Mechanisms of Marine Ecosystem Predictability Along U.S. Coasts

Mike Jacox
on behalf of the
NOAA Marine Prediction Task Force

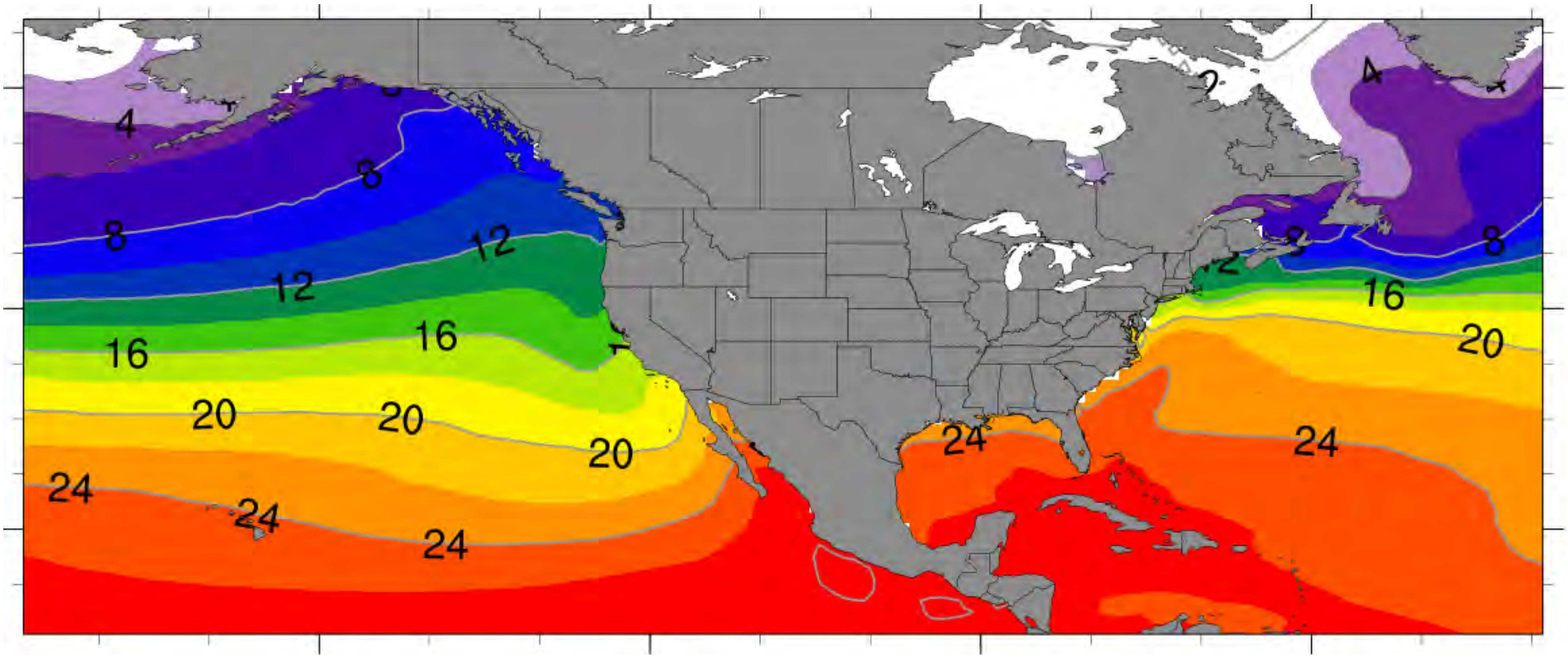
PICES Annual Meeting
Yokohama, Japan
October 30, 2018

2017 NOAA MAPP Competition: “Research to explore seasonal prediction of **coastal high water levels** and changing **living marine resources**”

NOAA National Ocean Service (NOS):
Coastal resilience and coastal intelligence through improved products and services

NOAA National Marine Fisheries Service (NMFS):
Increased production, delivery and use of climate-related information in fisheries management and protected species conservation

2017 NOAA MAPP Competition: "Research to explore seasonal prediction of **coastal high water levels** and changing **living marine resources**"



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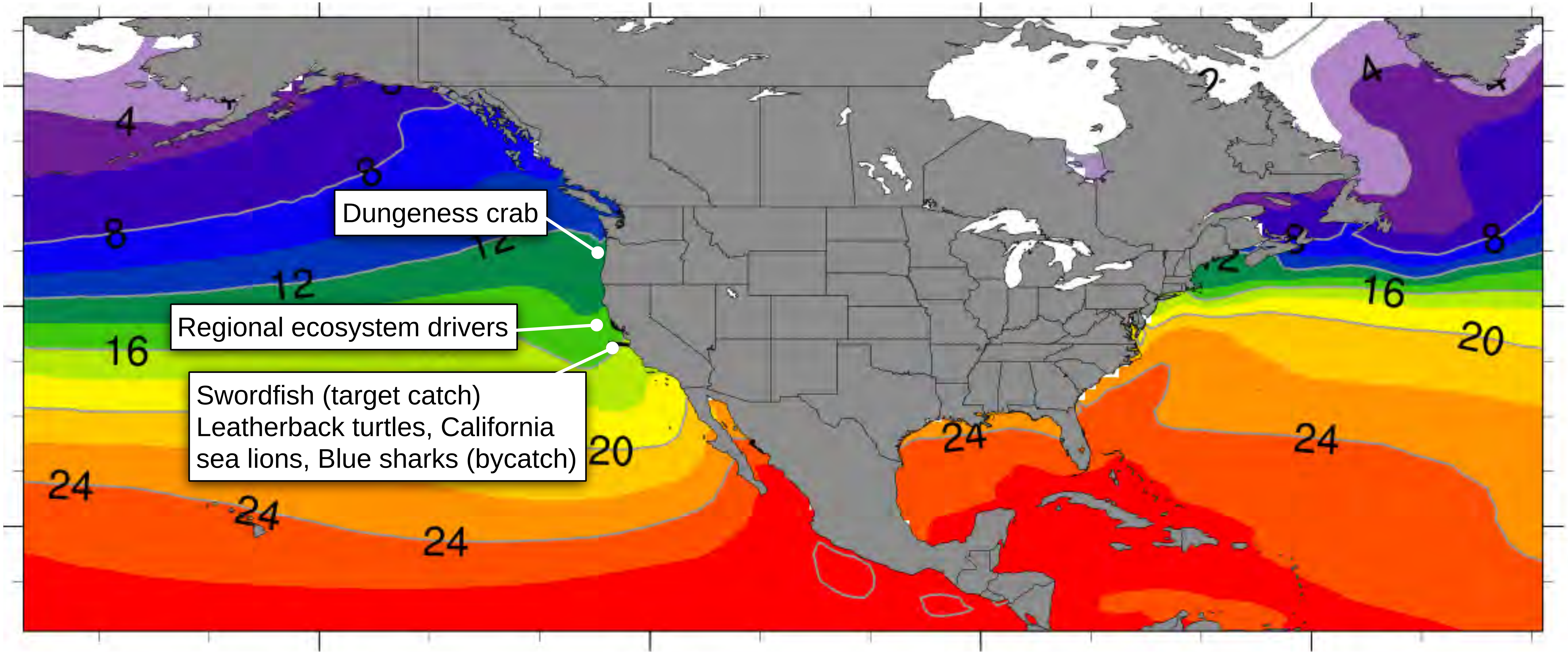

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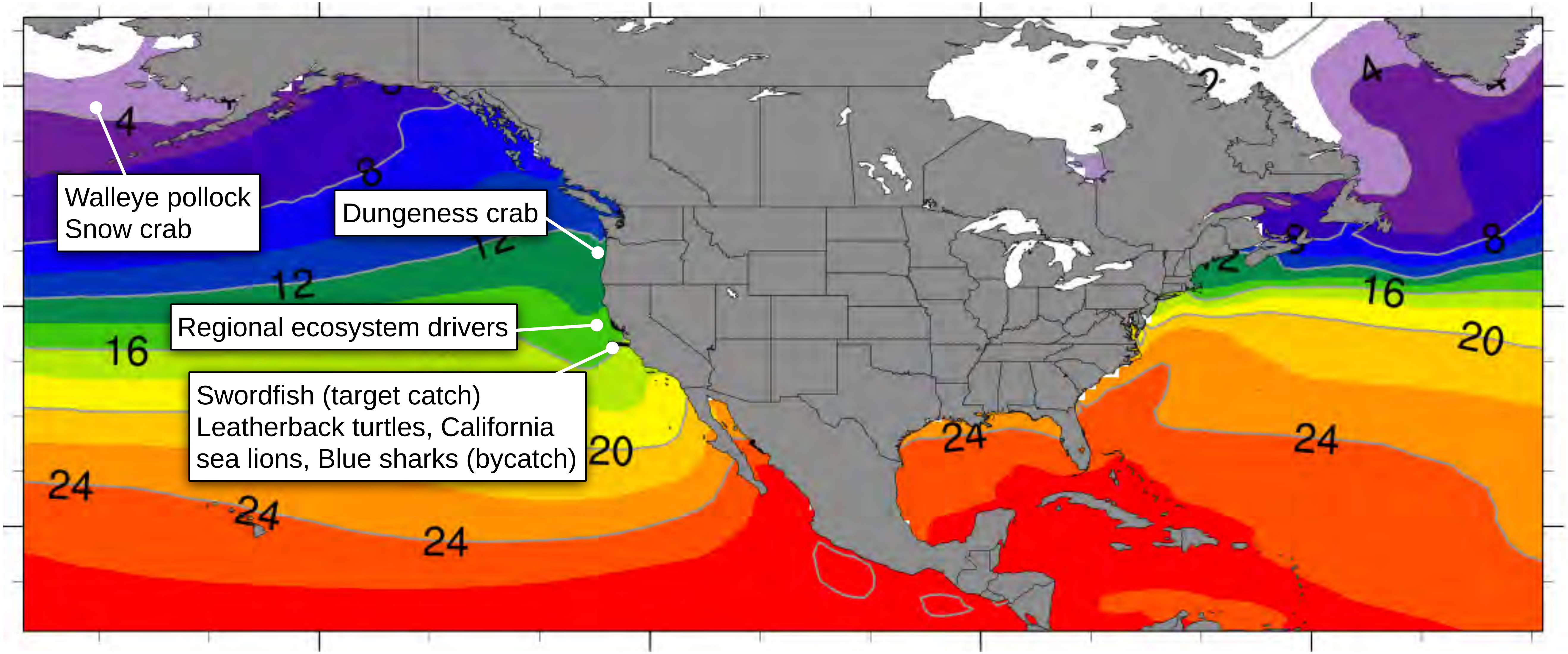

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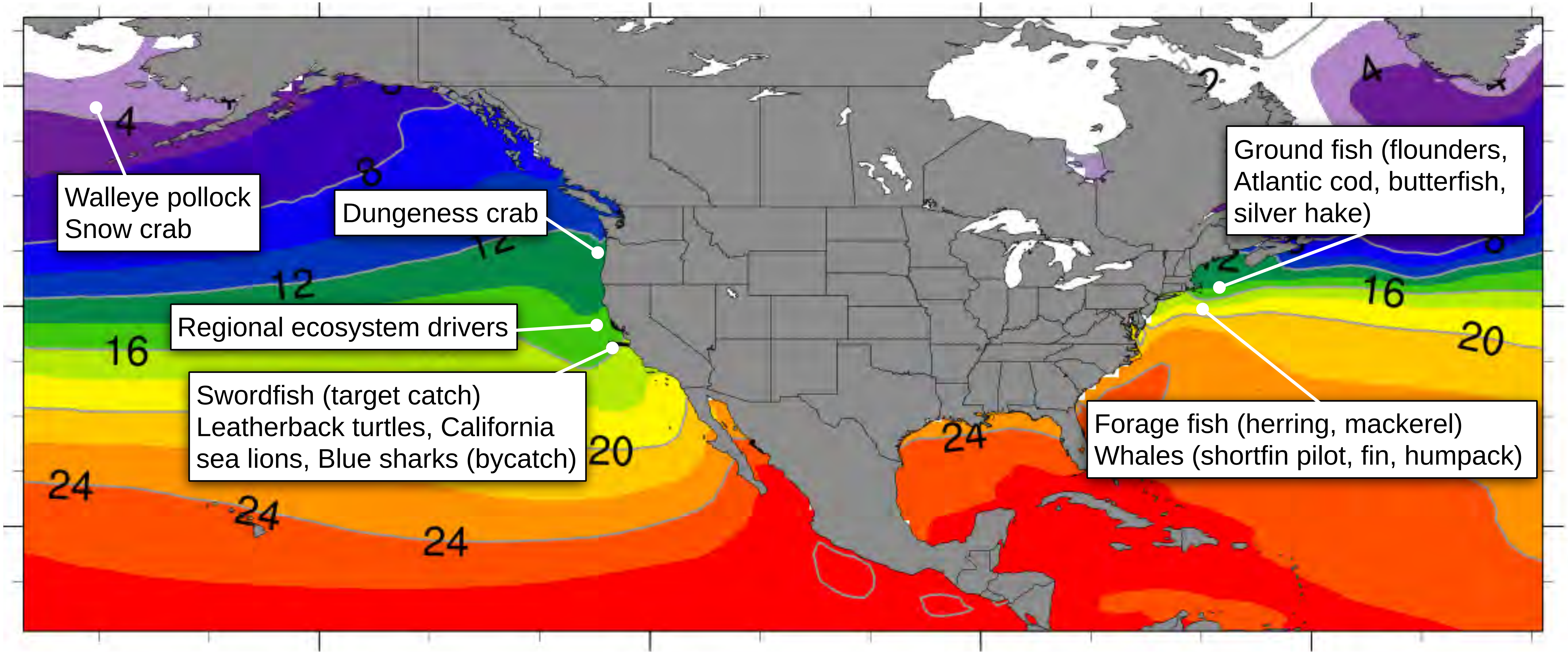

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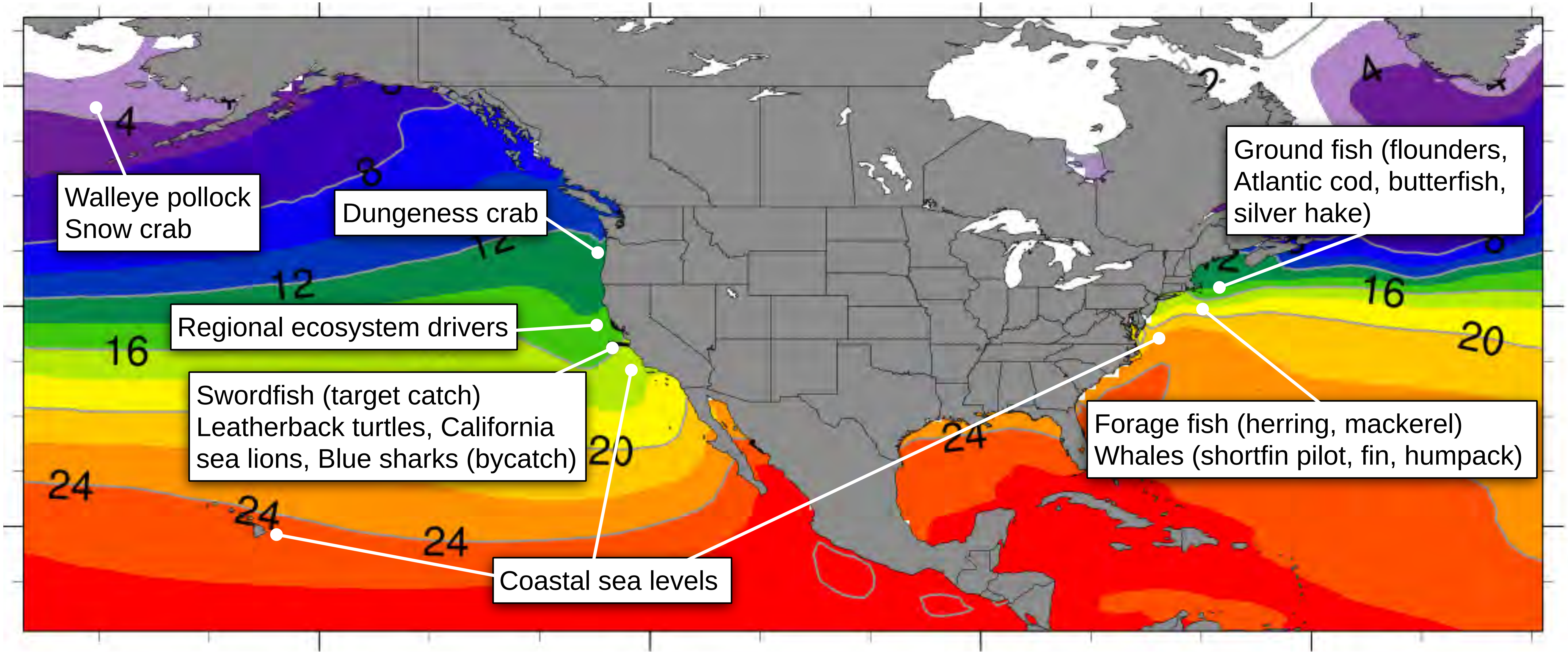

2017 NOAA MAPP Competition: “Research to explore seasonal prediction of **coastal high water levels** and changing **living marine resources**”

The **Marine Prediction Task Force (MPTF)** coordinates the activities of researchers supported through the MAPP/NMFS FY17 grant competition

Membership

All funded PIs are MPTF members
Co-chairs are Mark Merrifield, Antonietta Capotondi, and Mike Jacox

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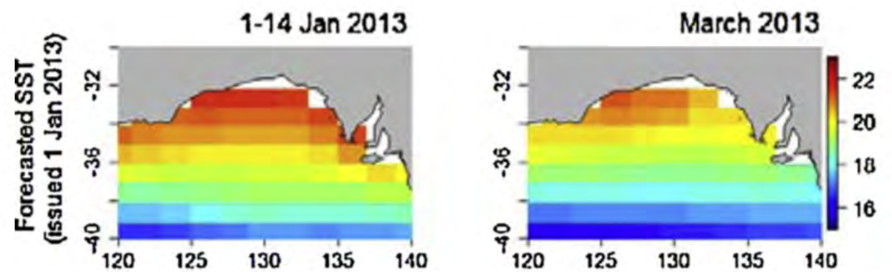
Common Threads/Interests

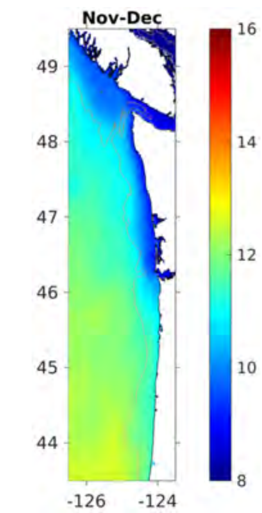
Sources of predictability
Modeling and prediction tools
Forecast assessment / skill metrics

Great Australian Bight Tuna (Evanson et al. 2015)

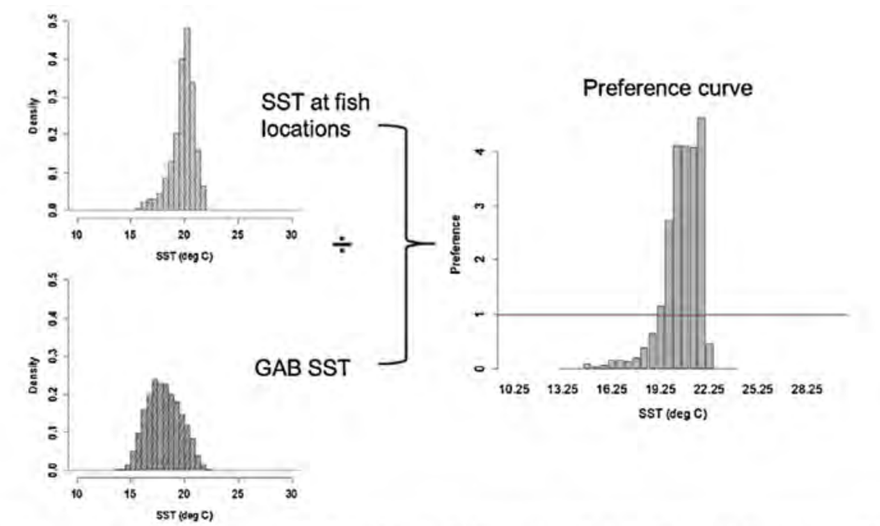
Pacific Northwest Sardines (Kaplan et al. 2015)

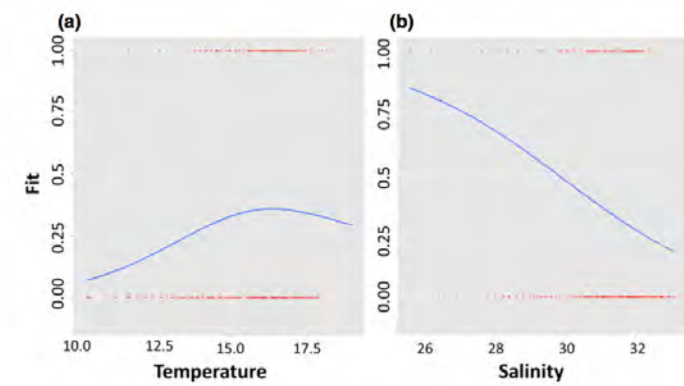
Physical Forecast





Empirical Relationship



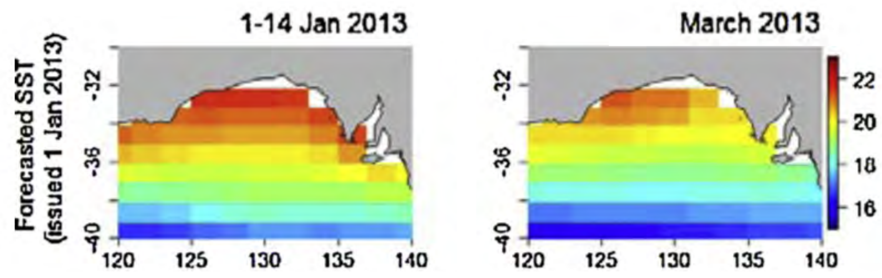


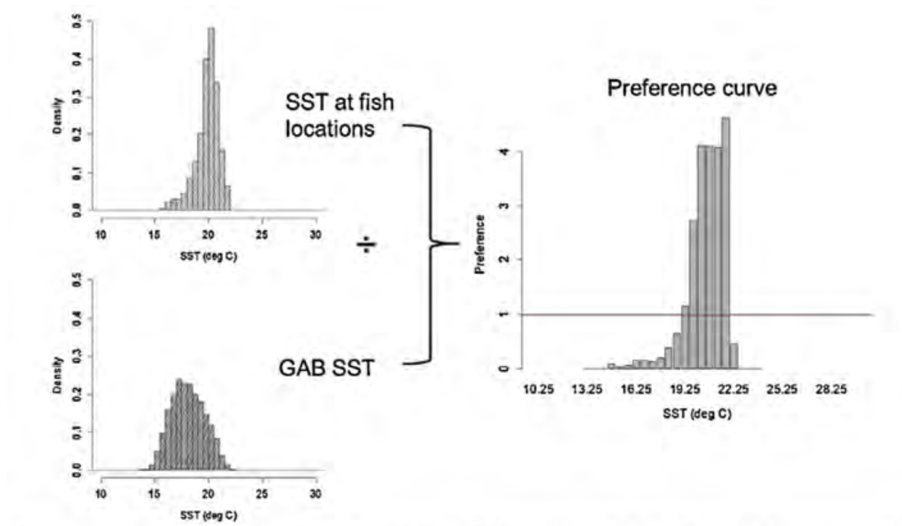
Physical Forecast

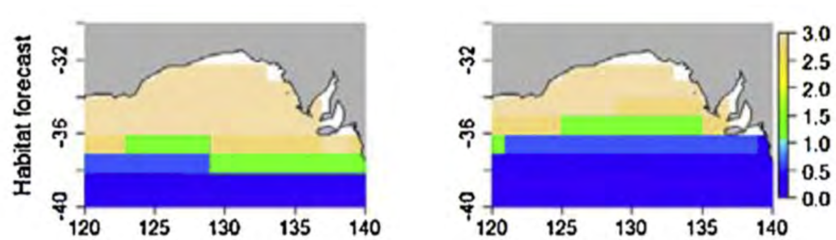
Empirical Relationship

Habitat Forecast

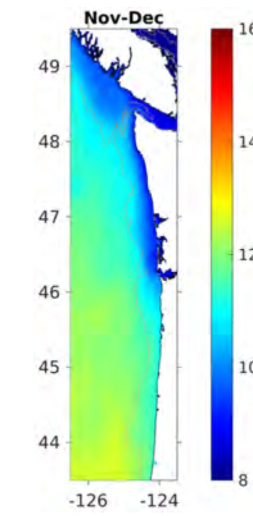
Great Australian Bight Tuna (Evanson et al. 2015)

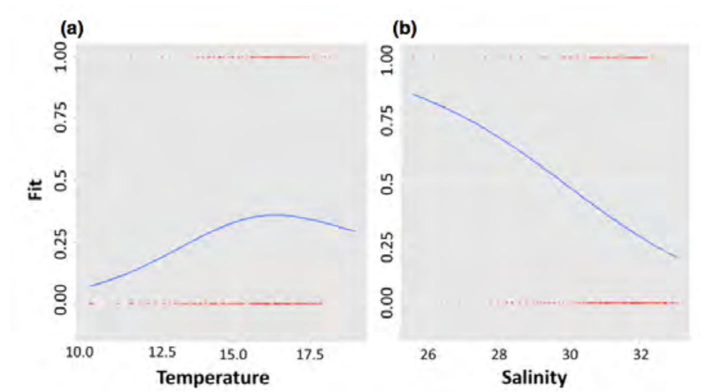


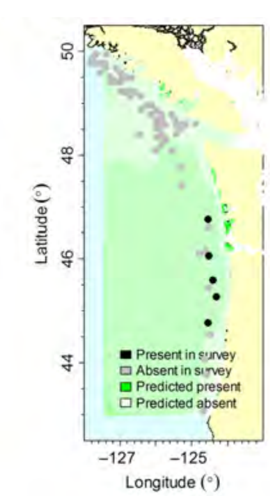


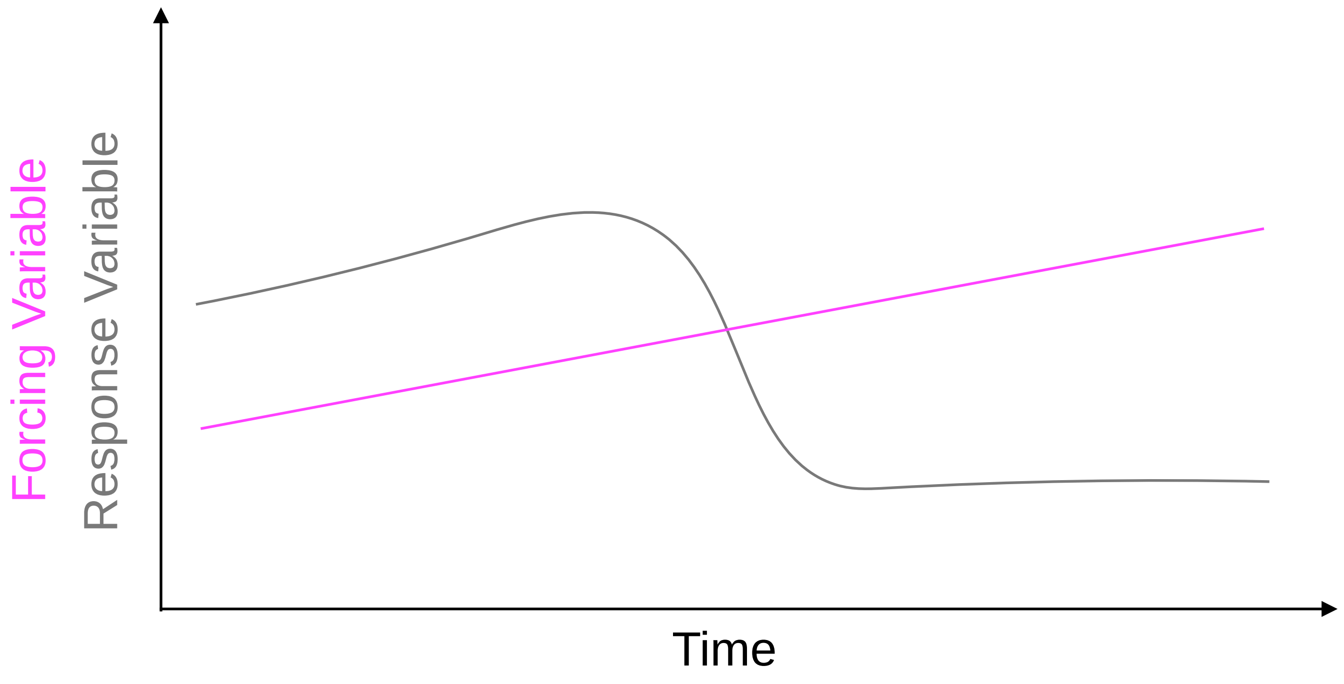


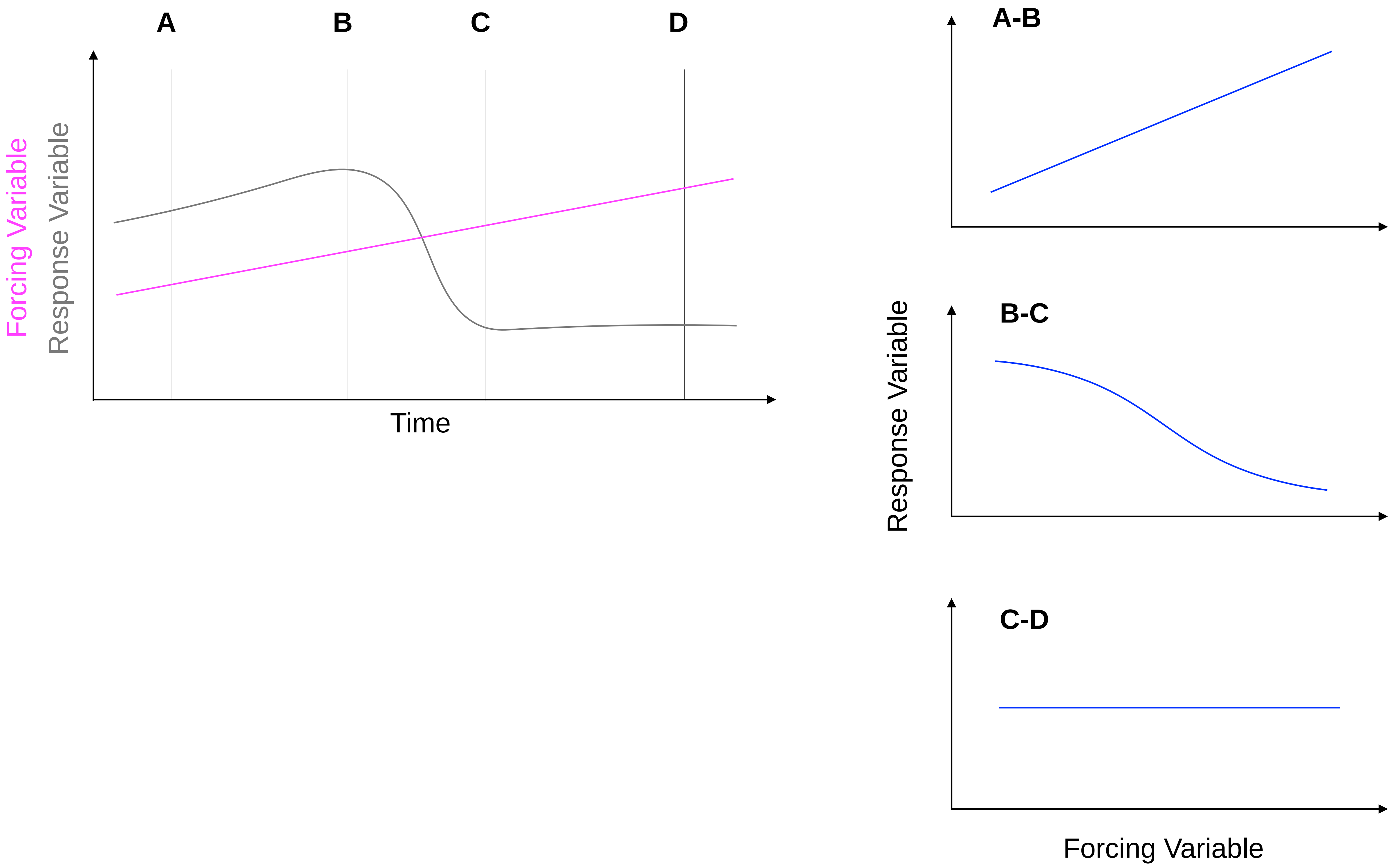
Pacific Northwest Sardines (Kaplan et al. 2015)

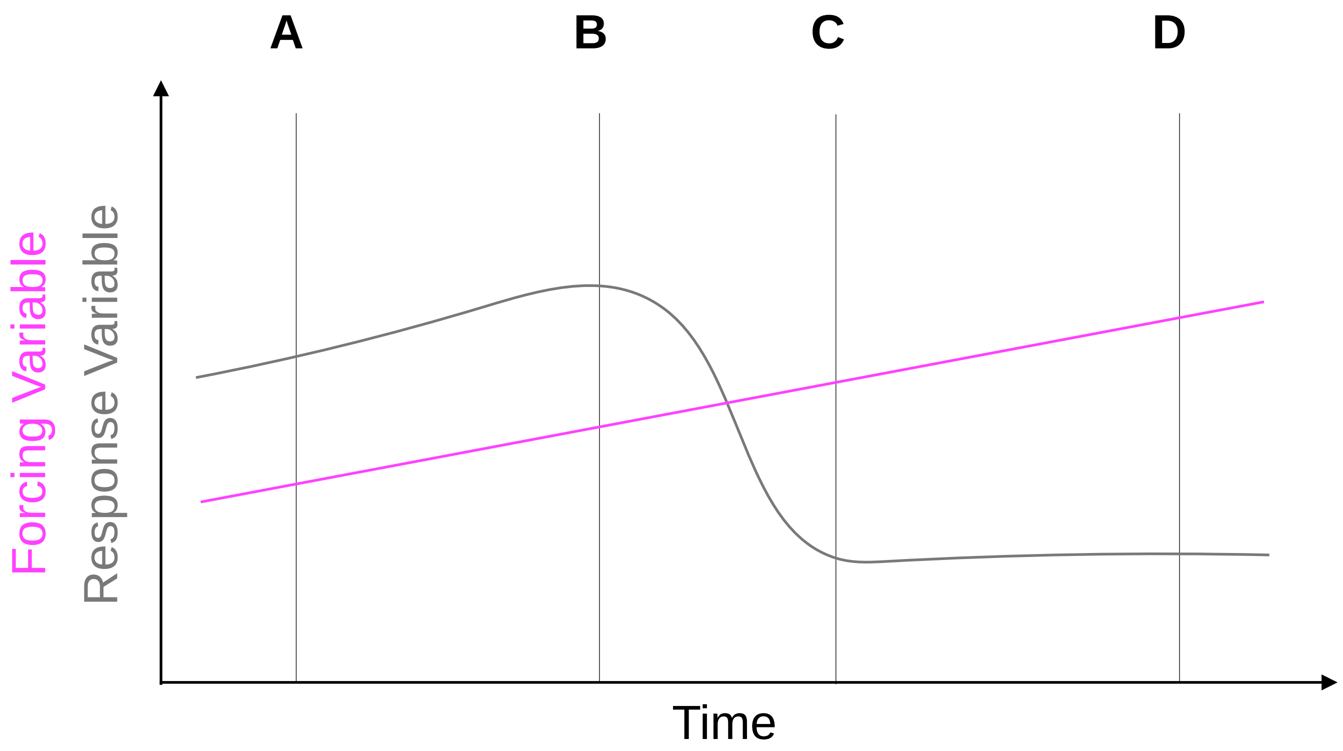


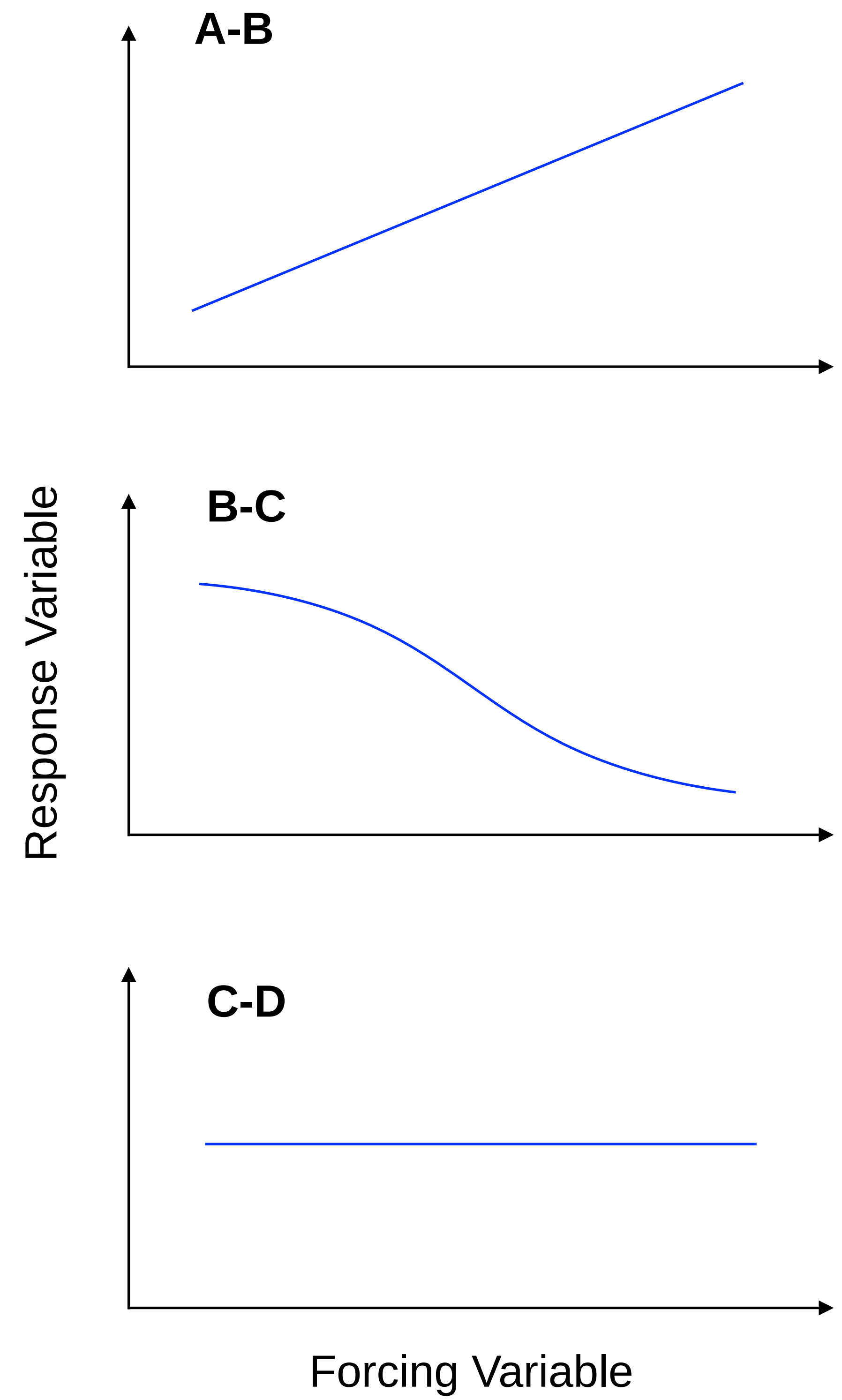





Forcing Variable
Response Variable
Time


A
B
C
D
Forcing Variable
Response Variable
Time
A-B
B-C
C-D
Response Variable
Forcing Variable





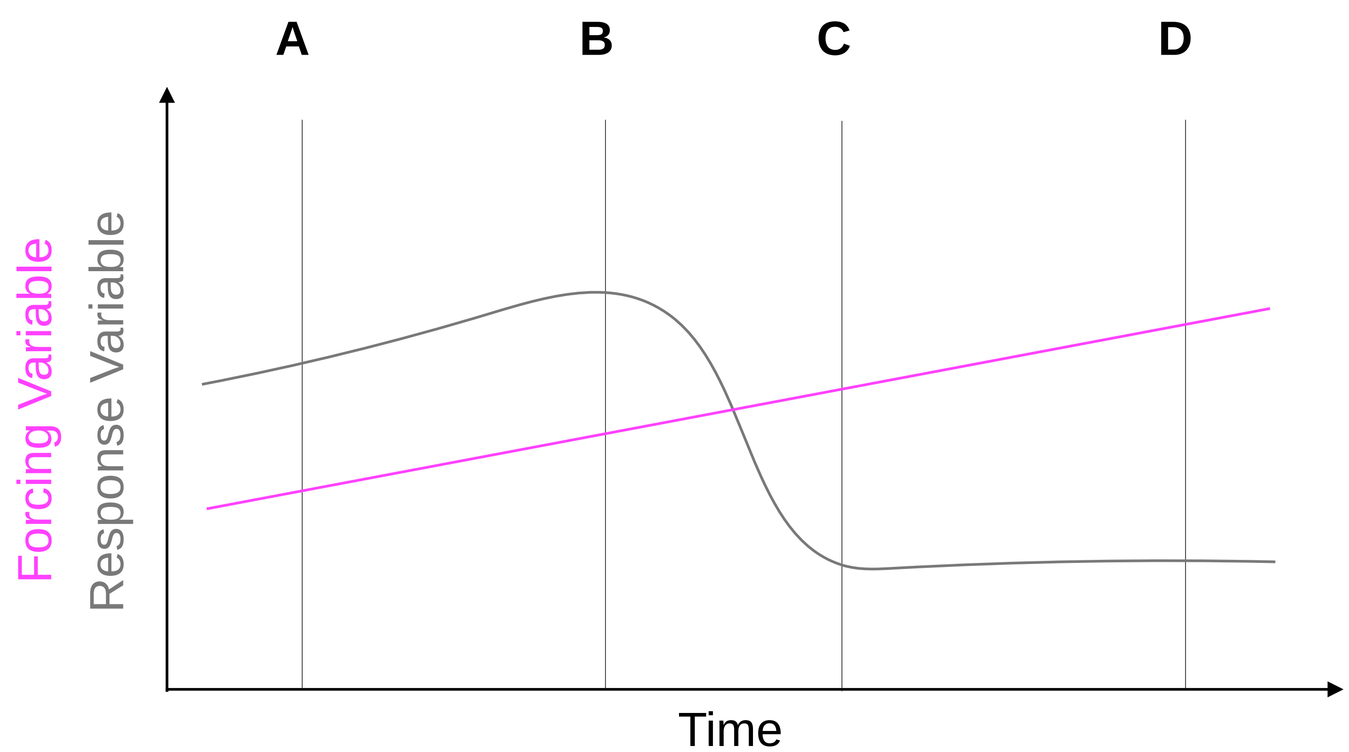
Question:

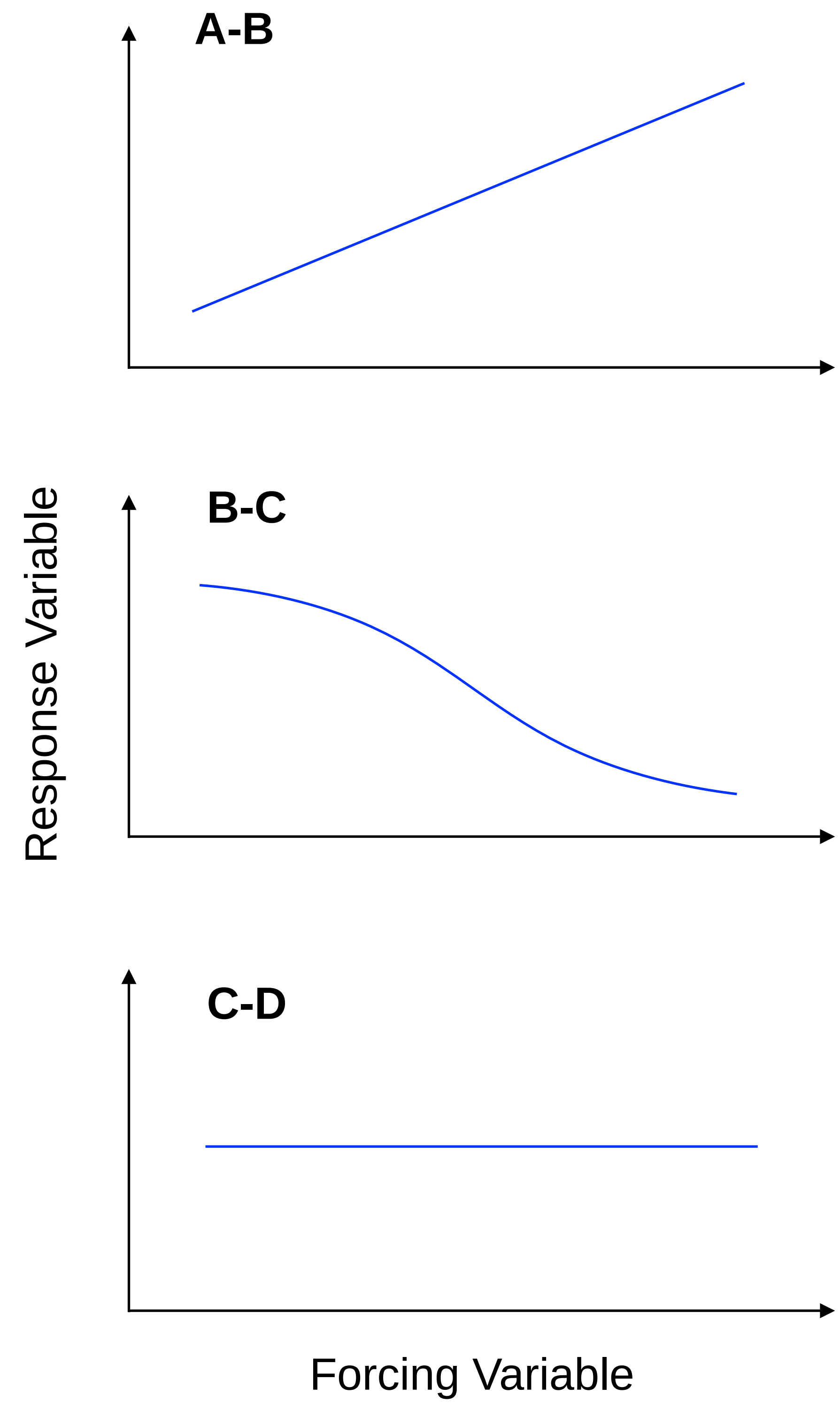
Reviews in Fish Biology and Fisheries **8**, 285–305 (1998)

When do environment–recruitment correlations work?

RANSOM A. MYERS

Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1. E-mail: Ransom.Myers@Dal.Ca





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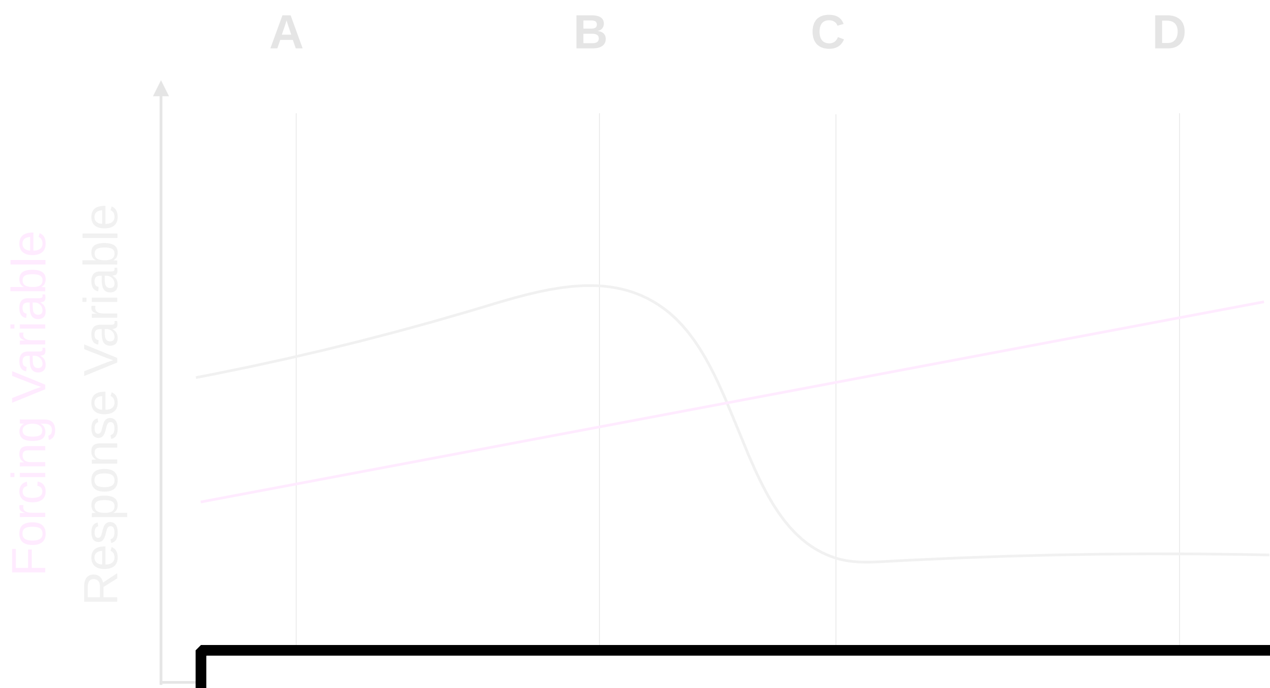
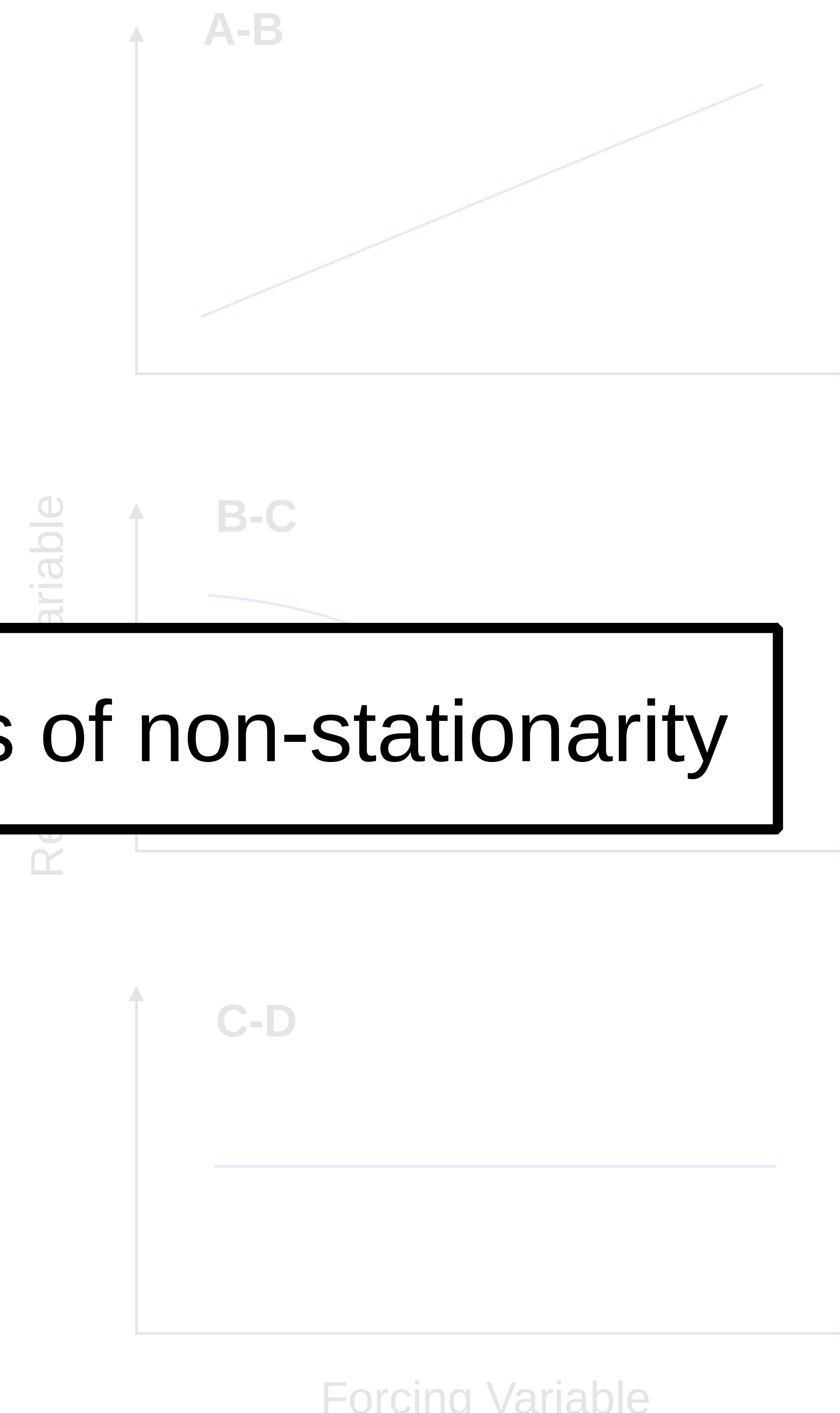
Answer: Not very often





Motivation 1: Address concerns of non-stationarity

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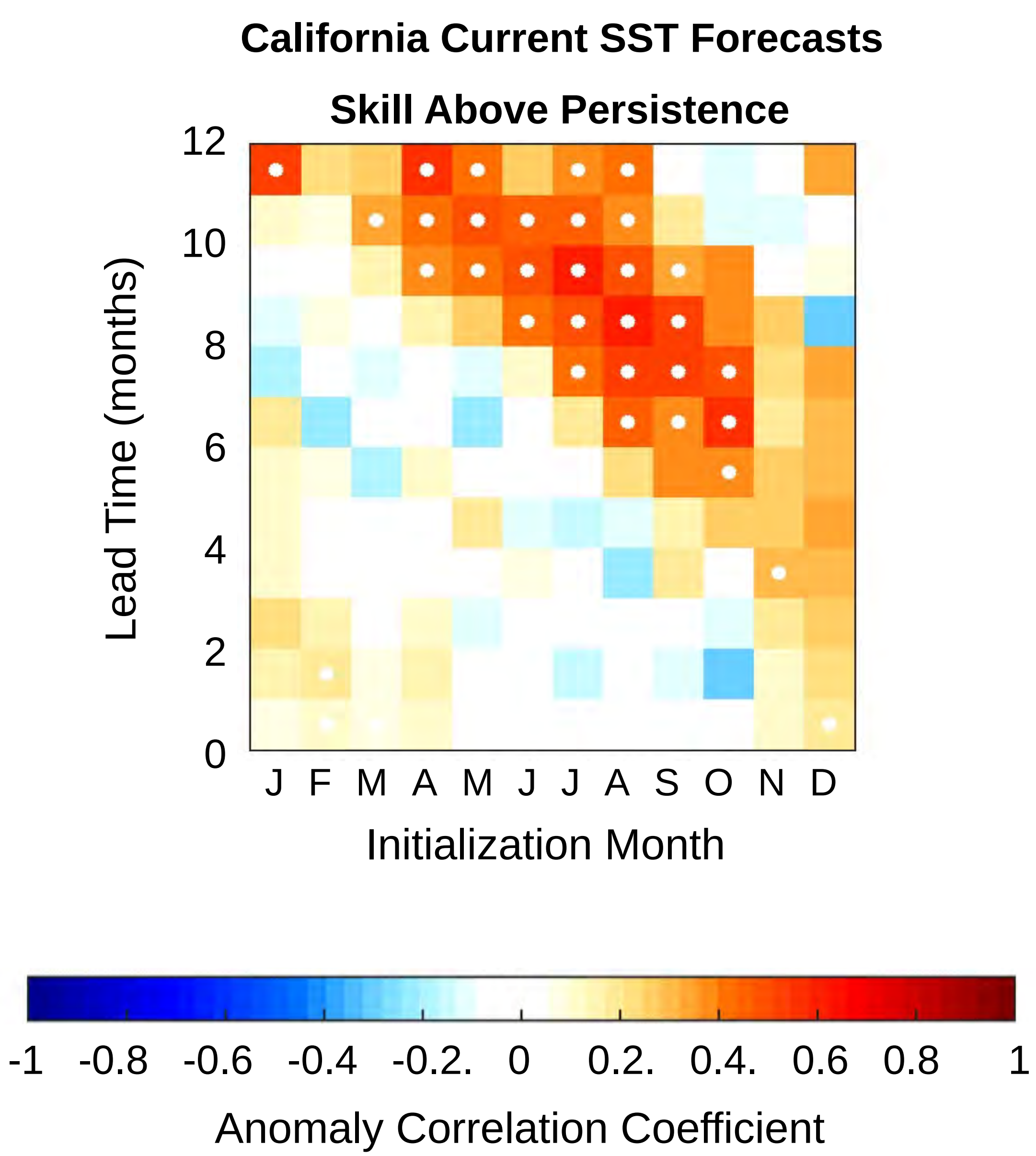
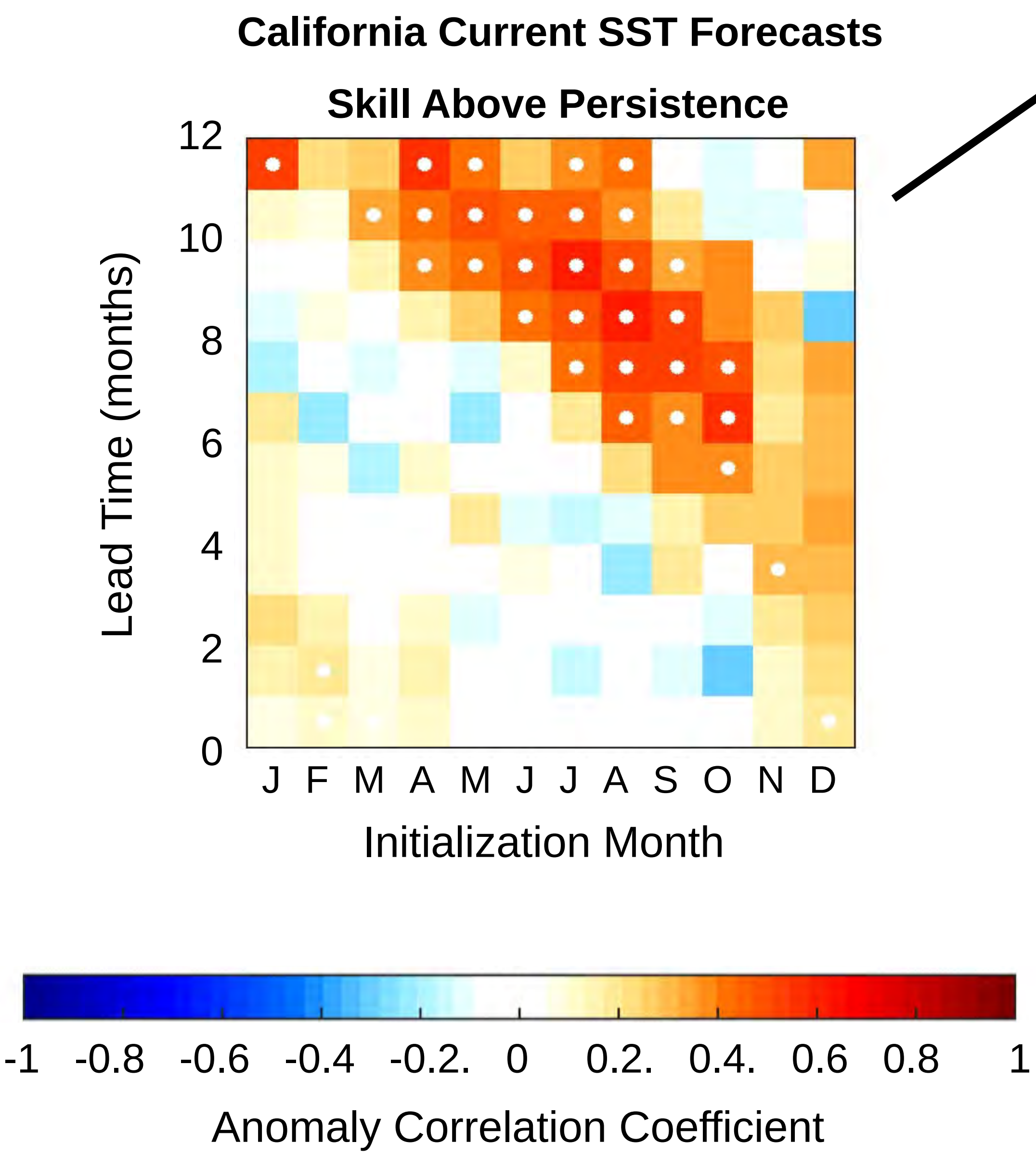
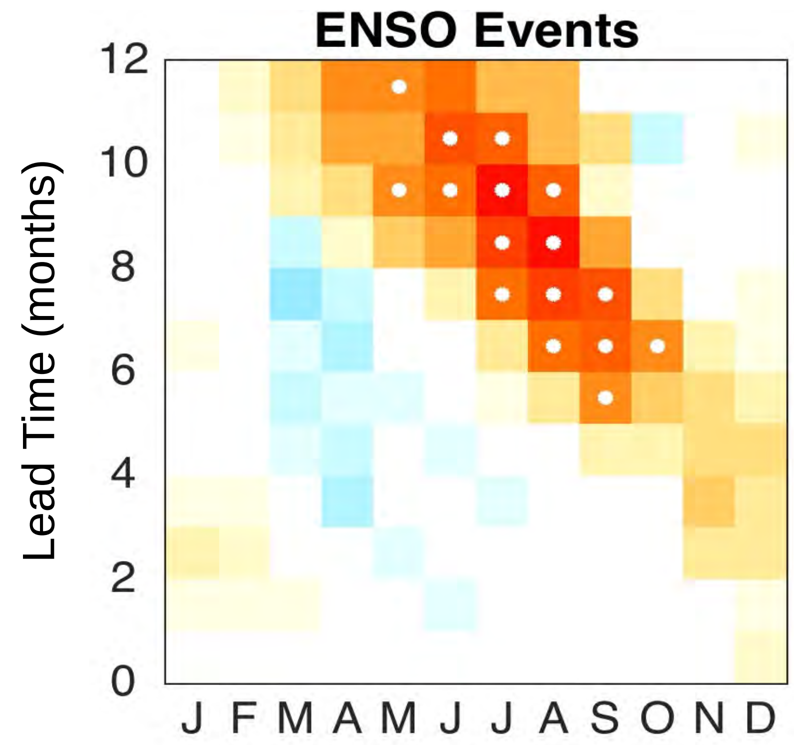


Jacox et al. (2017)

1983, 1987, 1988, 1989, 1992
1998, 1999, 2000, 2003, 2008





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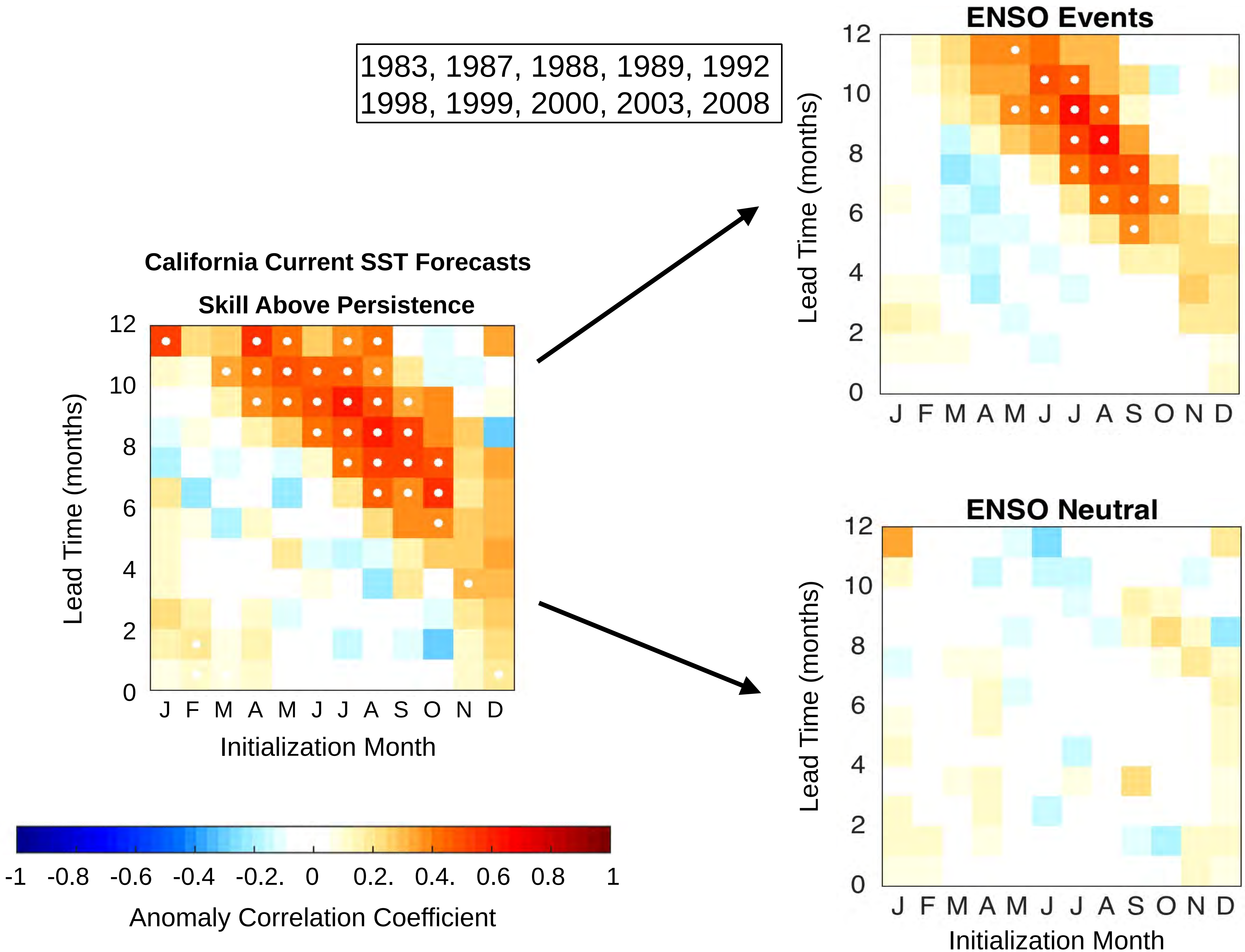
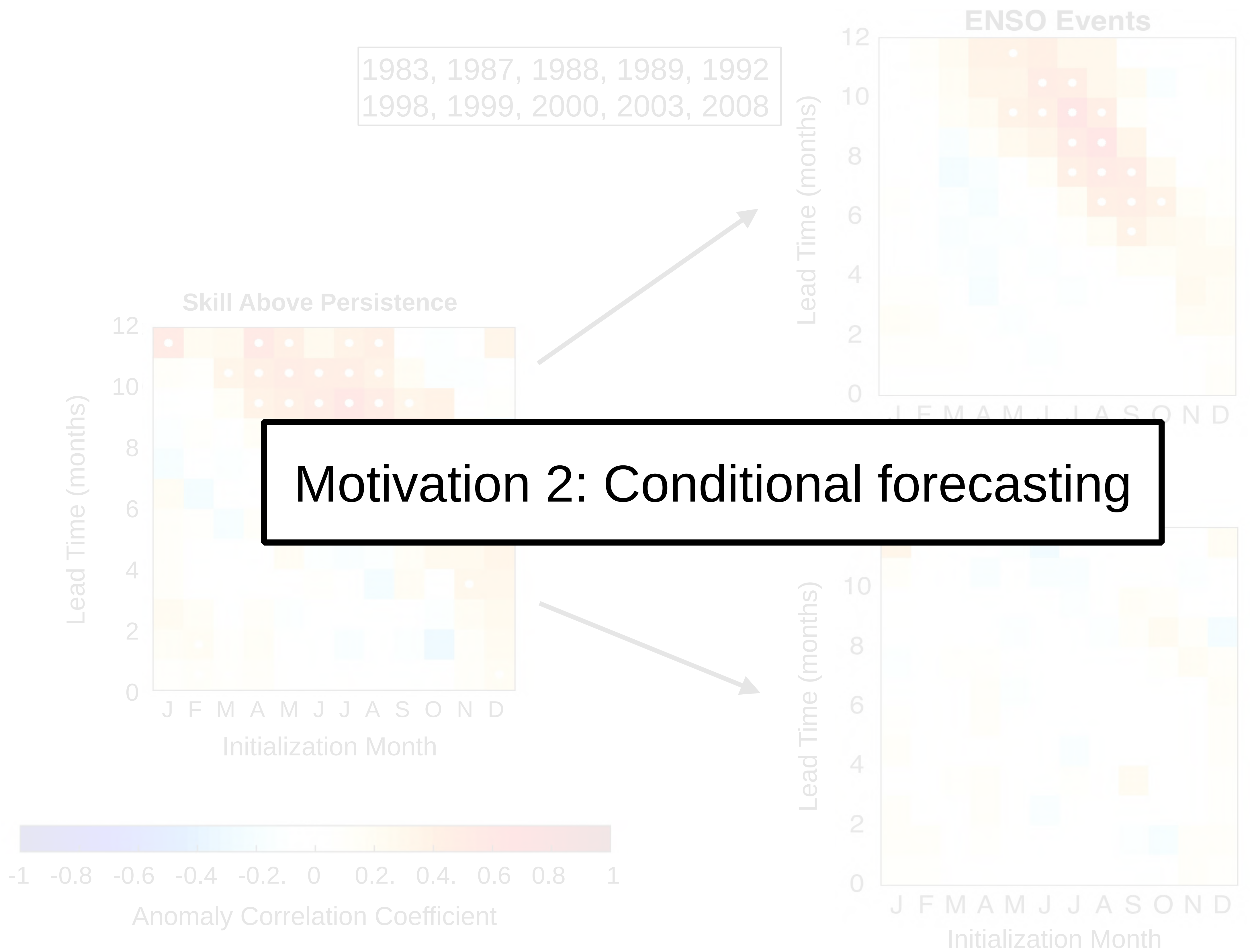


Jacox et al. (2017)

Motivation 2: Conditional forecasting



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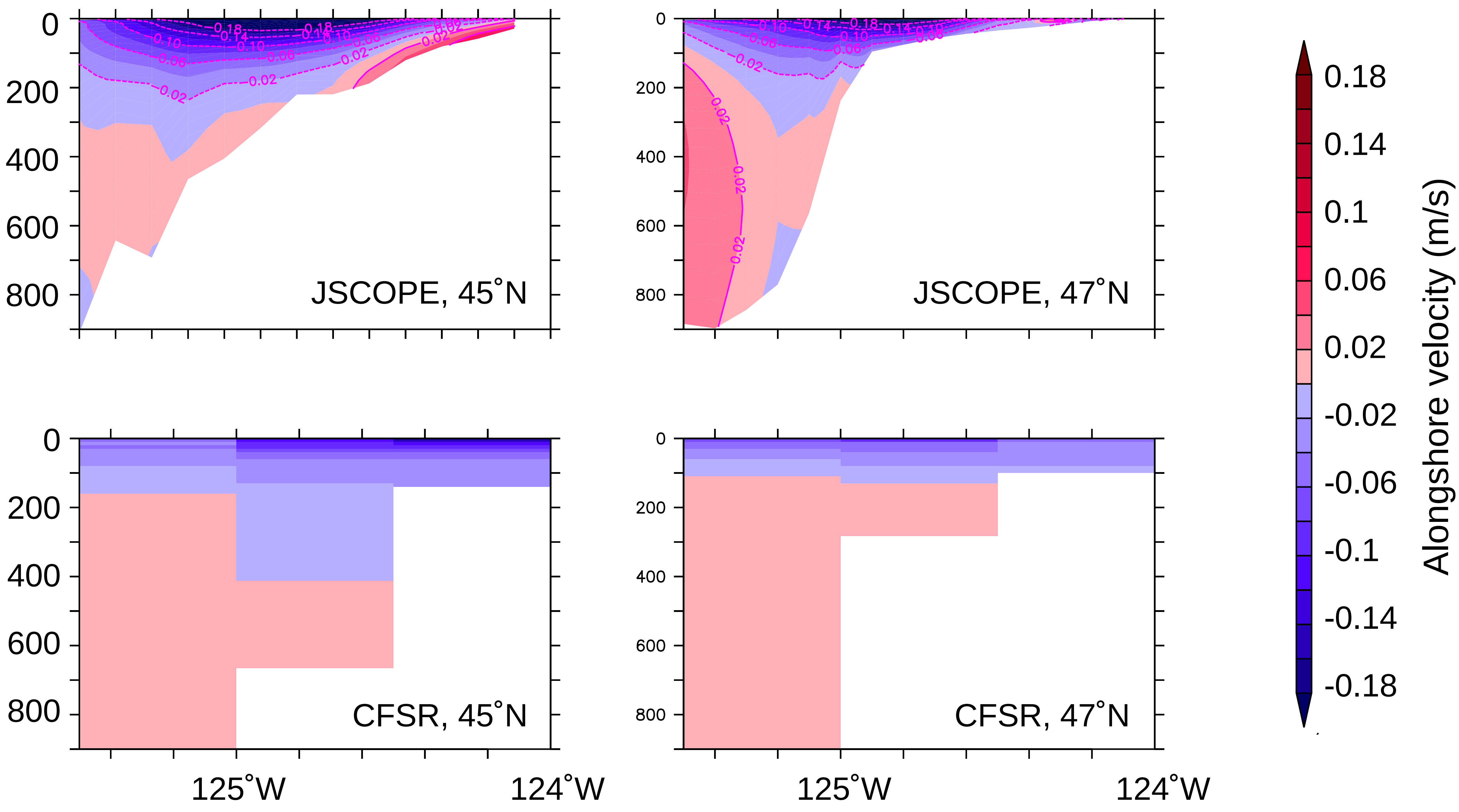
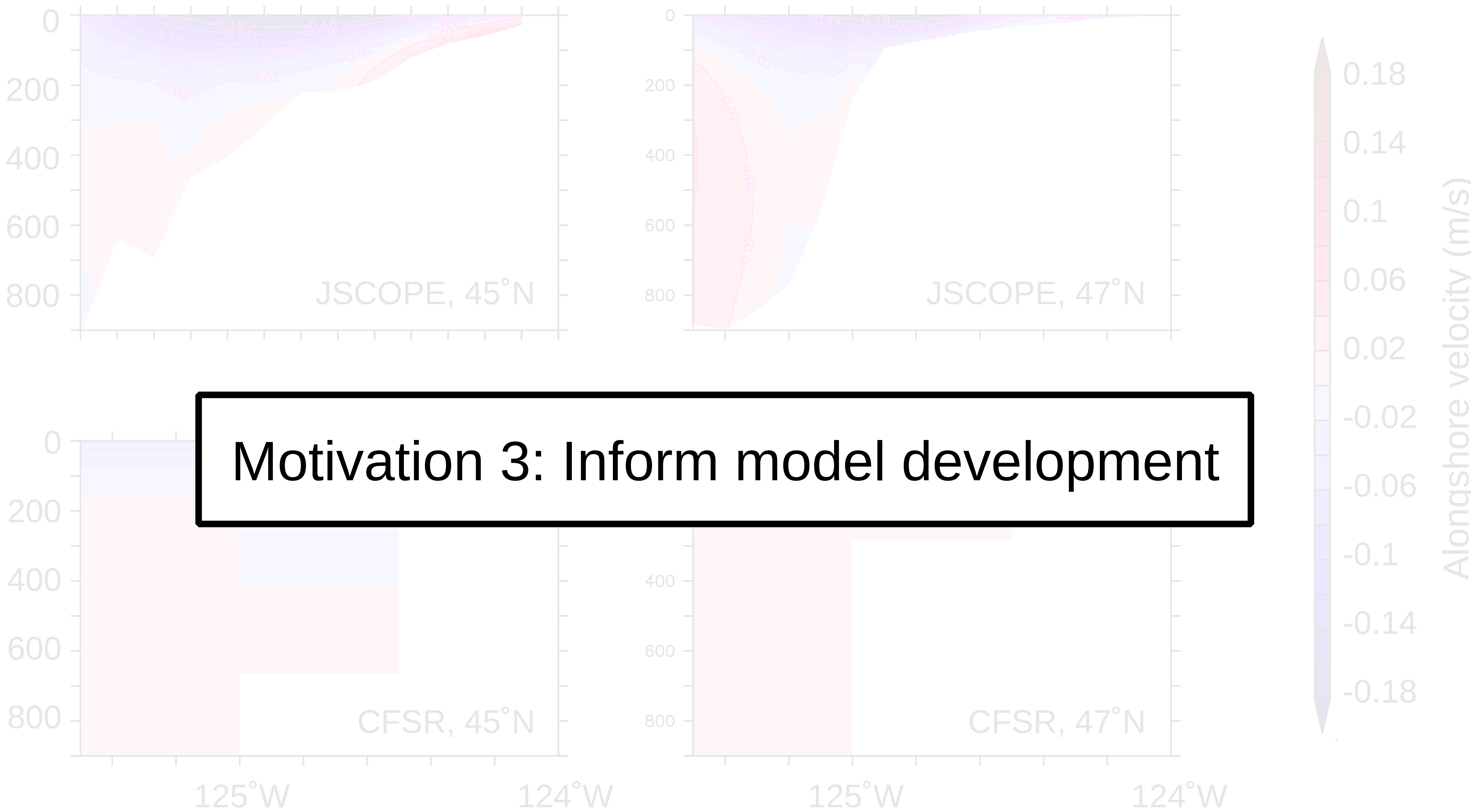
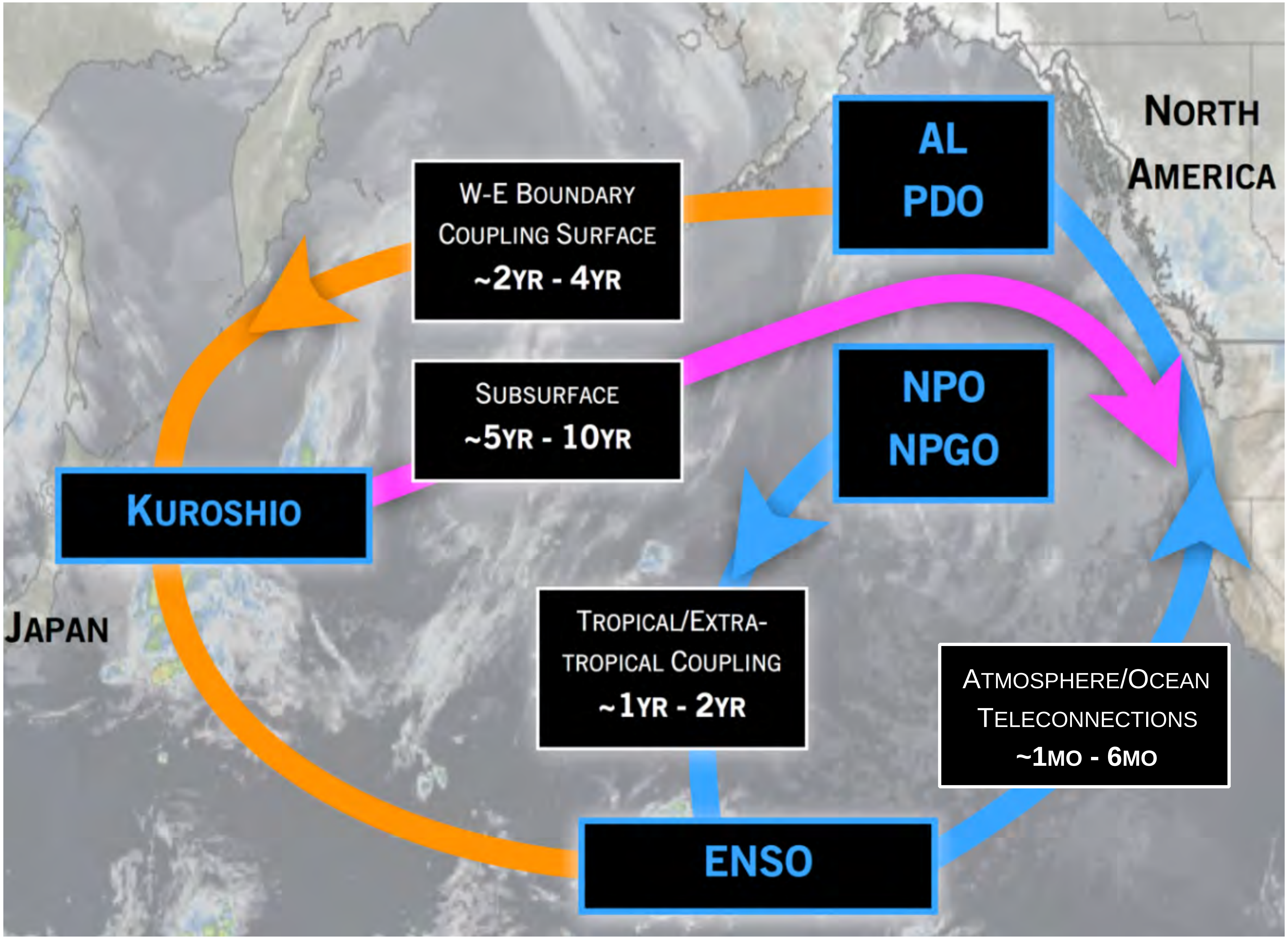


Courtesy Samantha Siedlecki

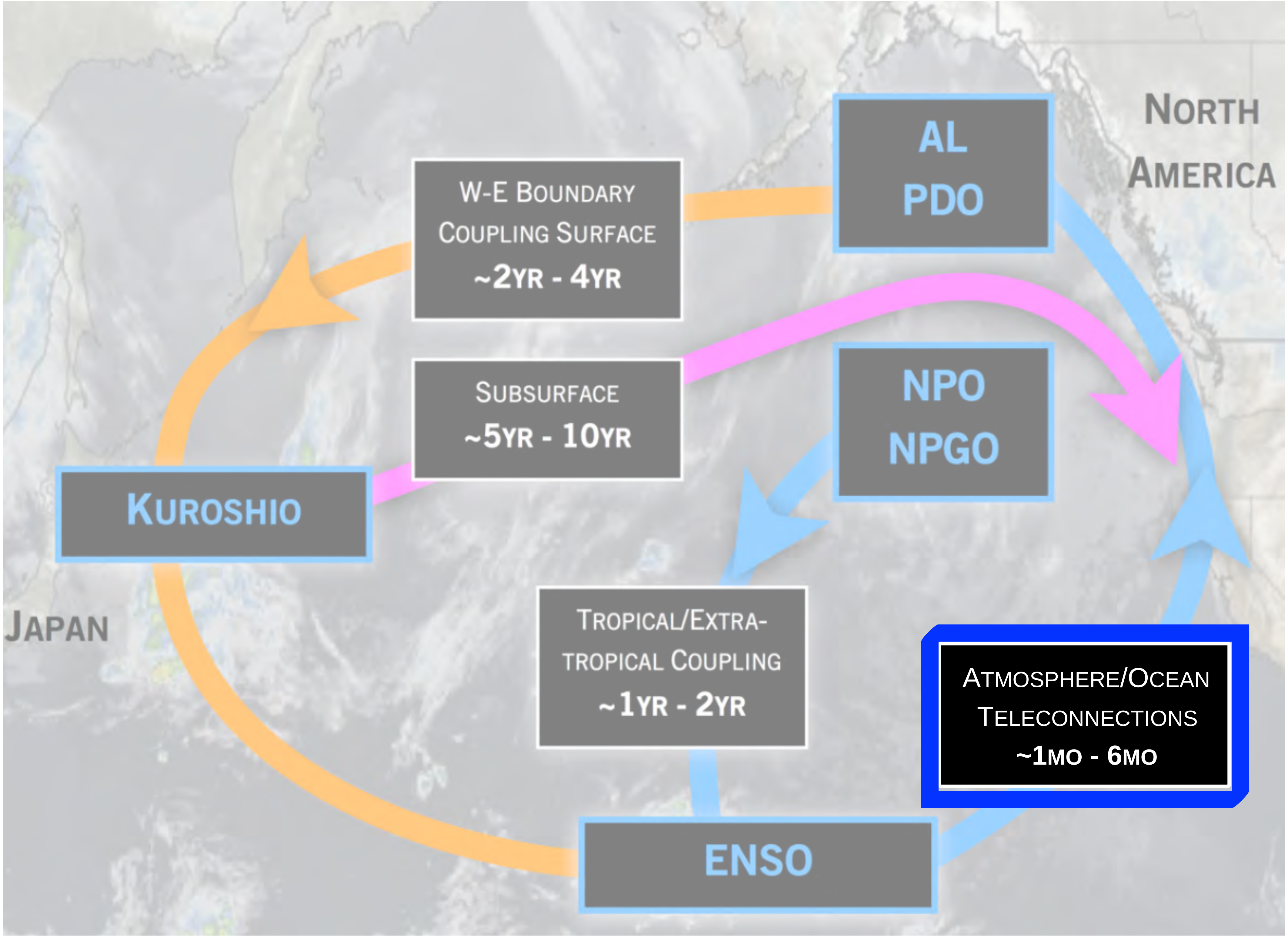


Motivation 3: Inform model development

Courtesy Samantha Siedlecki



Courtesy Manu Di Lorenzo



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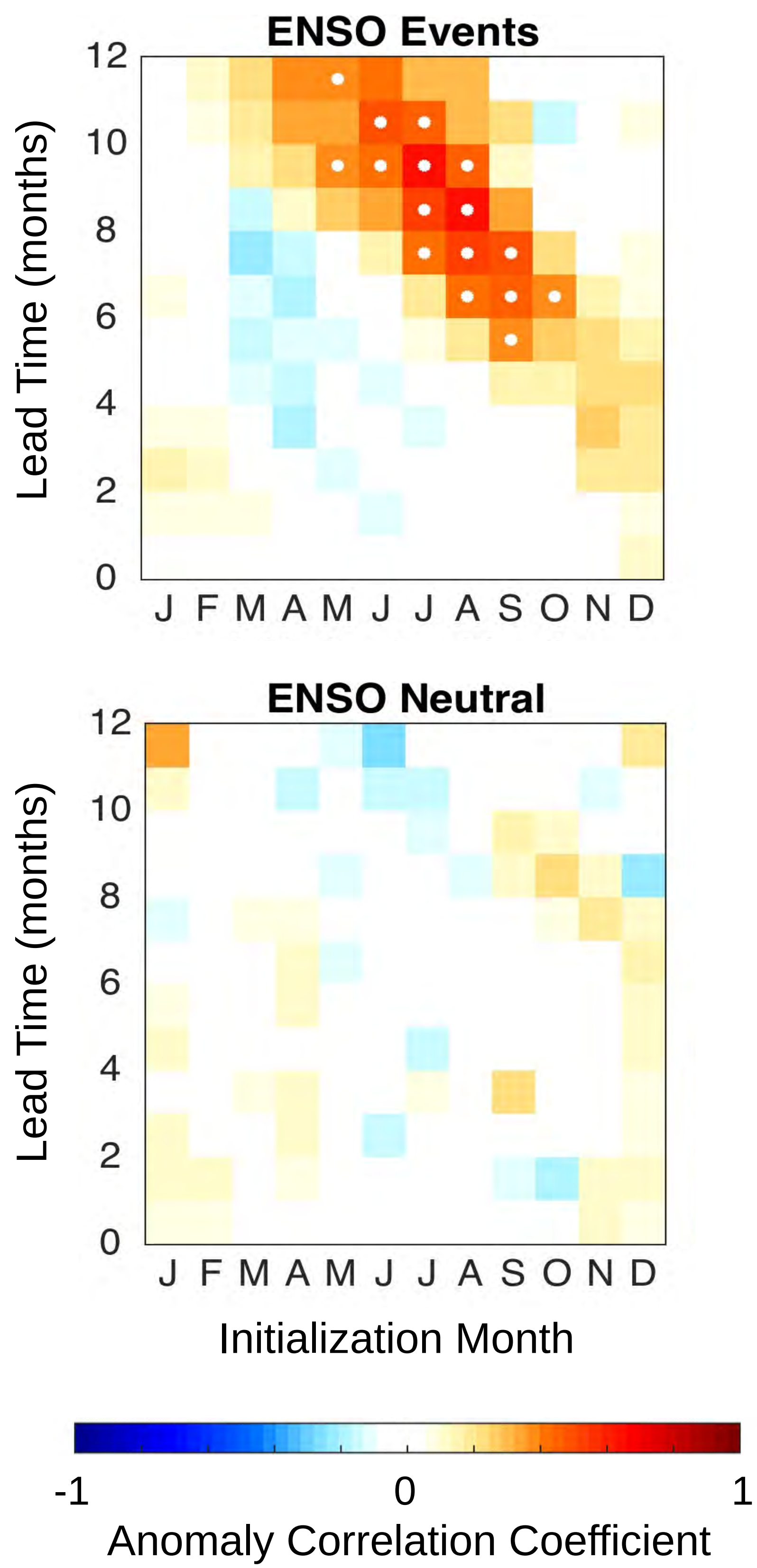
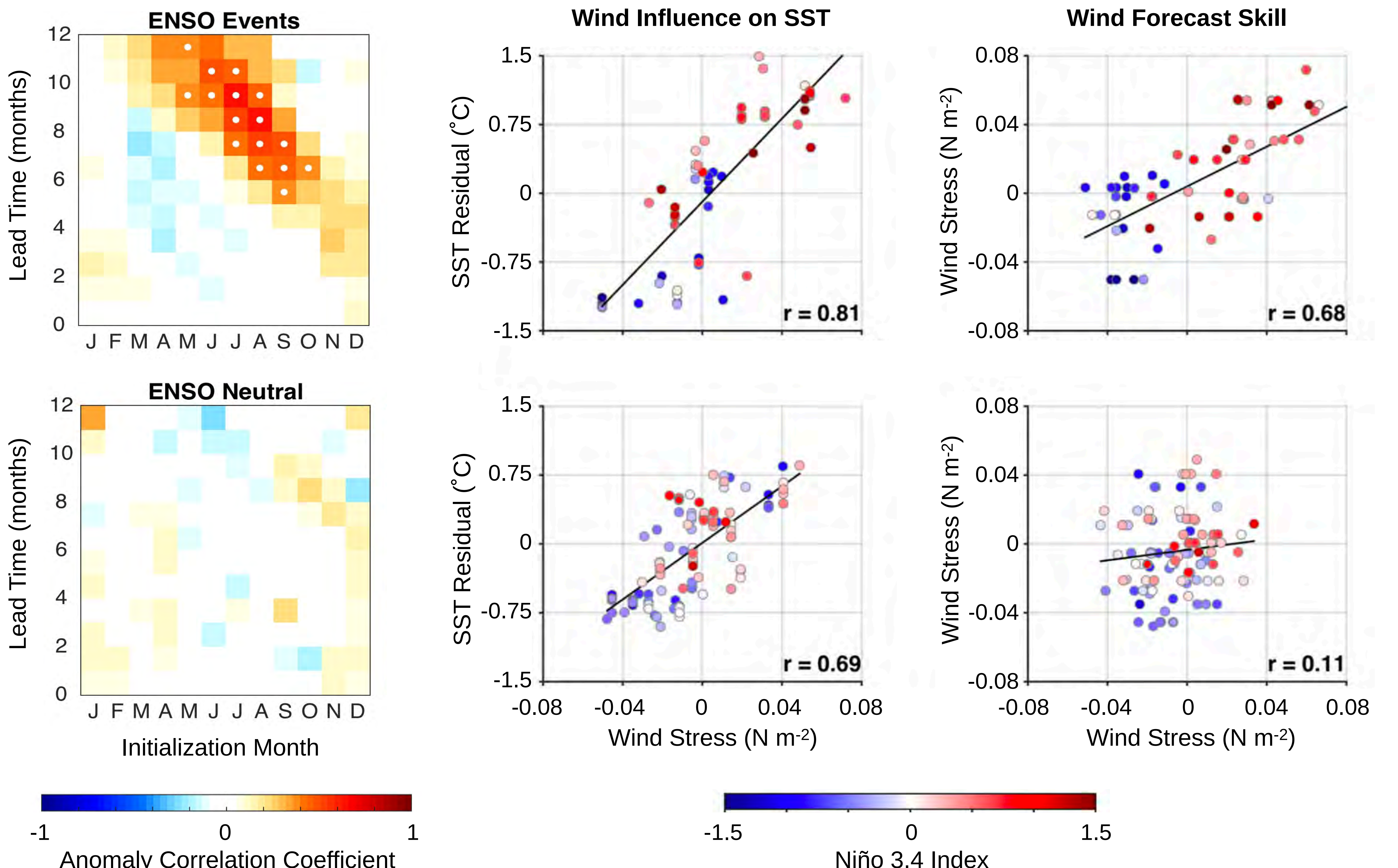
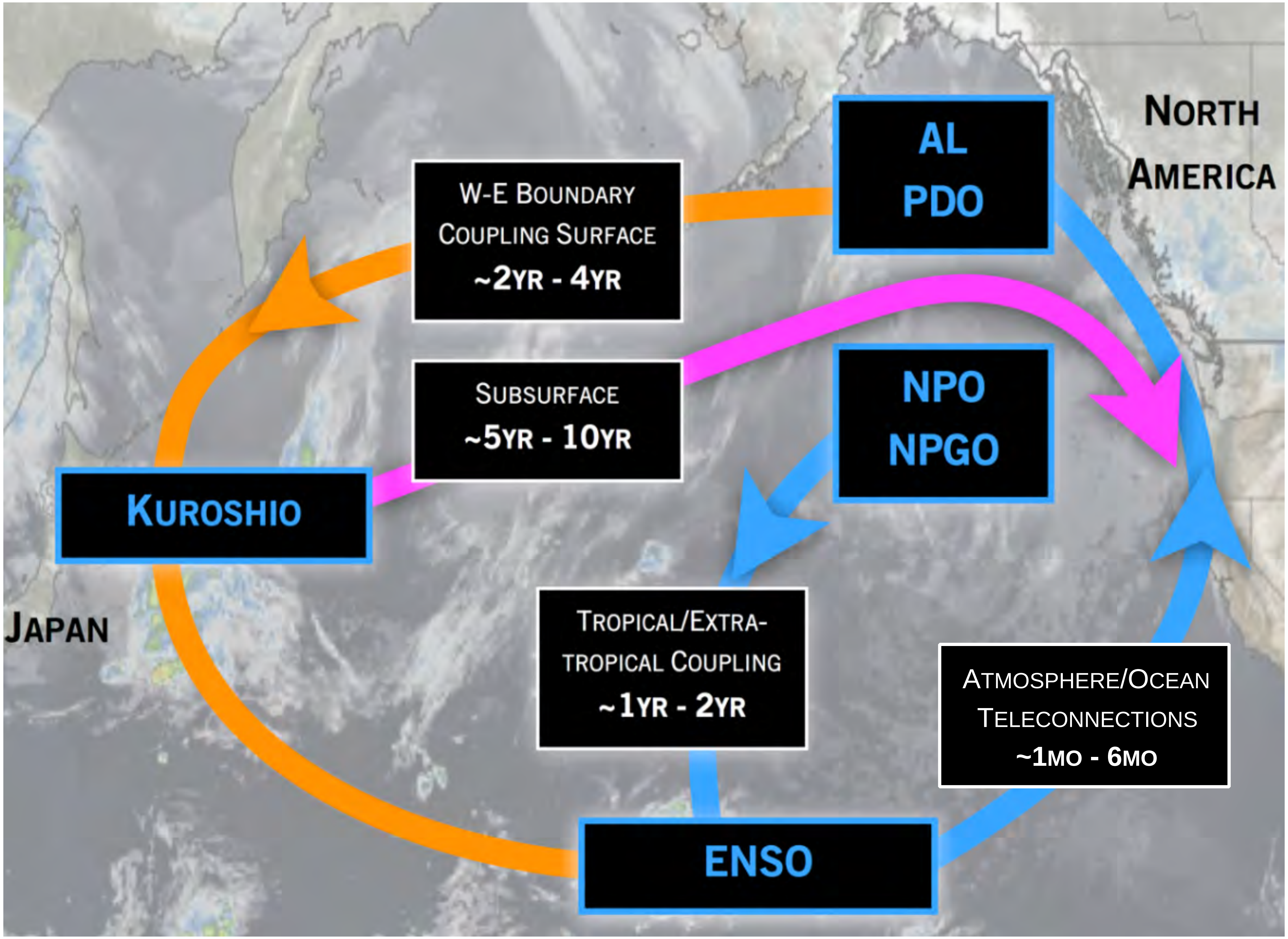

ENSO Events
Lead Time (months)
12
10
8
6
4
2
0
J F M A M J J A S O N D
ENSO Neutral
Lead Time (months)
12
10
8
6
4
2
0
J F M A M J J A S O N D
Initialization Month
-1
0
1
Anomaly Correlation Coefficient



Jacox et al. (2017)



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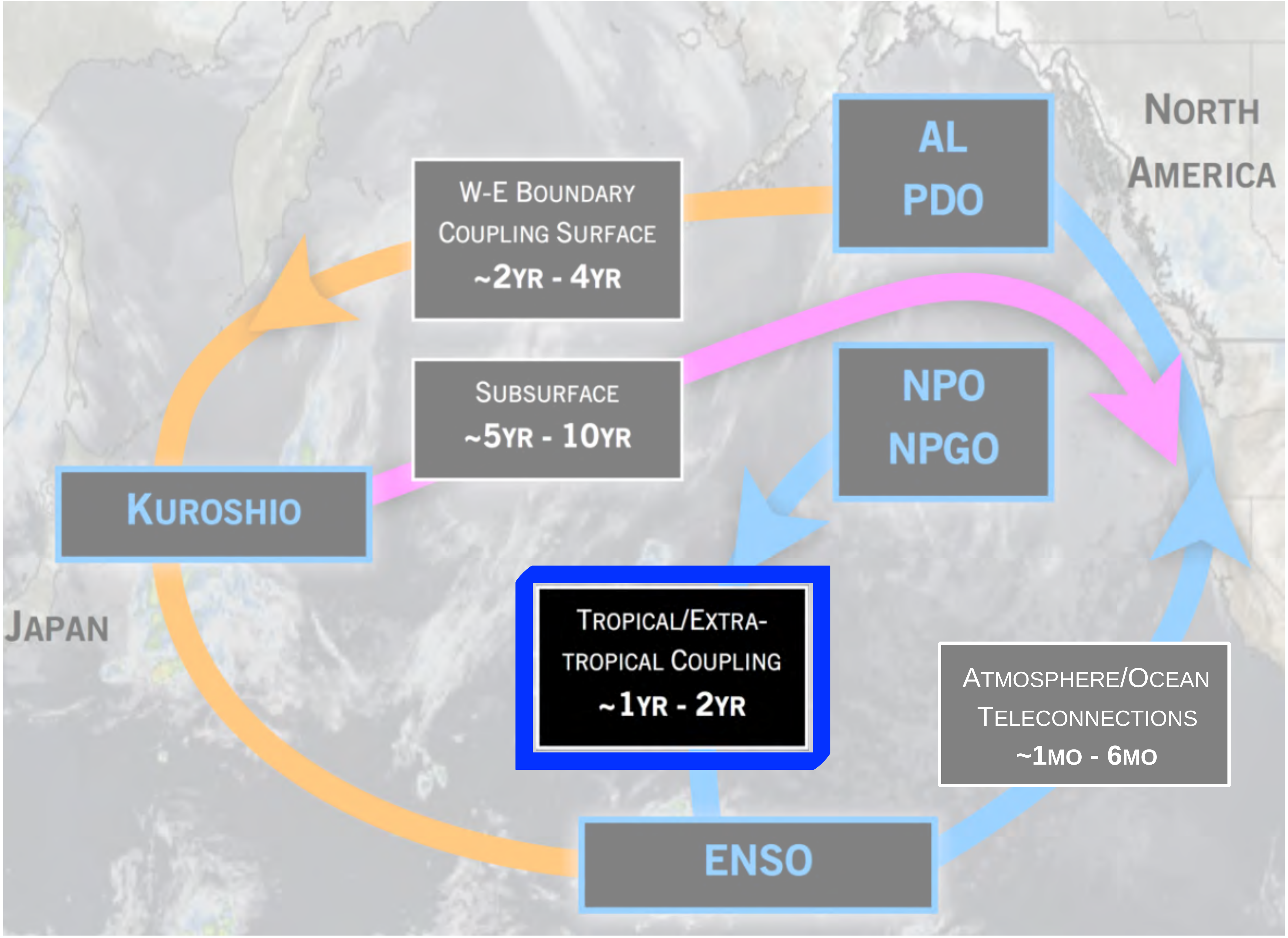
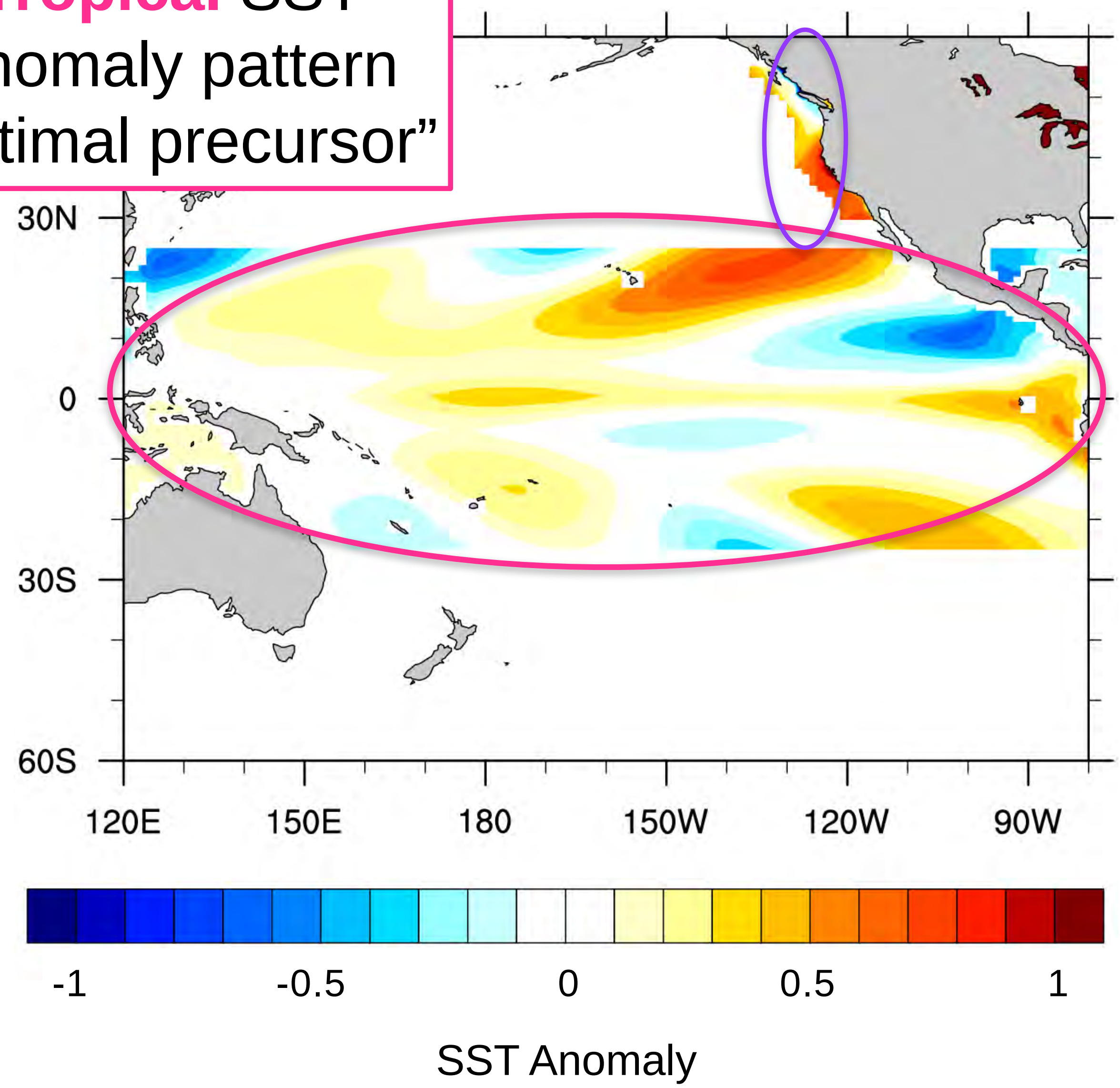


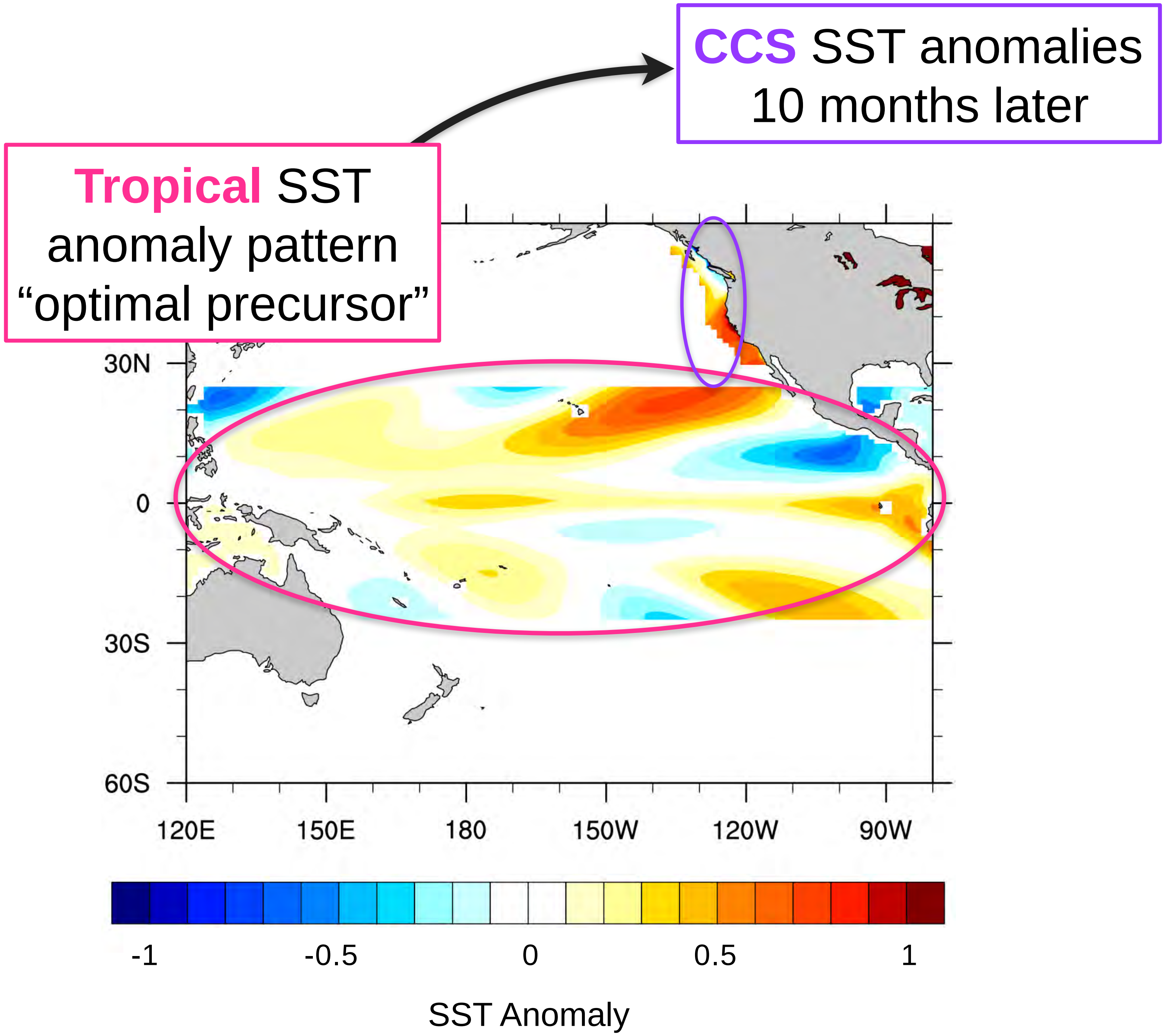
Courtesy Manu Di Lorenzo

Tropical SST anomaly pattern “optimal precursor”

CCS SST anomalies 10 months later



Courtesy Antonietta Capotondi



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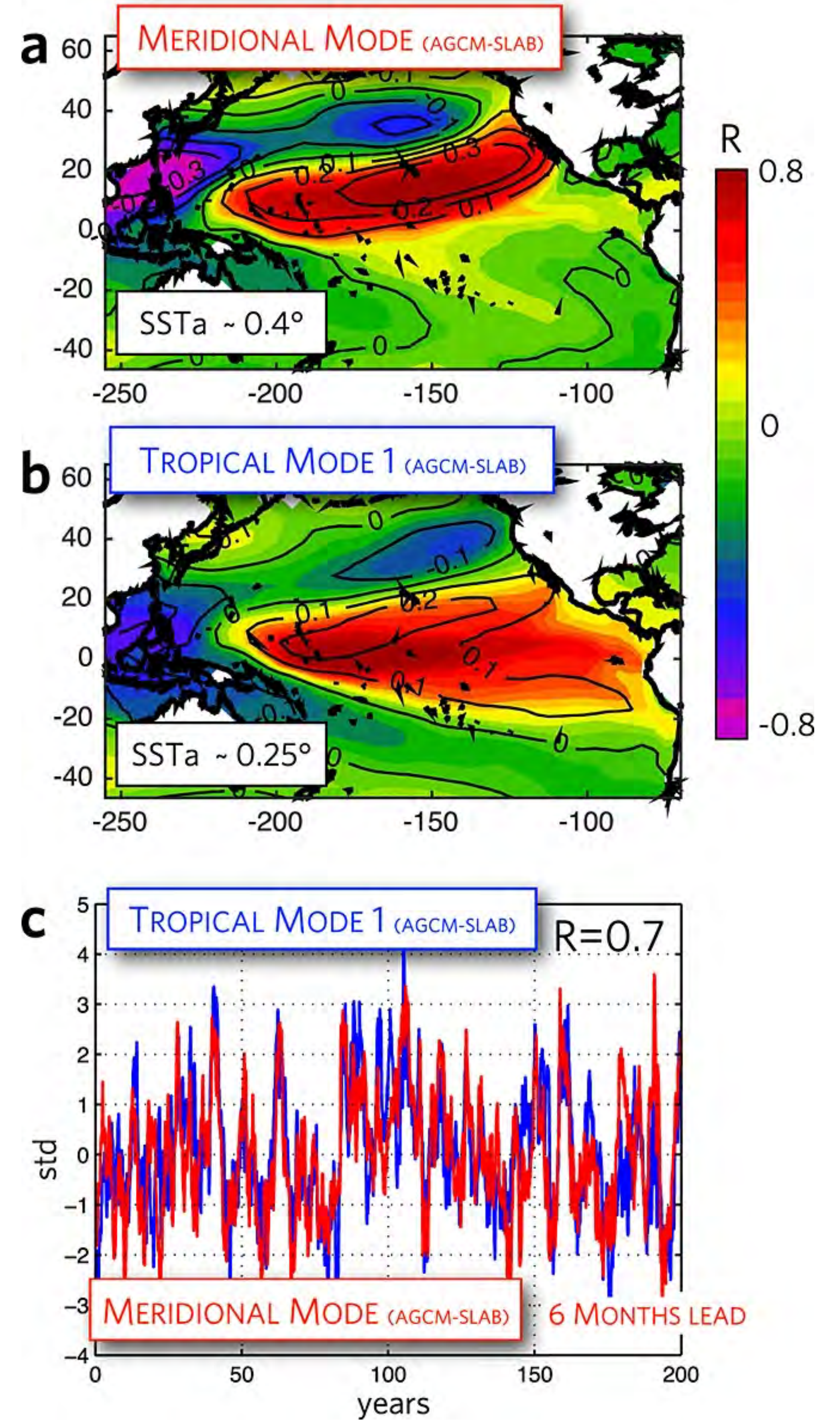
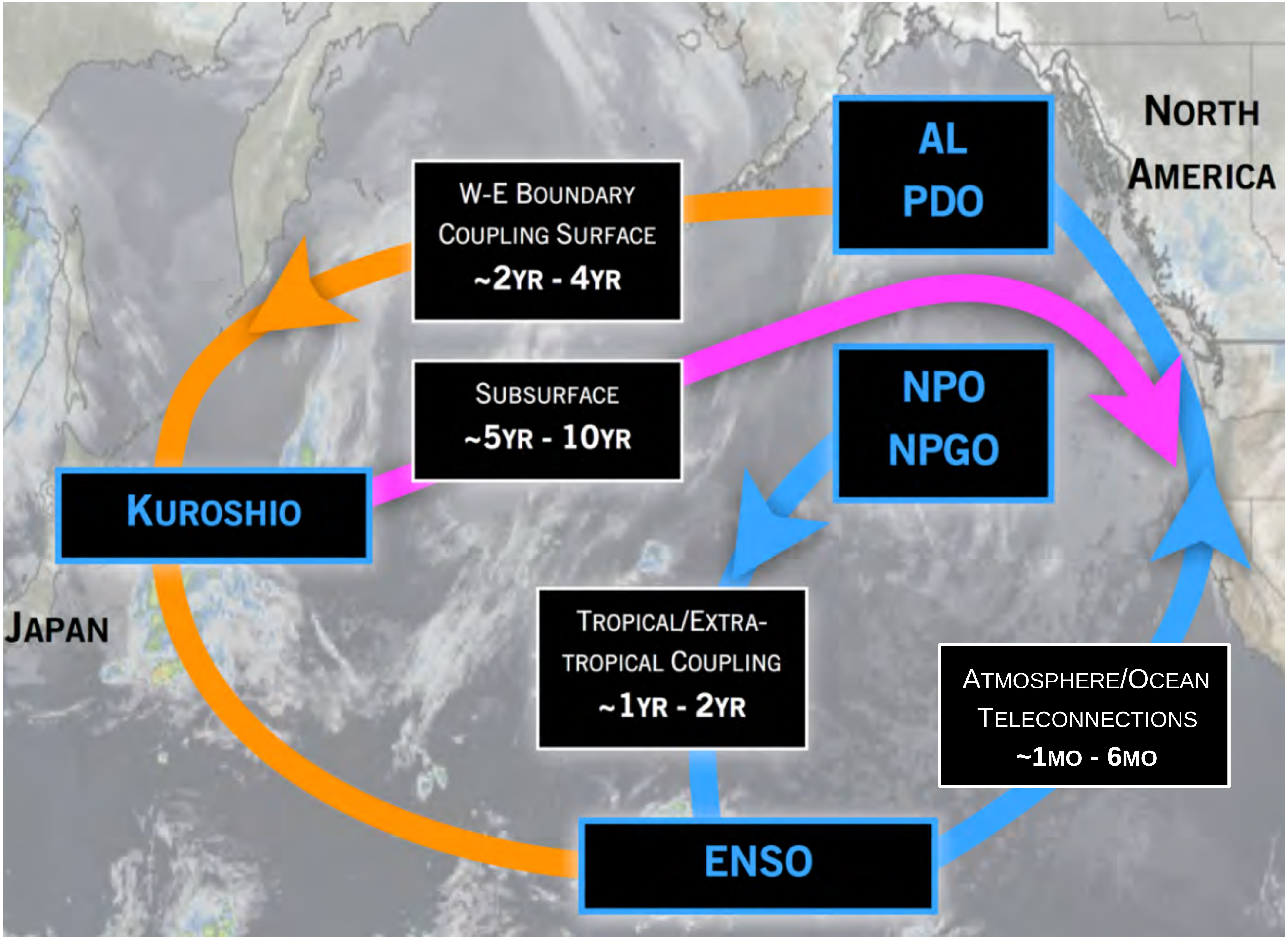


Di Lorenzo et al. (2015)



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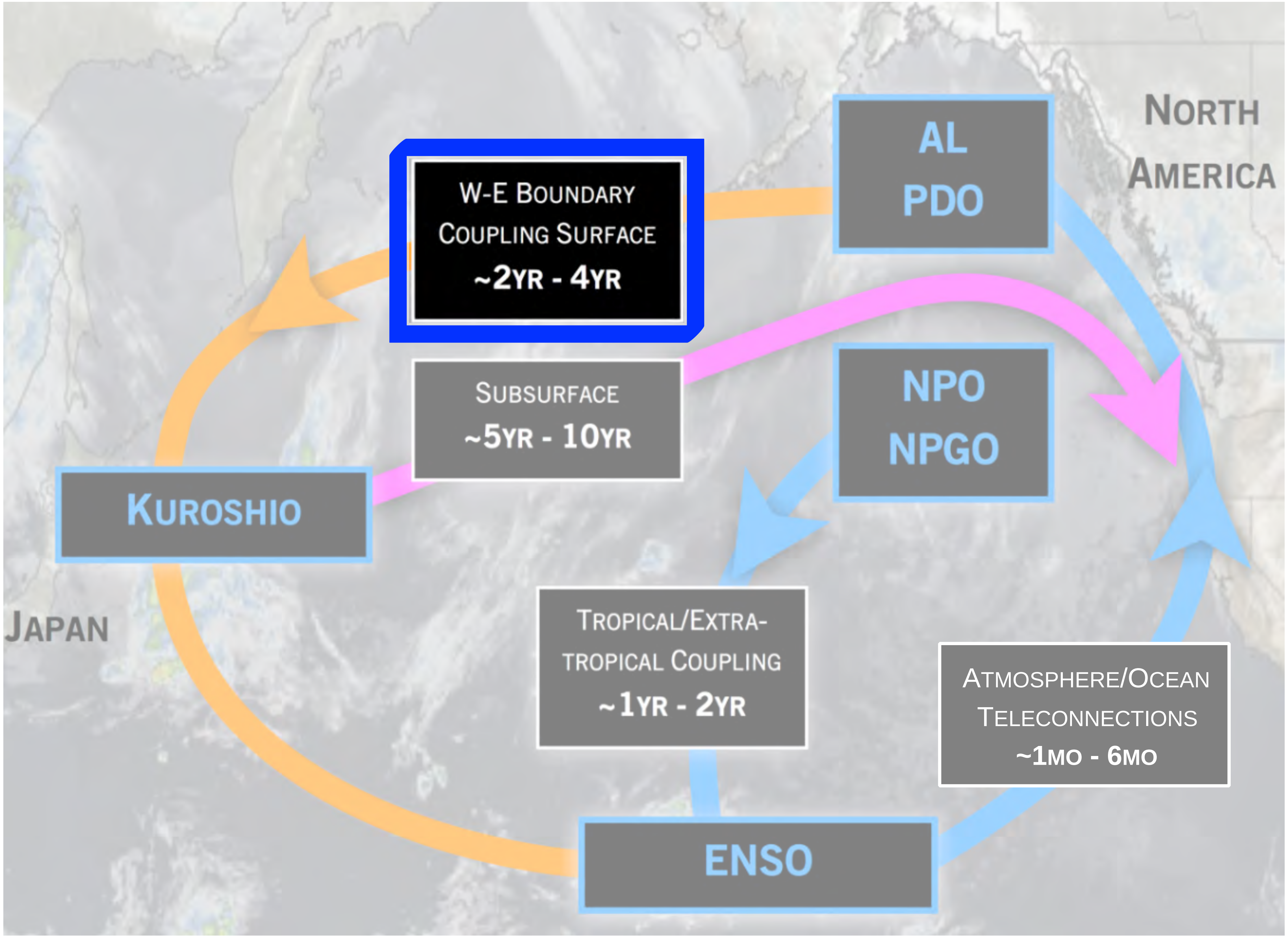

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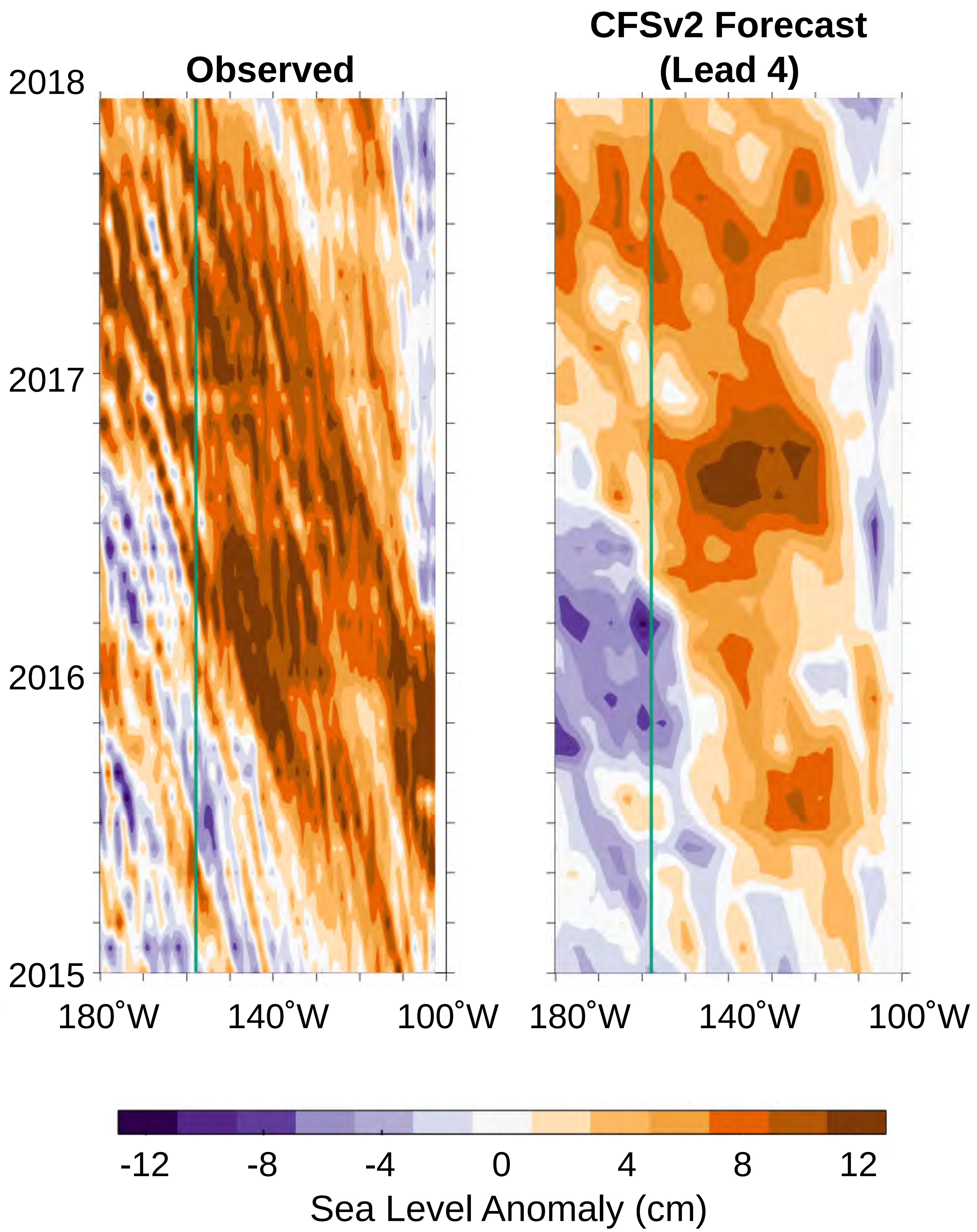
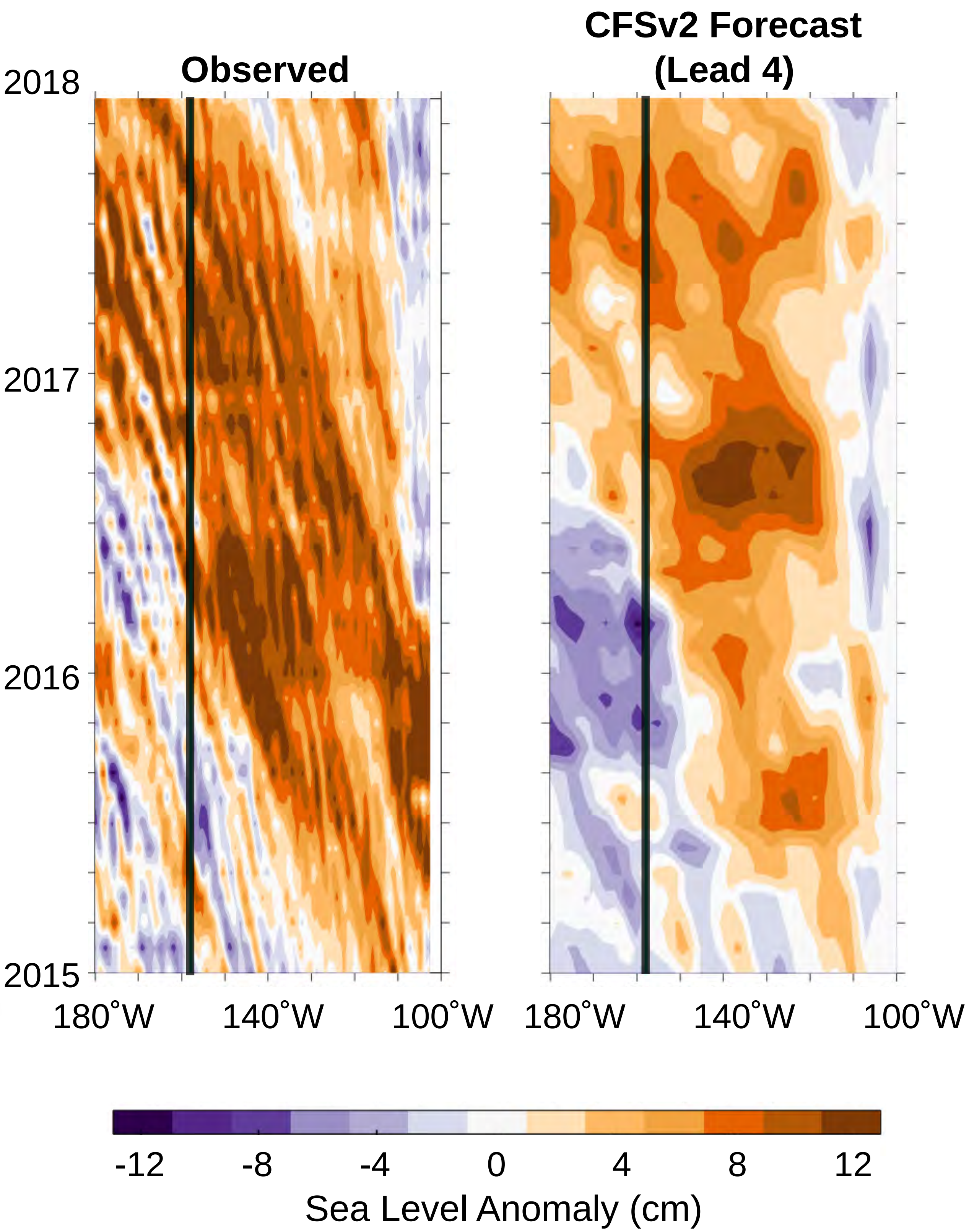
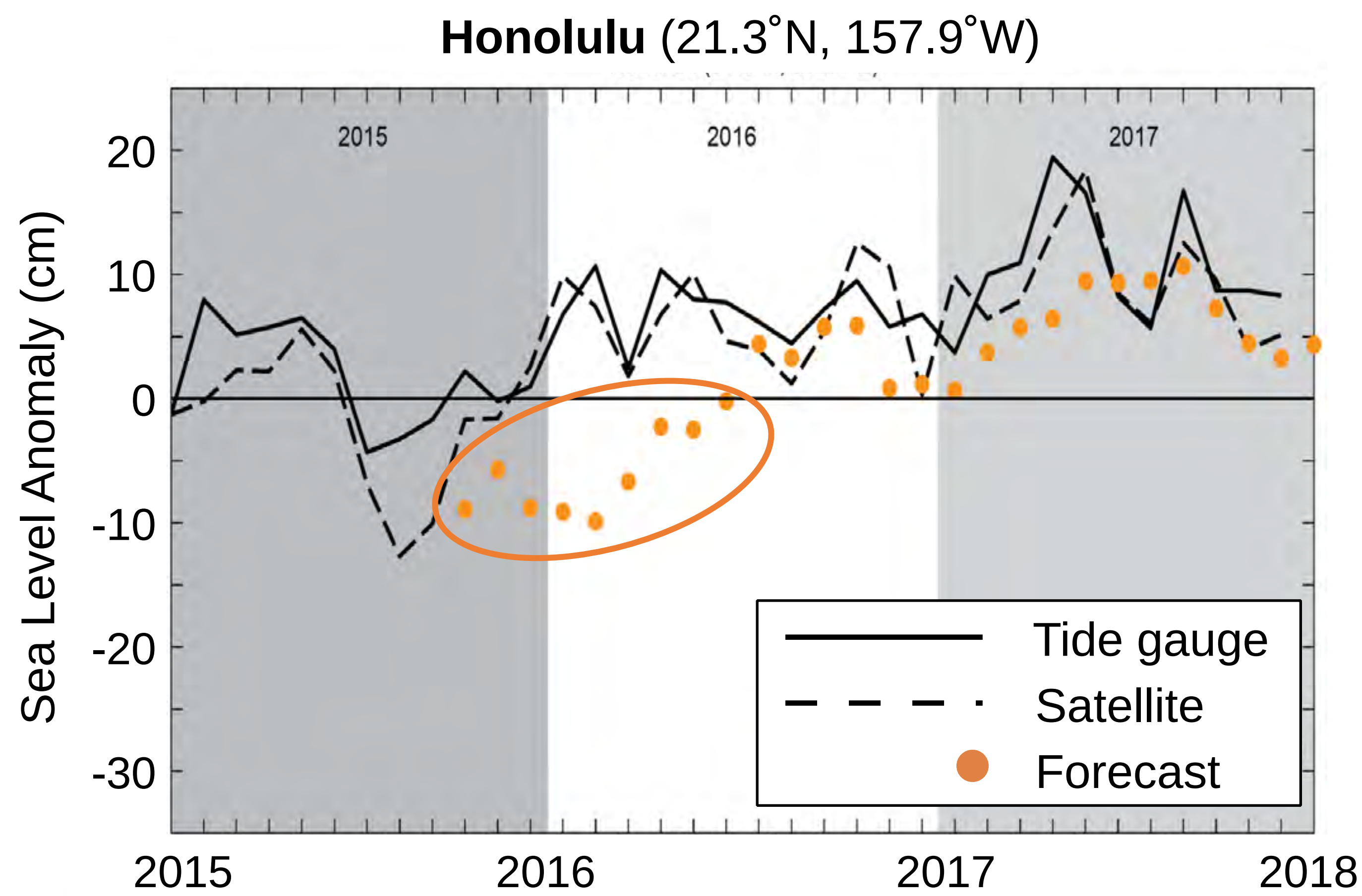


Courtesy Matthew Widlansky





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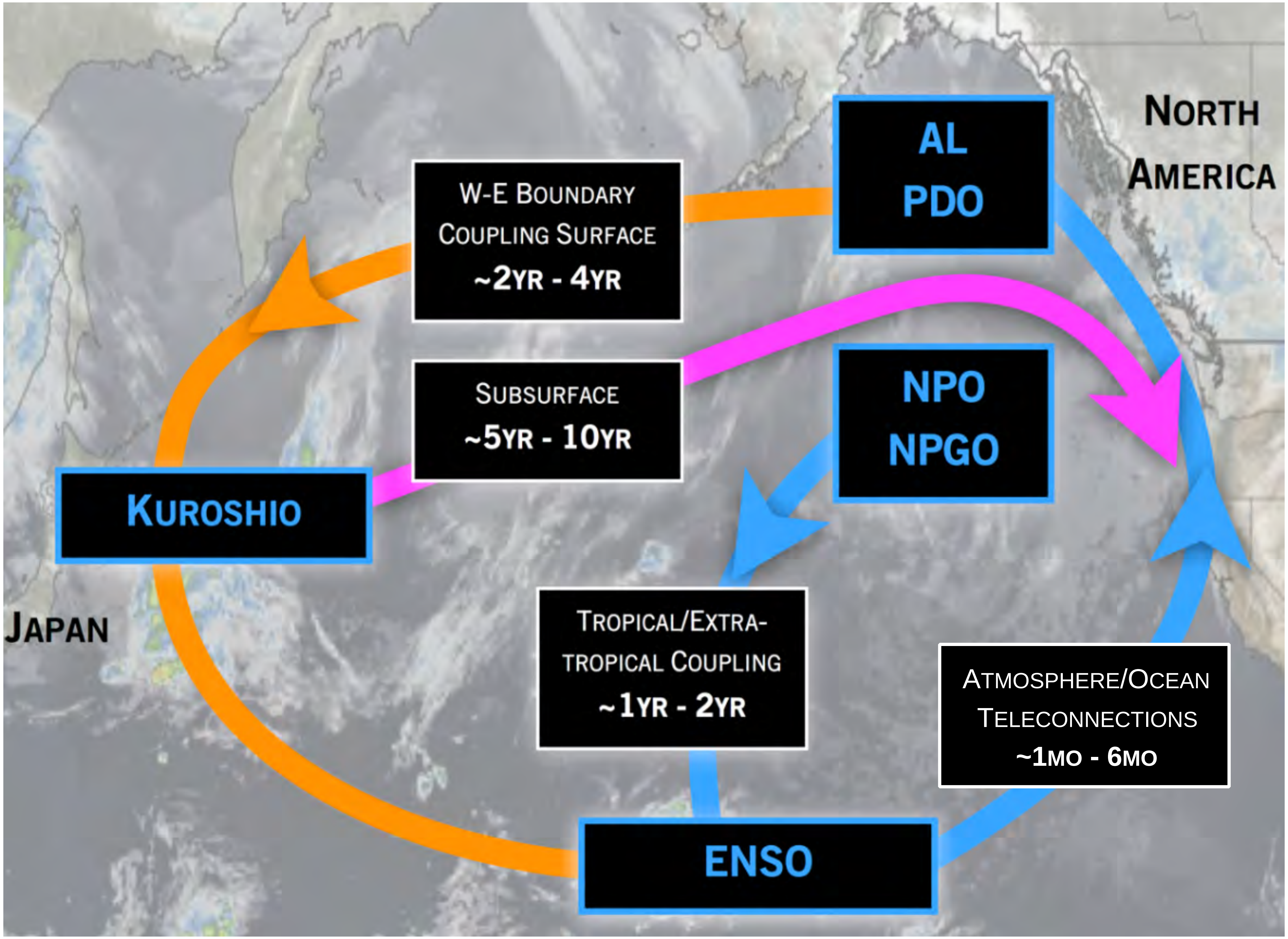

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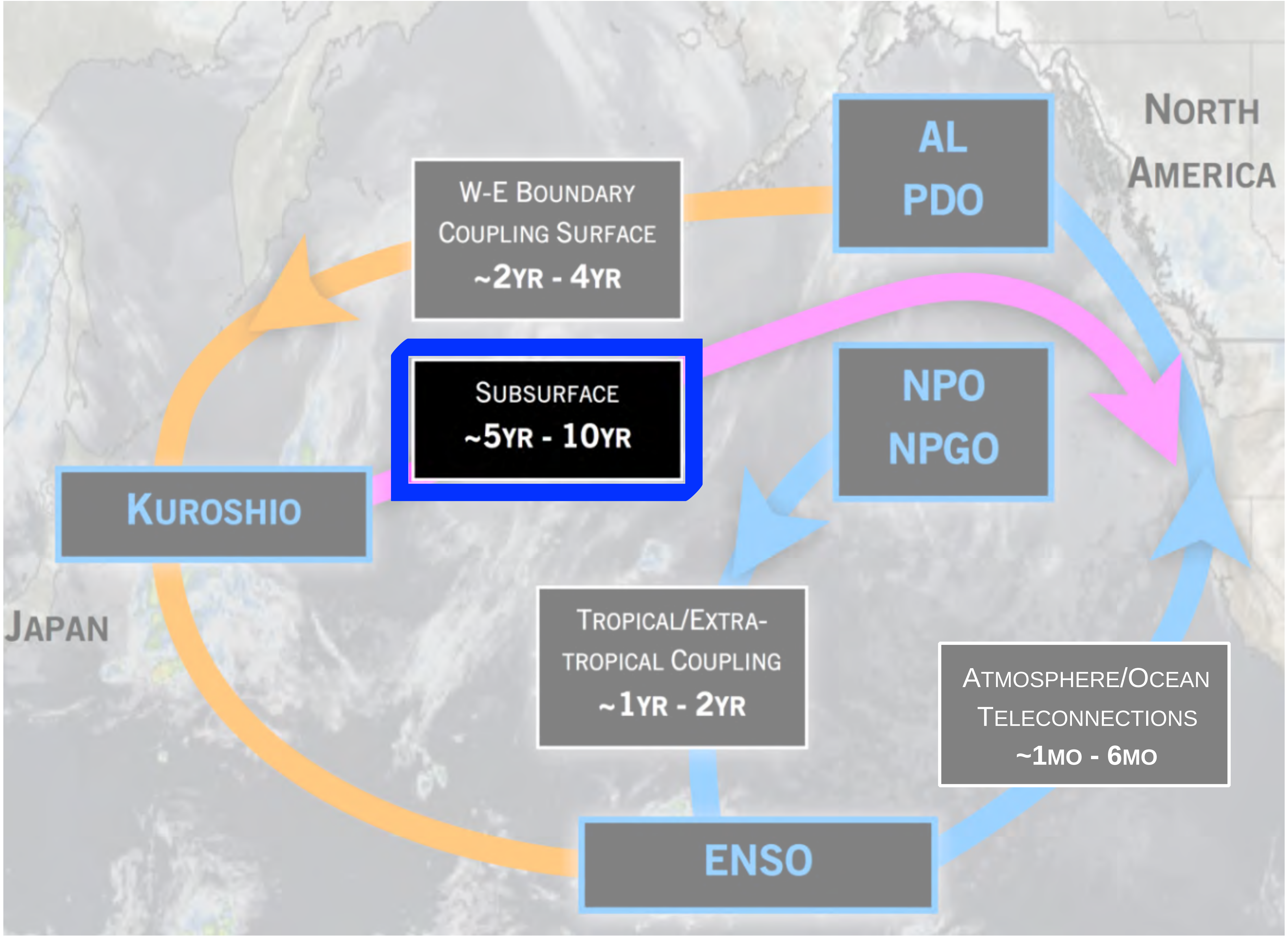
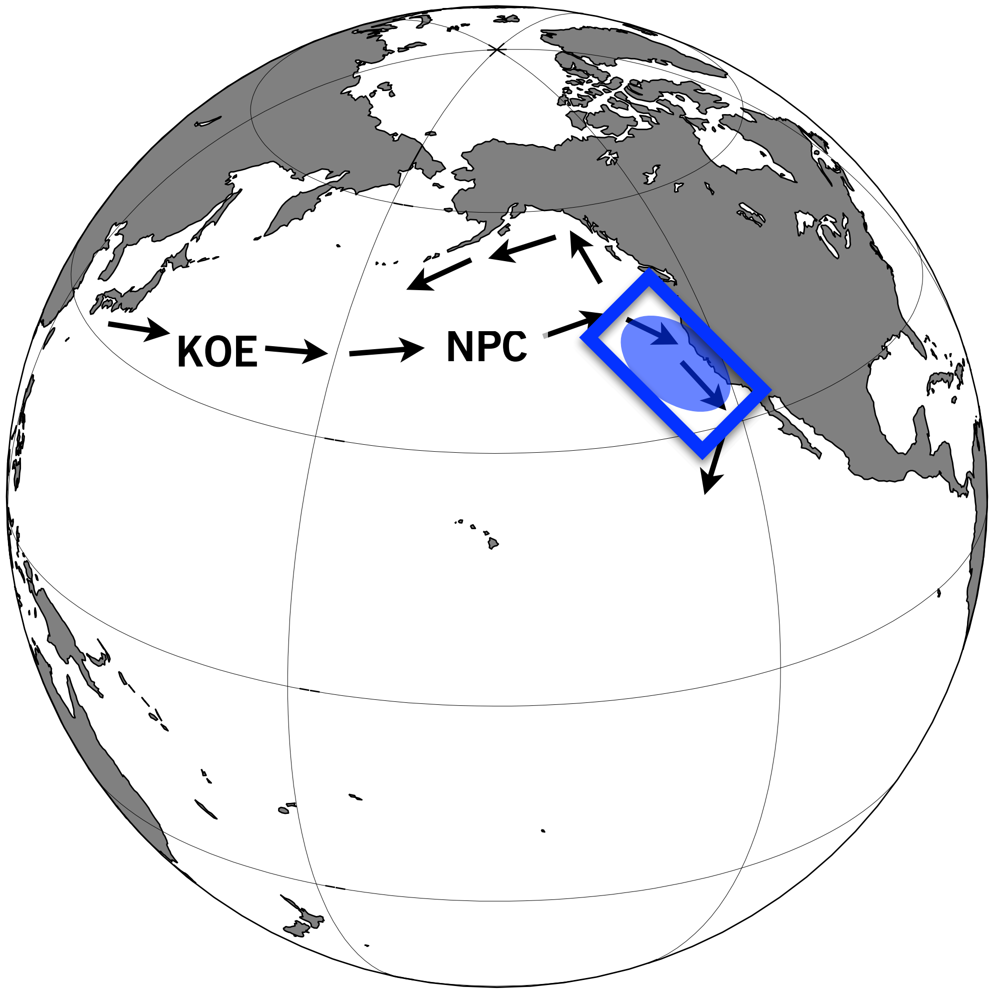
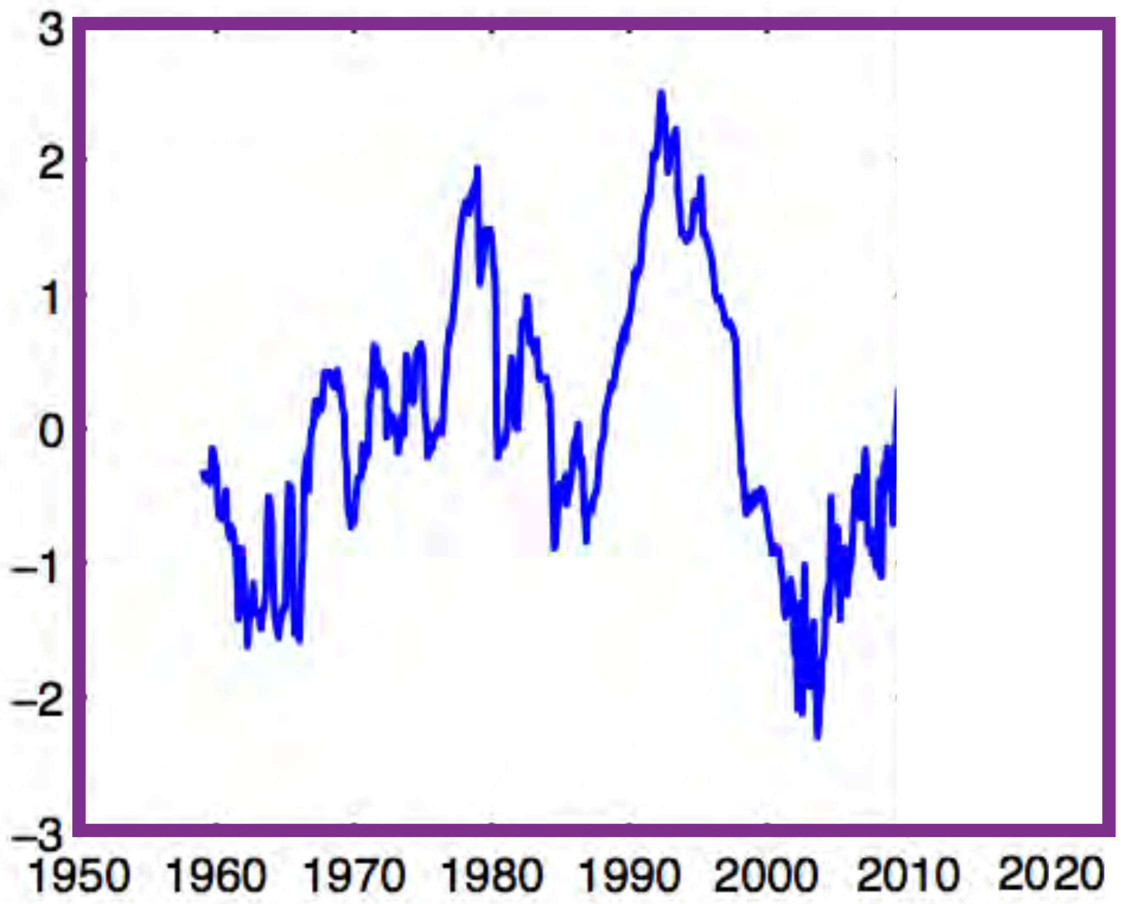


Courtesy Manu Di Lorenzo

CCS Subsurface Salinity Index (ORA S3)

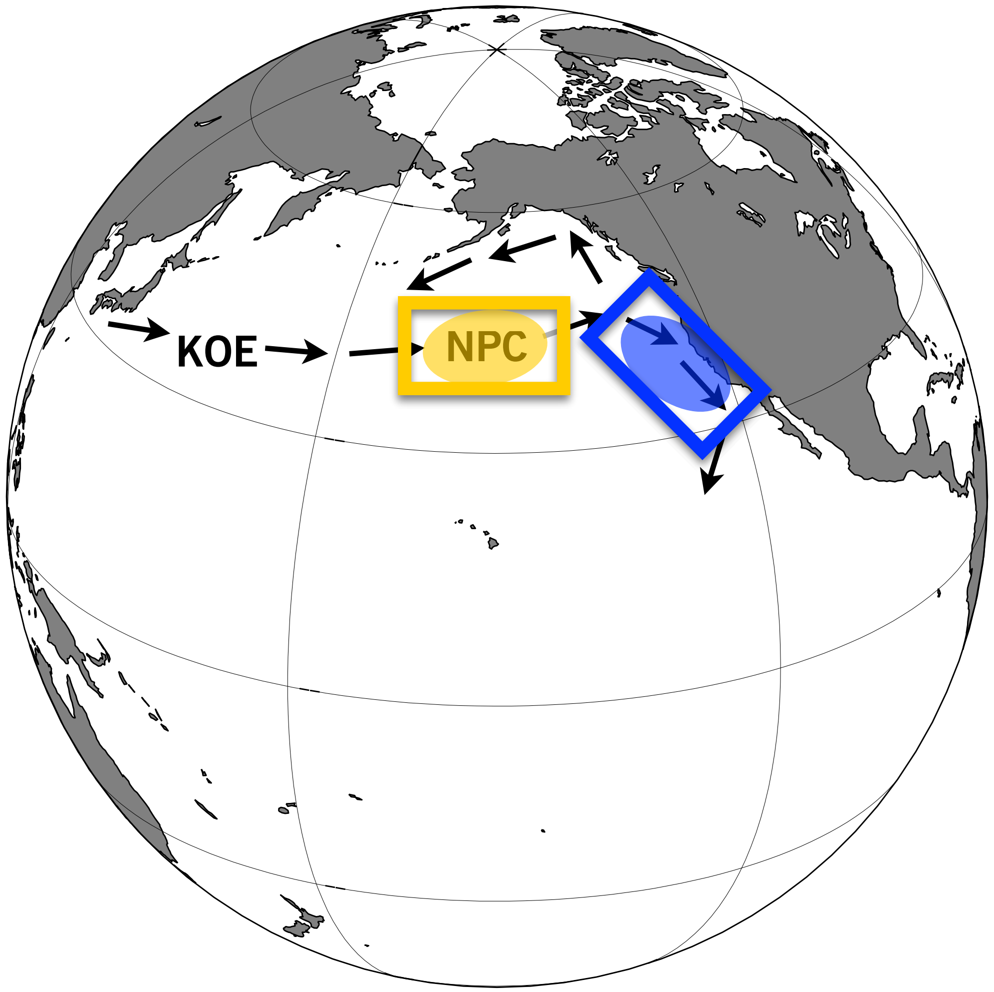


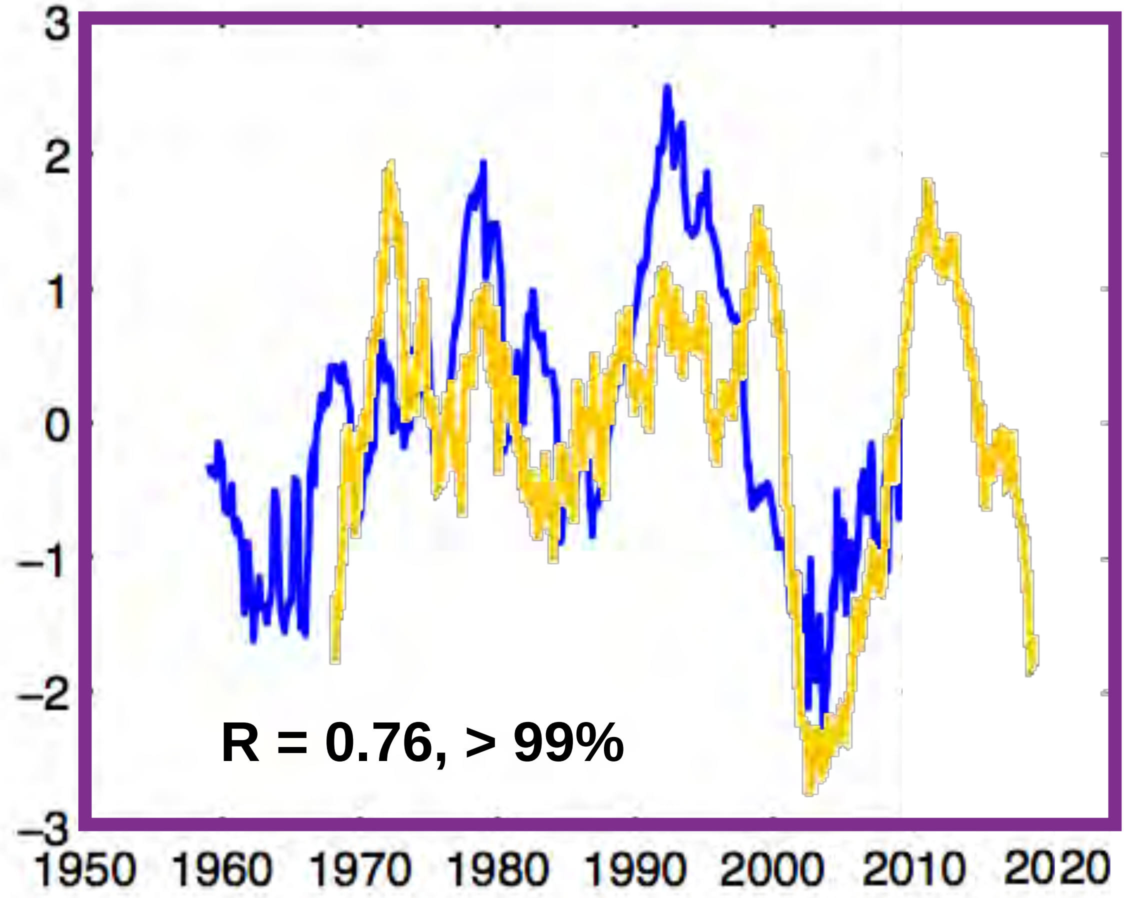


Pozo Buil and Di Lorenzo (2017)

CCS Subsurface Salinity Index (ORA S3)

Gyre Salinity Index ~ 10 years prior (ORA S3)



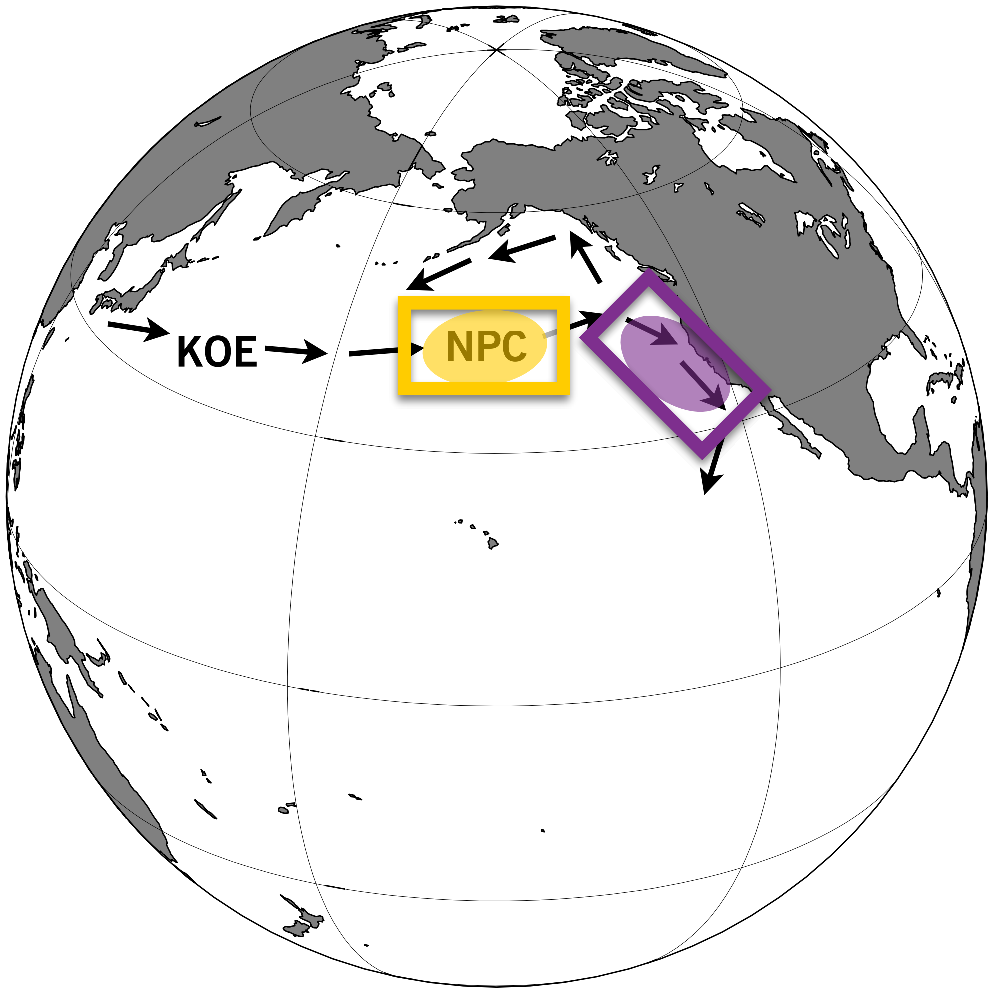


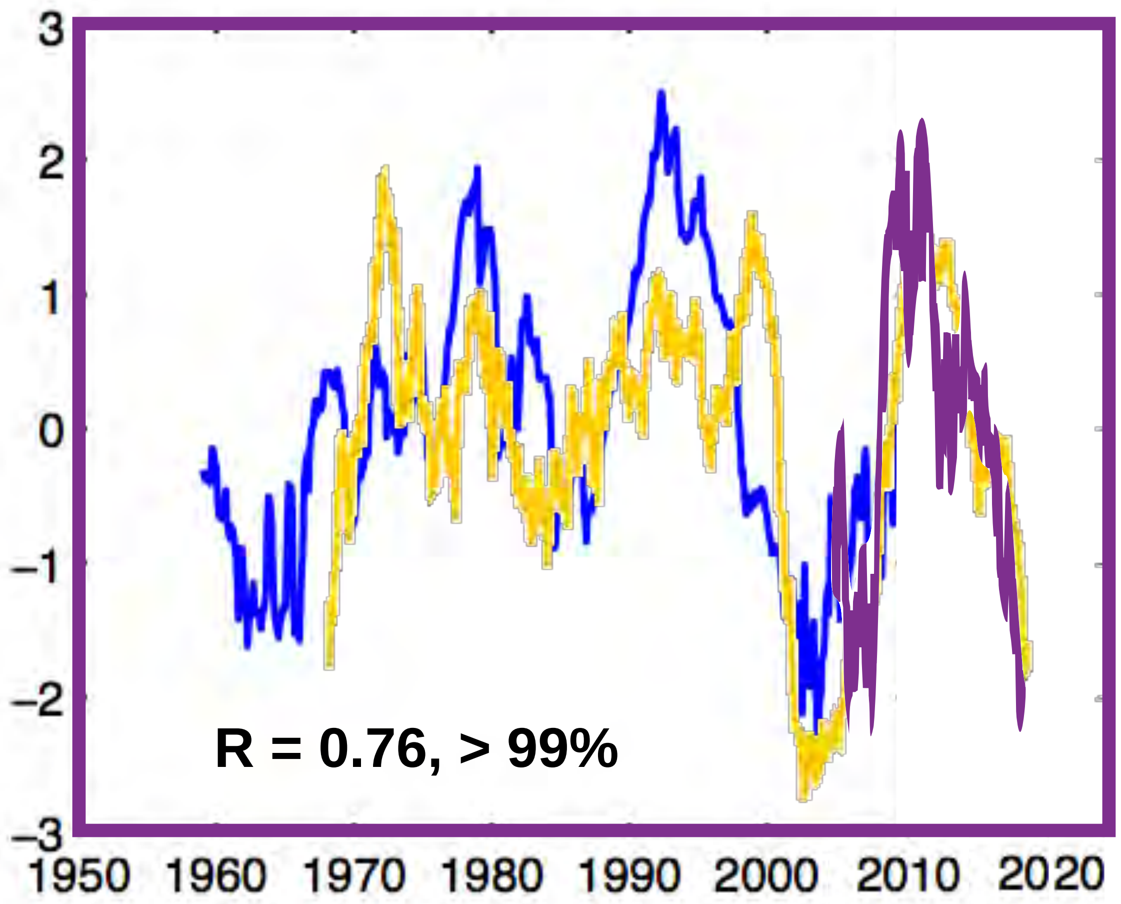
Pozo Buil and Di Lorenzo (2017)

CCS Subsurface Salinity Index (ORA S3)

Gyre Salinity Index ~ 10 years prior (ORA S3)

CCS Subsurface Salinity Index (Argo)





Pozo Buil and Di Lorenzo (2017)

NOAA Marine Prediction Task Force (2017-2020)