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

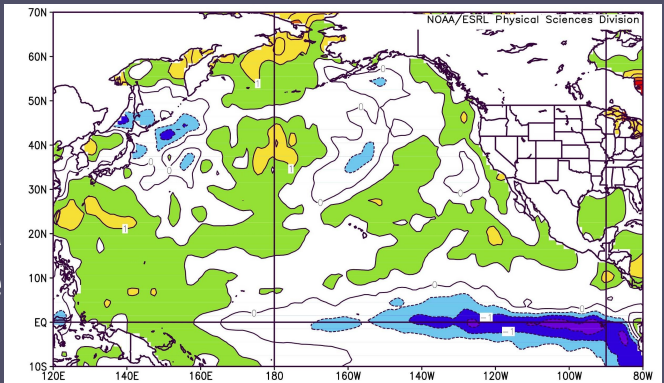
- 2017-2018 was similar to last year— La Niñas and weaker than normal Aleutian lows.
- SST anomalies in 2017-2018 tended to be positive, particularly in the Bering Sea.
- PDO was slightly positive with a decline to near zero in summer 2018.
- ~70% chance of a weak-moderate El Niño for winter 2018-2019.



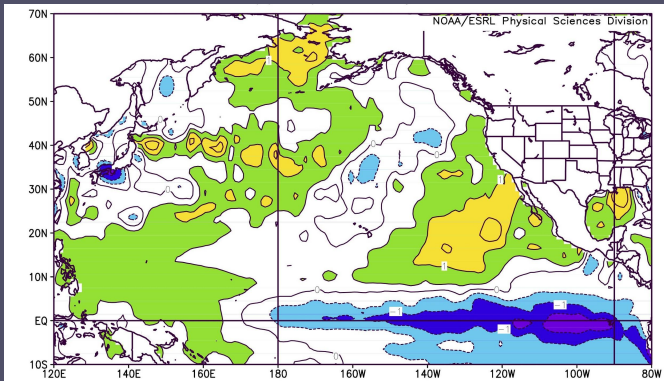
Sea Surface Temperature Anomalies

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Warmer than normal, delayed onset of sea ice



Autumn 2017

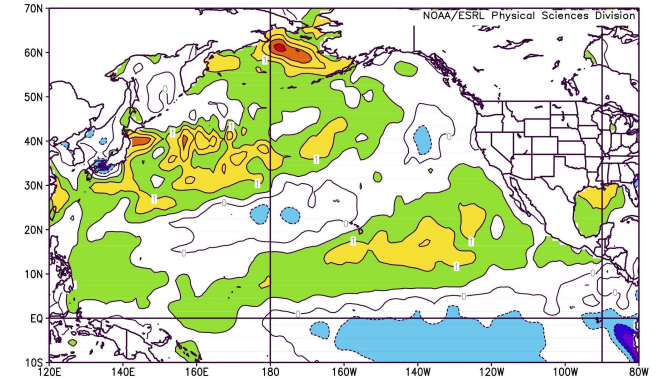


Winter 2017/18

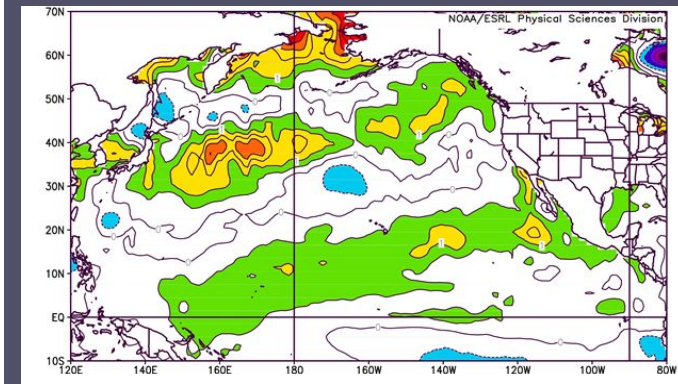
Weak to moderate La Niña conditions

Warm relative to seasonal norm in EBS

End of La Niña

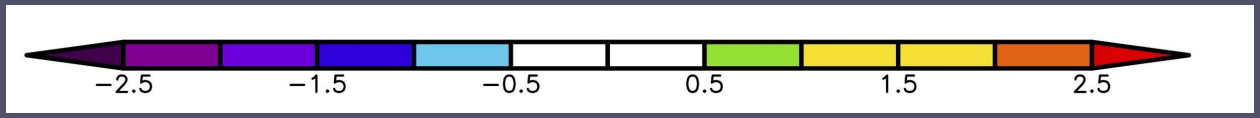


Spring 2018



Summer 2018

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

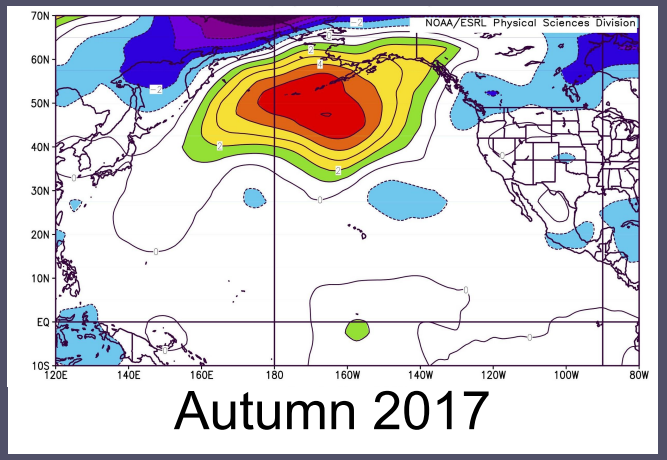


From NOAA's Optimum Interpolation SST analysis

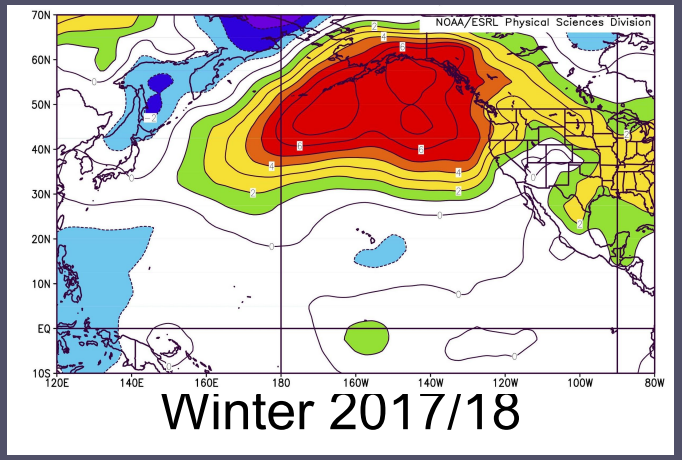
Sea Level Pressure Anomalies

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



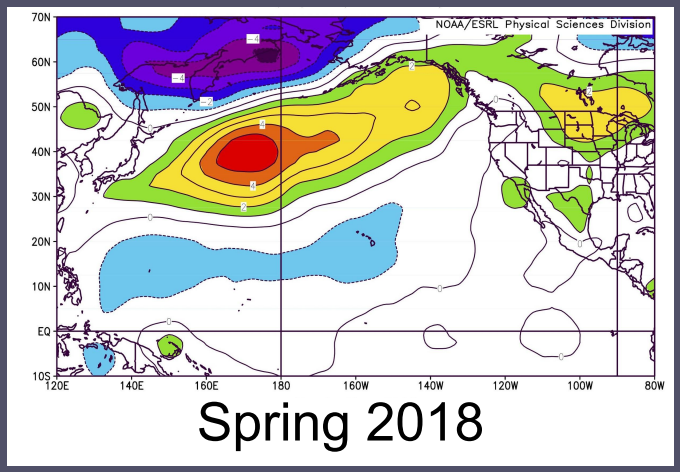
Autumn 2017



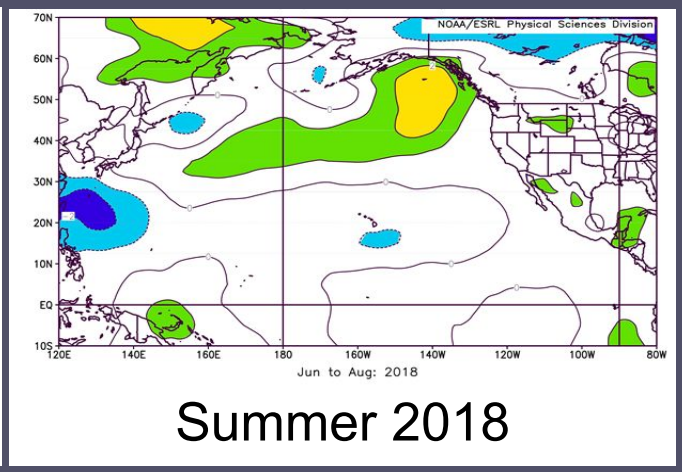
Winter 2017/18

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.

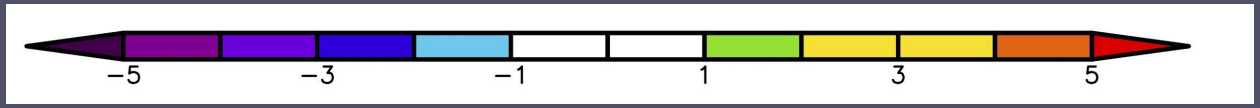


Spring 2018



Summer 2018

Weak anomalies; typical for Summer.

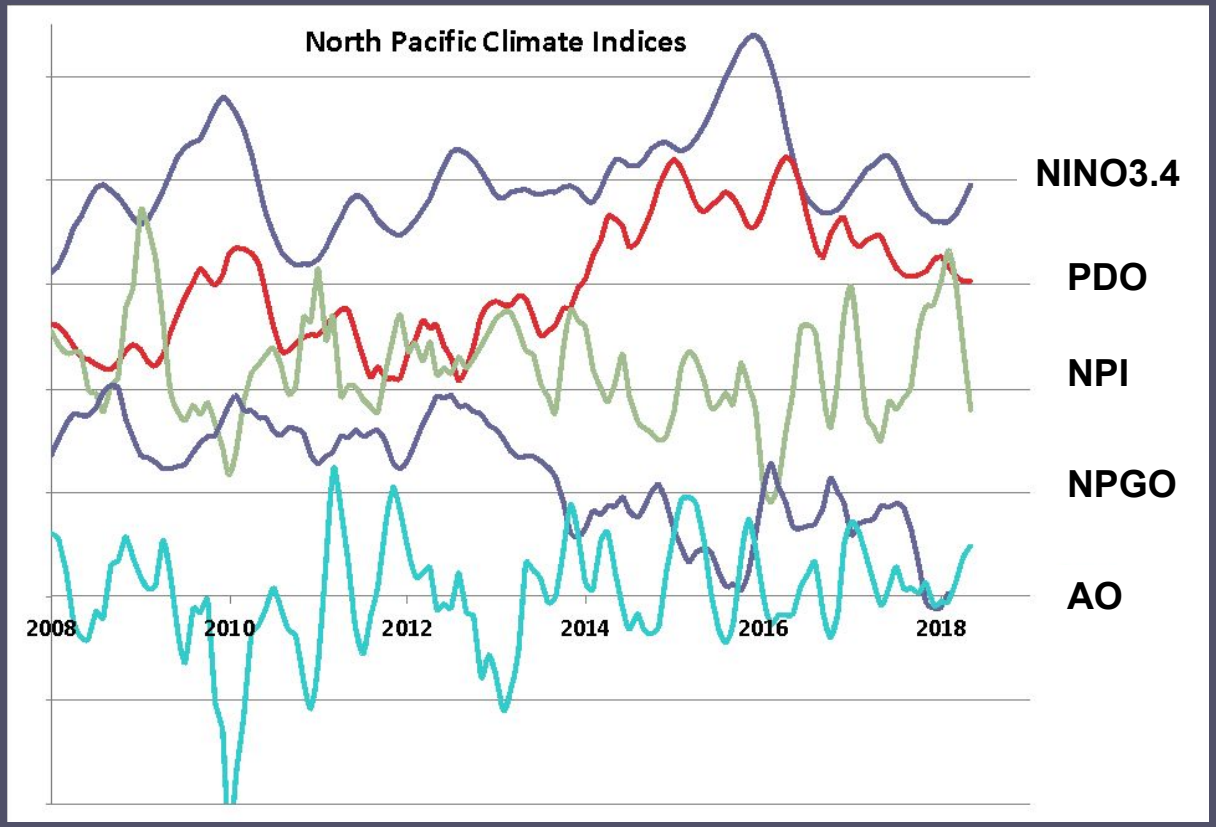


From the NCEP/NCAR Reanalysis project

Climate Indices

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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.

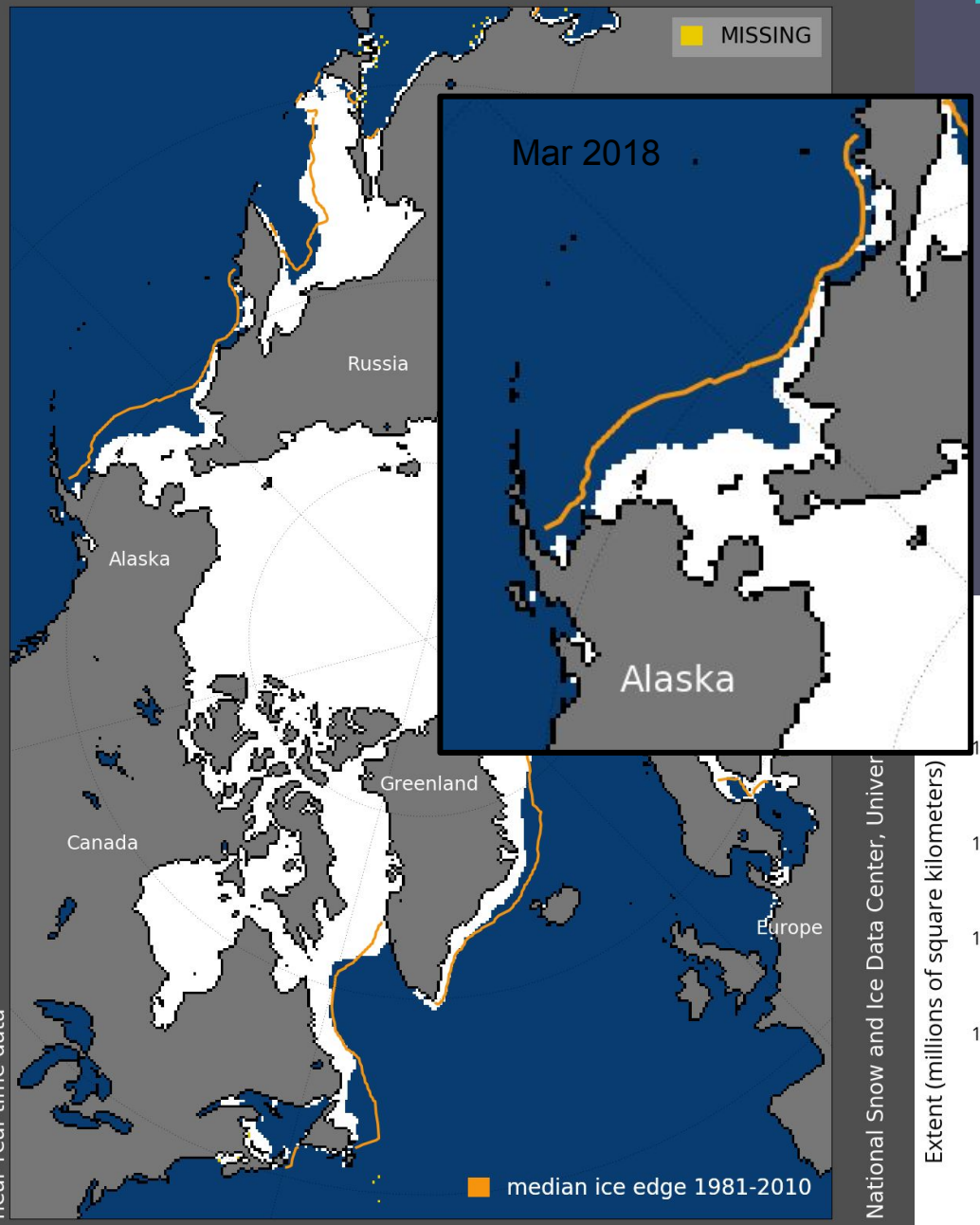
NPI strongly positive early 2018. Common with La Niña, but magnitude greater than expected.

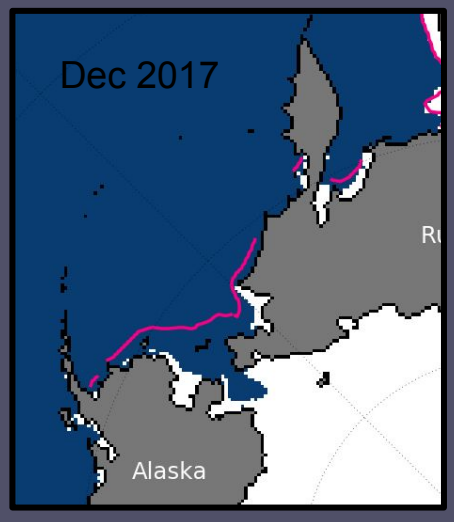
NPGO negative 2017 to 2018 (Feb); declining since 2012.

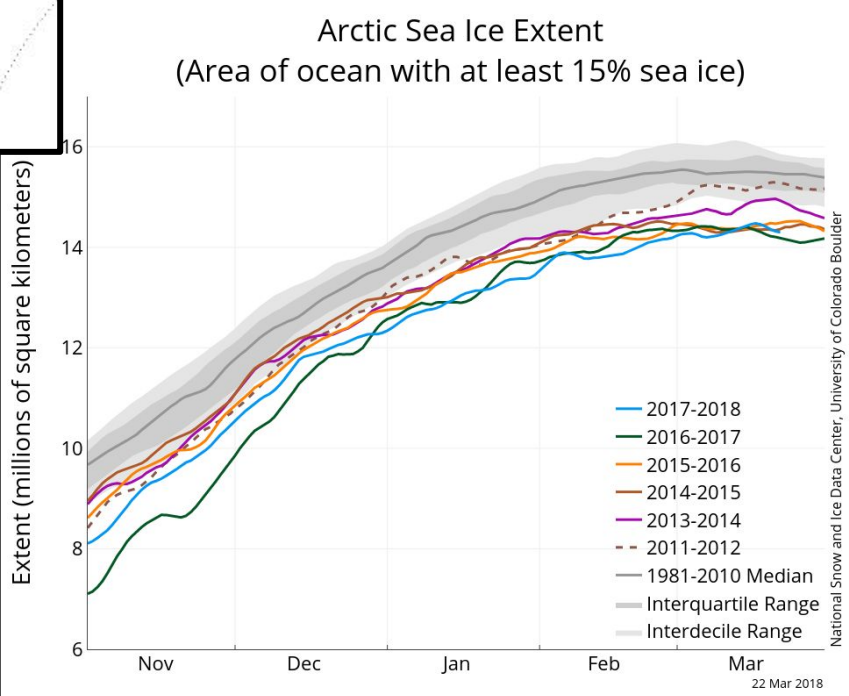
AO near-neutral in 2017; transition to positive in spring/summer 2018 resulting in low pressure in the Arctic.

Maximum sea ice extents

National Snow and Ice Data Center

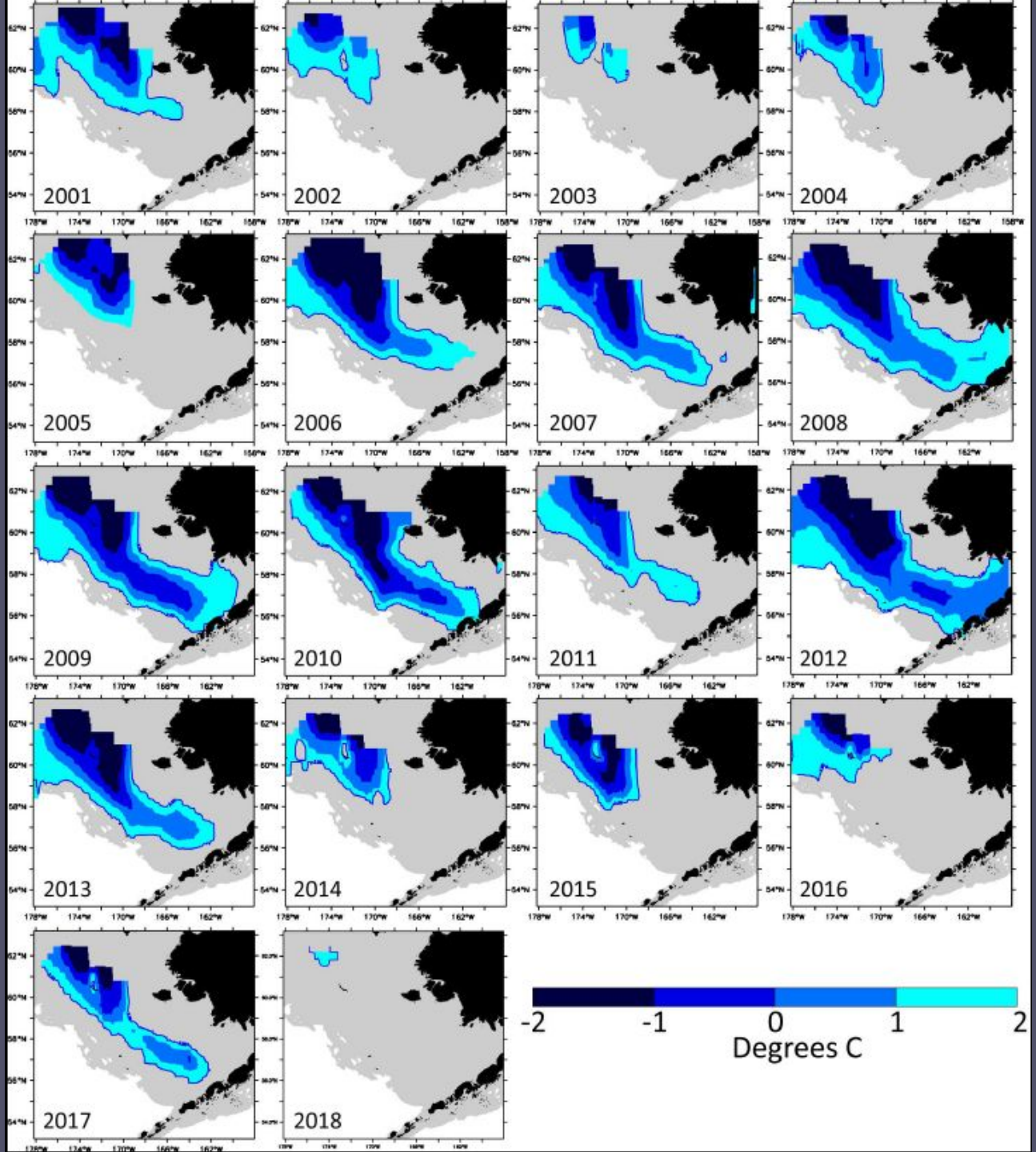






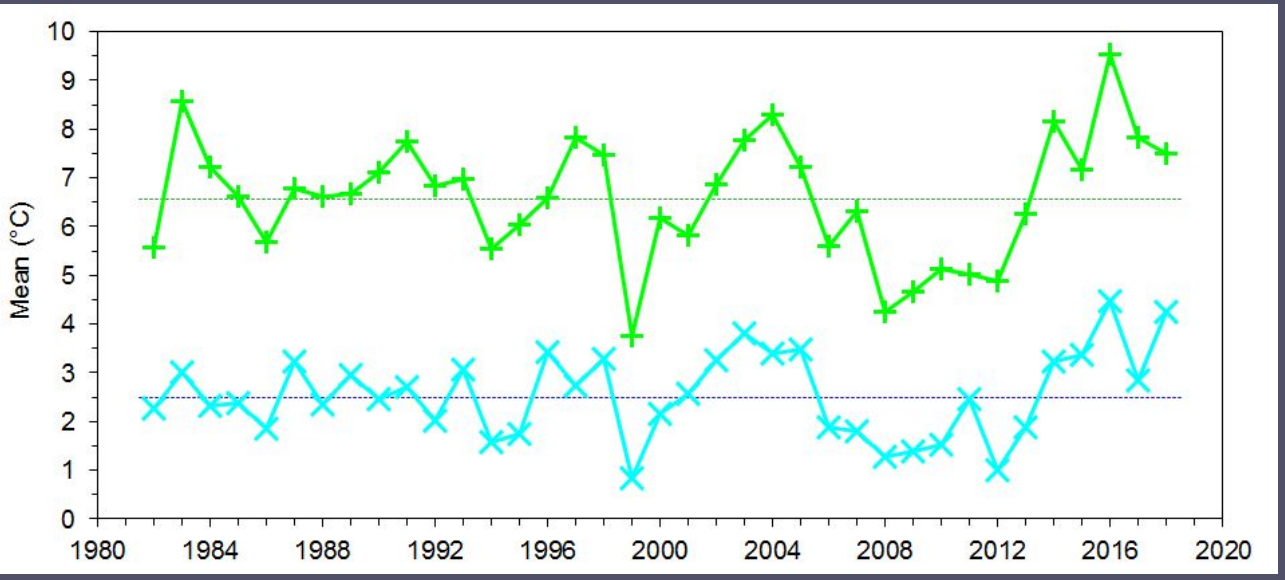
EBS cold pool

Overland, Ladd



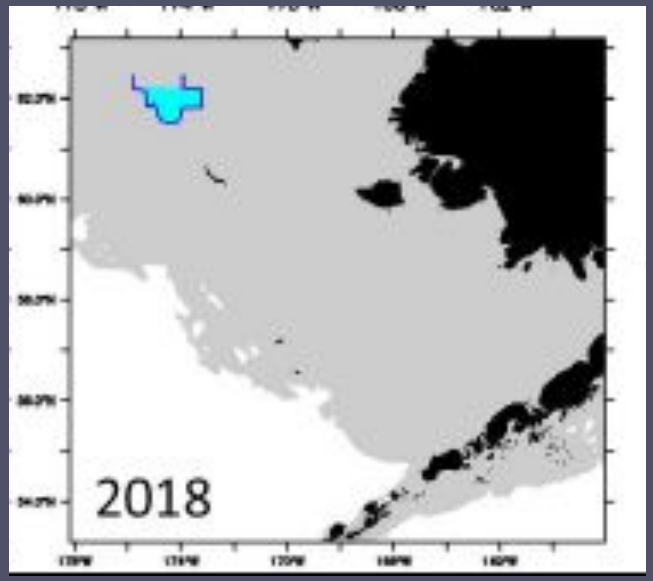
2018 Southeastern BS water temperatures

Lauth, Overland et al.



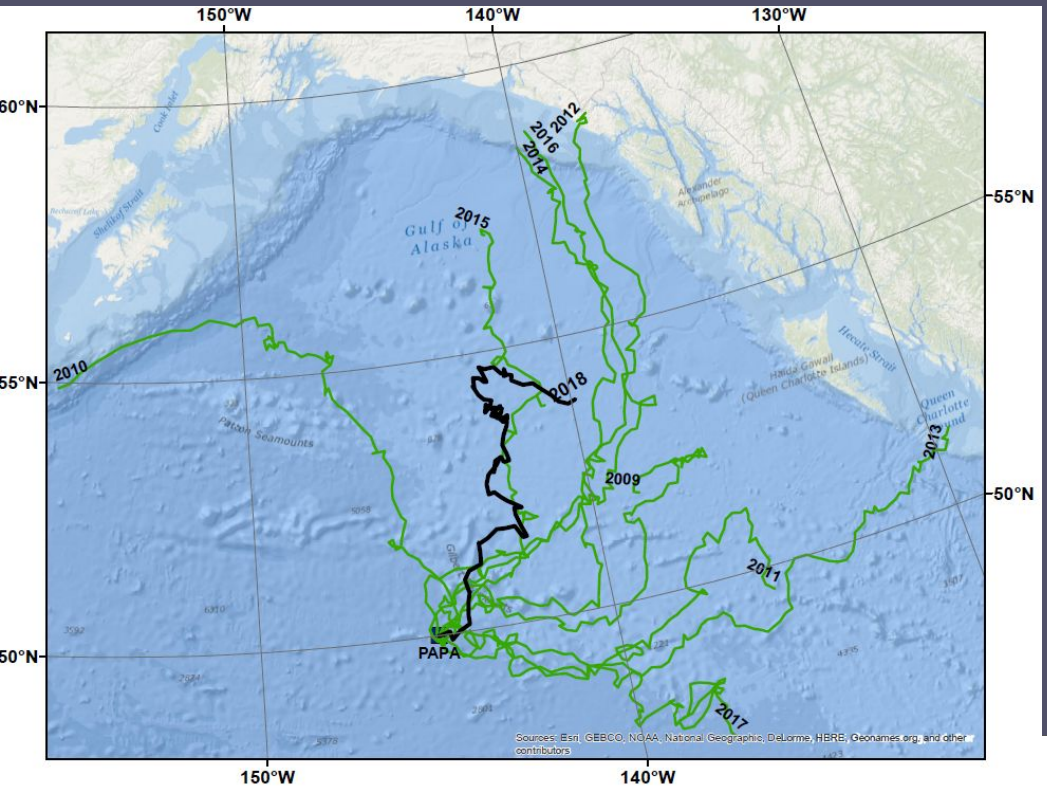
- Residual heat, persistent SW winds, and lack of sea ice maintained above-average water temperatures (surface and bottom).

- *Where's the cold pool?*



GOA Ocean Surface Currents – PAPA Trajectory Index

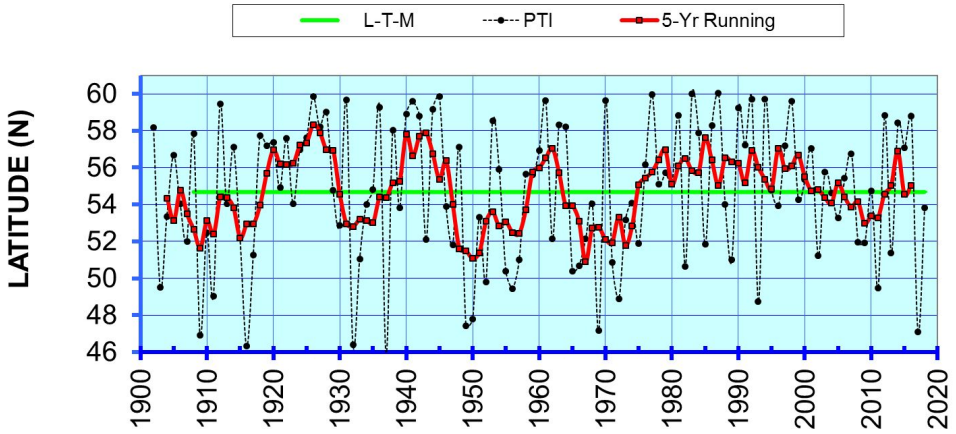
Stockhausen



- 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

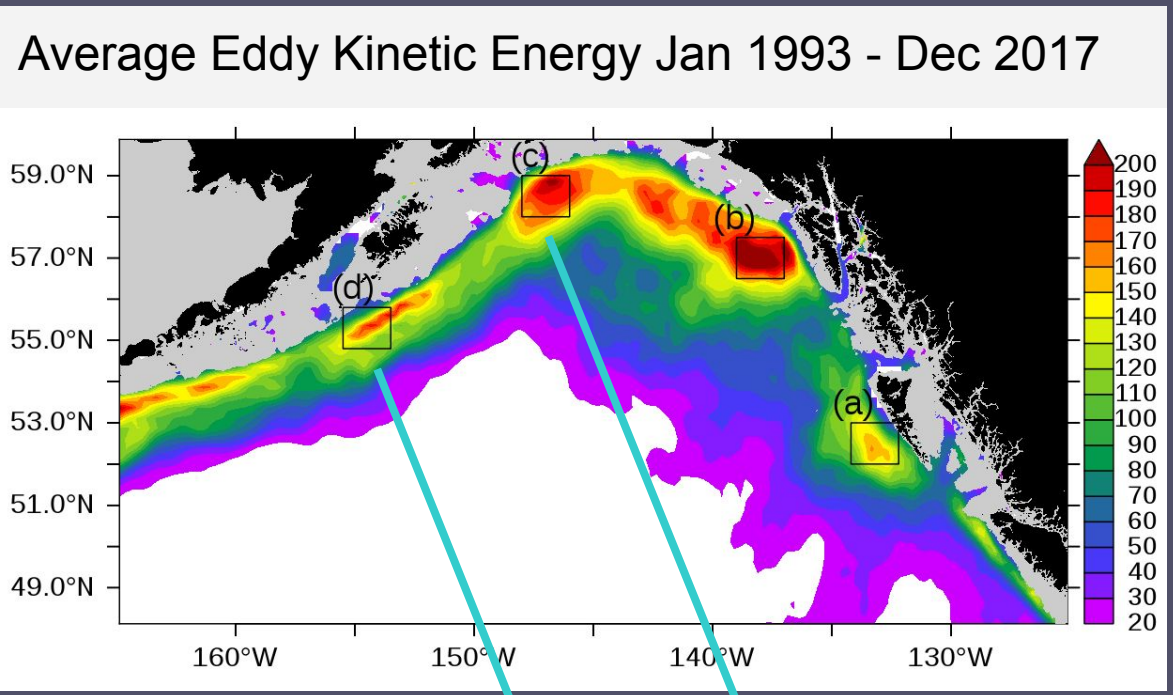
- Endpoint and PTI near mean
- Not indicative of increased transport or northerly shift of the Alaska Current

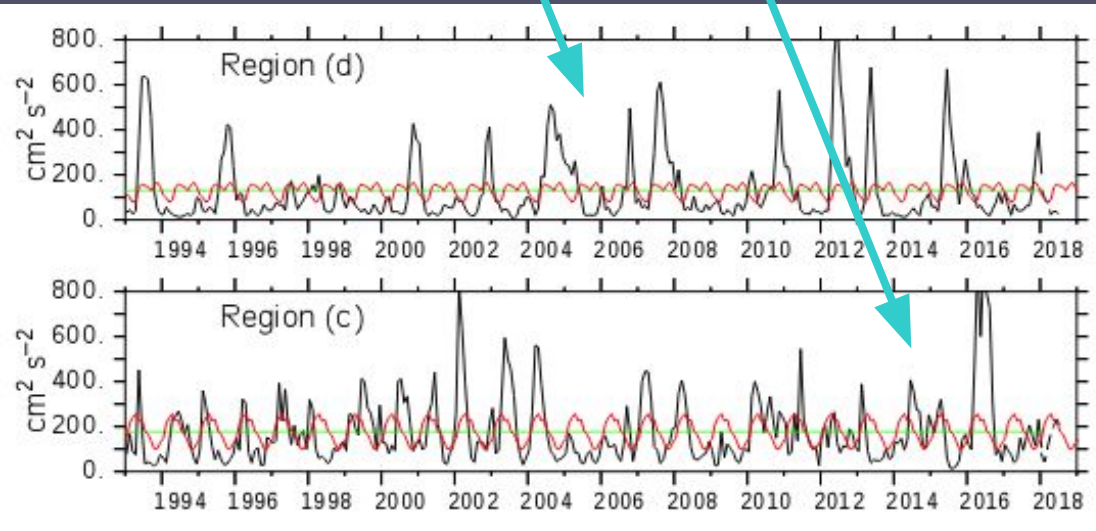
Papa Trajectory Index (PTI) End-point Latitudes (Winters 1902-2018)



Eddies in the Gulf of Alaska

Ladd





Seasonal cycles:
(c) High EKE in spring
(d) High EKE in fall

(c) Strong persistent eddy in 2016, currently average

(d) Currently low

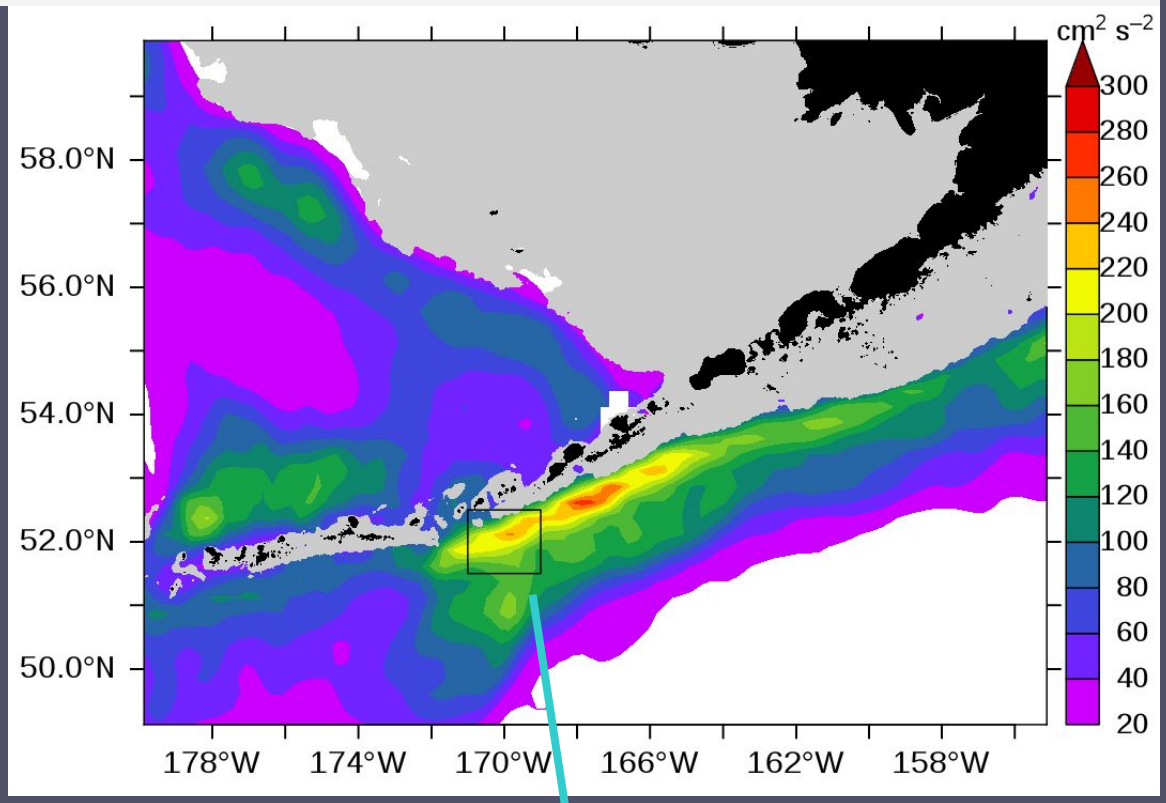
E GOA: influenced by winds (climate and gap scale)

W GOA: influenced by propagation and intrinsic variability

Eddies in the Aleutian Islands

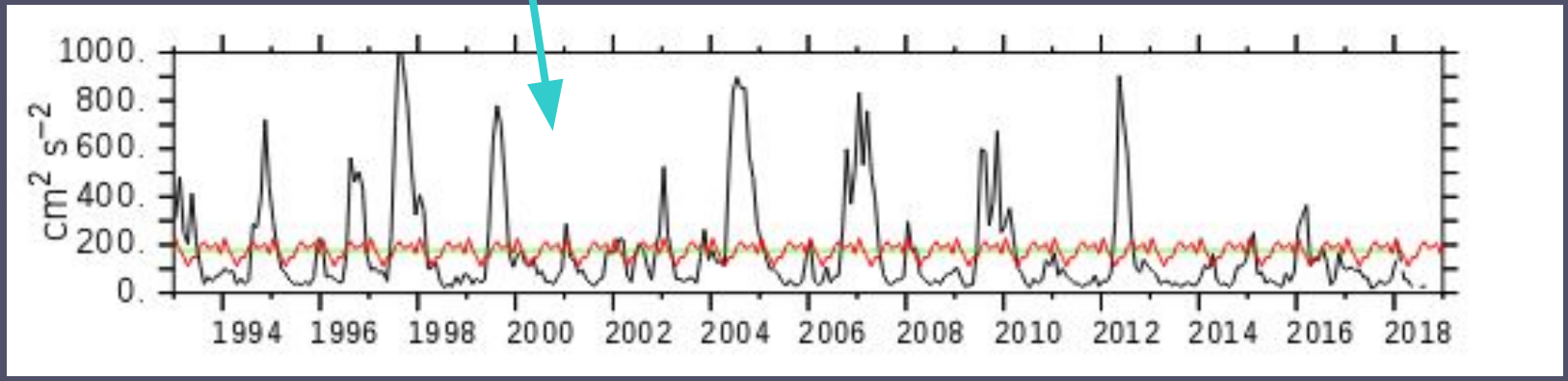
Ladd

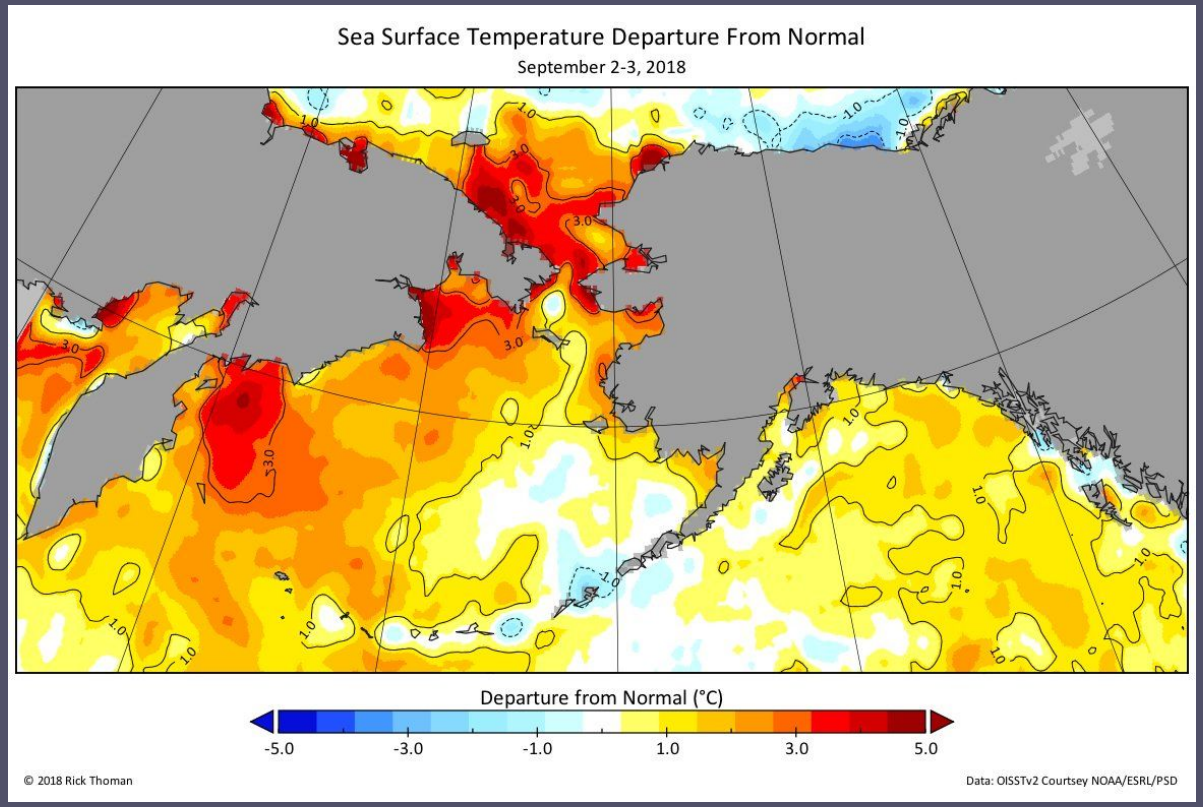
Average Eddy Kinetic Energy Jan 1993 - Dec 2017



EKE low fall 2012–2018

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

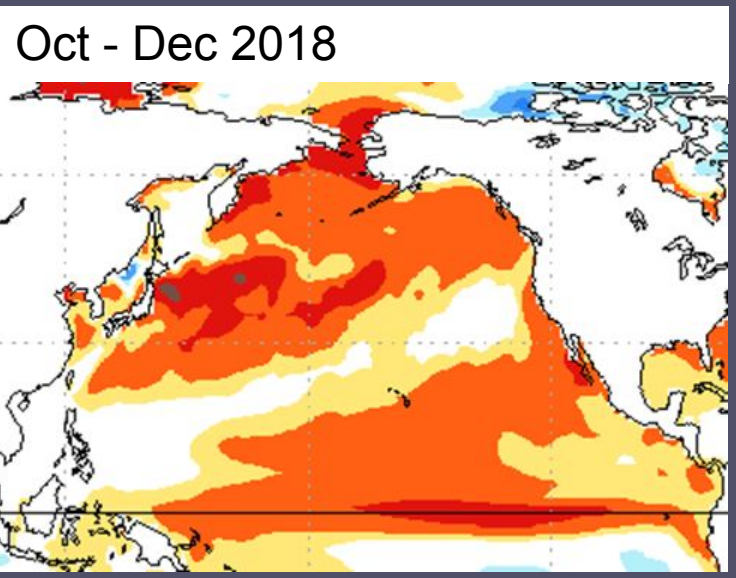




2019 Sea Surface Temperature Forecasts

SST Projections from the National Multi-Model Ensemble

Bond



- Warm conditions across N. Pacific through Dec
- Positive anomalies greatest (>1˚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).

