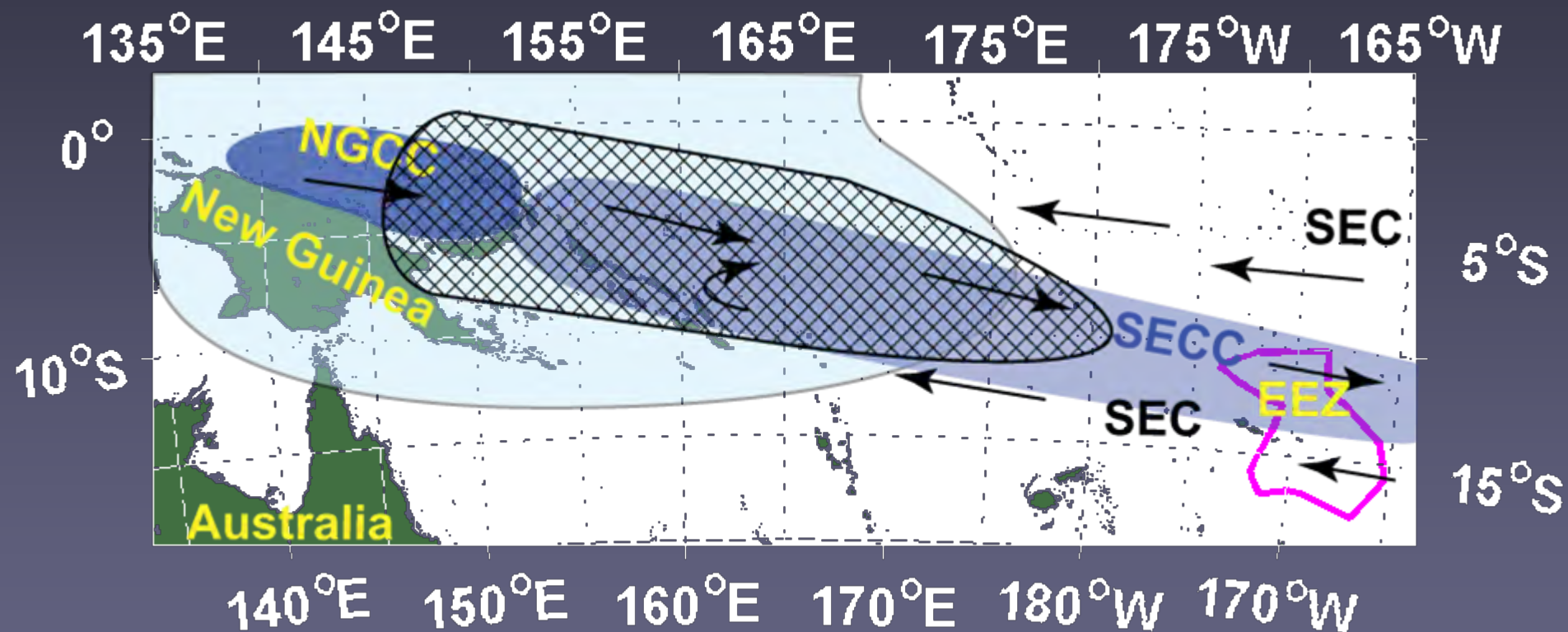
warm pool

SPCZ



SECC

NGCC

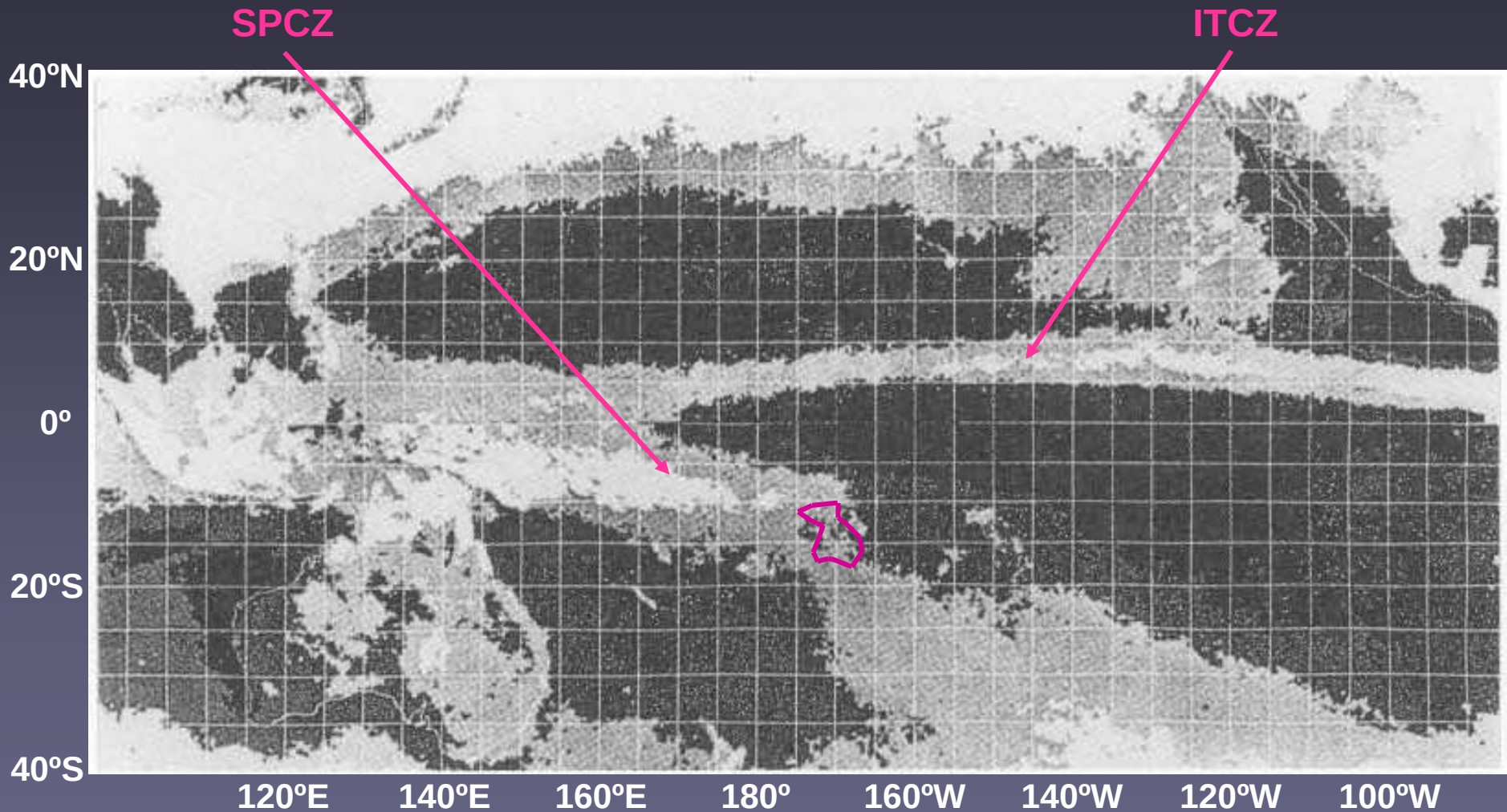


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Satellite Cloud Image of the Pacific Ocean



(from Tomczak and Godfrey, 1994)

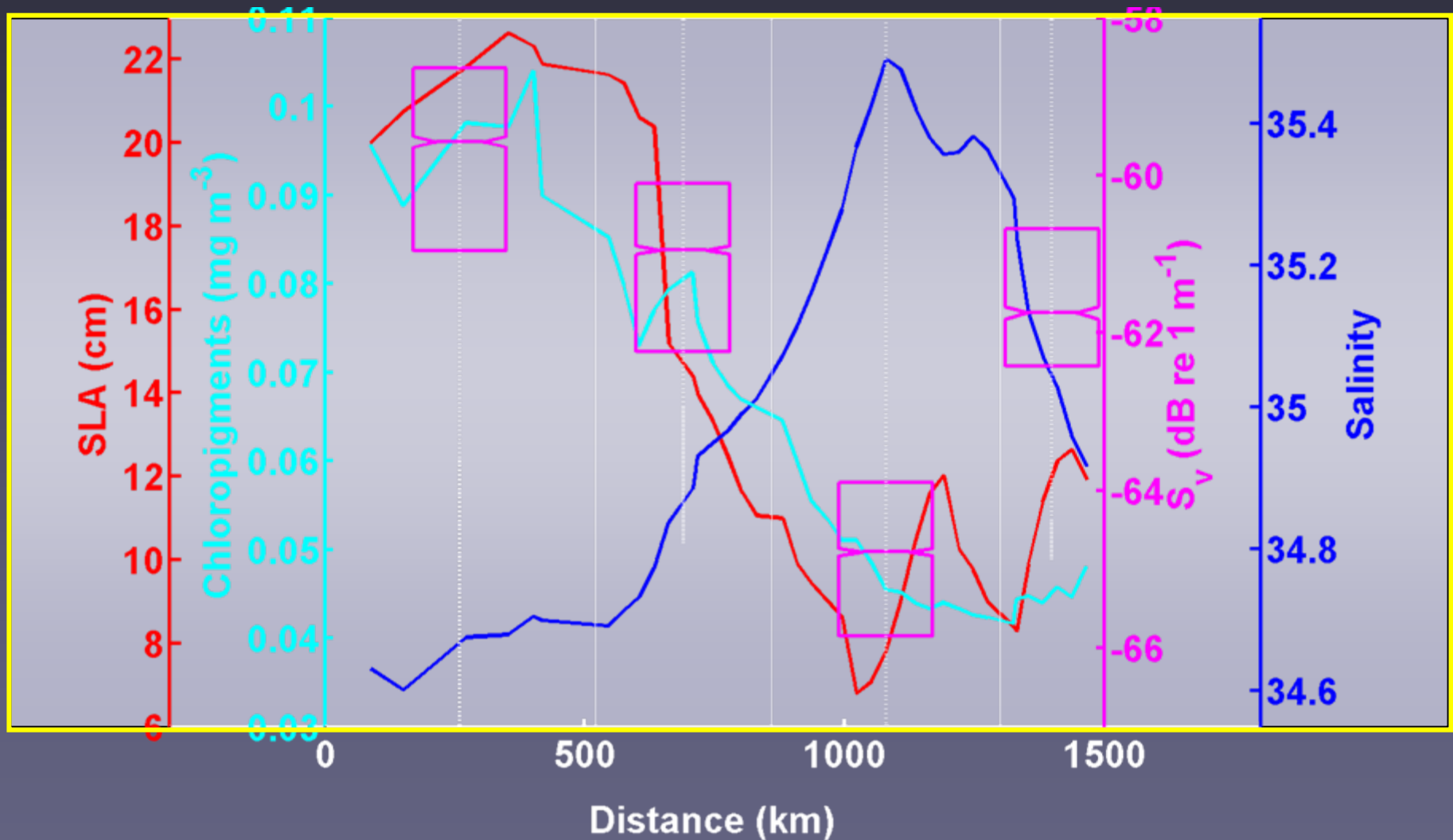


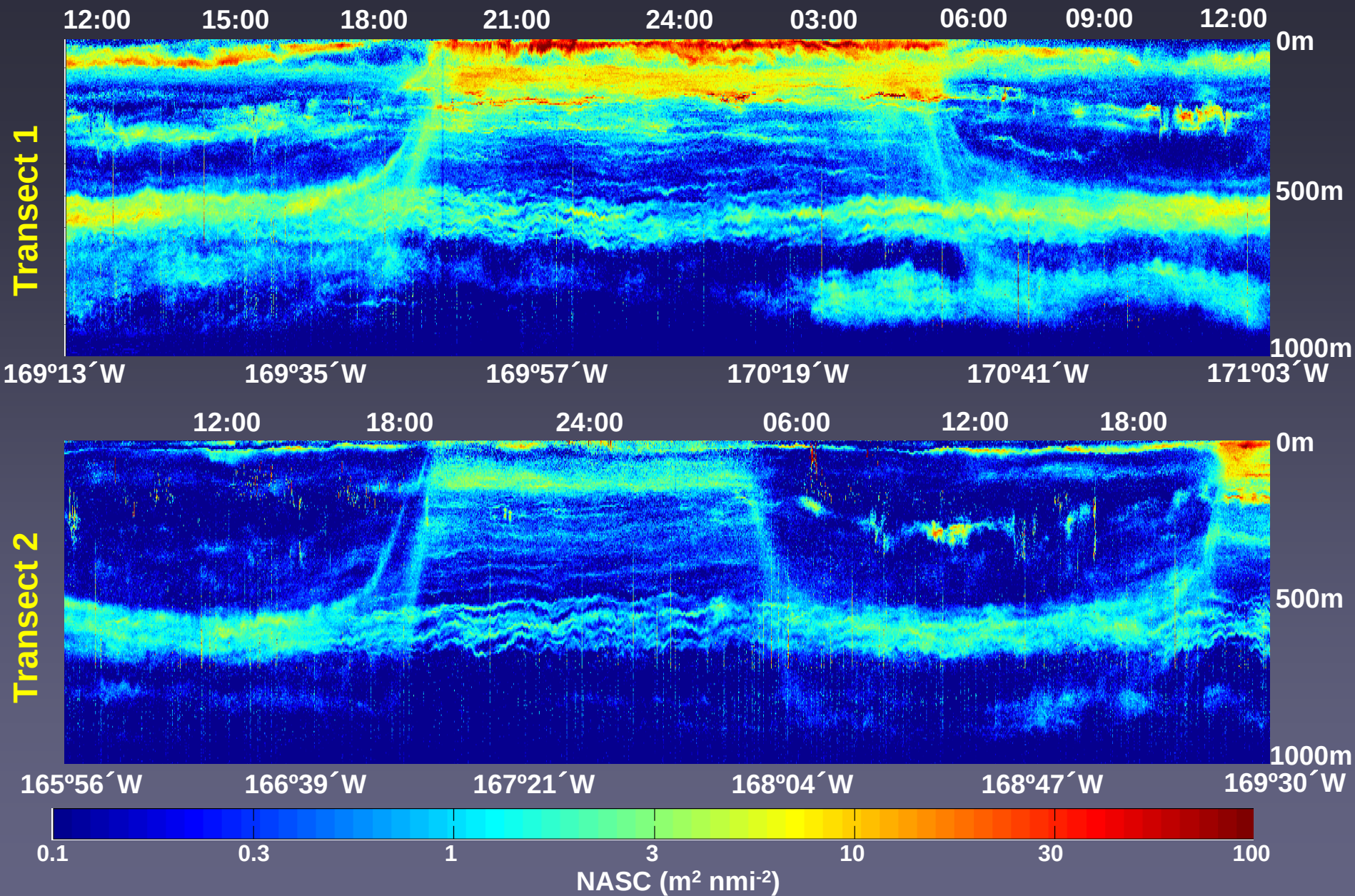
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NW Eddy TR1 TR2 TR3





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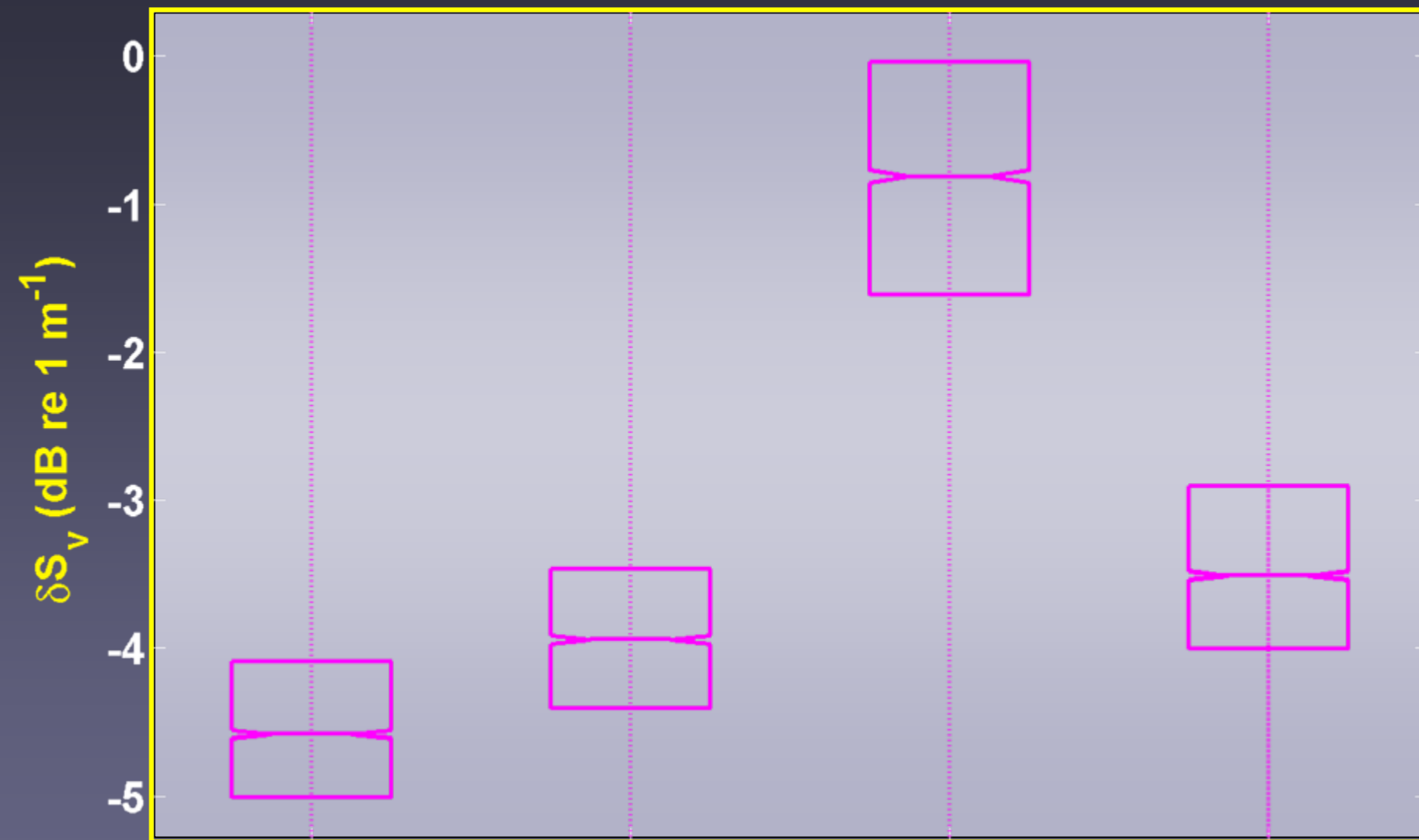


NW Eddy

TR1

TR2

TR3

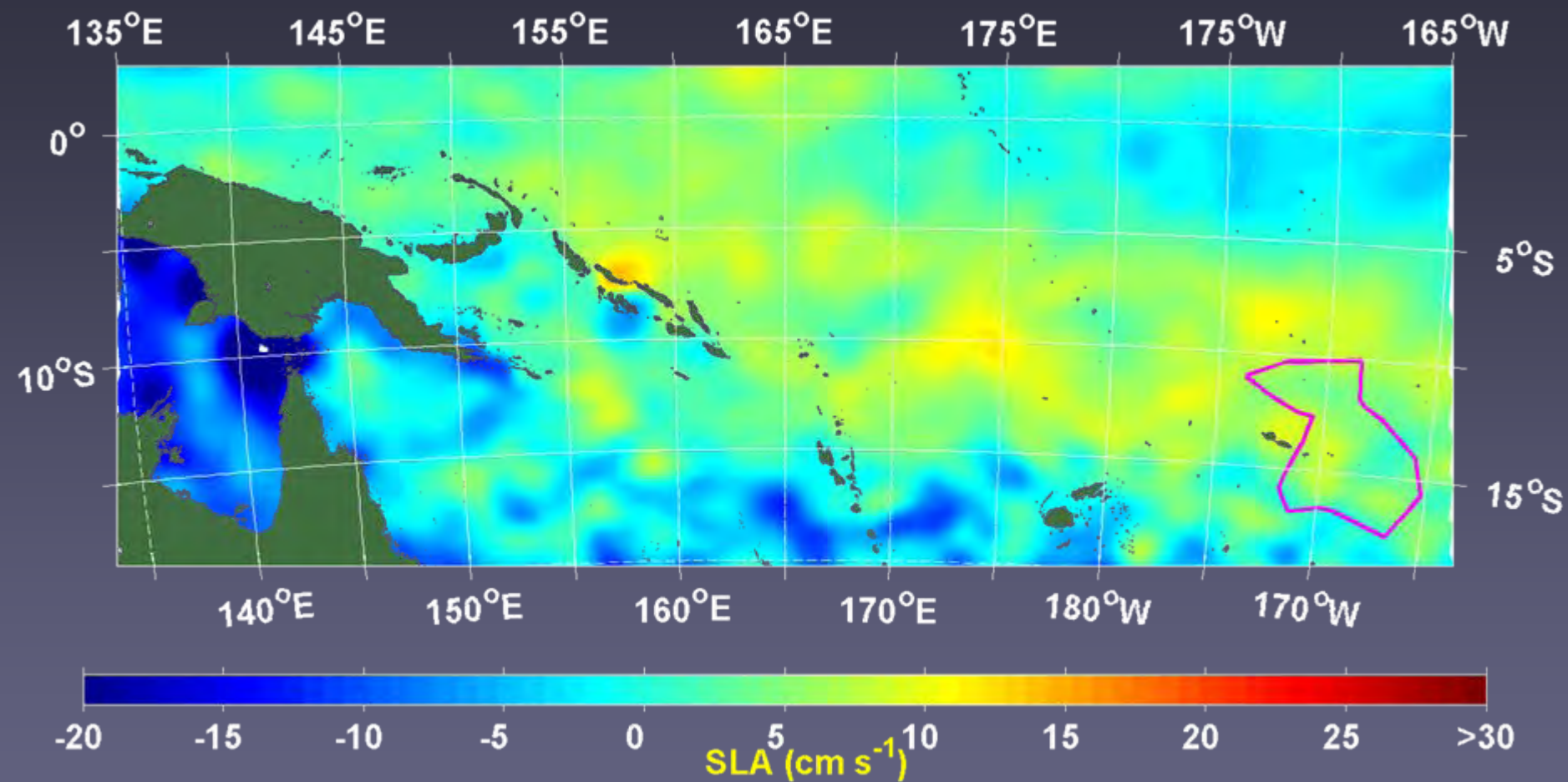


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2005 Sep

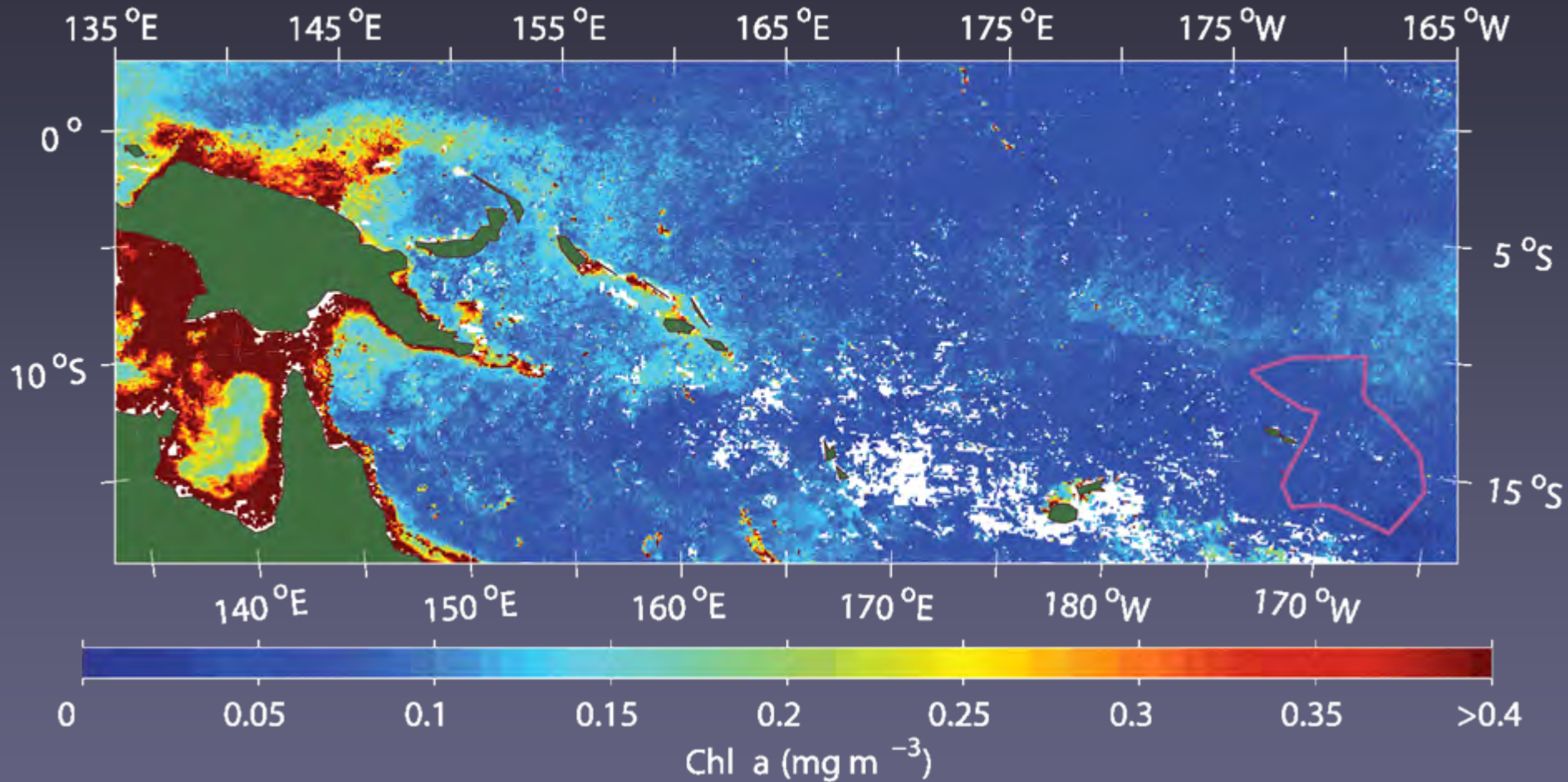


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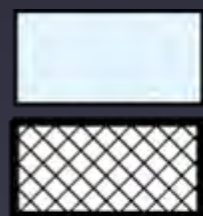
2002 Nov



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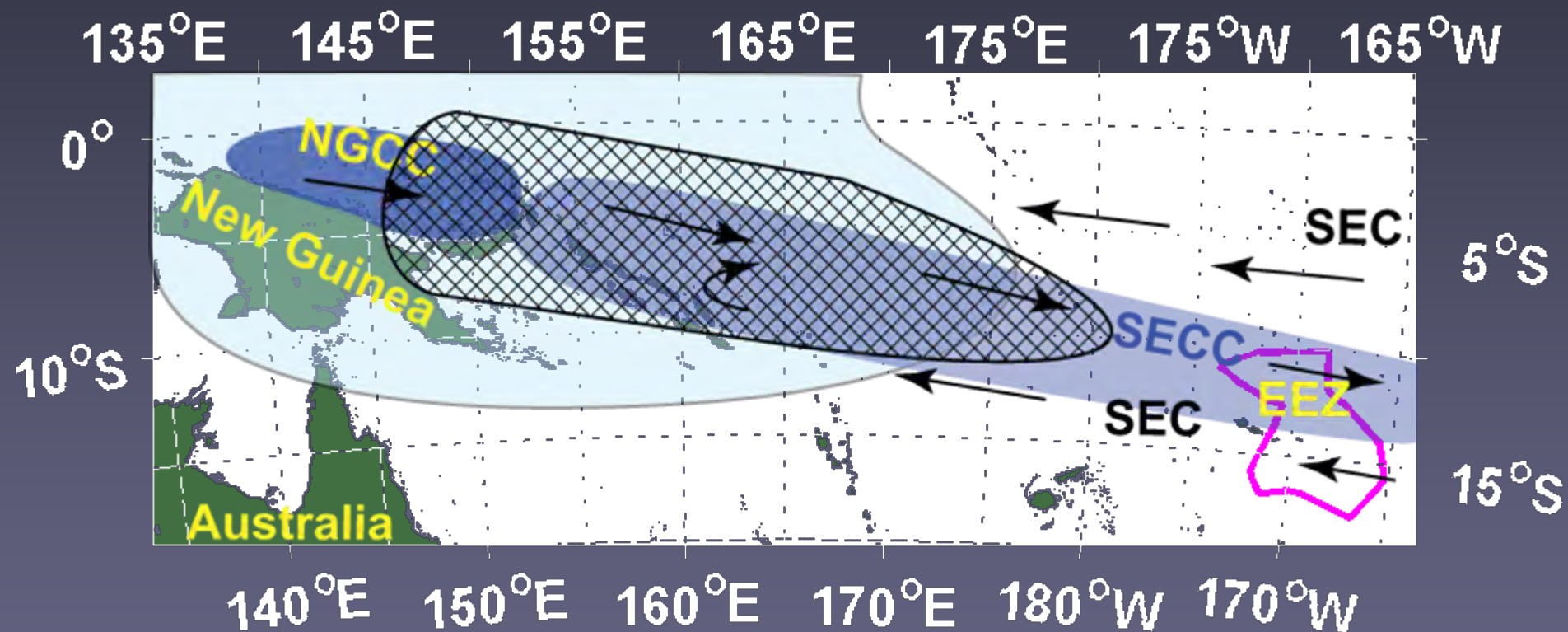
warm pool

SPCZ



SECC

NGCC

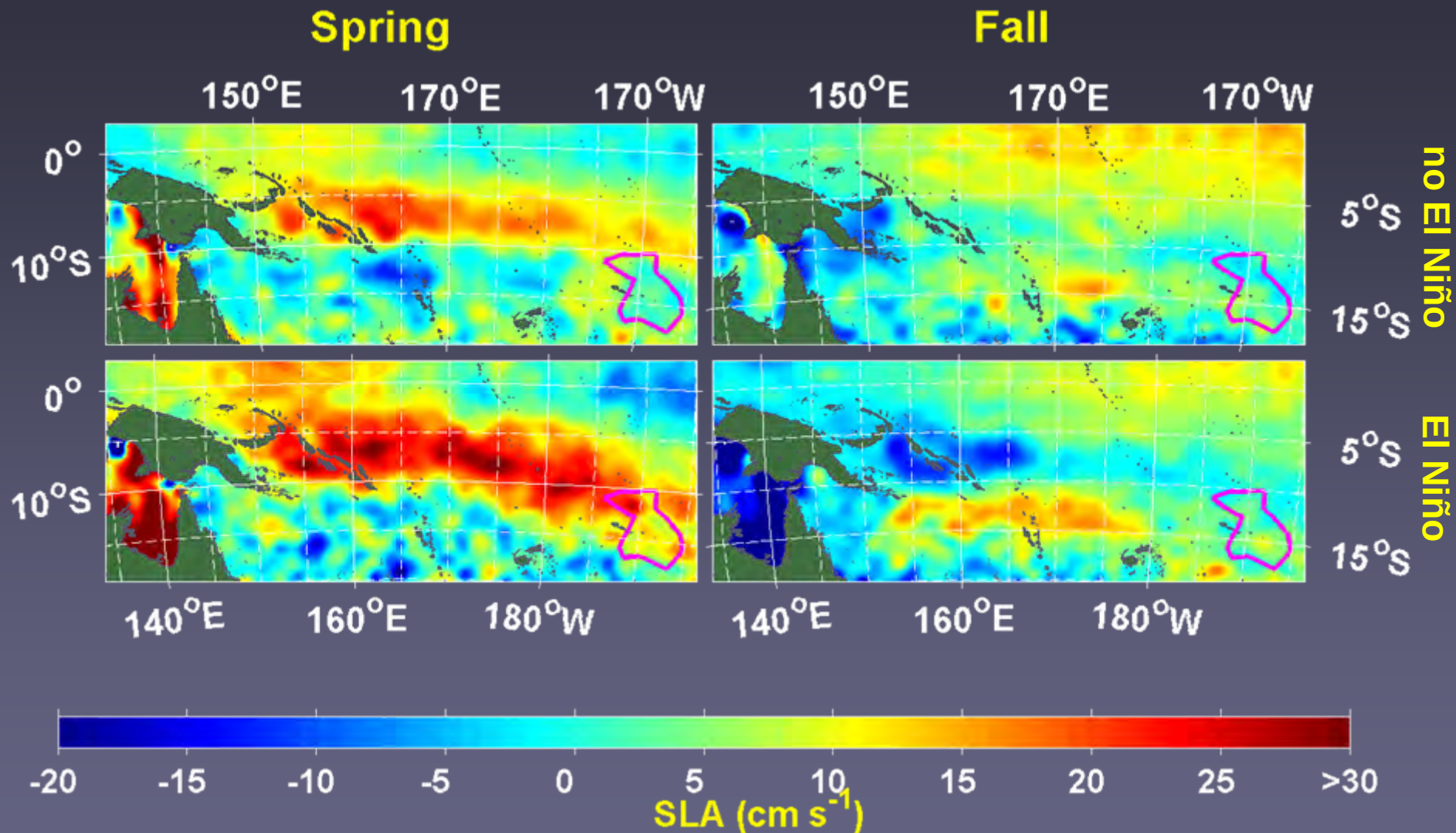


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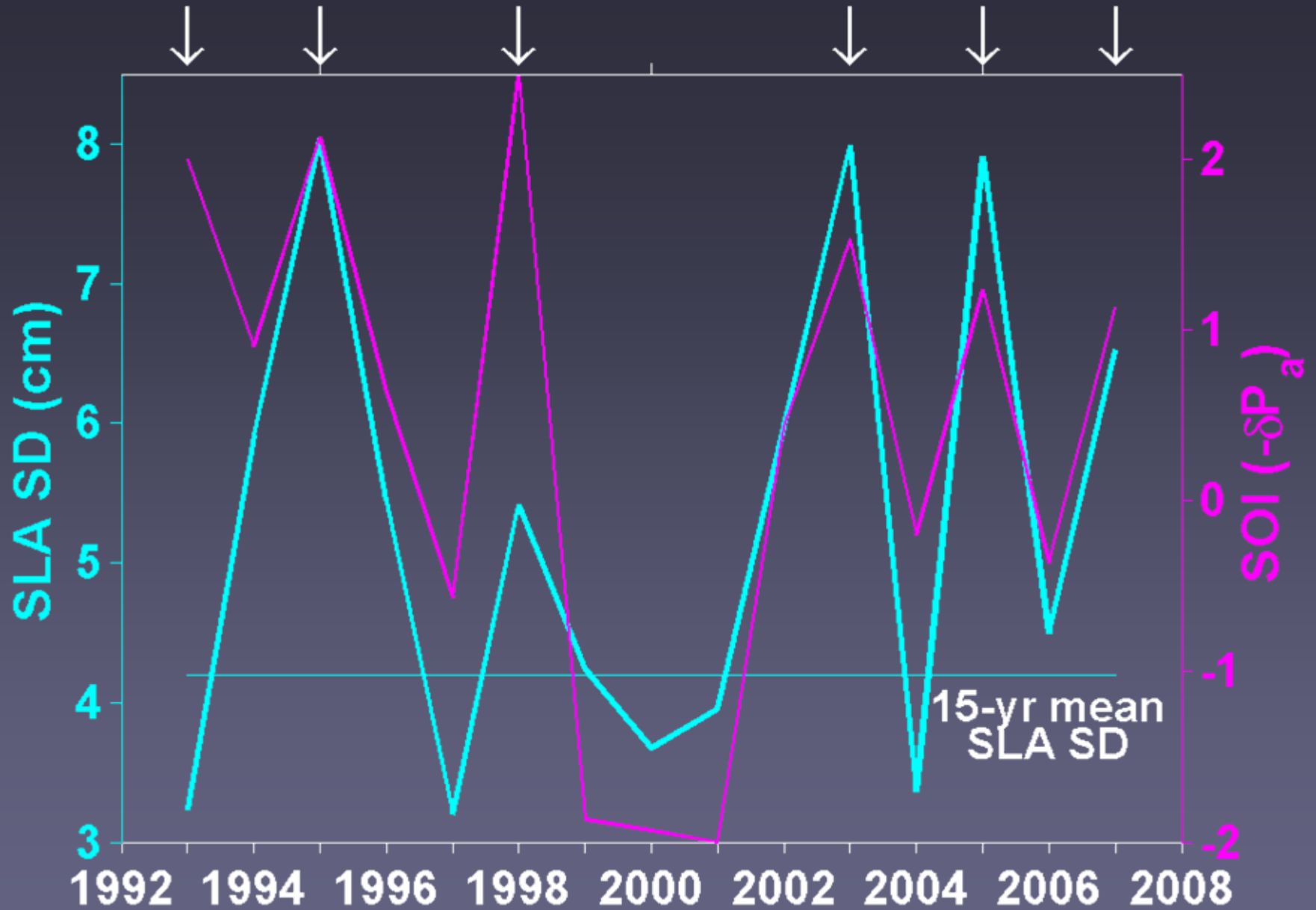
Correlation between SOI & SLA SD from 1992 to present:
 $r^2 = 0.31$, $p = 10^{-3}$



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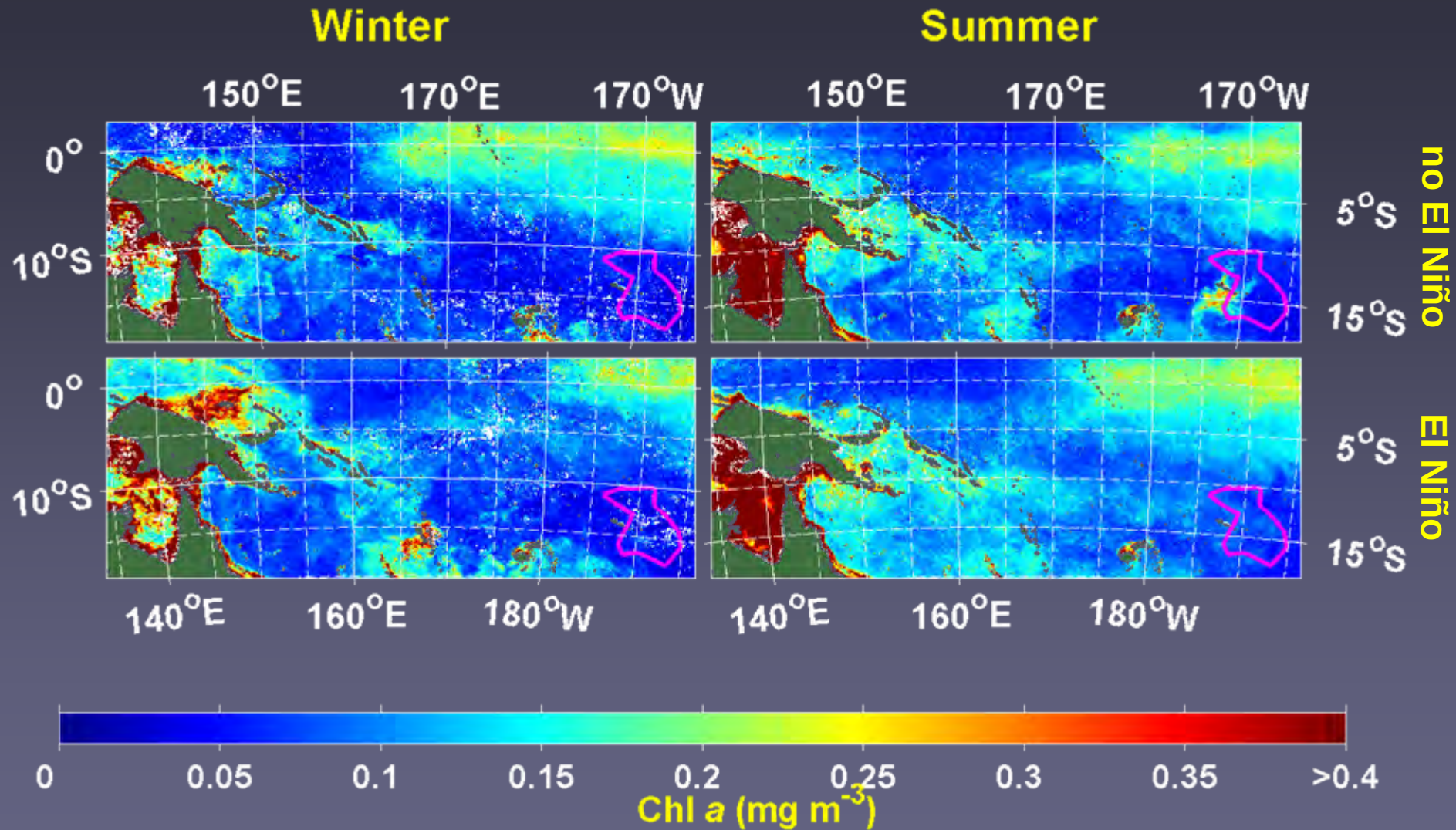


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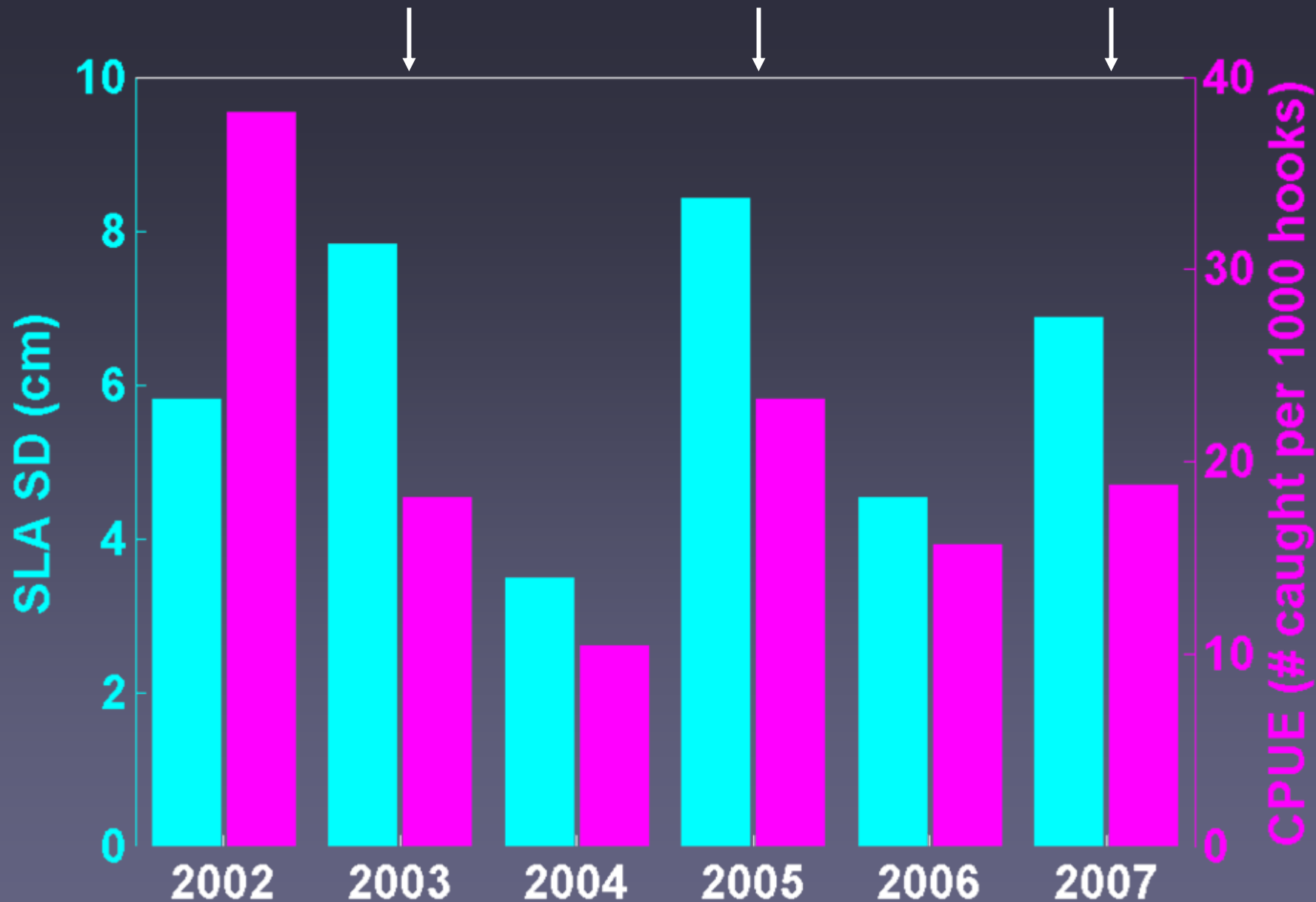
Correlation between SOI & CPUE: $r^2 = 0.35$, $p = 10^{-4}$



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Conclusion

- During peak times, SECC carries Chl-a rich waters towards east from upwelling regions at NGCC
- Enhanced primary productivity in SECC allows for an increase in micronekton biomass, reaching the EEZ
- Seasonal signals in primary productivity at NGCC and strength of SECC are exceptionally strong during El Niños
- Albacore CPUE in EEZ and strength of SECC positively correlate with El Niño events
- Observed micronekton biomass in the SECC and albacore CPUE are most likely linked by higher concentration of albacore in presence of prey
- Results indicate that the local longline fishery performance for albacore may be predicted from
 - strength of upwelling and eastward velocity of NGCC
 - Chl-a concentrations in the NGCC and SECC
 - Strength of the seasonal intensification of the SECC
 - SOI

