

Climate and Oceanography Update

# ECOSYSTEM STATUS REPORT

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NPFMC Groundfish Plan Team  
September 19, 2018



# Outline



- 🦈 2018 climate and oceanography
- 🦈 2019 sea surface temperature forecasts

# Current North Pacific Climate Highlights

Bond

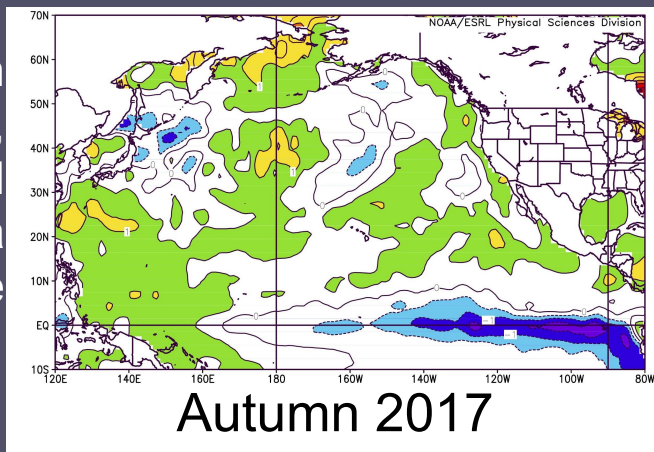
- 2017-2018 was similar to last year— La Niñas and weaker than normal Aleutian lows.
- SST anomalies in 2017-2018 tended to be positive, particularly in the Bering Sea.
- PDO was slightly positive with a decline to near zero in summer 2018.
- ~70% chance of a weak-moderate El Niño for winter 2018-2019.



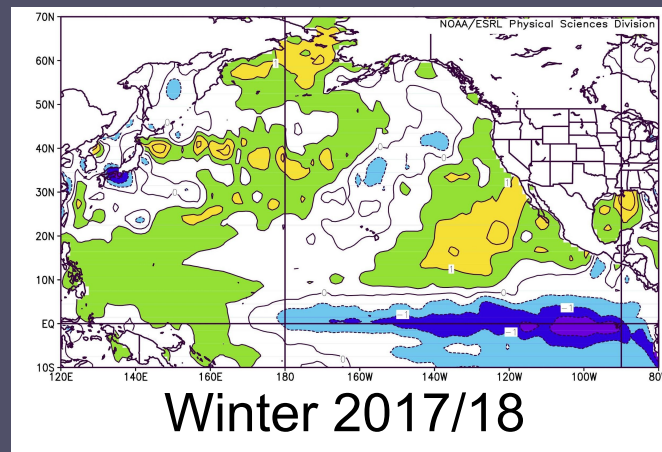
# Sea Surface Temperature Anomalies

Bond

Warmer than normal, delayed onset of sea ice

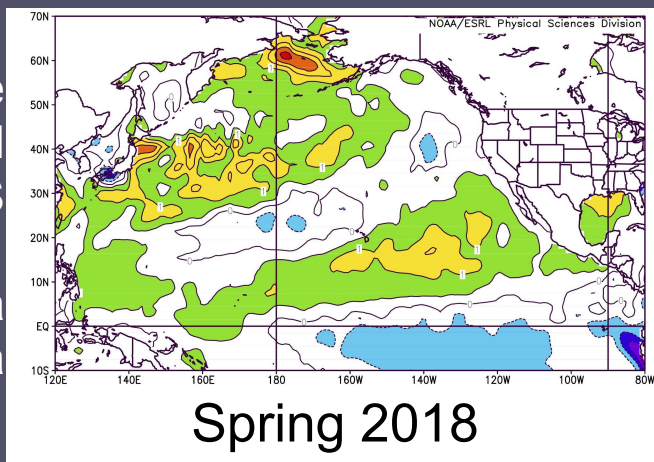


Weak to moderate La Niña conditions

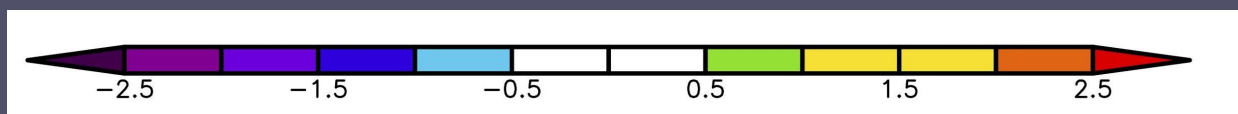
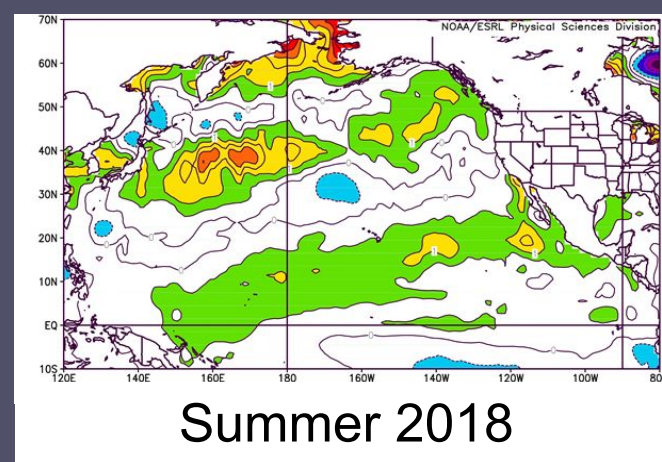


Warm relative to seasonal norm in EBS

End of La Niña



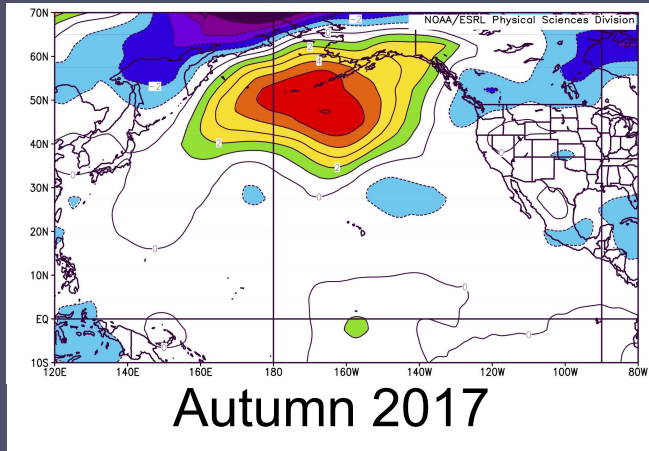
Particularly strong anomalies (> 2°C) developed near Bering Strait.



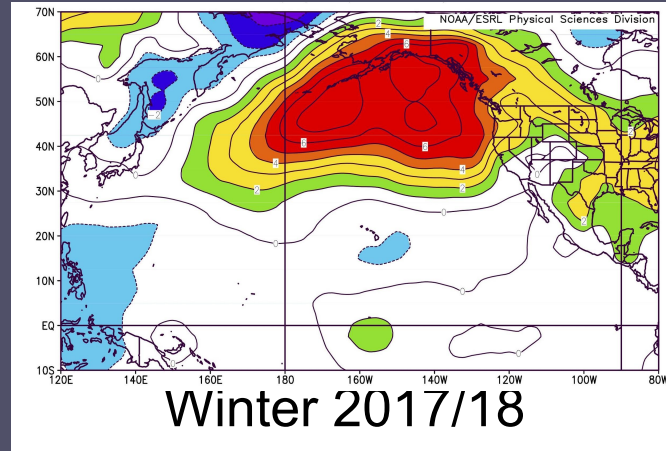
# Sea Level Pressure Anomalies

## Bond

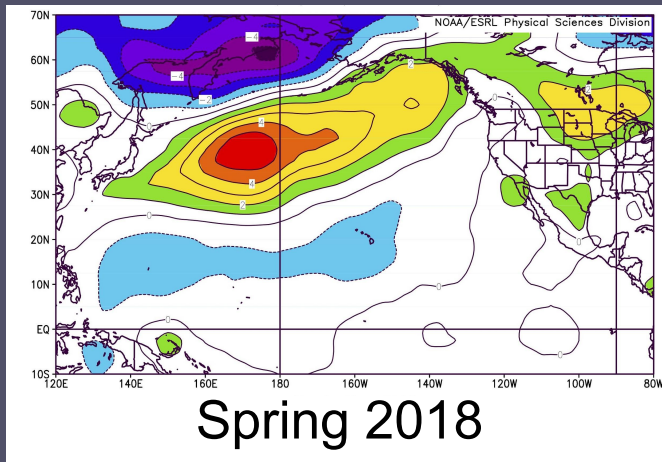
Enhanced storminess along east coast of Asia. Suppressed storminess from AI to GOA.



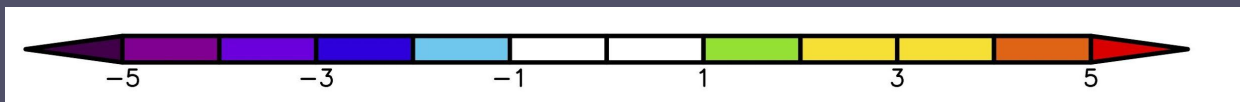
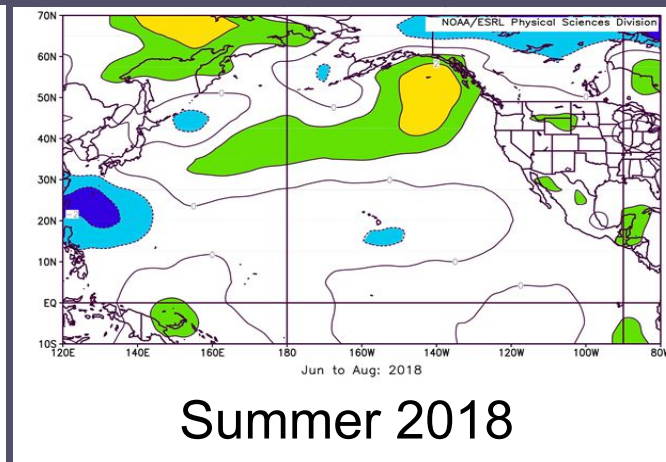
Expansion of Fall pattern. Strong wind anomalies from SW across the Bering Sea.



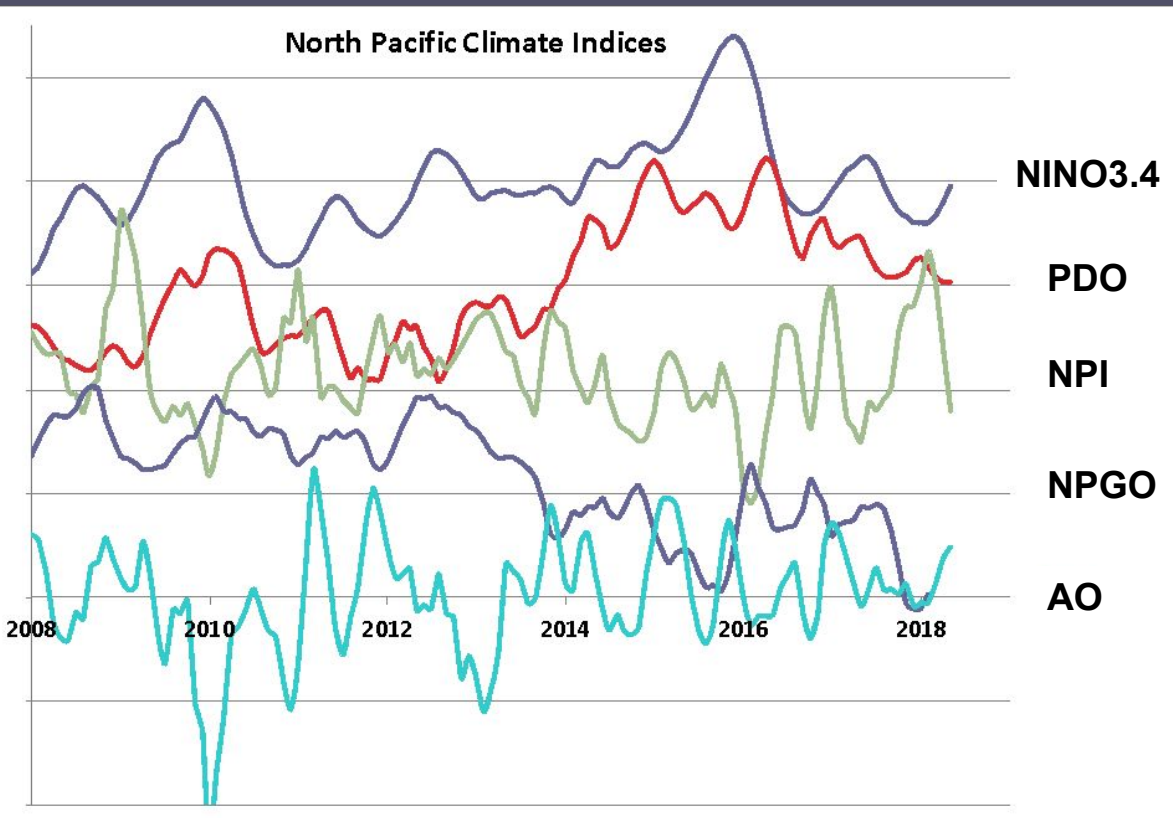
Warm, SW flow anomalies across the Bering Sea. Upwelling-favorable winds in coastal GOA.



Weak anomalies; typical for Summer.



The North Pacific atmosphere-ocean climate system was **mostly on the warm side** during 2017-18.



Second fall/winter with negative NINO3.4; weak to moderate La Niña event.

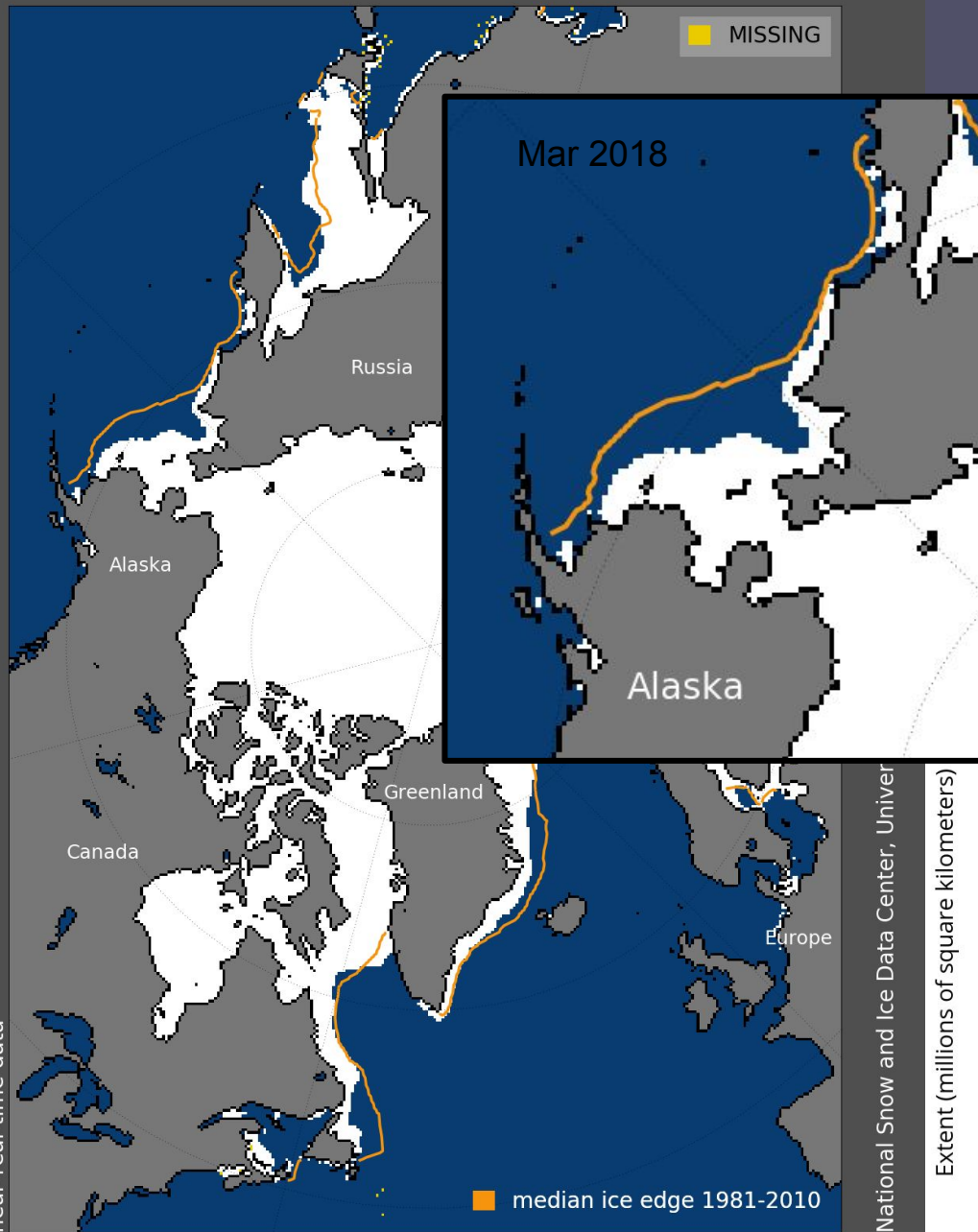
Positive PDO that began in 2014 ended in 2017.

NPI strongly positive early 2018. Common with La Niña, but magnitude greater than expected.

NPGO negative 2017 to 2018 (Feb); declining since 2012.

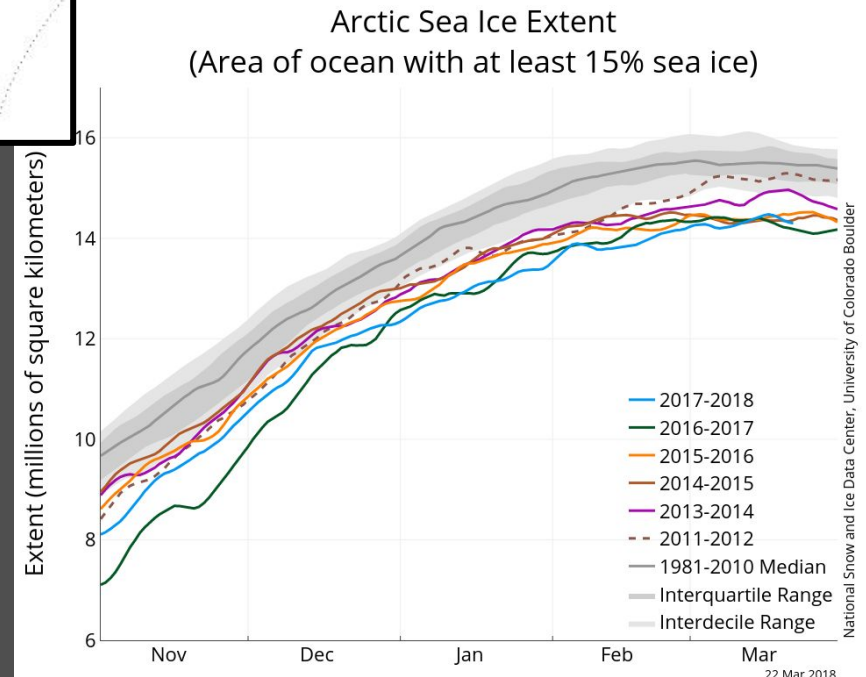
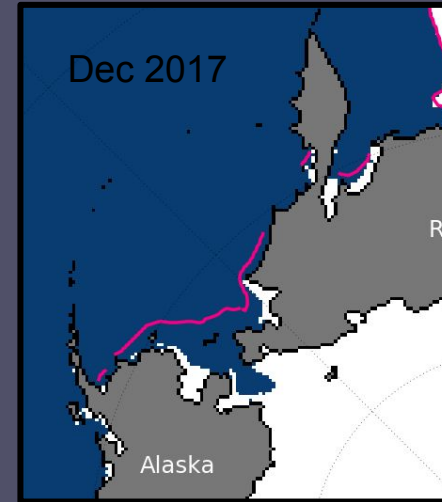
AO near-neutral in 2017; transition to positive in spring/summer 2018 resulting in low pressure in the Arctic.

# Sea Ice Extent, 17 Mar 2018

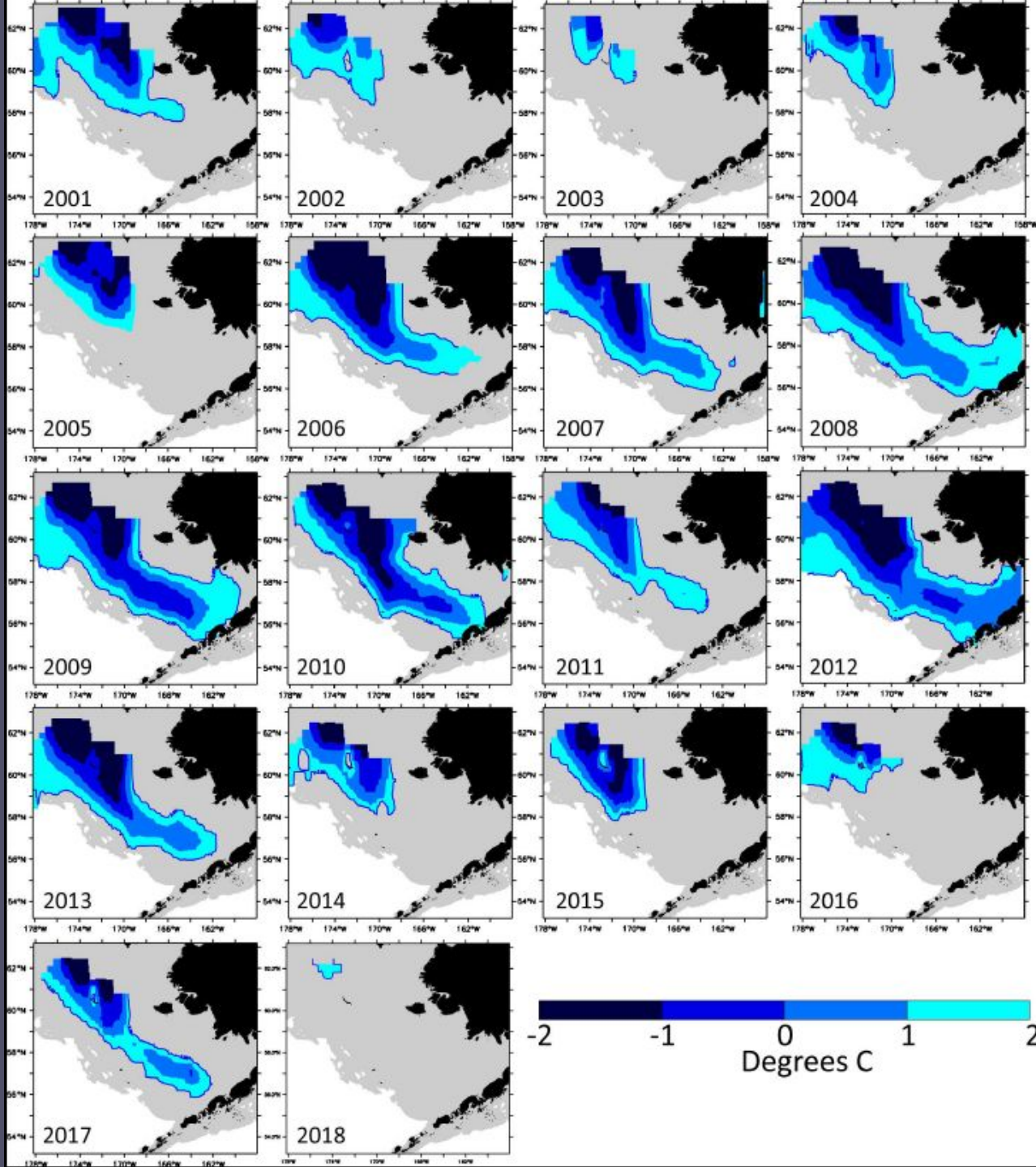


# Maximum sea ice extents

National Snow and Ice Data Center



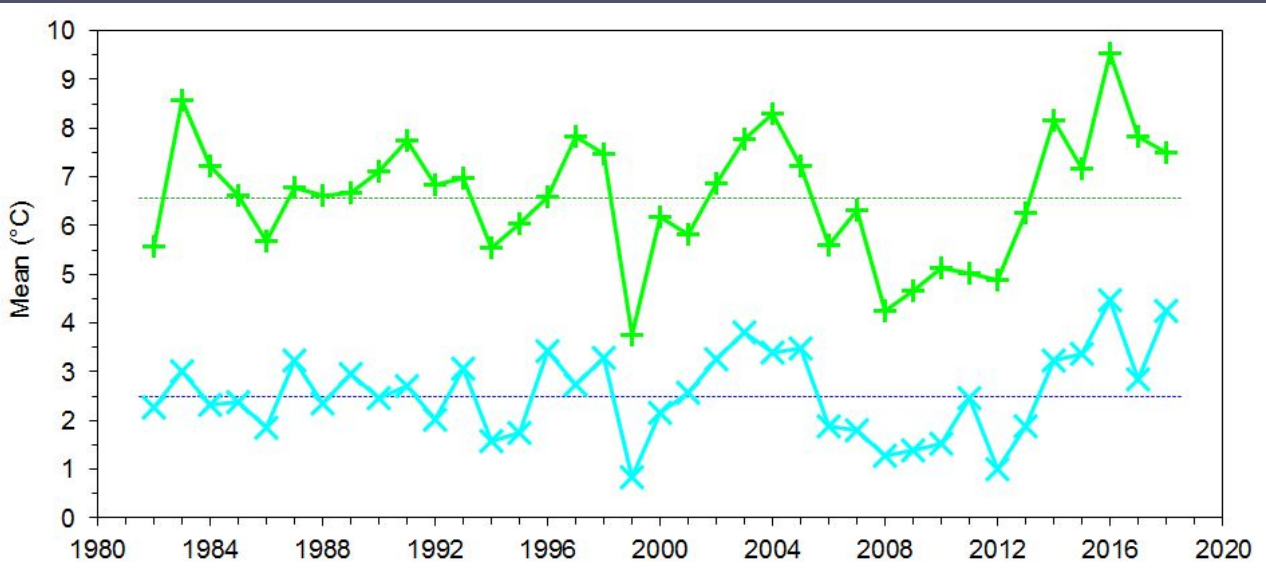
# EBS cold pool Overland, Ladd





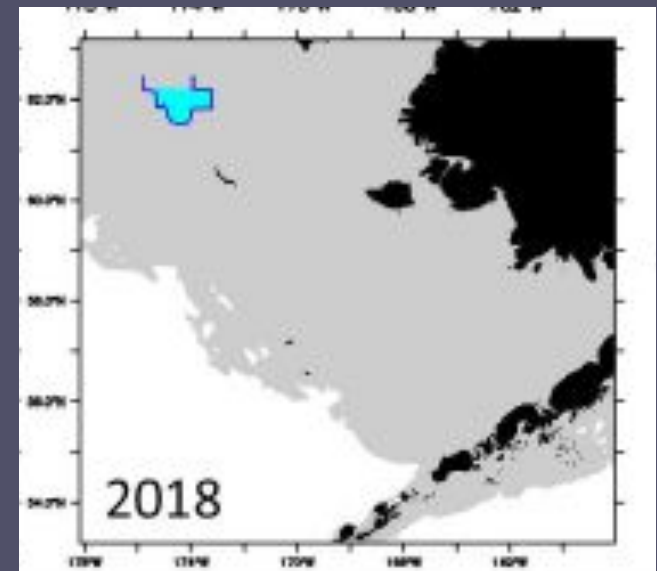
# 2018 Southeastern BS water temperatures

Lauth, Overland et al.



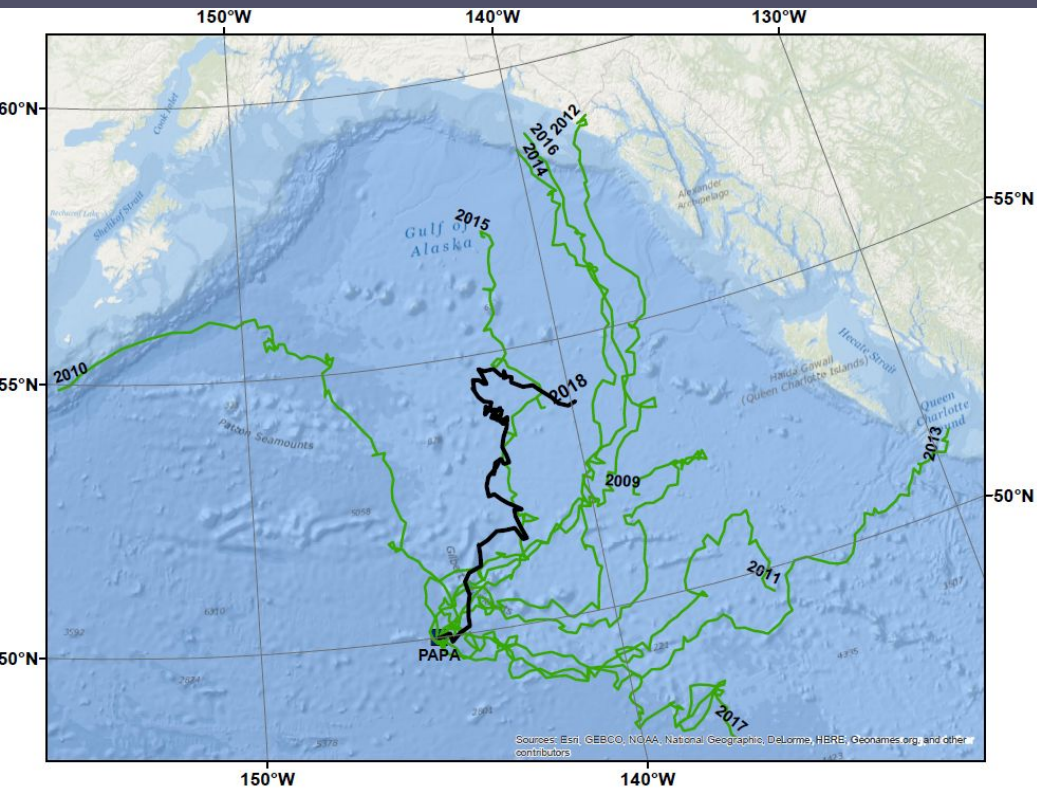
- Residual heat, persistent SW winds, and lack of sea ice maintained above-average water temperatures (surface and bottom).

- *Where's the cold pool?*



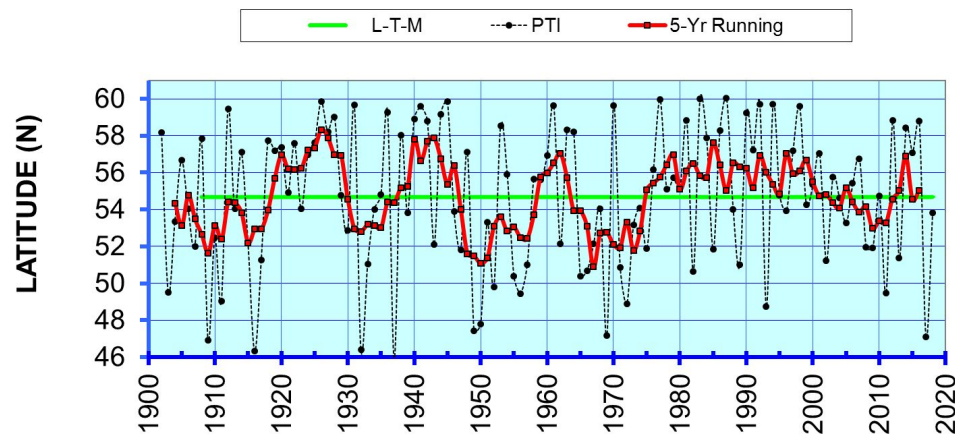
# GOA Ocean Surface Currents – PAPA Trajectory Index

Stockhausen



- Simulated surface drifter released from Ocean Station PAPA Dec 1 for 90 days
- 2014-2016 trajectories similar (S wind anomalies -> “Blob”)
- Directionality reflected wind patterns

**Papa Trajectory Index (PTI) End-point Latitudes (Winters 1902-2018)**

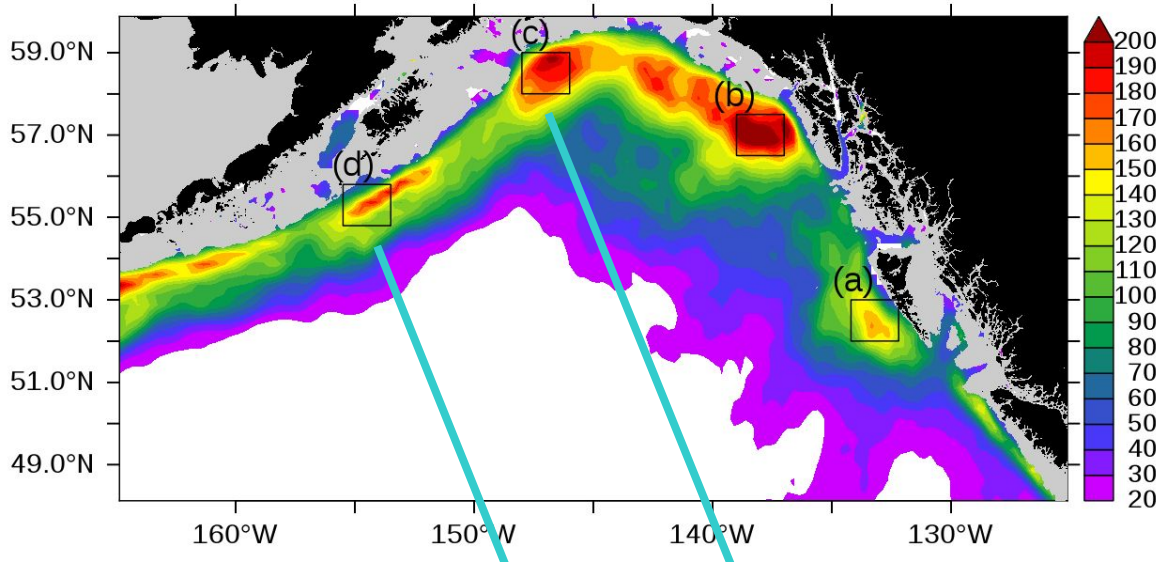


- Endpoint and PTI near mean
- Not indicative of increased transport or northerly shift of the Alaska Current

# Eddies in the Gulf of Alaska

Ladd

## Average Eddy Kinetic Energy Jan 1993 - Dec 2017



Seasonal cycles:

(c) High EKE in spring

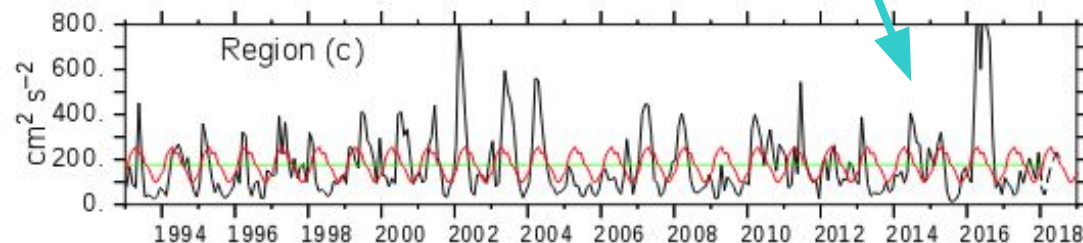
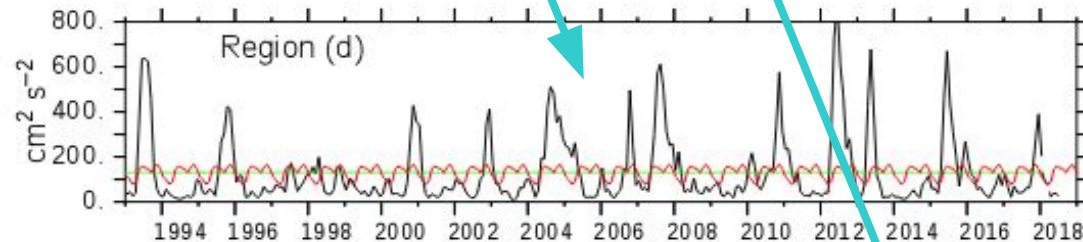
(d) High EKE in fall

(c) Strong persistent eddy in 2016, currently average

(d) Currently low

E GOA: influenced by winds (climate and gap scale)

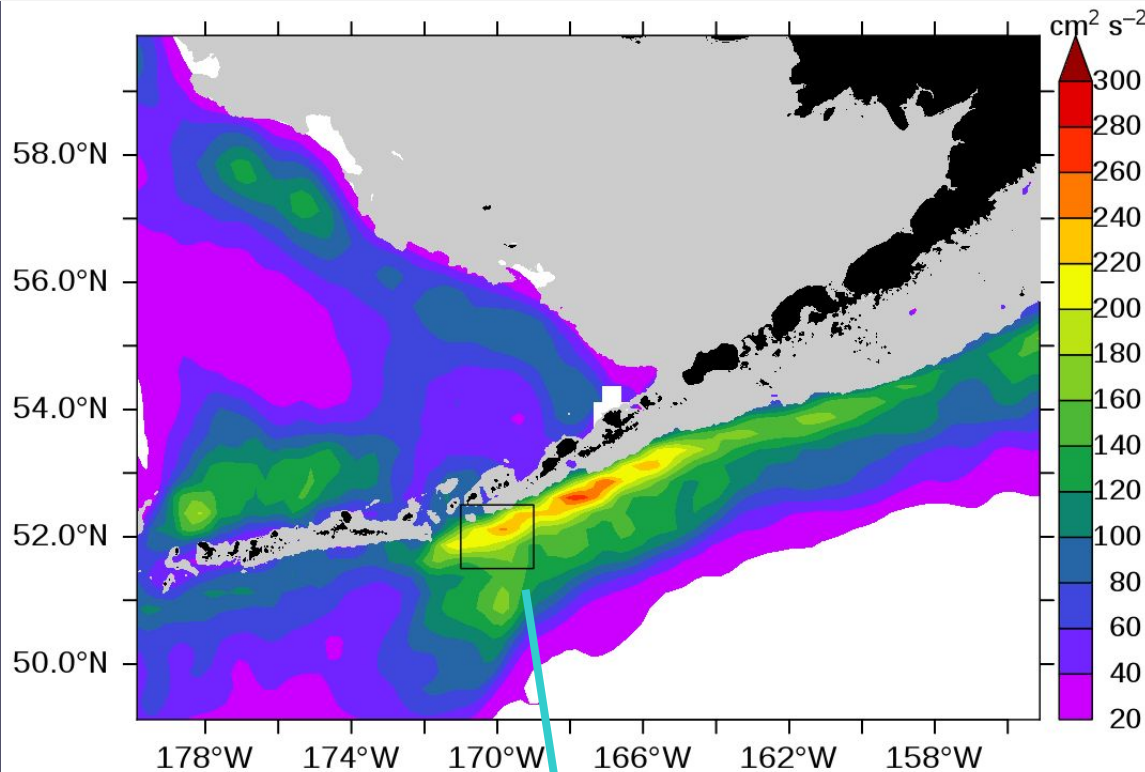
W GOA: influenced by propagation and intrinsic variability



# Eddies in the Aleutian Islands

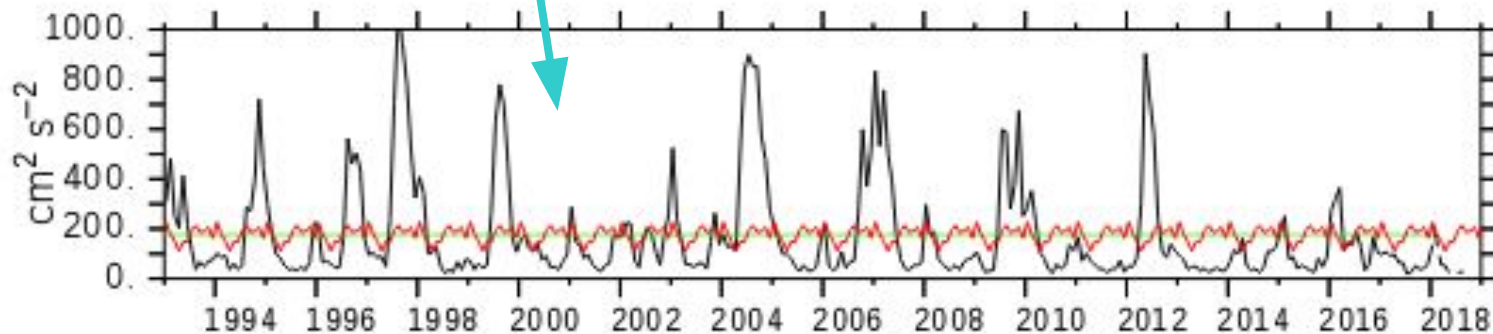
Ladd

Average Eddy Kinetic Energy Jan 1993 - Dec 2017



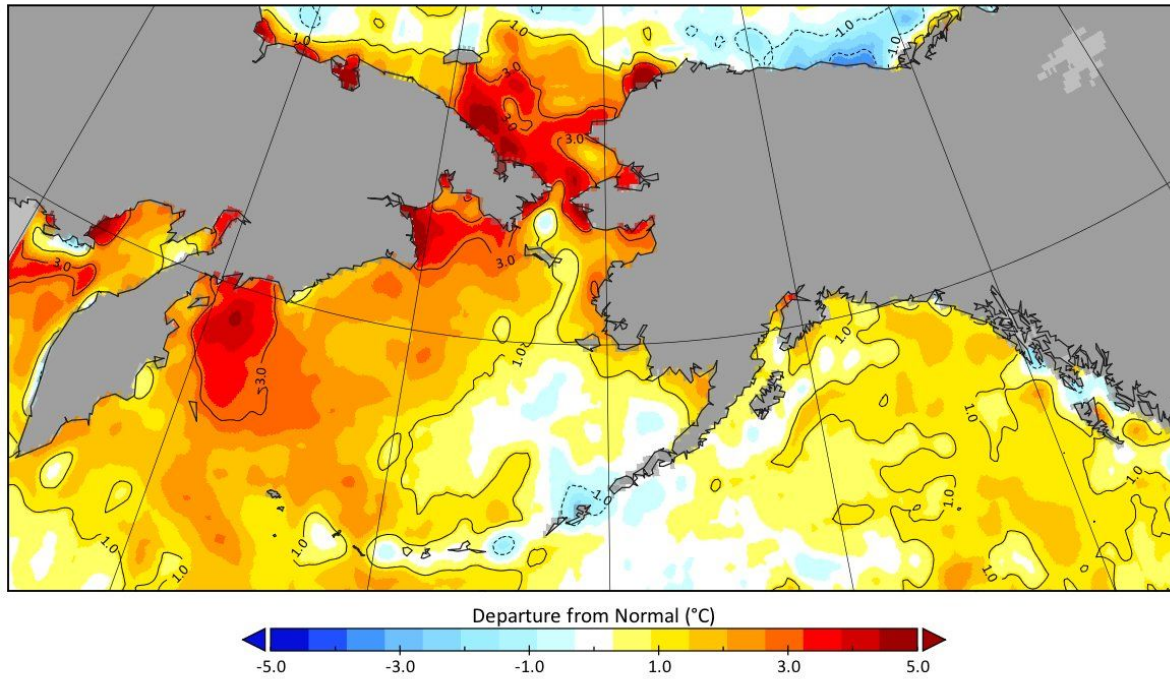
EKE low fall 2012–2018

Lower than average  
volume, heat, salt,  
nutrient fluxes to BS  
through Amukta Pass  
since summer 2012



## Sea Surface Temperature Departure From Normal

September 2-3, 2018



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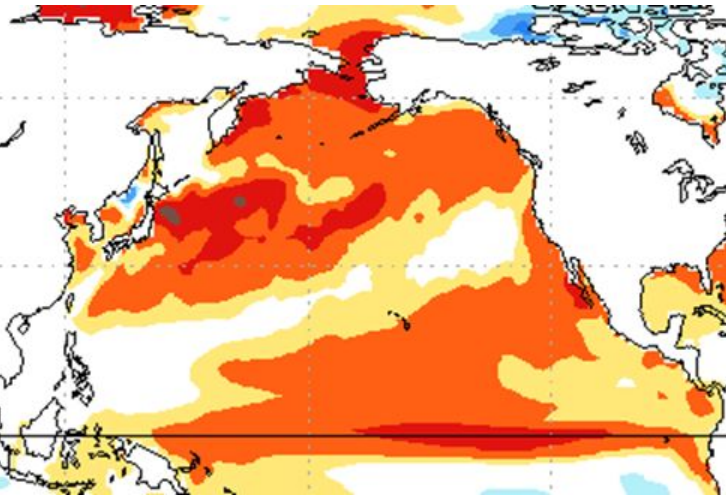
Data: OISSTv2 Courtesy NOAA/ESRL/PSD

# 2019 Sea Surface Temperature Forecasts

# SST Projections from the National Multi-Model Ensemble

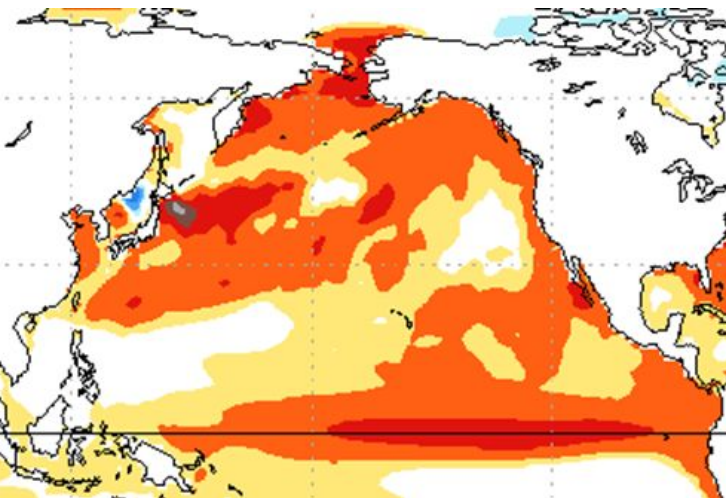
Bond

Oct - Dec 2018

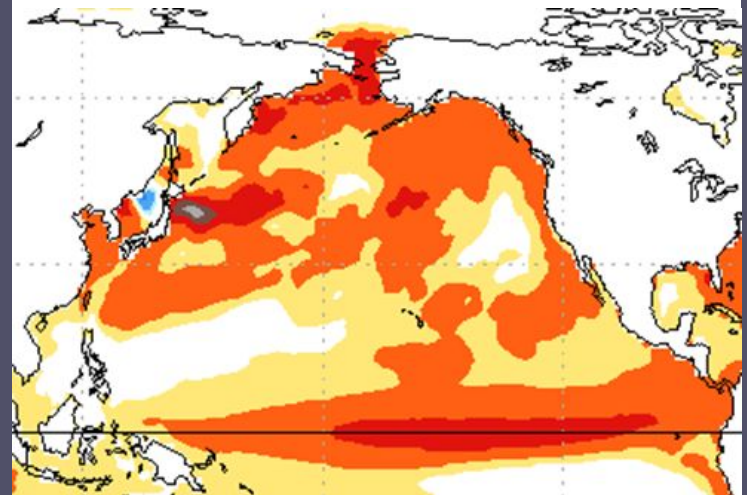


- Warm conditions across N. Pacific through Dec
- Positive anomalies greatest ( $>1^{\circ}\text{C}$ ) in NBS
- 70% chance of El Niño
- Aleutian low deeper than normal in late winter of 2018/19 = warm weather for Alaska enhanced by warm waters.
- No typical PDO pattern in N Pacific in early 2019 (warm everywhere).

Dec 2018 - Feb 2019



Feb - April 2019



-3 -2 -1 -0.5 -0.25 0.25 0.5 1 2 3

