Impacts of IPO and AMO on Global Ocean Heat Content Distribution

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Energy view for “hiatus”

Radiative imbalance

The pattern of heat redistribution for different internal variabilities?

Data we analyze:
A fully coupled preindustrial control run in CESM LENS Project
Global mean OHC change

For IPO, heat redistributes between surface and subsurface ocean.

For AMO, upper layers’ OHC increases (decreases) in positive (negative) phase.
Basin-scale influence of IPO

Pacific Meridional Streamfunction

Ocean Heat Content ($10^{21}$ J)

Pacific zonally integrated heat density (J/m²)

Pacific Meridional Streamfunction
Basin-scale influence of AMO

Atlantic Meridional Streamfunction

Atlantic zonally integrated heat density (J/m²)

Atlantic Meridional Streamfunction
In-phase IPO and AMO

Global Mean Surface Temperature change (degC)

<table>
<thead>
<tr>
<th></th>
<th>IPO+</th>
<th>AMO+</th>
<th>IPO+&amp;AMO+</th>
<th>IPO−</th>
<th>AMO−</th>
<th>IPO−&amp;AMO−</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>0.053</td>
<td>0.040</td>
<td>0.076</td>
<td>−0.054</td>
<td>−0.054</td>
<td>−0.087</td>
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<td></td>
<td>(±0.012)</td>
<td>(±0.015)</td>
<td>(±0.027)</td>
<td>(±0.012)</td>
<td>(±0.016)</td>
<td>(±0.032)</td>
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Summary

1. Main feature of OHC change for IPO: Heat redistribution between surface and subsurface in the tropical and subtropical Pacific ocean through the change of STCs

2. Main feature of OHC change for AMO: Surface and subsurface OHC increase in positive phase and decrease in negative phase. Strong heat anomaly in subpolar Atlantic ocean through the change of AMOC

3. In-phase variation of IPO and AMO amplifies the surface change of OHC and GMST