How Winds and Sea Level Differences Control Coastal Ocean Currents

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Physics

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UCSB

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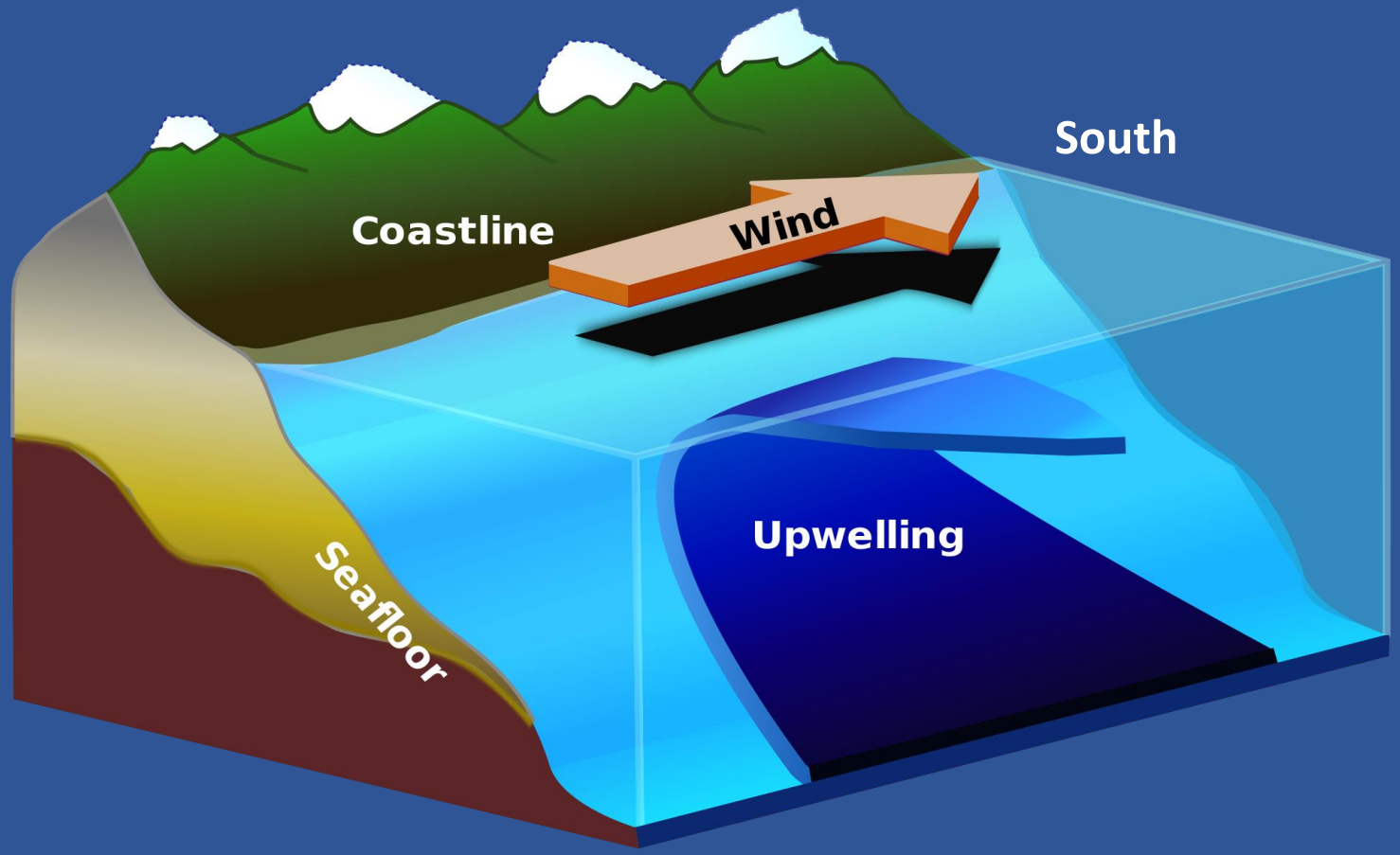
Wind is the Dominant Driver of Coastal Ocean Currents

Upwelling leads to productive ecosystems & cool waters



Currents Affect Coastal Ecosystems

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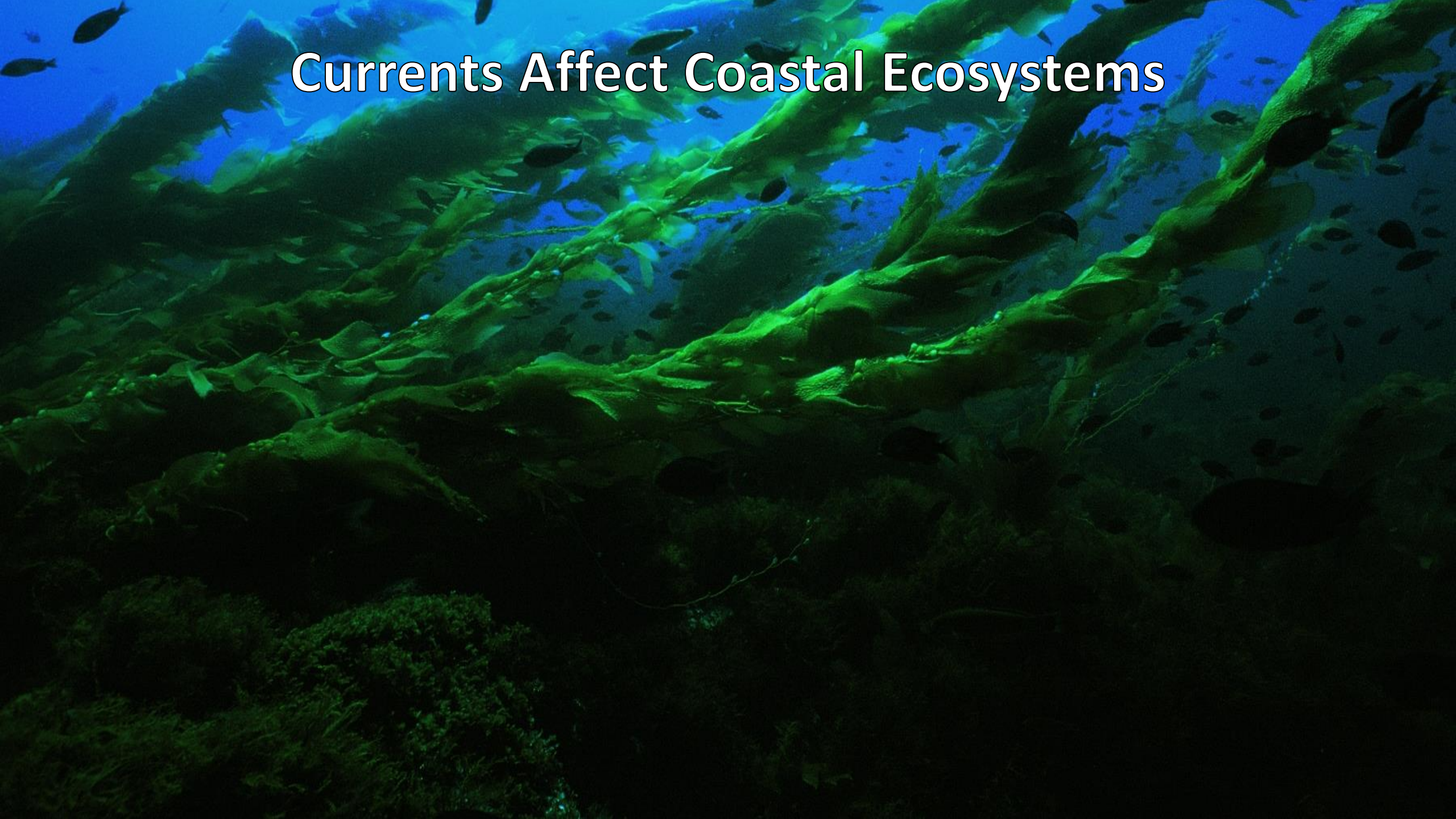

Currents Affect Coastal Ecosystems

Winds Weaken Periodically

= Wind

Winds Weaken Periodically

= Wind

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= Wind

Surface Currents Tend Equatorward When There is Wind

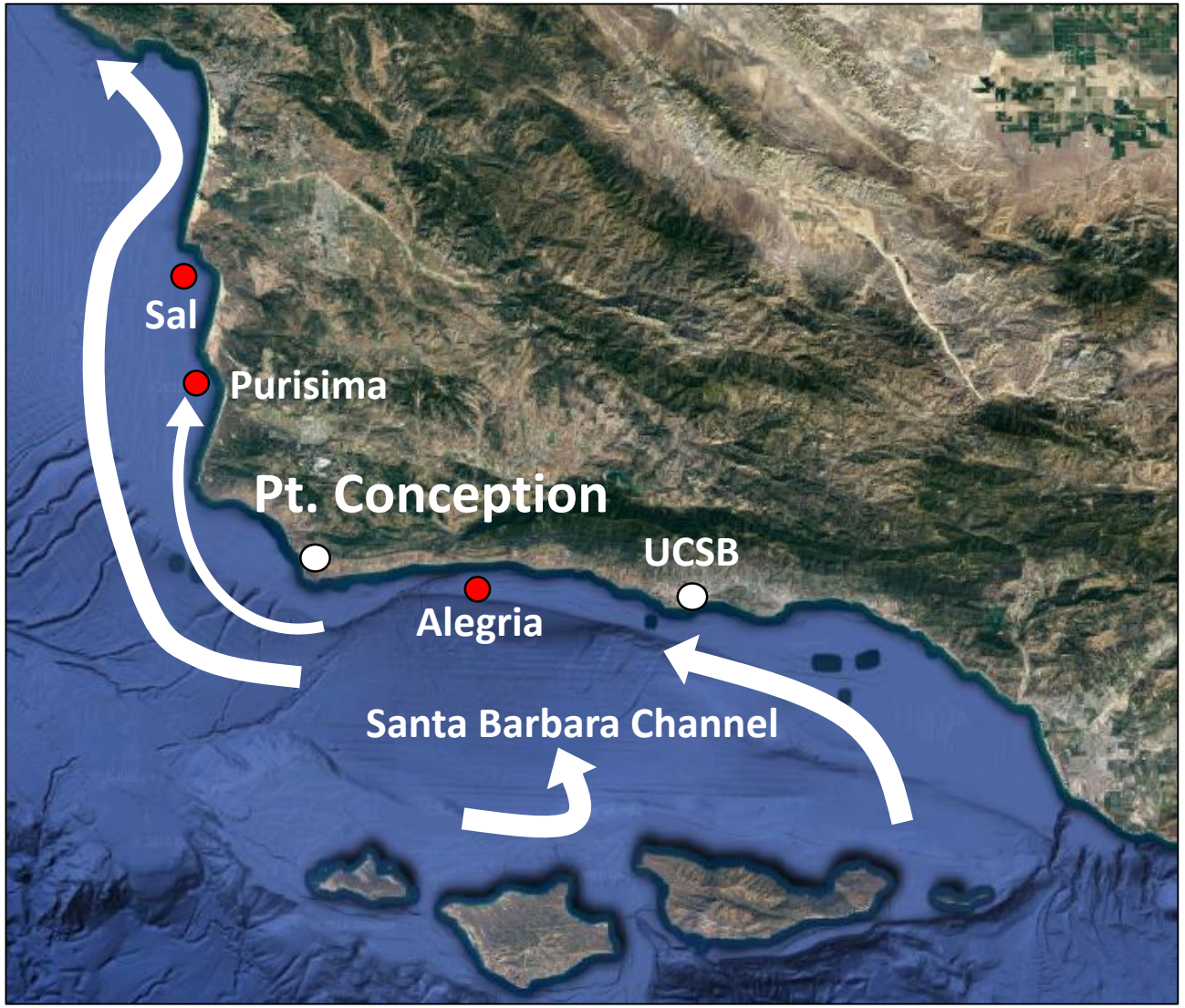
= Wind

= Currents

Wind Relaxations Lead to Poleward Surface Currents

= Wind

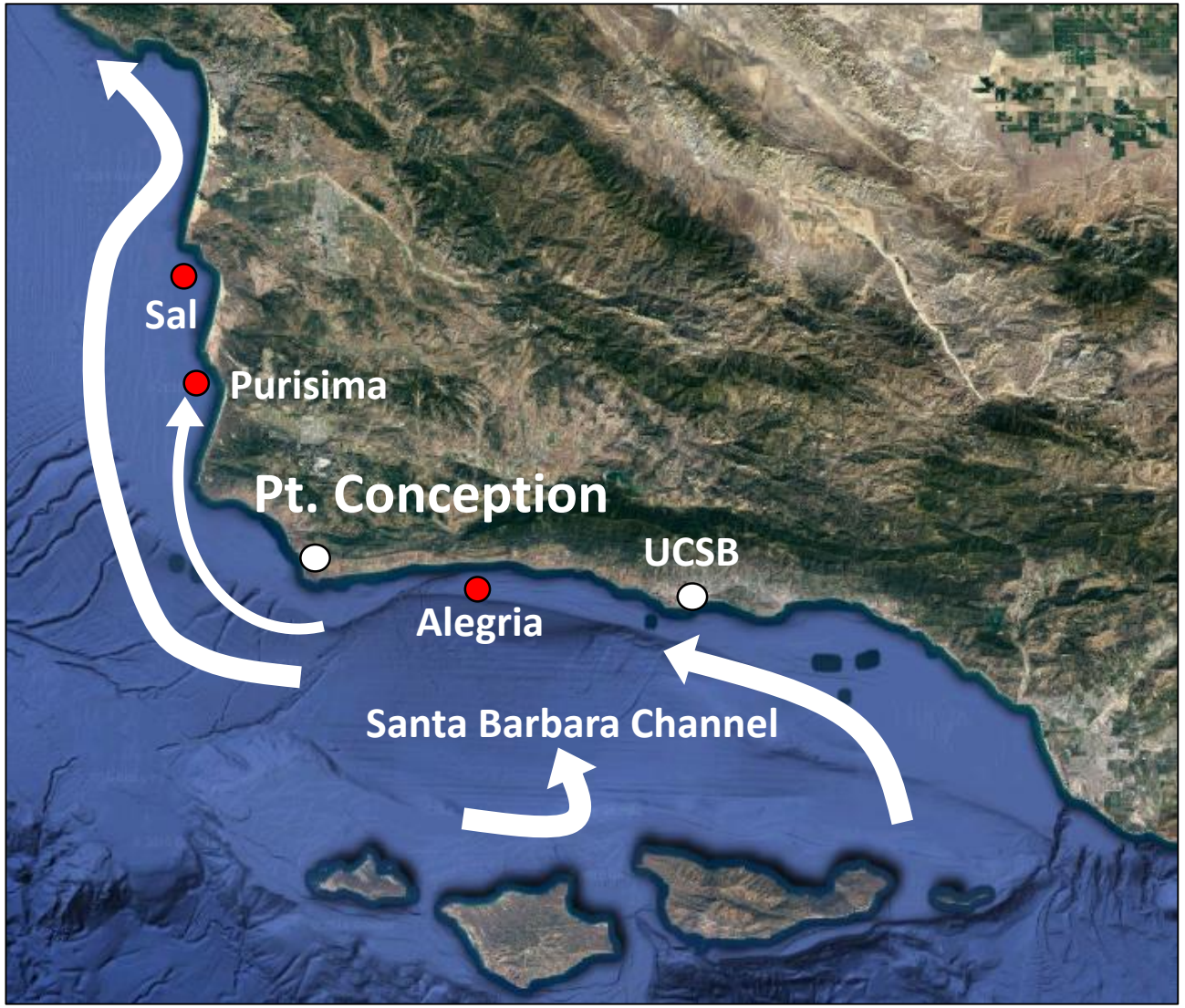
= Currents



How Do We Identify Poleward Flows?

What drives them?

What do they look like?



Wind Relaxations Lead to Poleward Surface Currents

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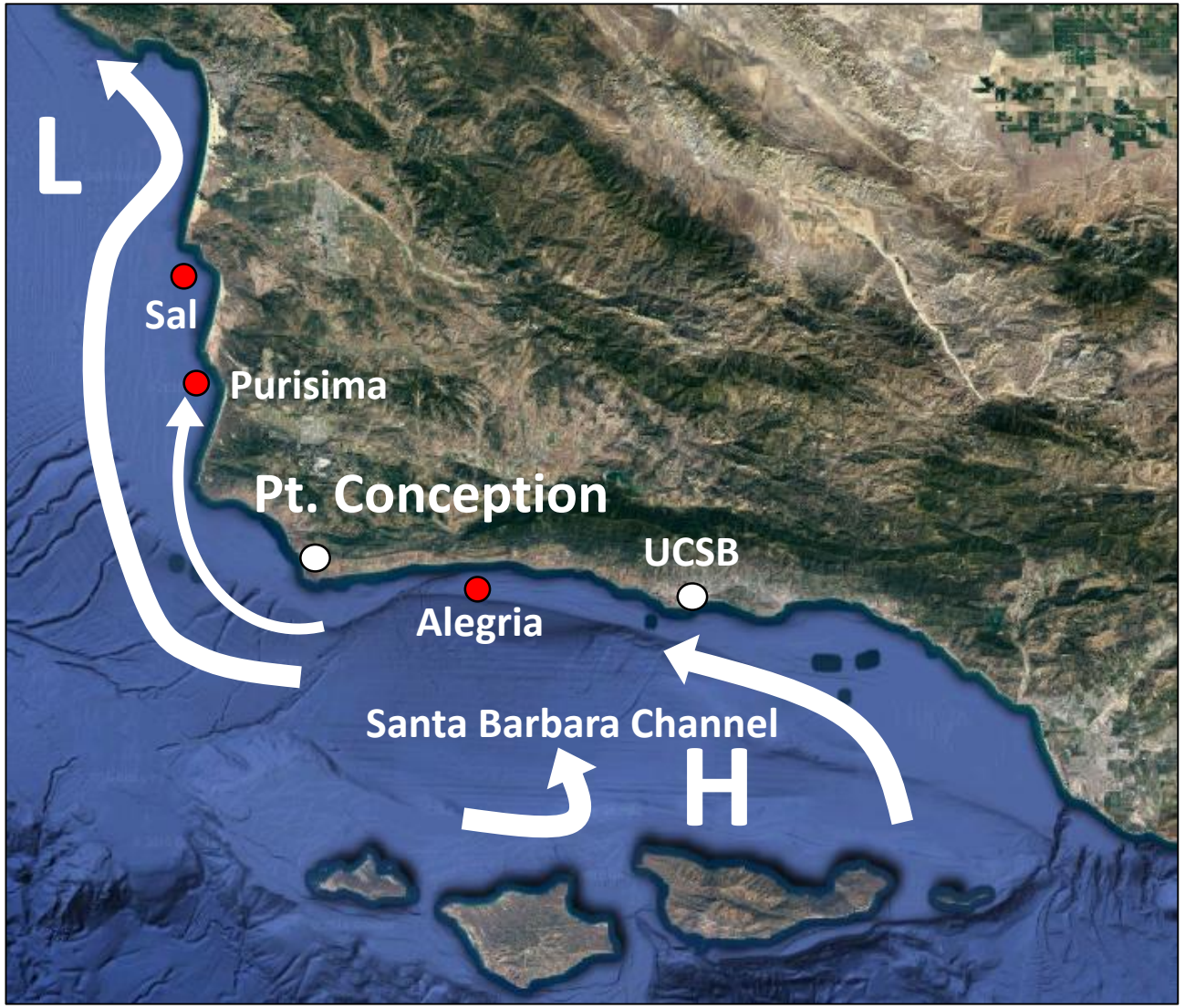


Strong Winds Form Sea Level Gradients

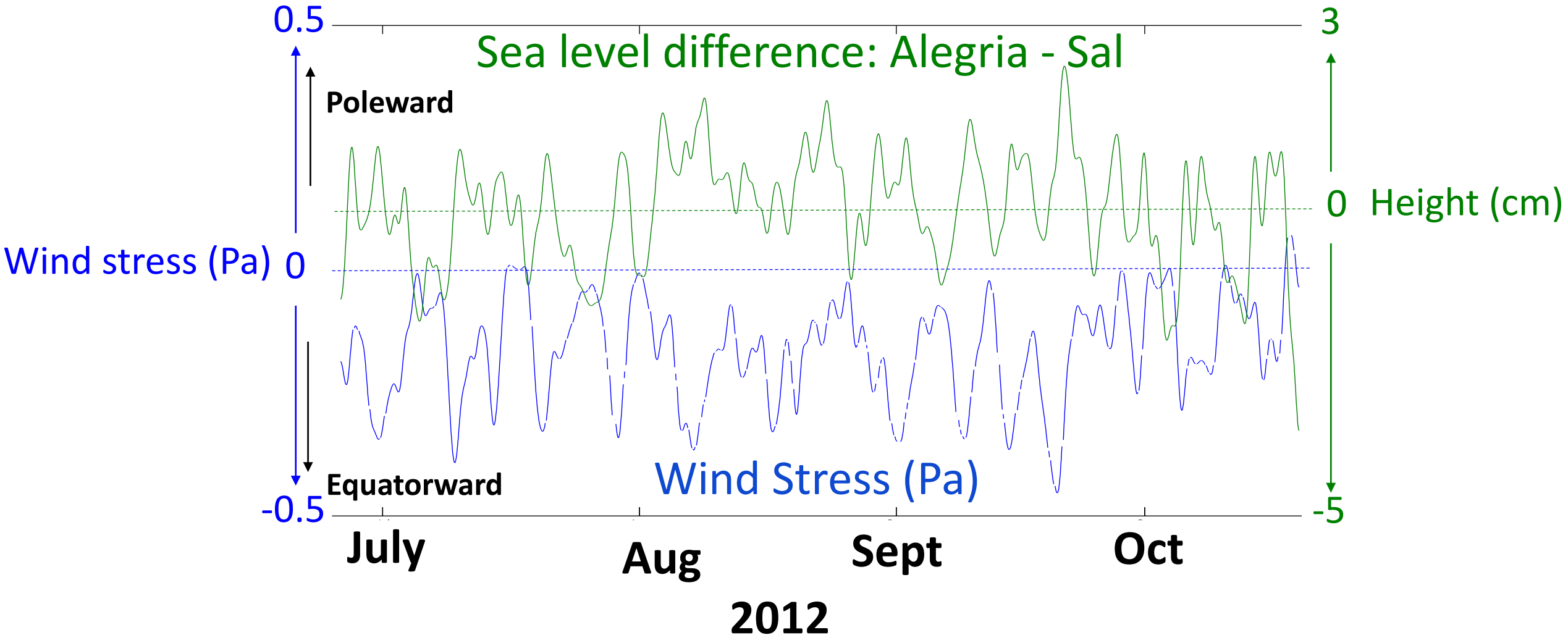
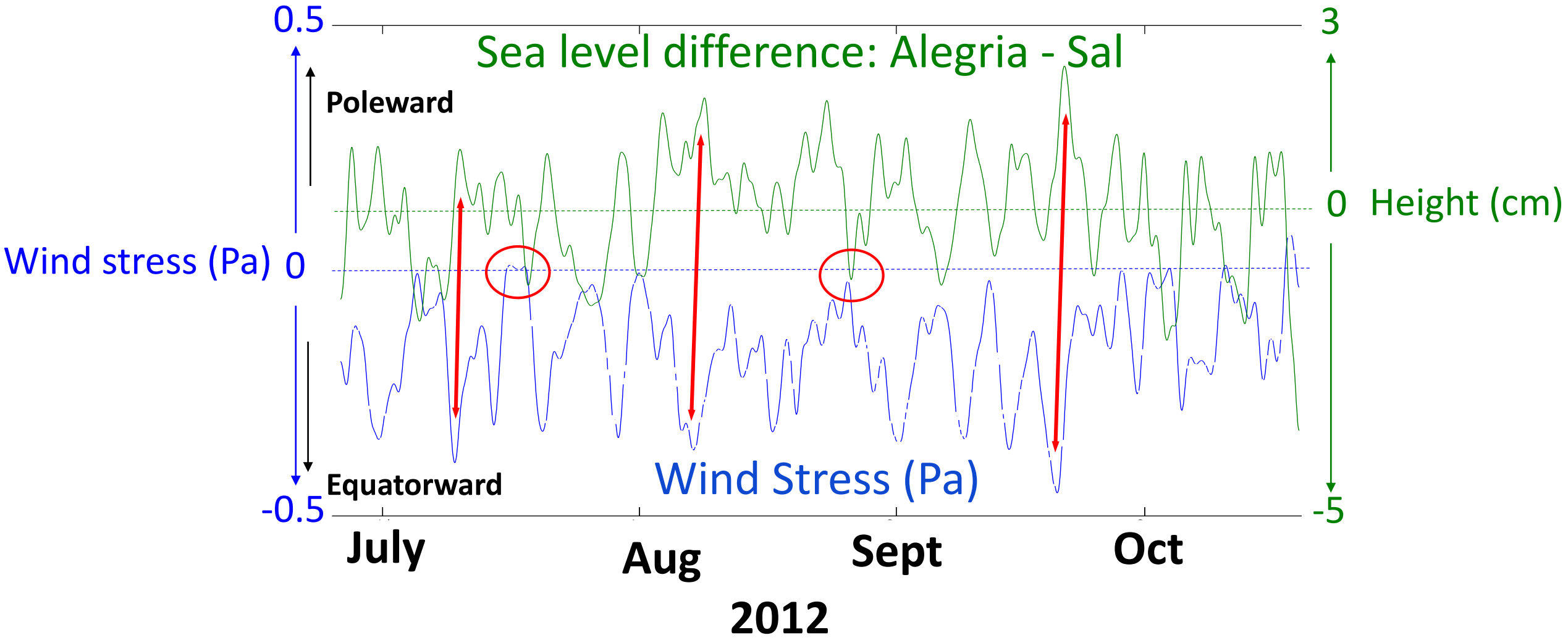


Image: Dr. Carter Ohlmann

Strong Winds Form Sea Level Gradients



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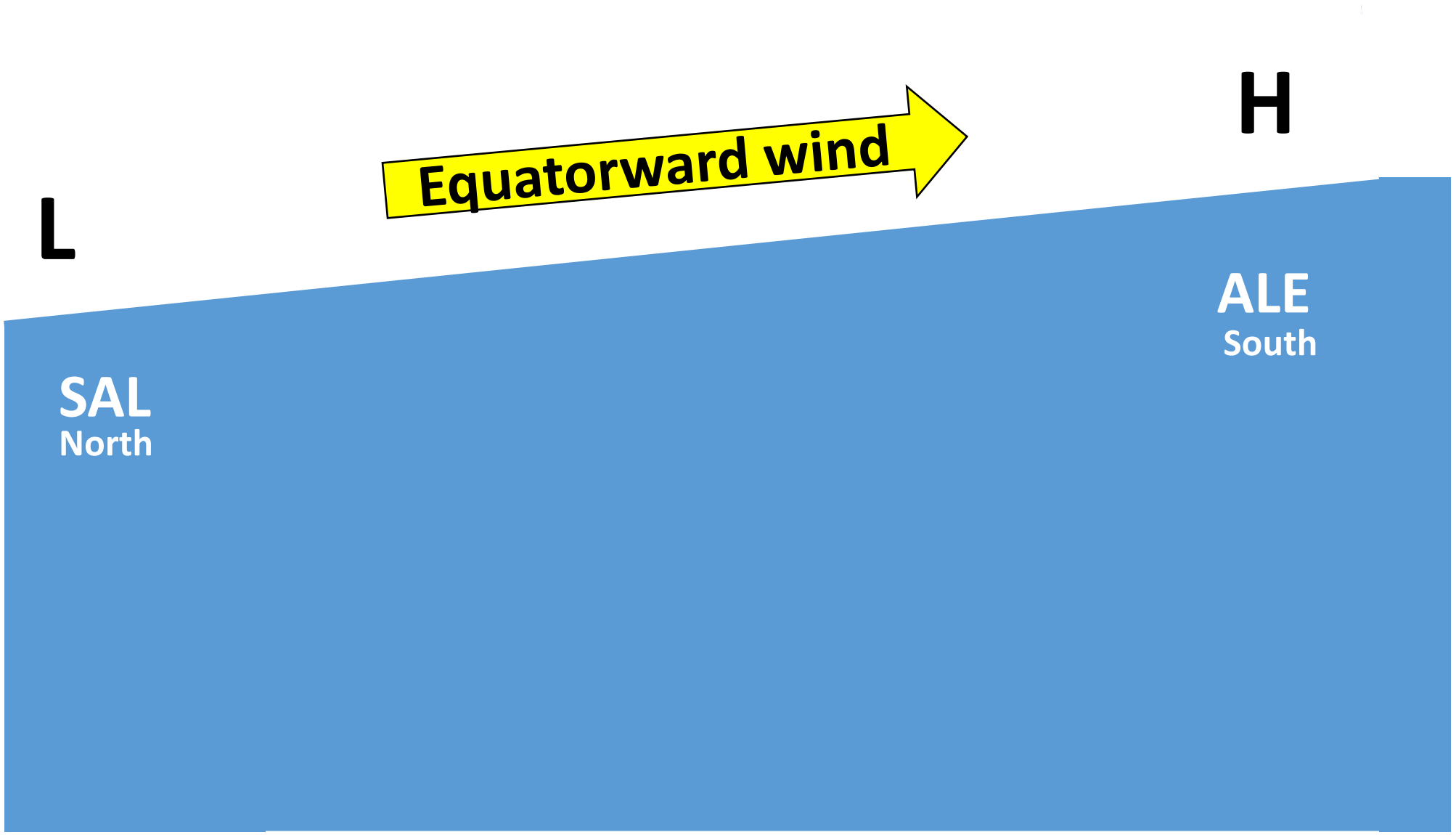
Wind Relaxations Lead to Poleward Surface Currents



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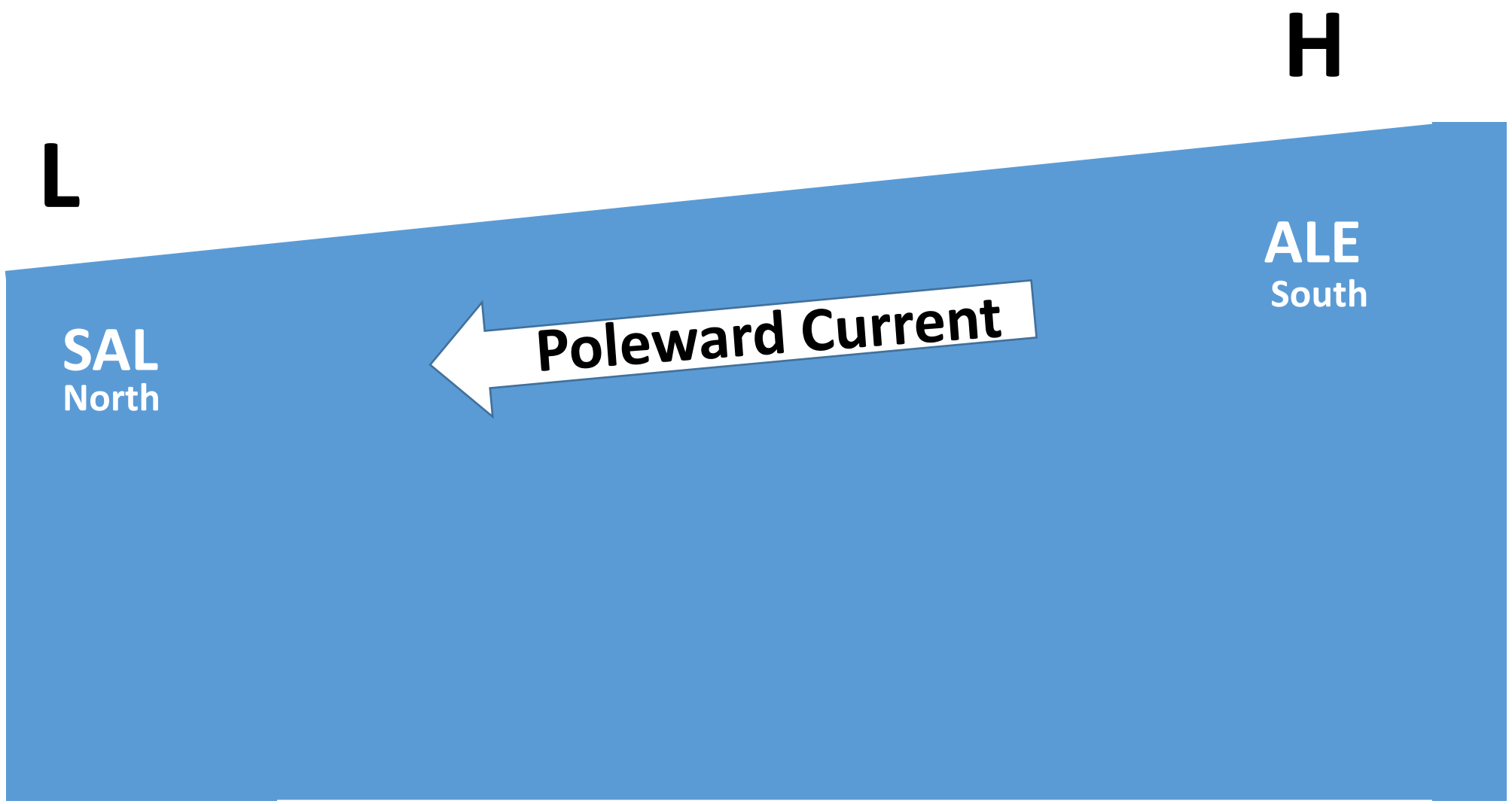
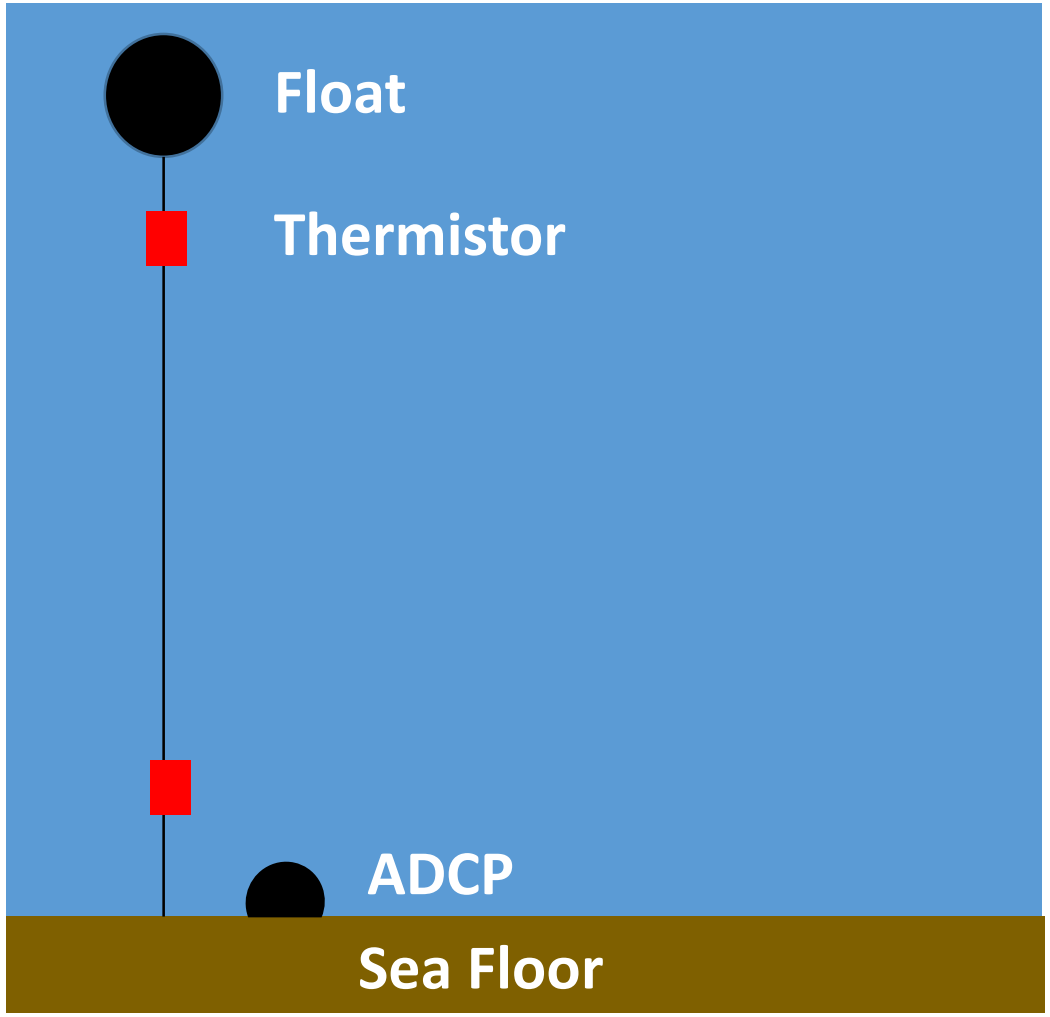


Moorings Near the Coast Observe the Currents

Measures:

Pressure
Velocity
Temperature



ADCP = Acoustic Doppler Current Profiler

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We can compute:

Moorings Near the Coast Observe the Currents

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Pressure
Velocity
Temperature

We can compute:

Pressure Gradients & Sea Level Difference

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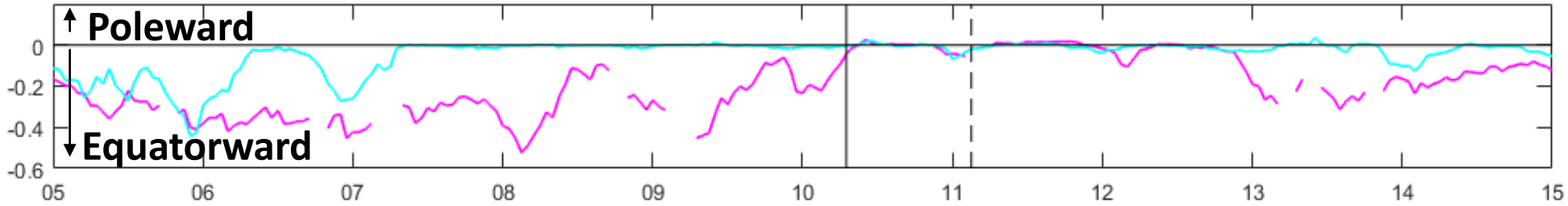
Acceleration of Current

Moorings Near the Coast Observe the Currents

Measures:	We can compute:
Pressure	Pressure Gradients & Sea Level Difference
Velocity	Acceleration of Current
Temperature	Density of Current

Identifying A Poleward Current

Wind Stress (Pa)



Purisima, June 2012

Identifying A Poleward Current

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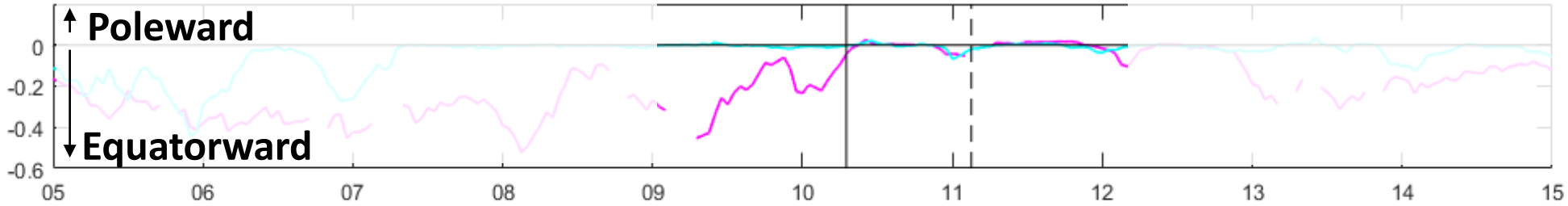

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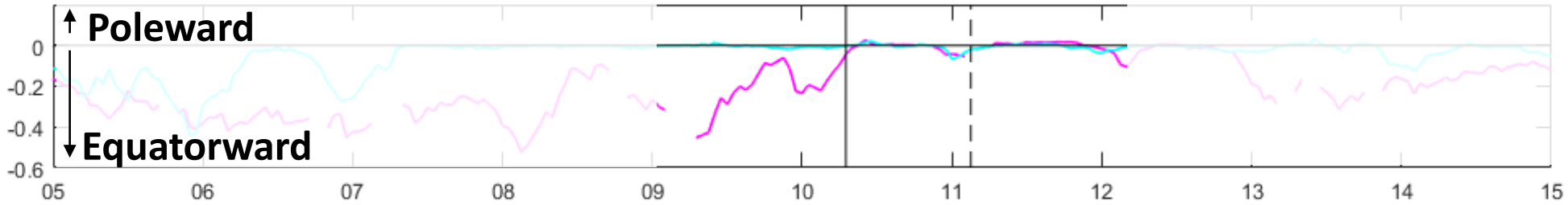
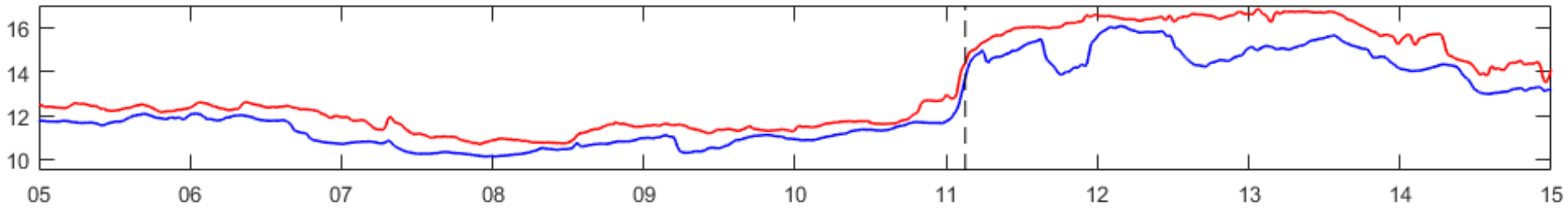


Temperature (C)



Surface

Bottom

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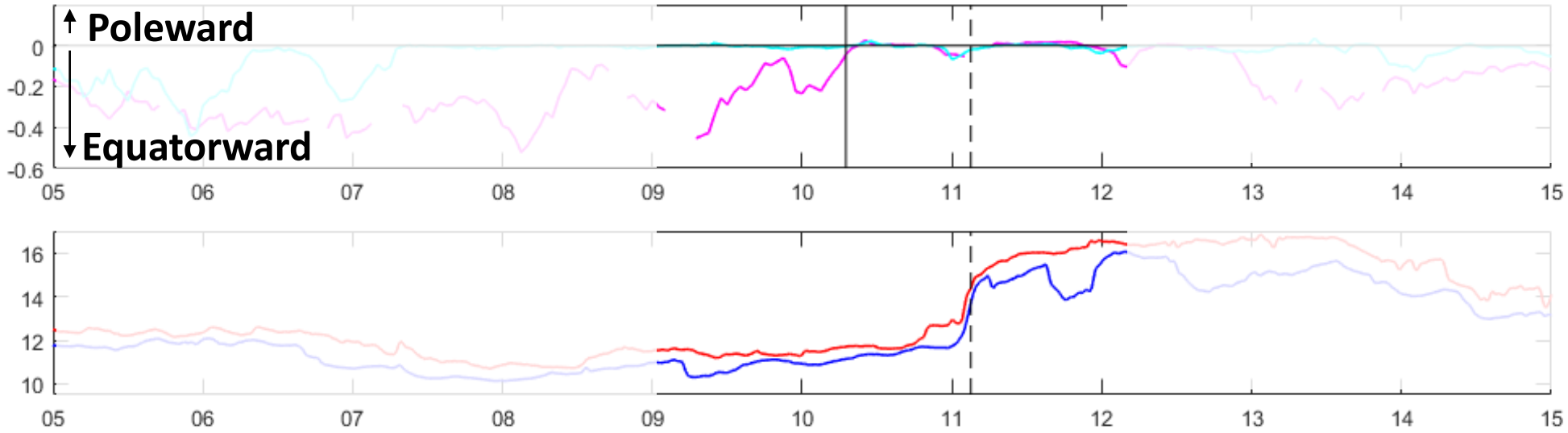
Identifying A Poleward Current

Wind Stress (Pa)

Temperature (C)



Surface

Bottom

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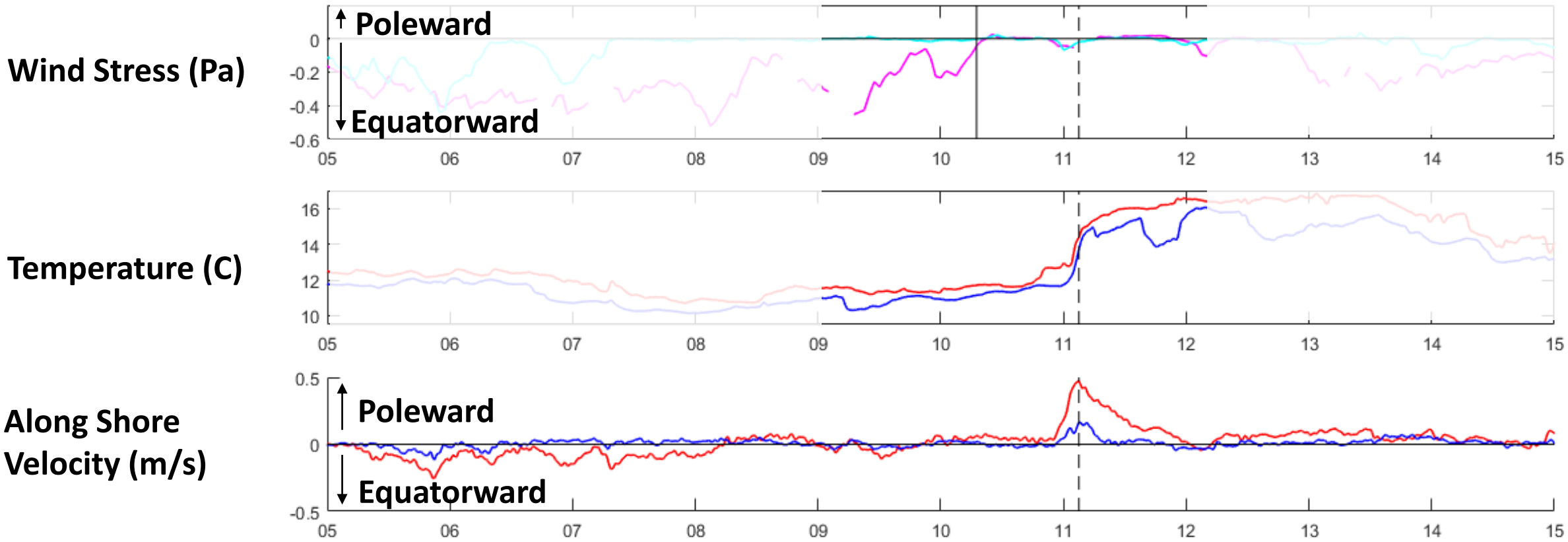
Identifying A Poleward Current



Surface

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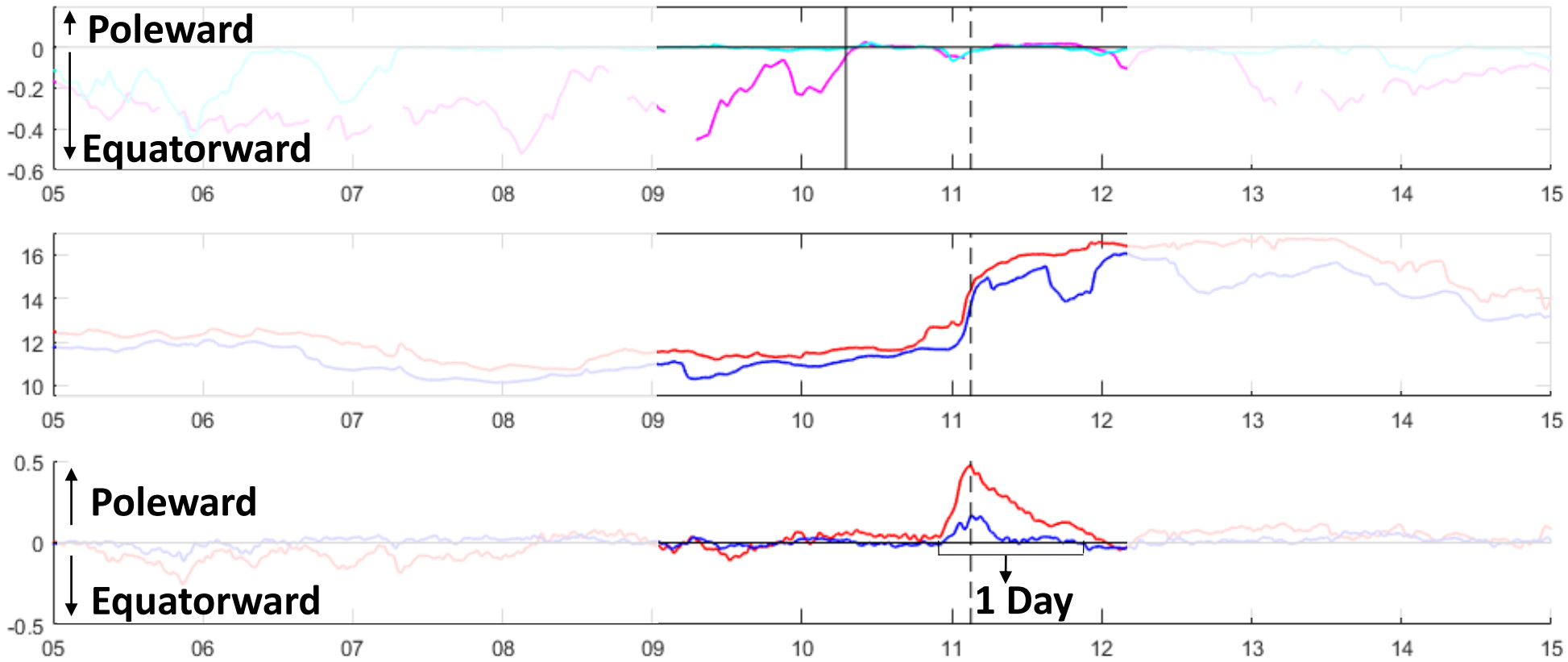
Identifying A Poleward Current



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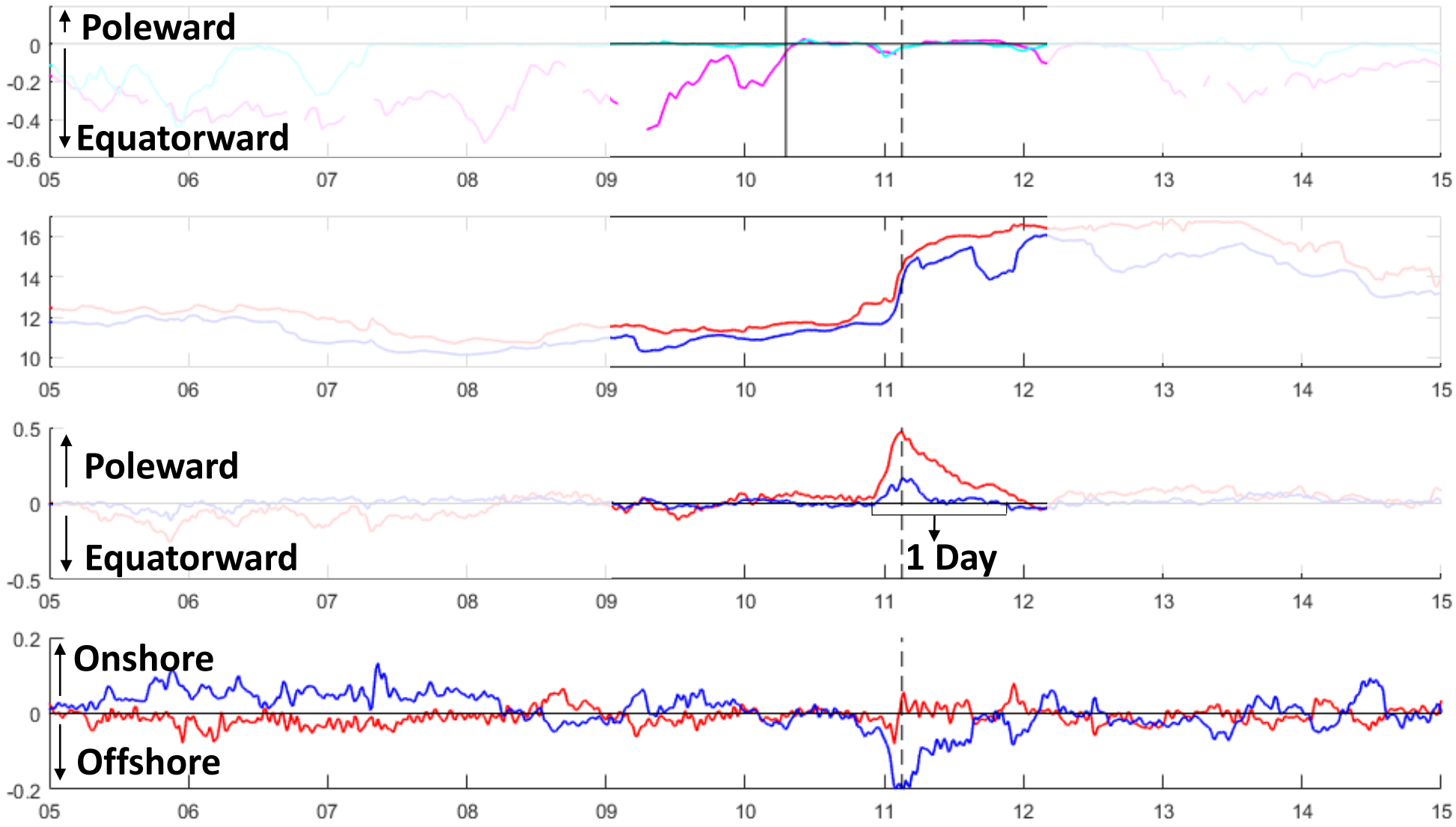
Identifying A Poleward Current



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Bottom

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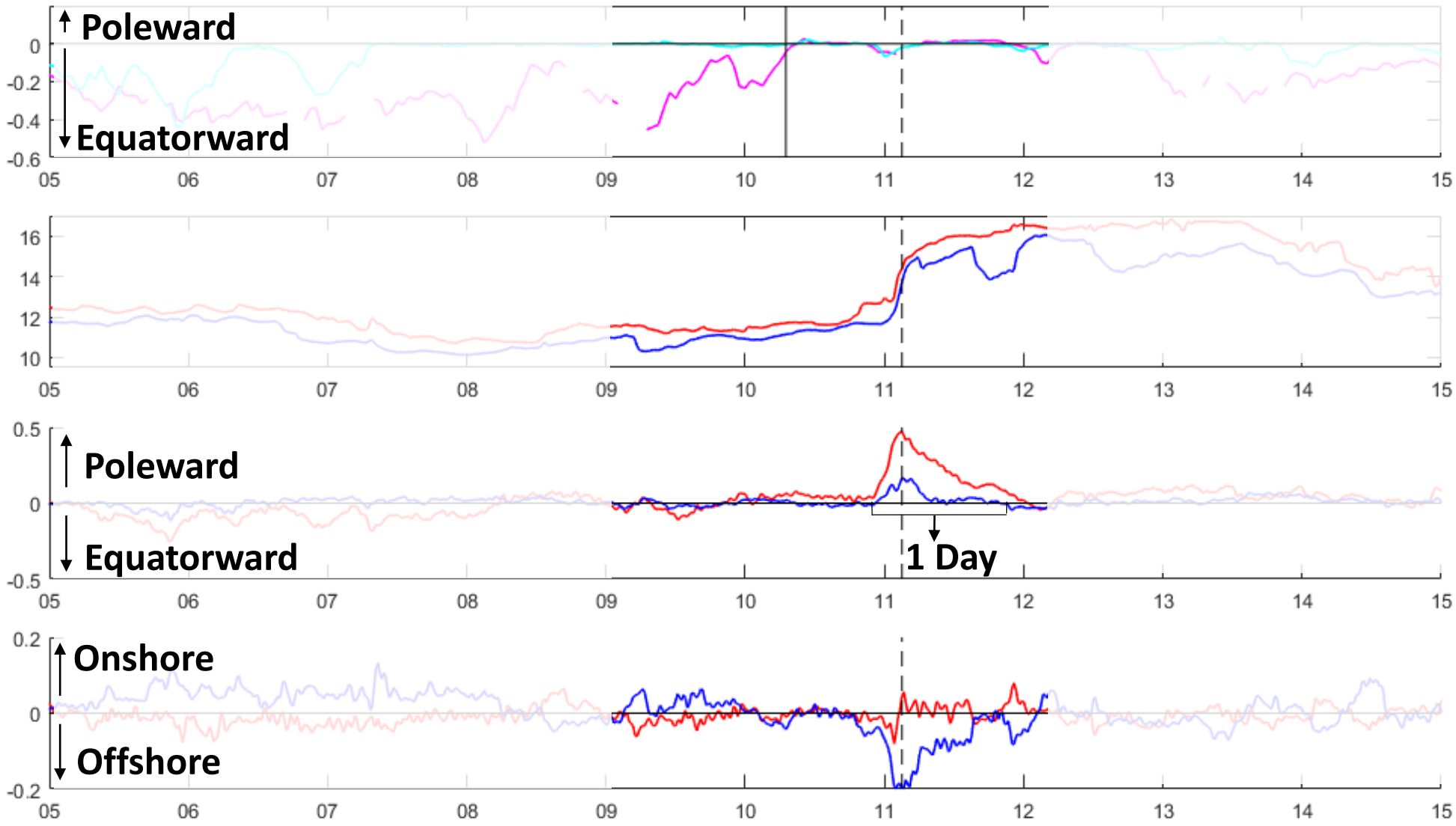
Identifying A Poleward Current



Surface

Bottom

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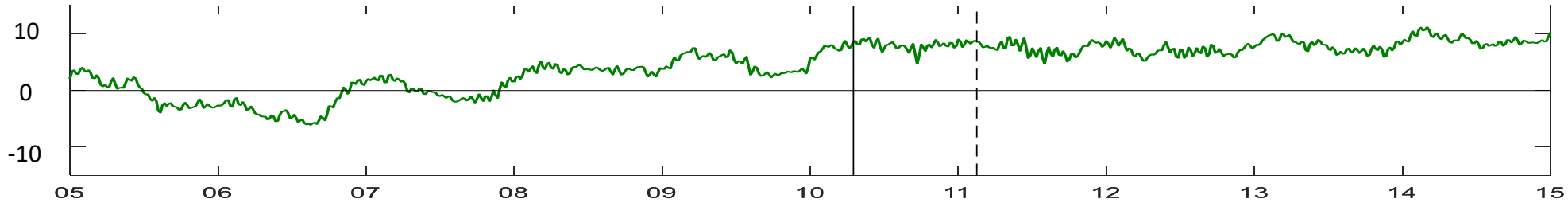
Identifying A Poleward Current

Local Sea Level Change (cm)



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Identifying A Poleward Current

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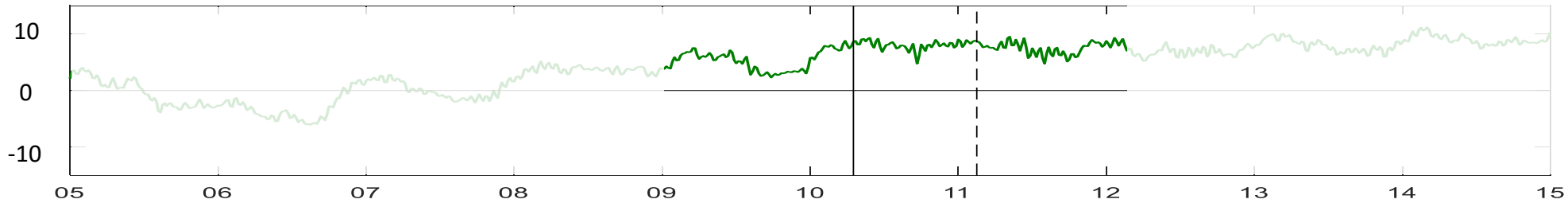

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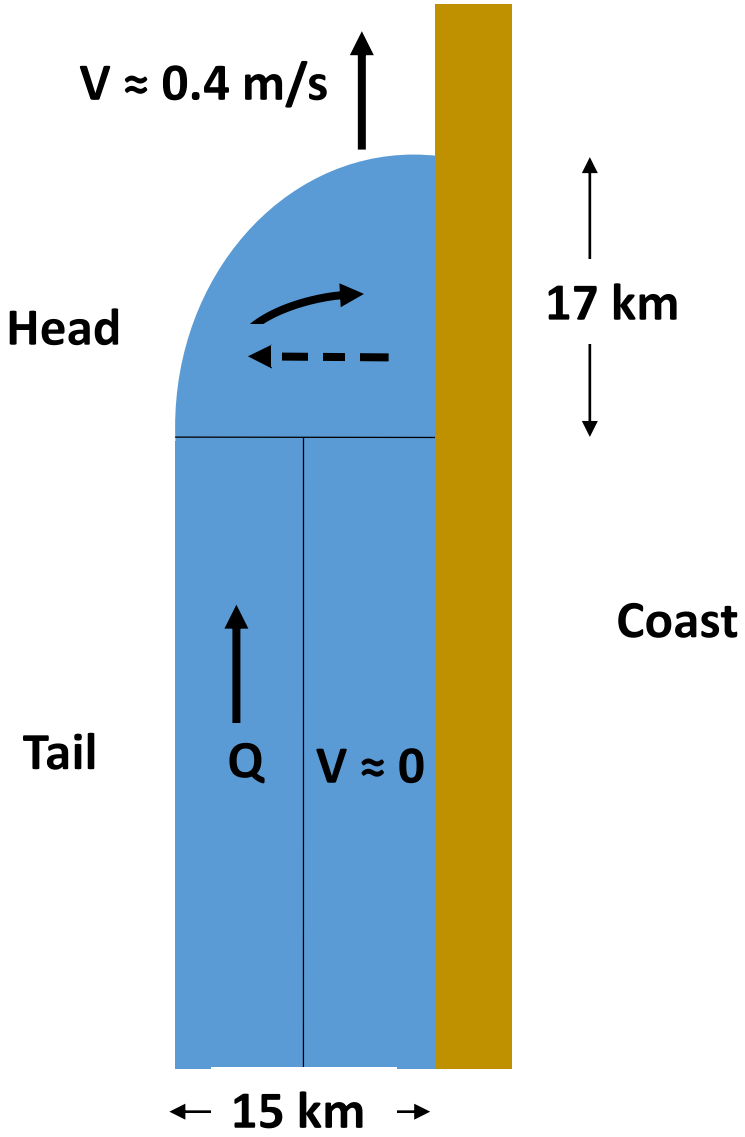
Building a Picture of Poleward Currents



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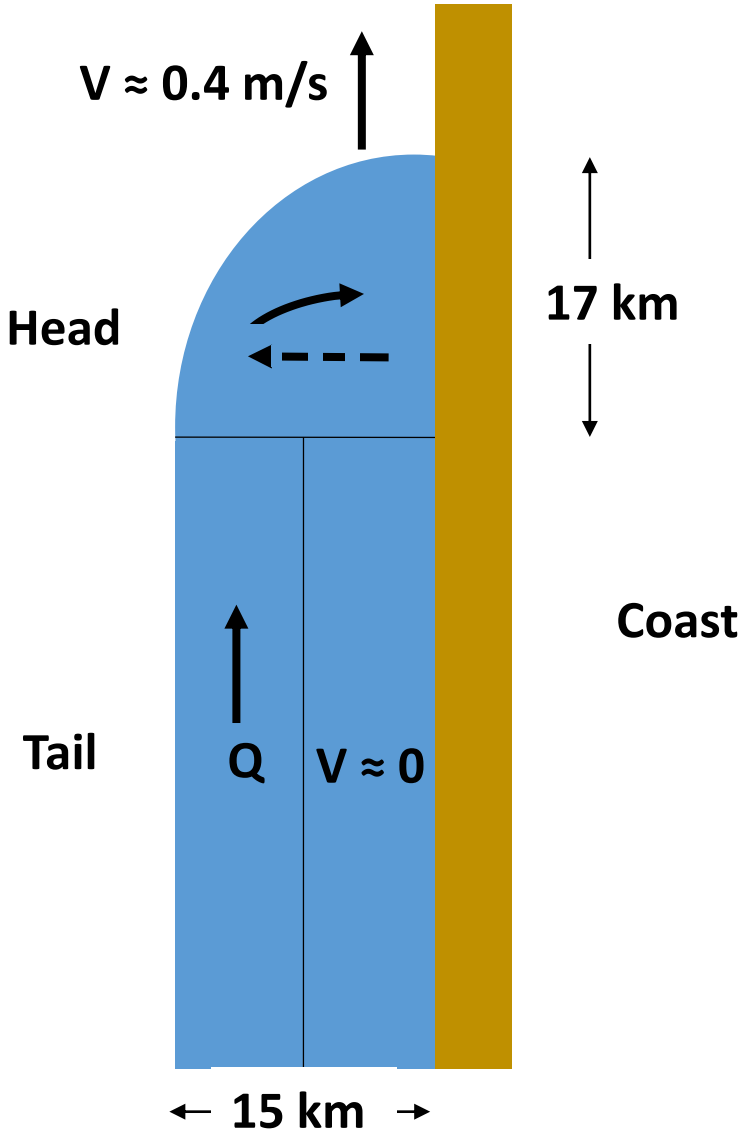
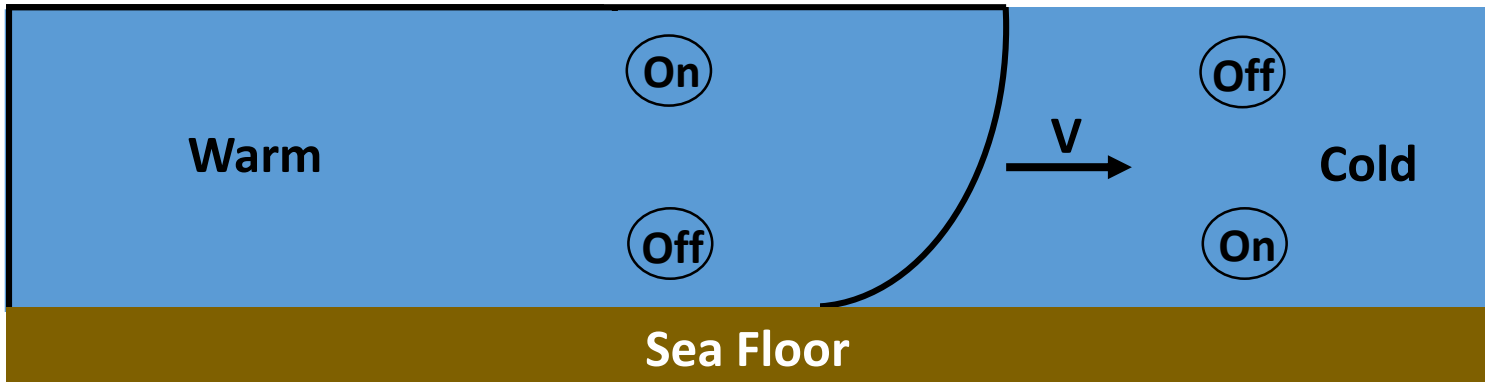
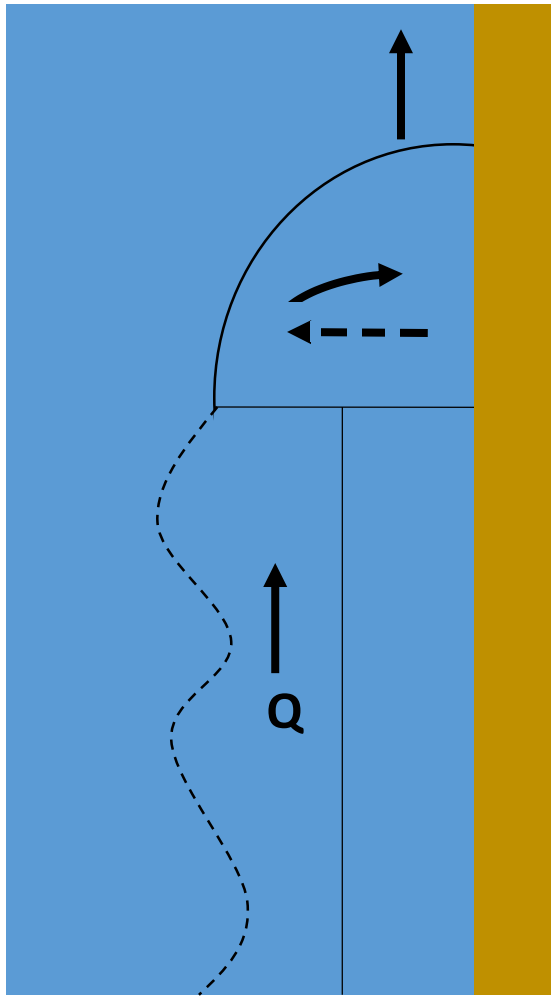




Future Studies will Focus on Dynamics Farther Offshore and Ecological Changes



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Questions?