Temporal and spatial variability of the Kuroshio at PN / TK sections during 1955-2010

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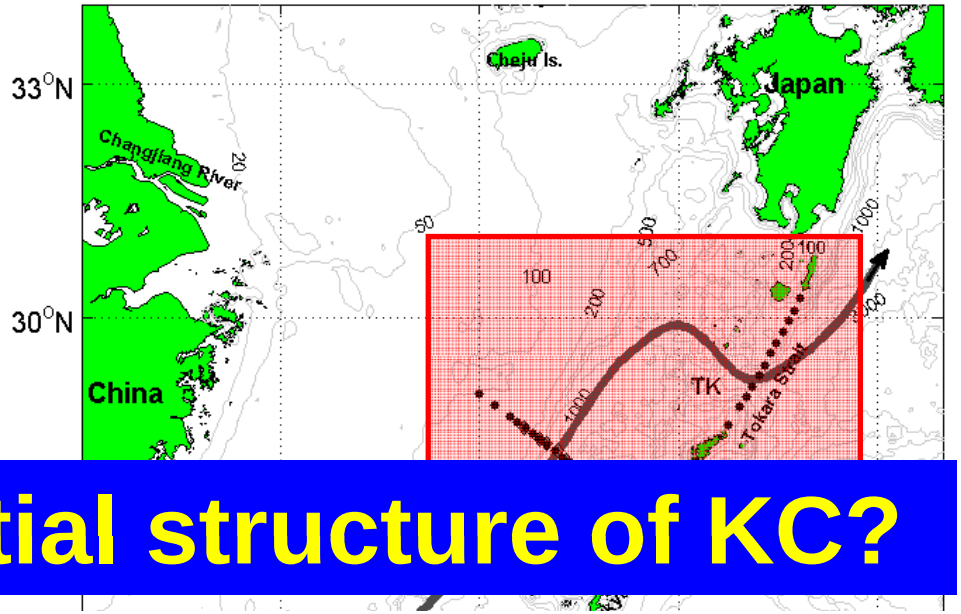
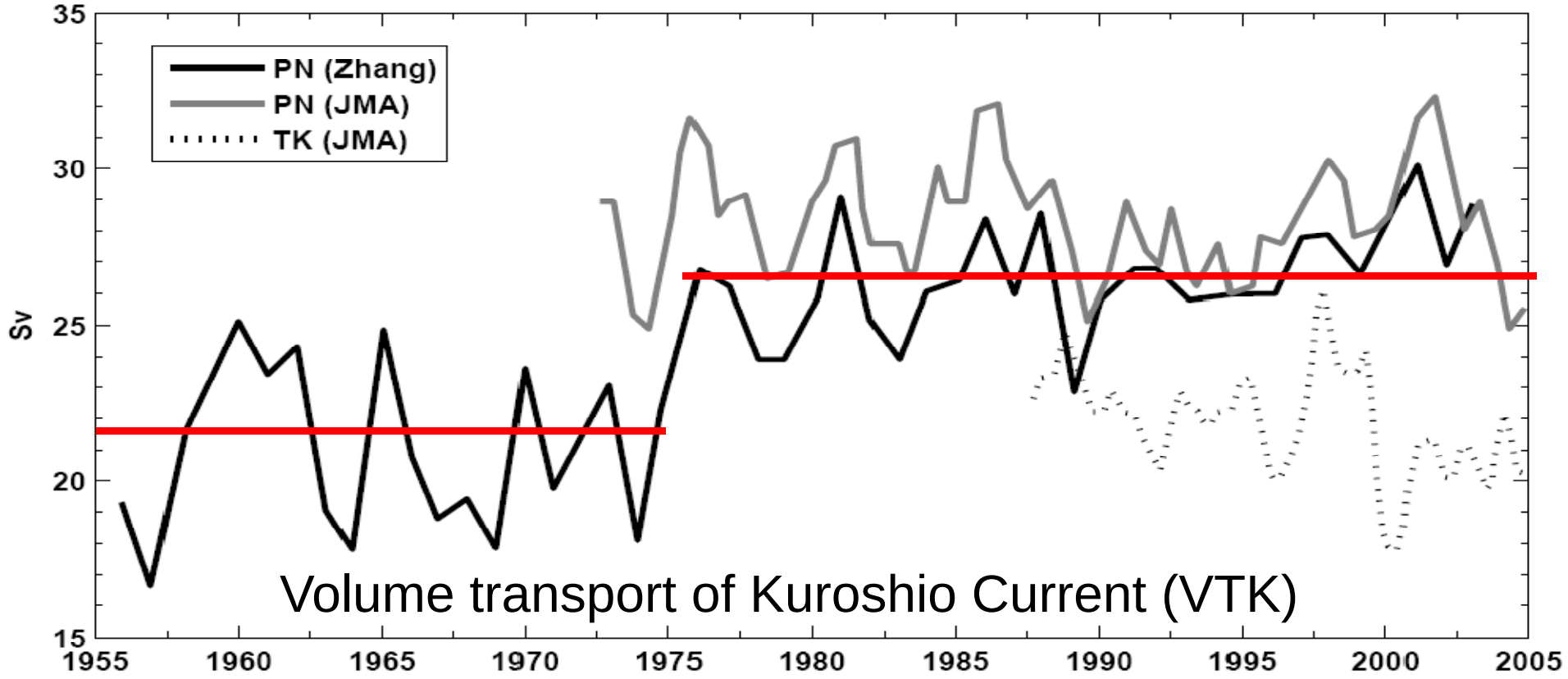
OUTLINE

1. Background
2. Establish of the KC time series
3. Temporal and spatial variability of KC
4. Summary

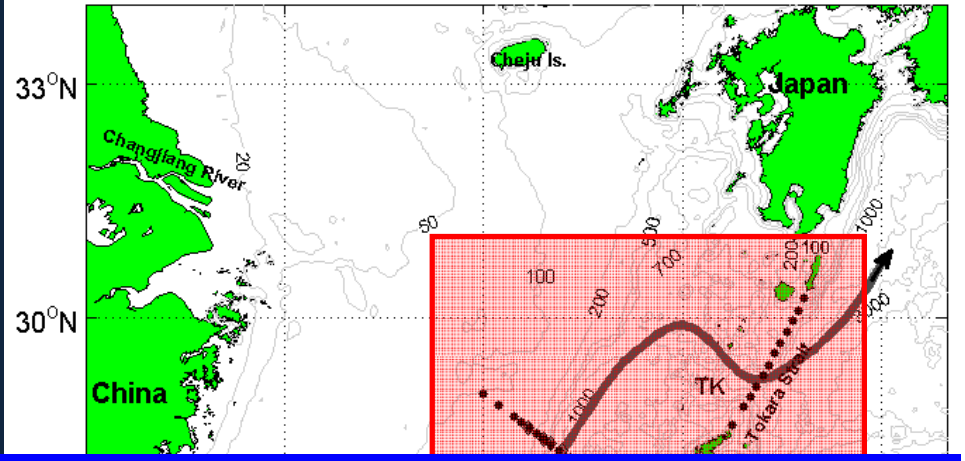
1. Background



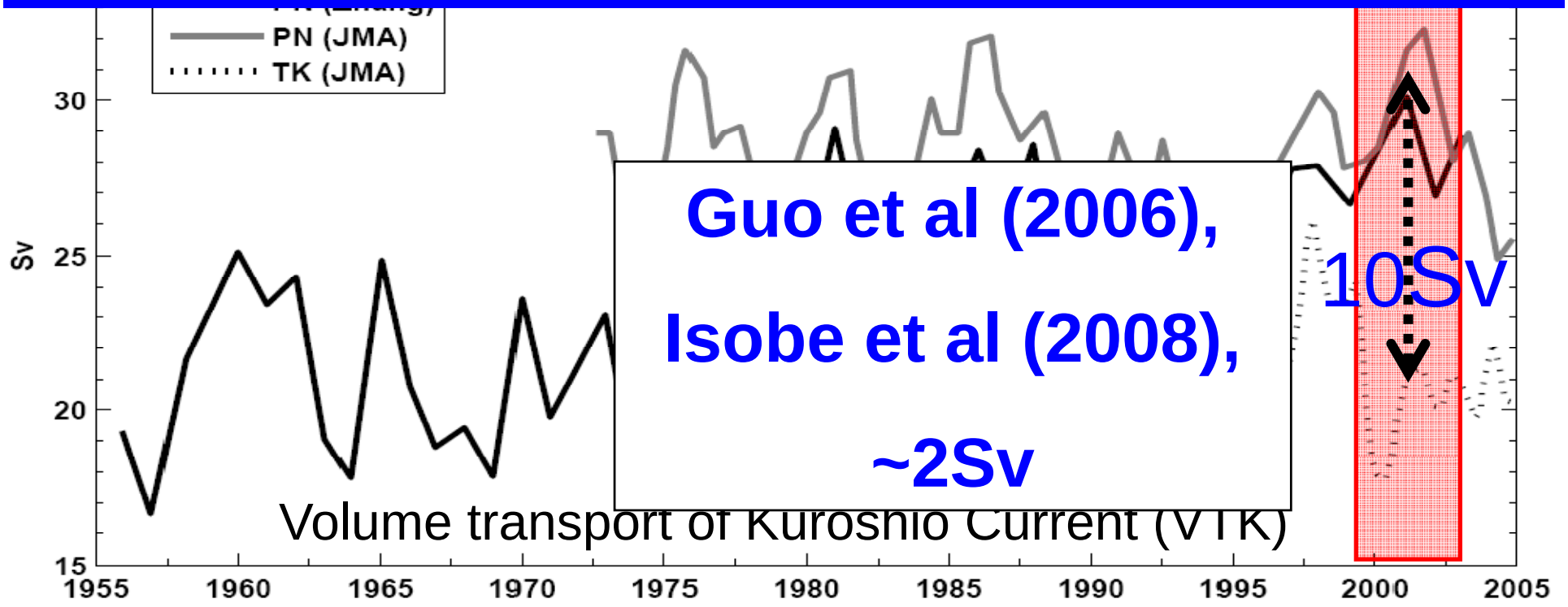
Q1: What is the spatial structure of KC?



1. Background



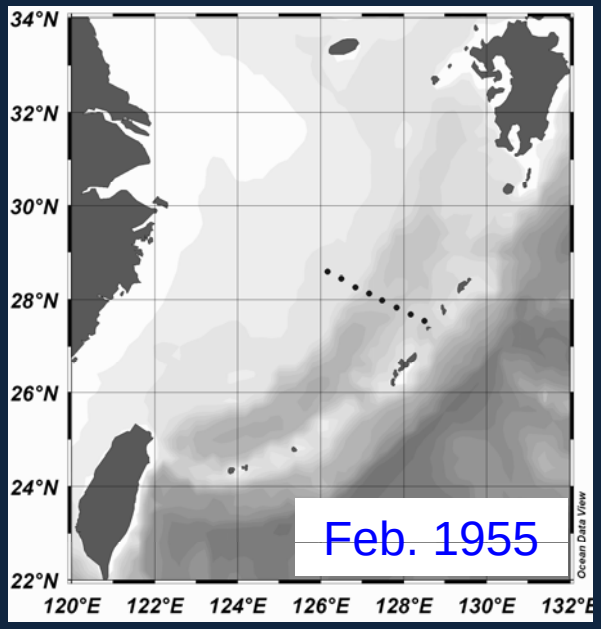
Q2: Is the time series of KC consistent and reliable?

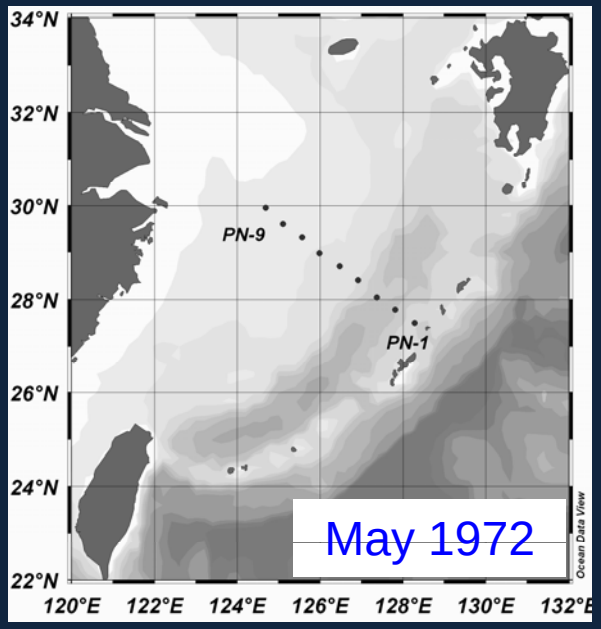


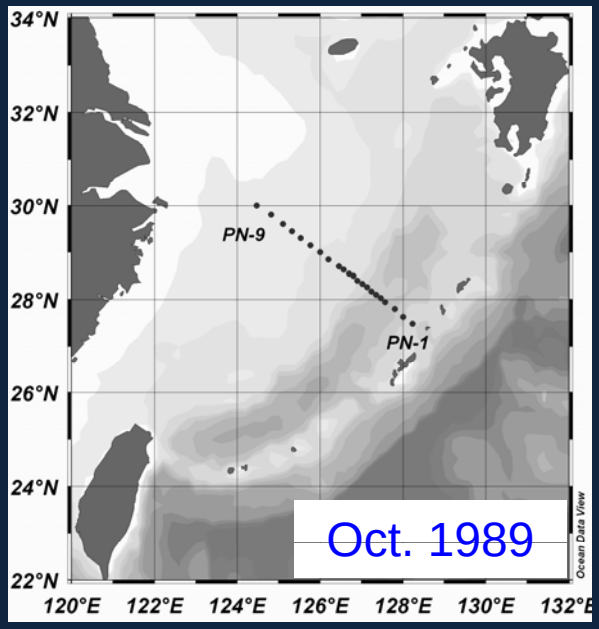
2. Establish of the KC time series

PN: 1955-2010, JMA

TK: 1987-2010, JODC







Different station numbers and spatial resolution
Need pre-processing and gridding

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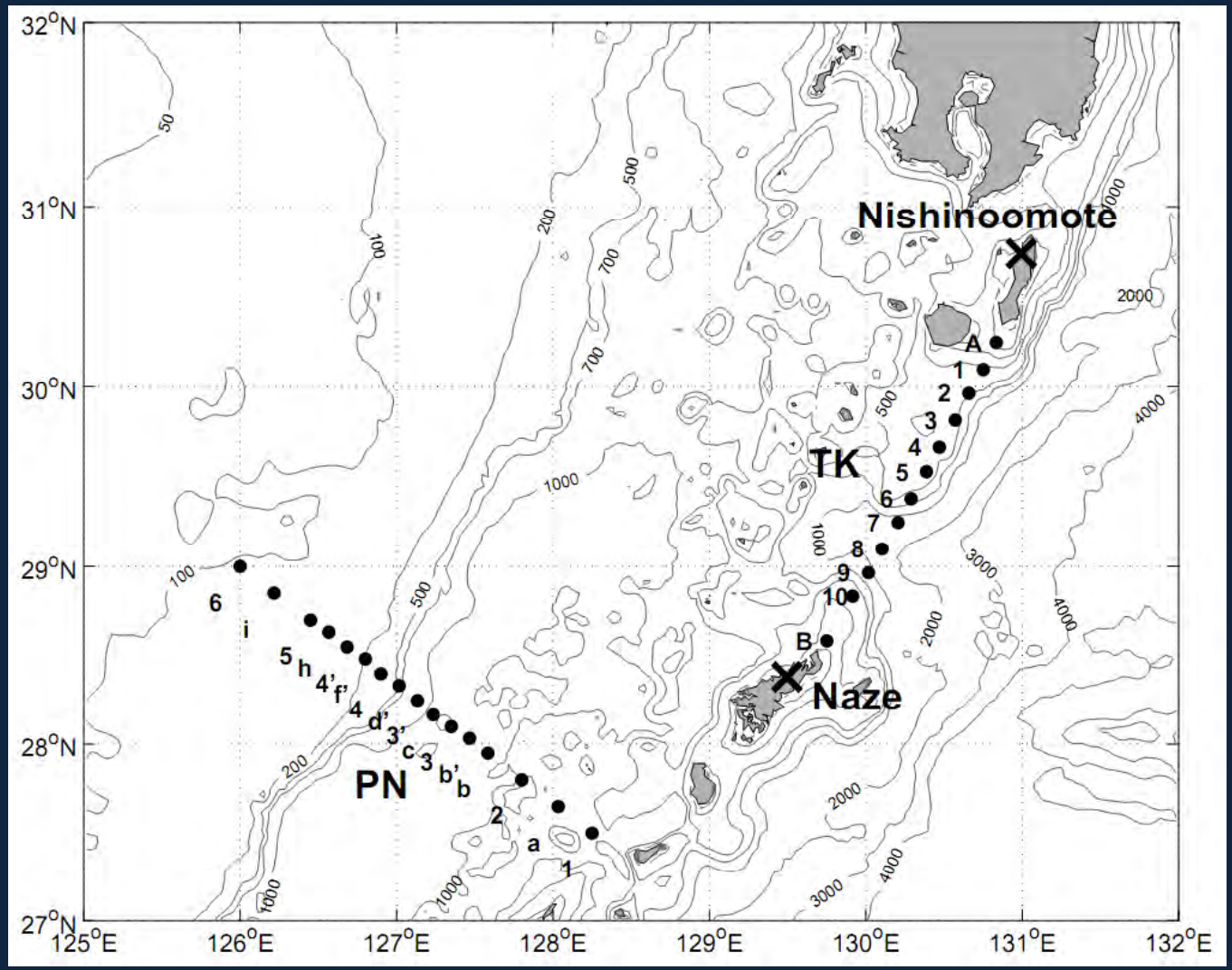

Standard Stations:

PN (16),

TK (12)

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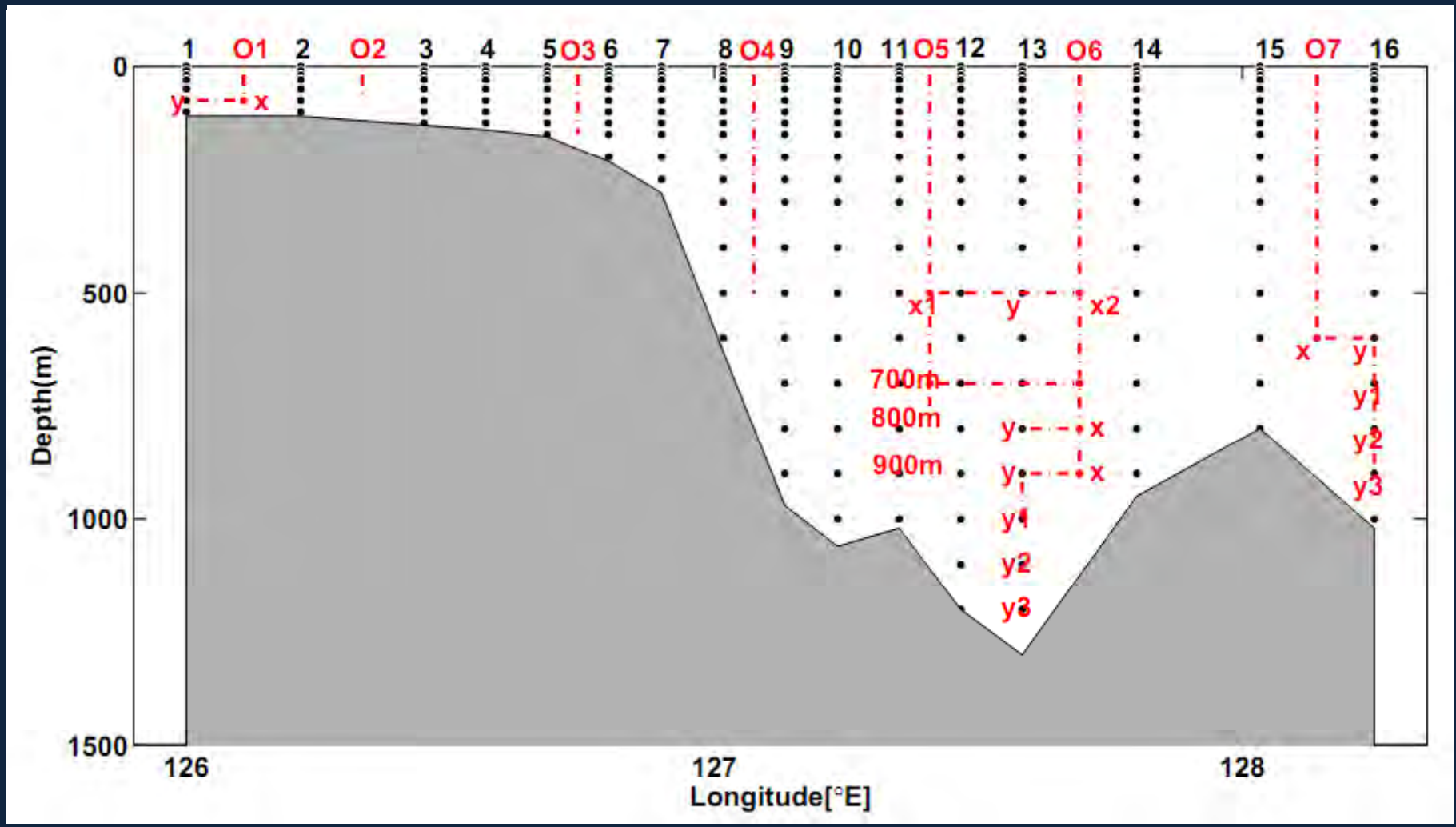

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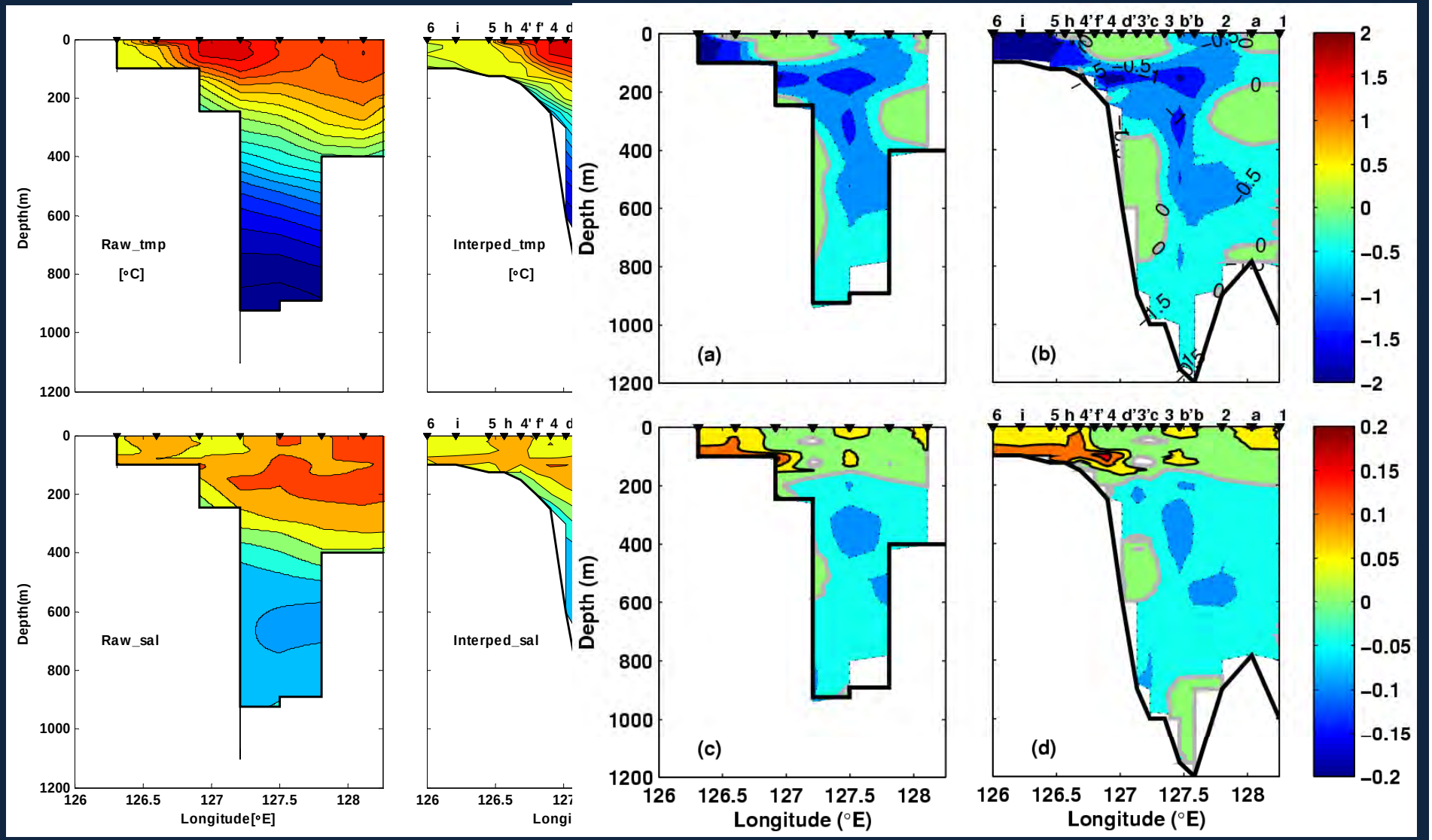


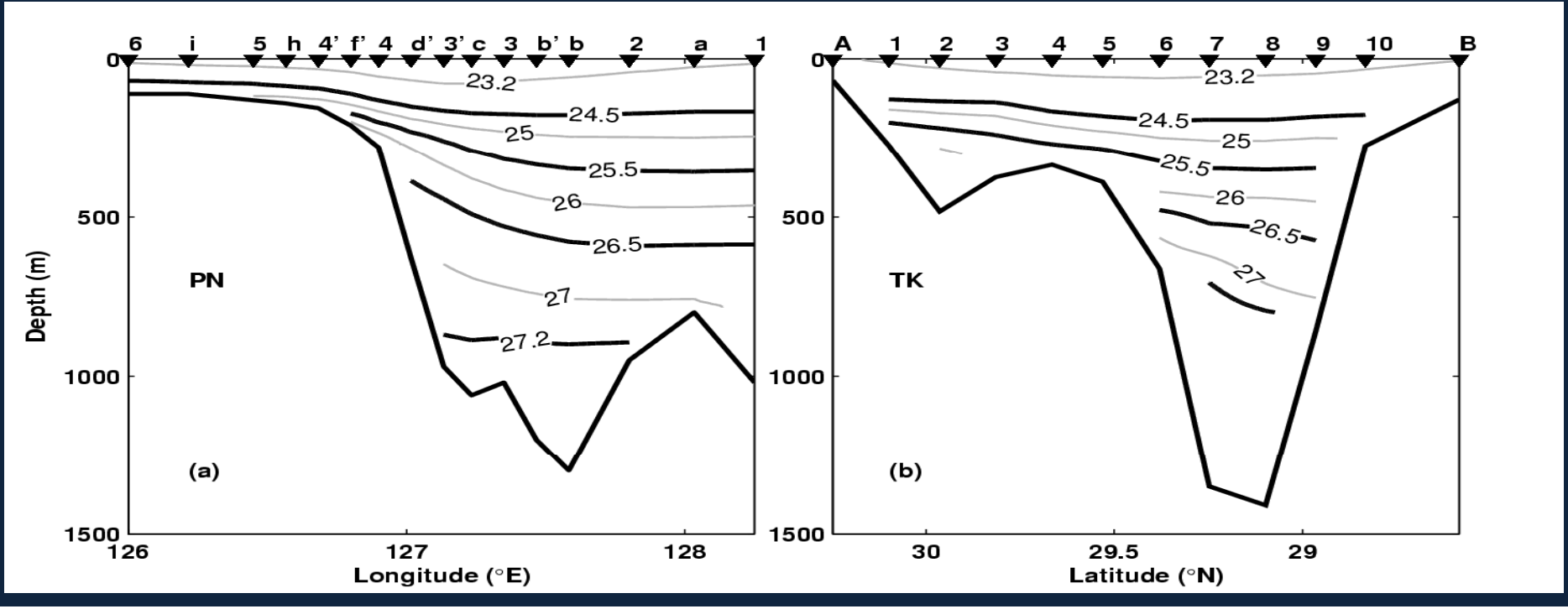
2. Establish of the KC time series

Inverse Method:

$$v(x,z) = v_0(x,z_0) - \int_{z_0}^{z} \frac{g}{\rho_0 f}\frac{\partial \rho}{\partial x} dz = v_0(x,z_0) + v_r(x,z)$$

$$\oint_L \int_{Z_i}^{Z_{i+1}} \rho(x,z)\cdot(v_r + v_0)dzdx = 0, \quad i = 1,2,\cdots,M$$

$$\oint_L \int_{Z_i}^{Z_{i+1}} s(x,z)\cdot(v_r + v_0)dzdx = 0, \quad i = 1,2,\cdots,M$$



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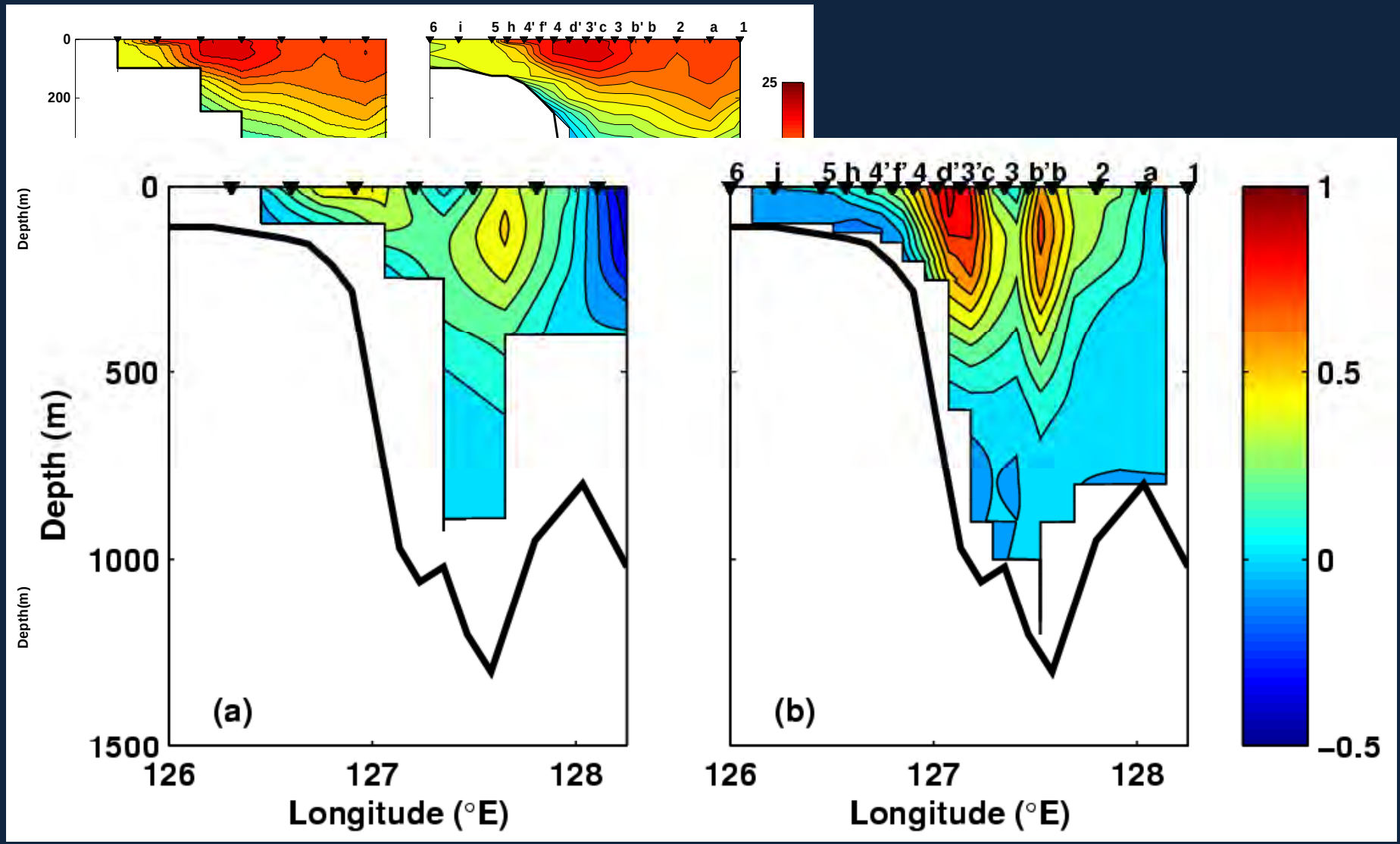

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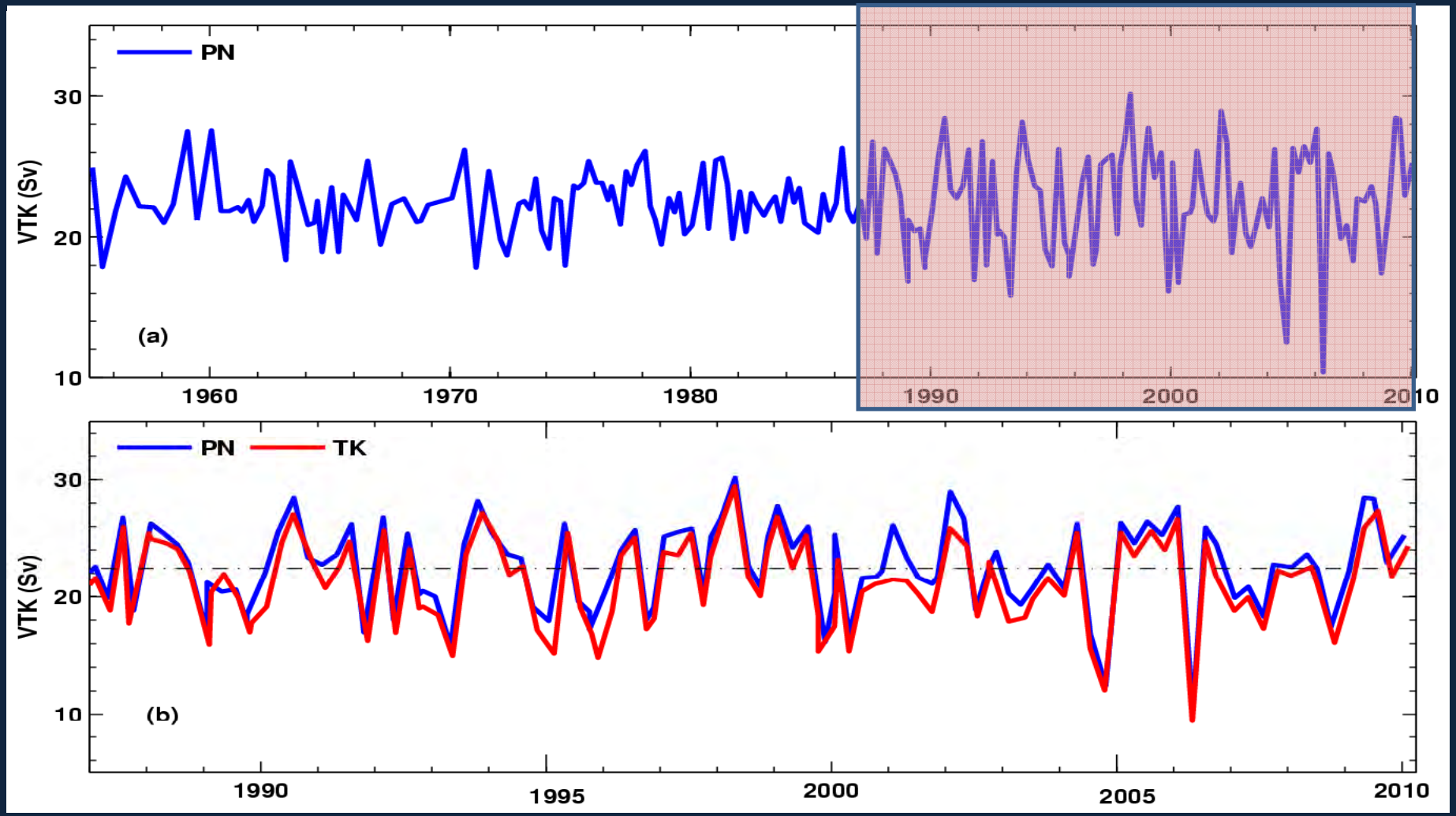

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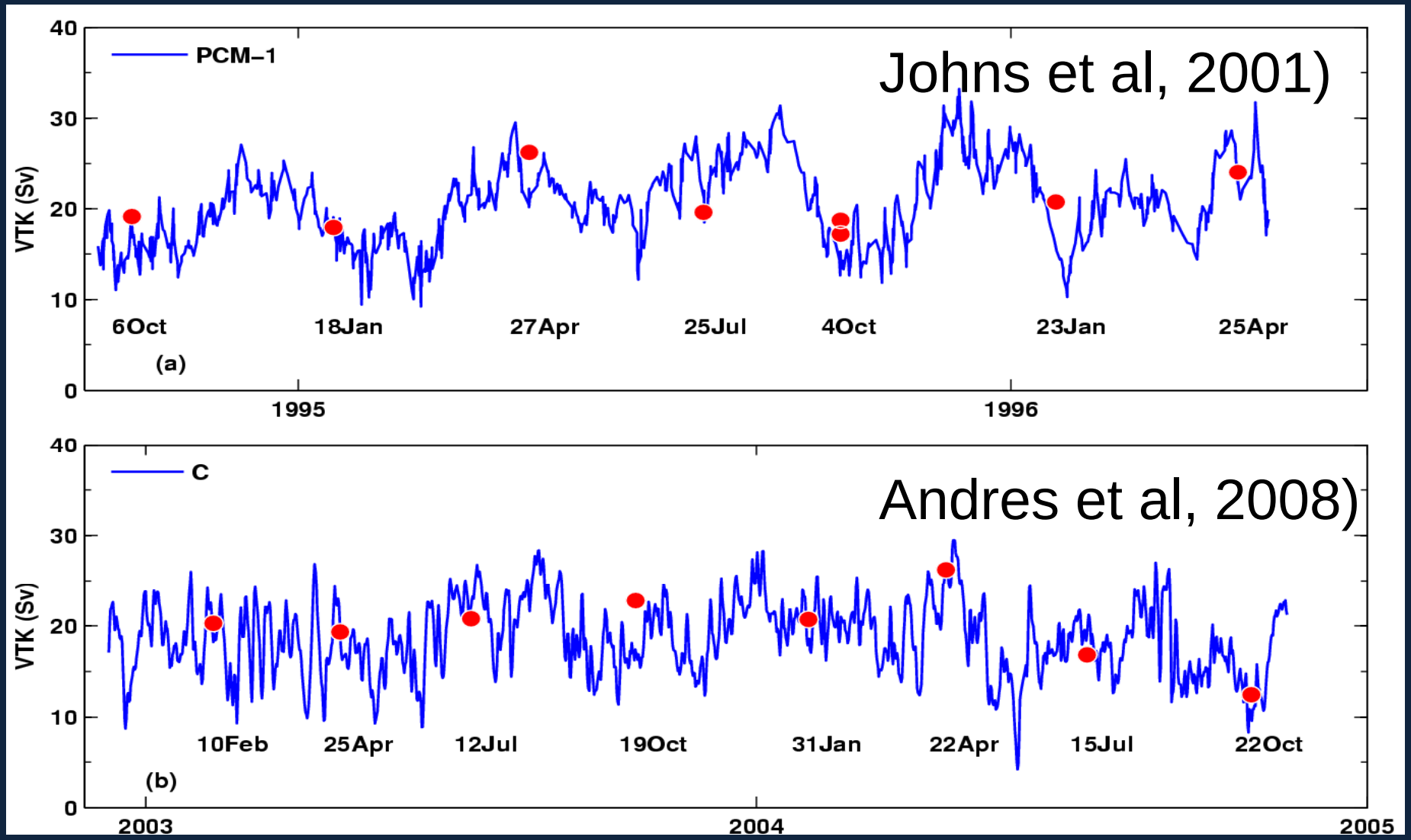

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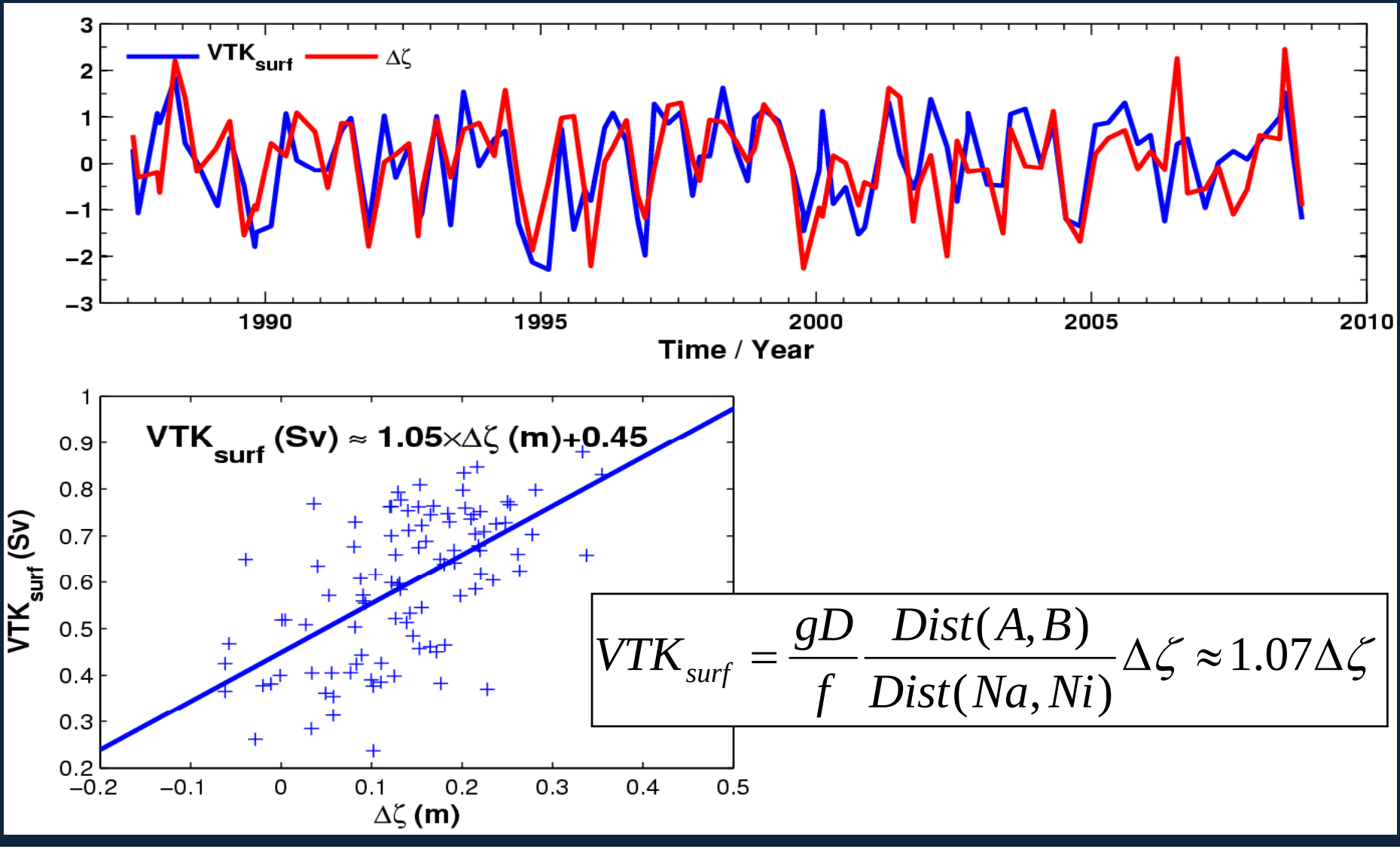
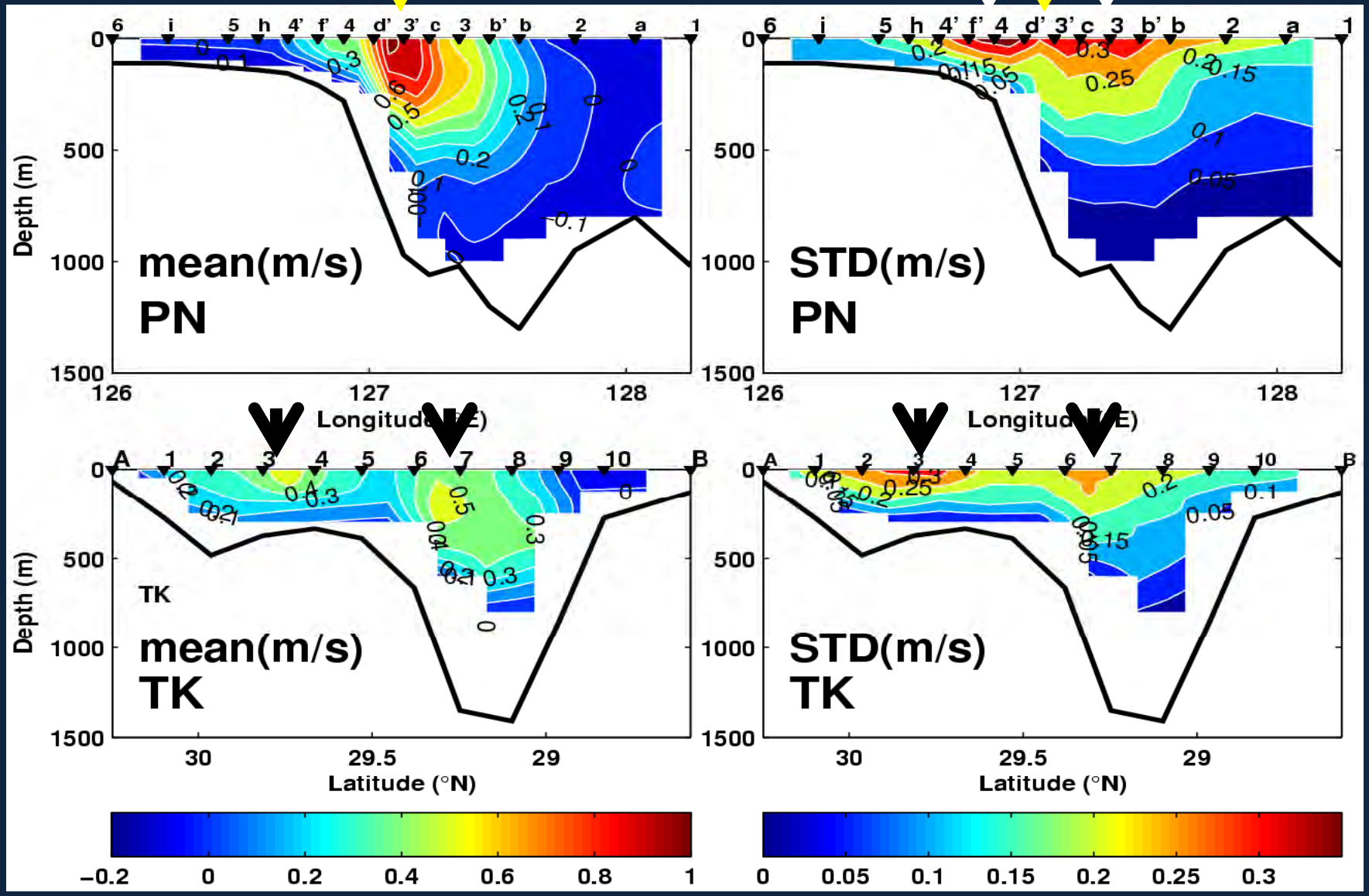


$$VTK_{surf} = \frac{gD}{f}\frac{Dist(A,B)}{Dist(Na,Ni)}\Delta\zeta \approx 1.07\Delta\zeta$$

3. Temporal and spatial variability of KC



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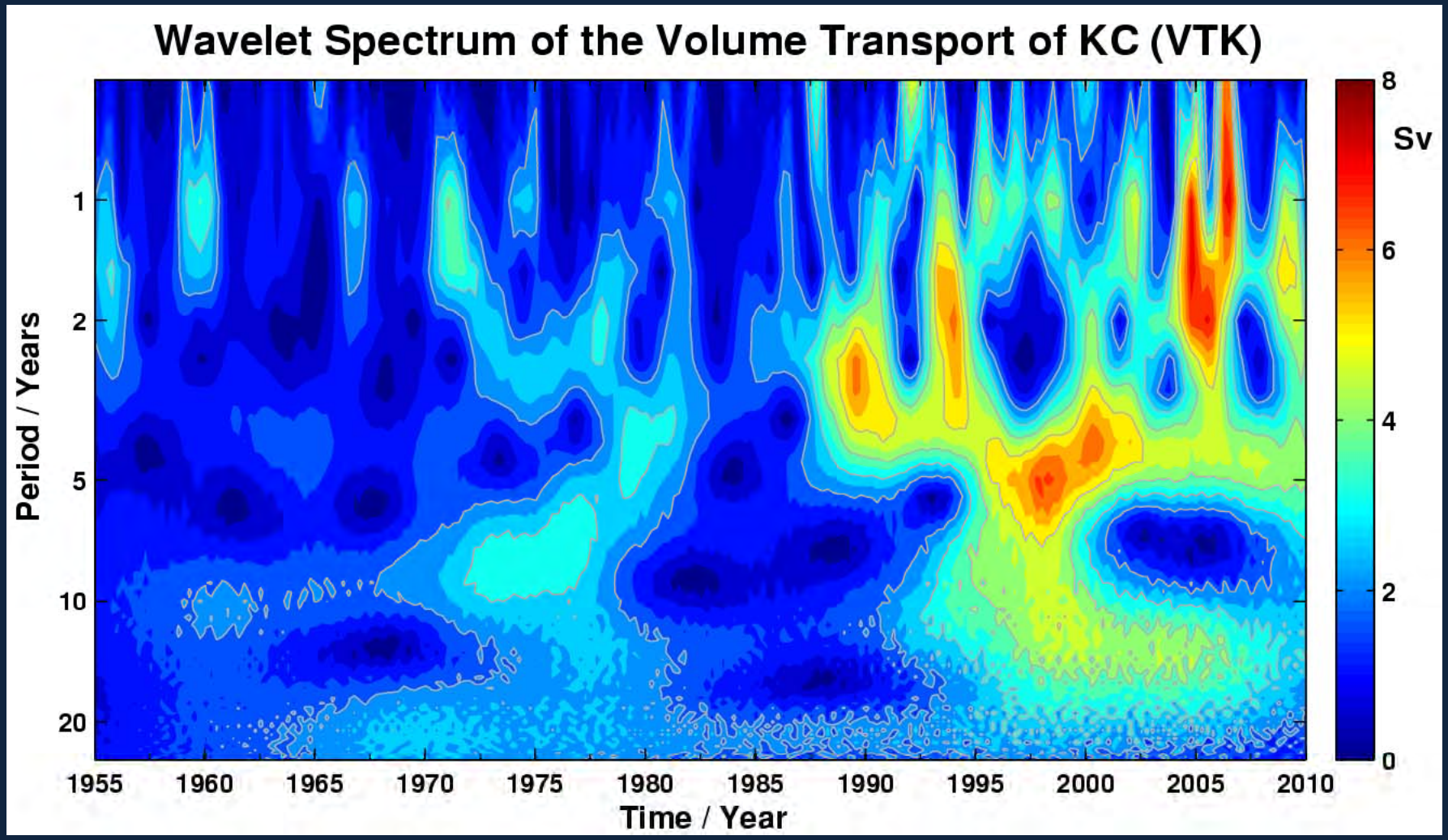

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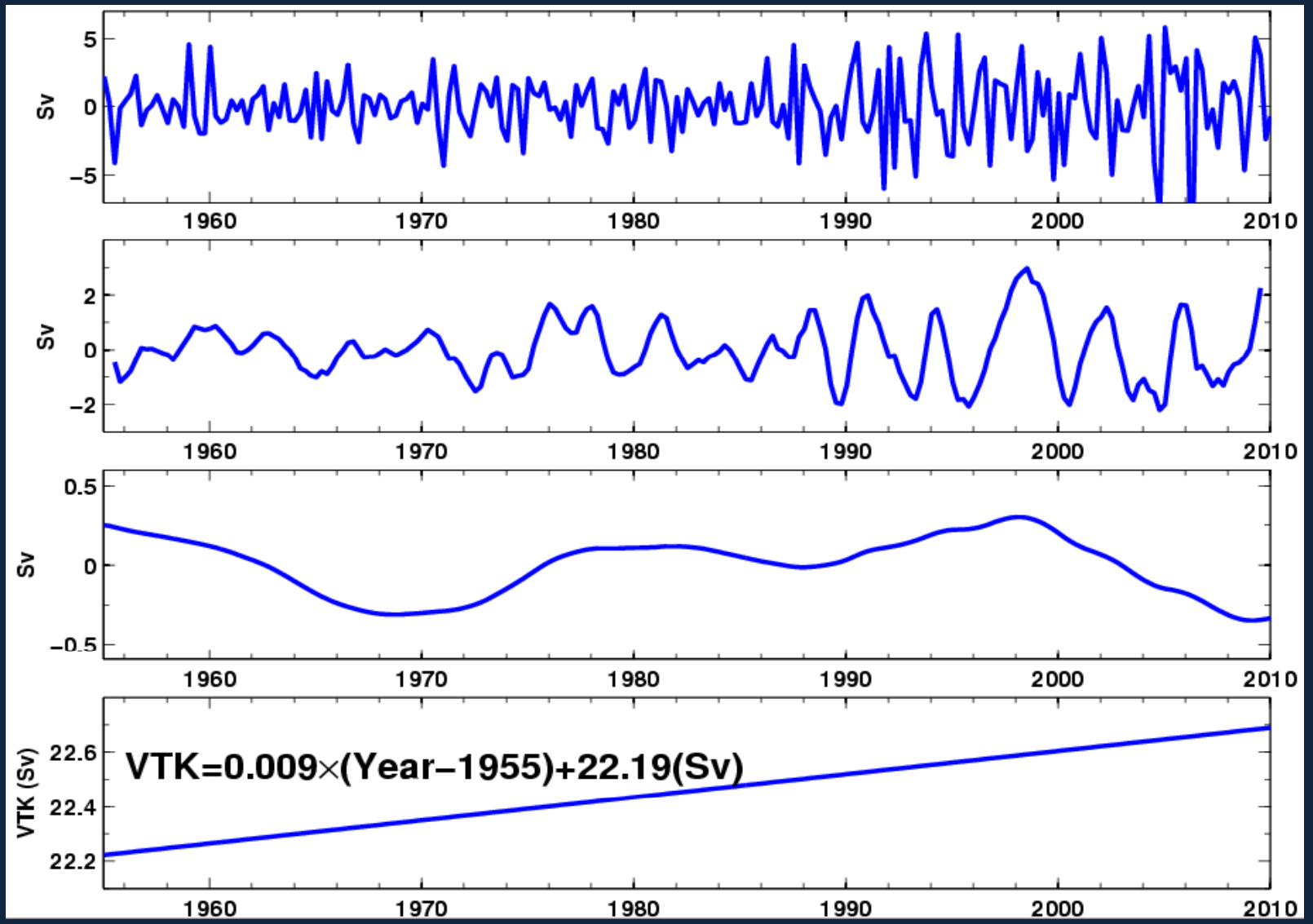

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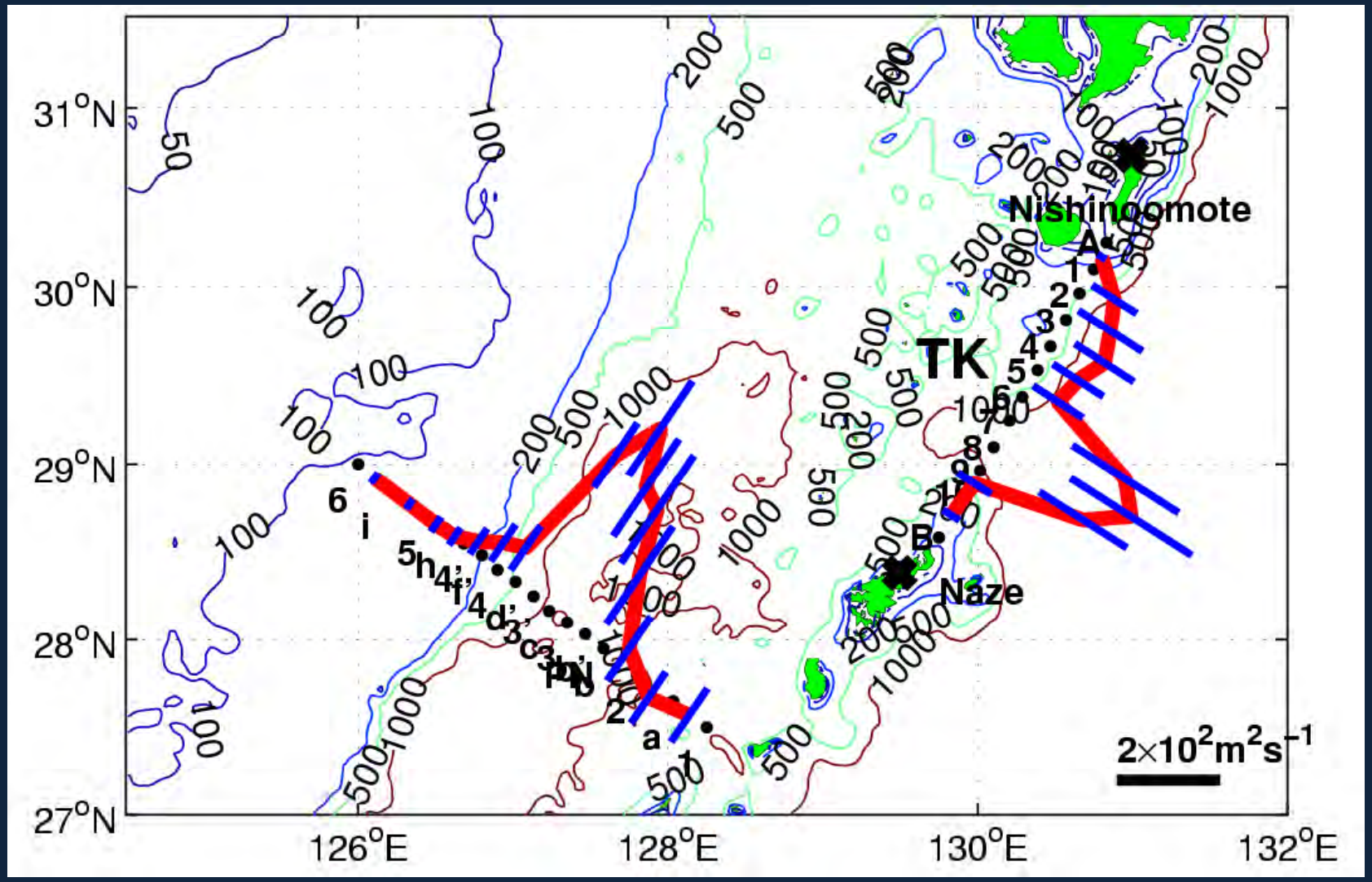

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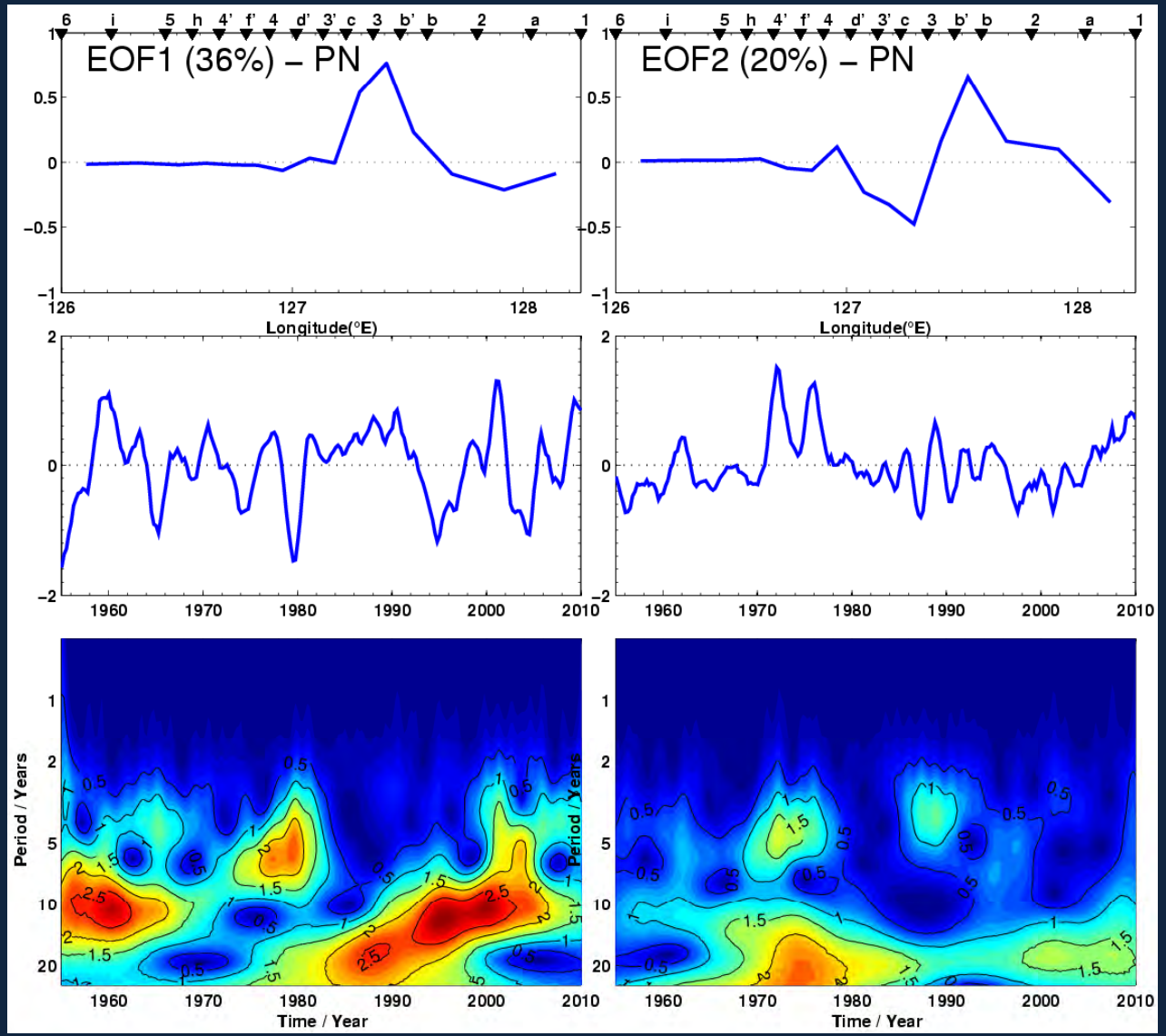

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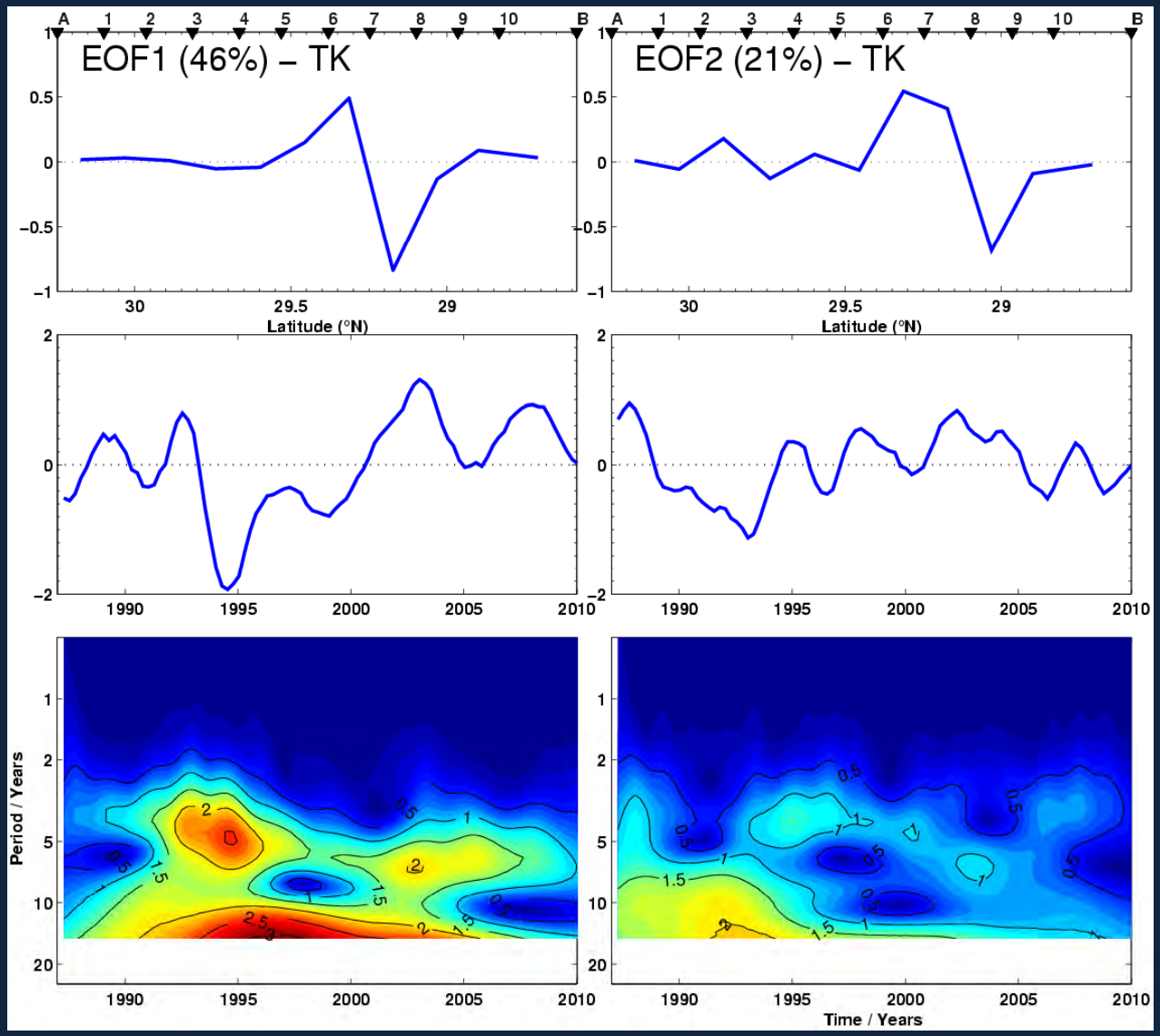

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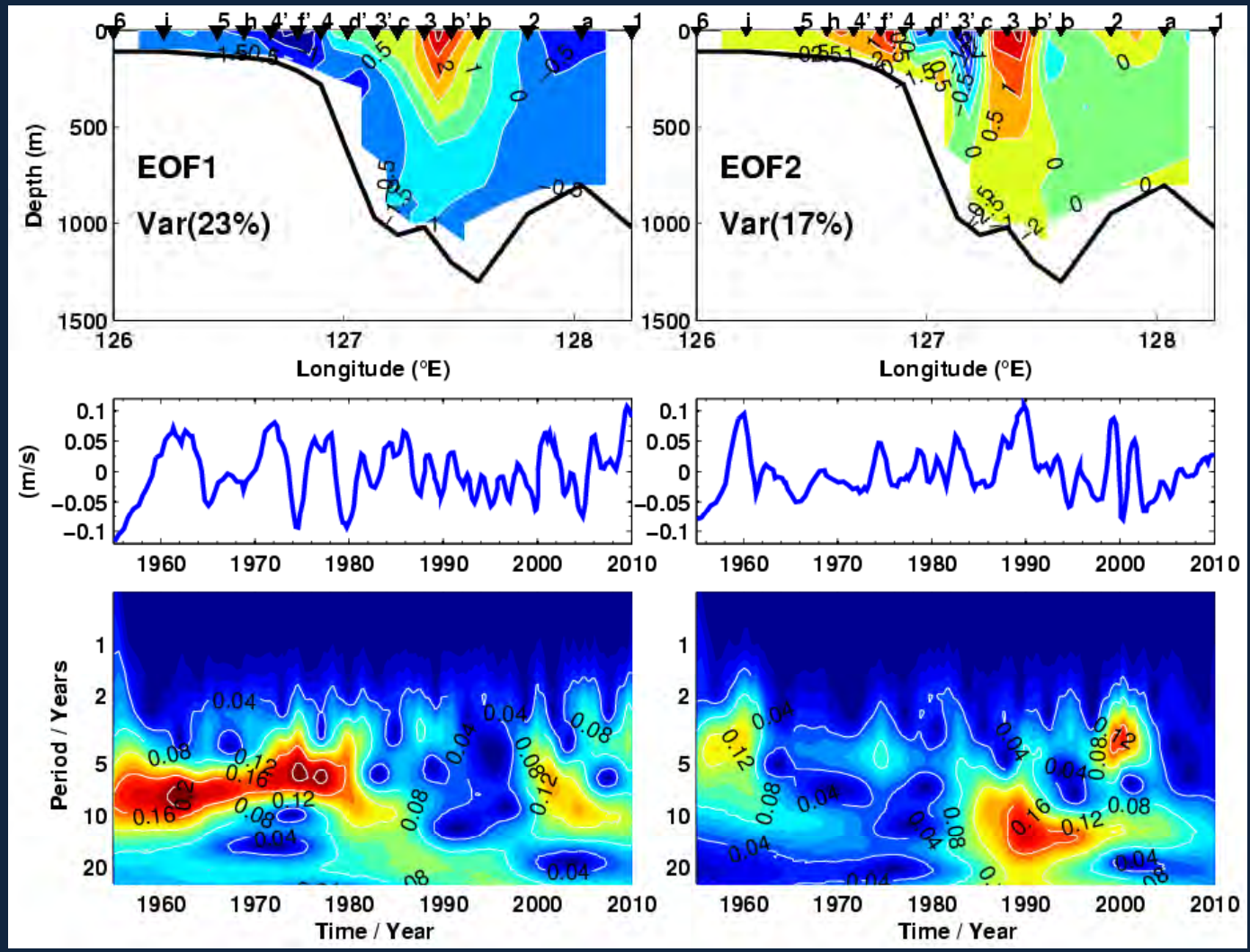

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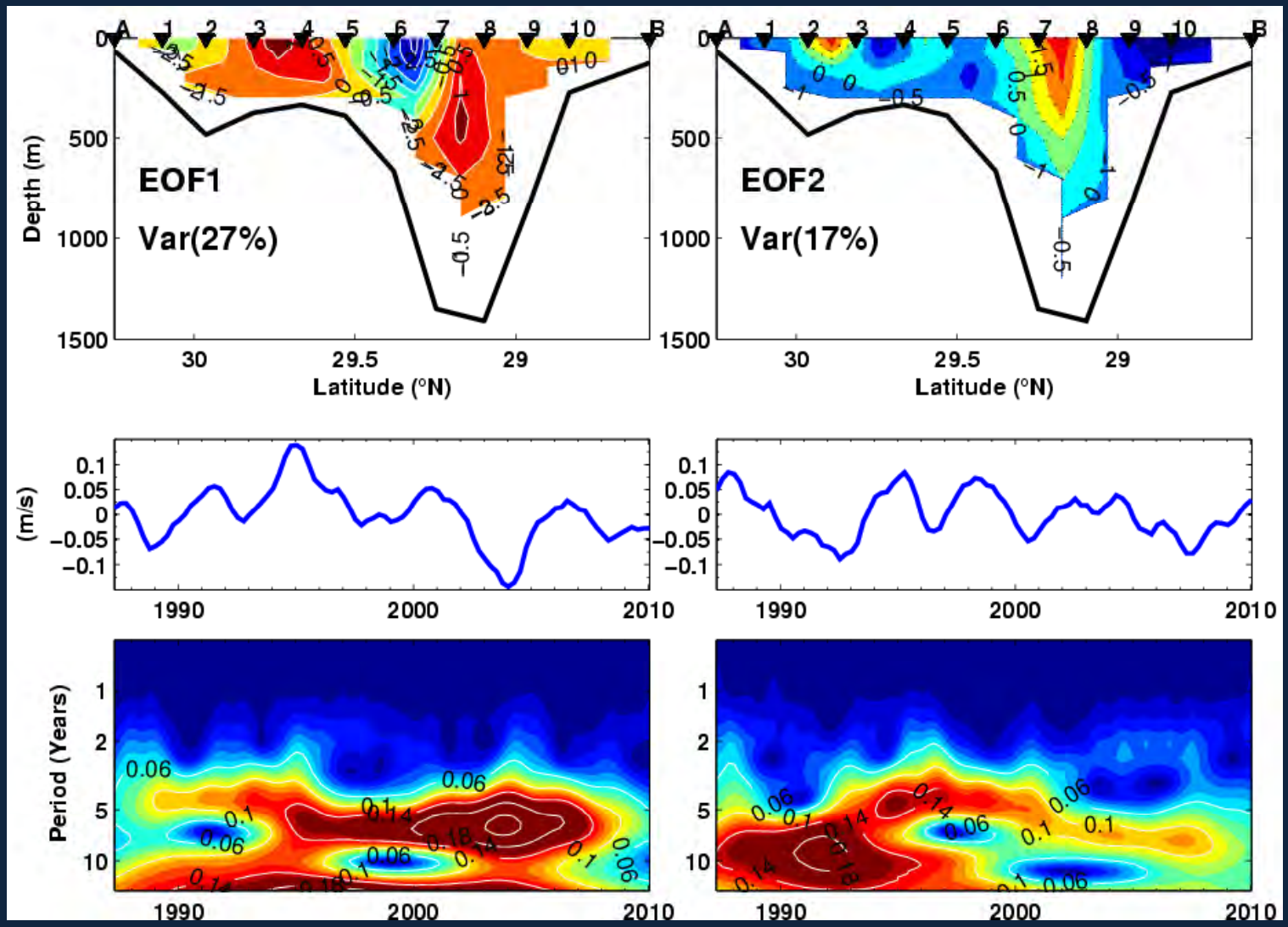

4. Summary

A consistent time series of KC in the ECS at the PN (TK) section during 1955-2010 (1987-2010) is established with an inverse method from the observed hydrographic data. It compares well with other published analyses.

- VTK shows consistent mass flux between the PN and TK section
- VTK fits well with the available moored current observation
- VTK_{surf} through the Tokara Strait is significantly linear correlated with the sea level difference across the strait
- KC exhibits a uniform and decrease variance from surface to bottom

4. Summary

The variability of VTK, VTK per unit width (uVTK) and current pattern, particularly on interannual to decadal time scales, are investigated using EOF and Wavelet Spectrum methods.

Temporal variability of VTK, uVTK, KC, are dominated by the interannual variability, followed by decadal variability .

Spatial variability of uVTK and KC:

- For PN section, is dominated by transport mode
- For TK section, is meander modes.