Features of the Northeast Pacific Ocean

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Based on Ssalto/Duacs altimeter products distributed by AVISO
Sea level from AVISO, based on TOPEX/Poseidon, Jason-1, 2, ERS-1, 2, Envisat, GFO. Referenced to Foreman et al. (2008) average sea level.
Based on SSALTO/DUACS altimeter products distributed by AVISO.
Extreme anomalies in coastal currents are not present in North Pacific Current.
Compare with dynamic height differences computed from Argo data monthly since 2002, as prepared by Howard Freeland:


Fig. 3 from Freeland 2006
Extreme anomalies in coastal currents are not present in North Pacific Current.
PDO corresponds poorly with variability in these currents.


http://www.o3d.org/npgo/
NPGO Mode

defined: as 2nd EOF of SSHa in the Northeast Pacific


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If the NPGO and N. Pacific Current correspond, then the increase since 1992 is mostly due to unusually low flow in 1992.
Next: Examine air pressure and wind anomalies at times of strong and weak North Pacific Current.
Average sea level air pressure in Jan-Feb

Air pressure anomaly at sea surface, from NOAA/ESRL Physical Sciences Division
Next: Examine air pressure and wind anomalies at times of strong and weak North Pacific Current.
Air pressure **anomaly** at sea surface, from NOAA/ESRL Physical Sciences Division

1* Strongest flow

2 Strong flow
Nov 1998 – Feb 2004
Nov-Feb only
Air pressure anomaly at sea surface, from NOAA/ESRL Physical Sciences Division

3  Weak flow
Mar 2009 – May 2009

4  Weak flow
Feb 2006 – Sep 2006
Air pressure anomaly at sea surface, from NOAA/ESRL Physical Sciences Division

5* Weakest Flow
All months

1* Strongest flow
Note the peaks in Alaska Current and Alaskan Stream in El Niño winter. Major peaks coincide with a drop in California Current. Some align with El Niño (X based on ONI), but a significant number do not. Variable correspondence with North Pacific Current.
Let’s look at air pressure anomalies in the months up to the maximum Alaska flows and minimum California flows, labelled with ⭐️.
Average sea level air pressure in Jan-Feb

Average Sea Surface Pressure Jan-Feb rel to 1968-1996
1 Strongest Alaska Flow
Jan 1998 - Feb 1998

2 Strong Alaska flow
Dec 2002 – Jan 2003
Anomaly of Sea Surface Air Pressure over two months

3 Strong Alaska flow
Dec 2005 - Jan 2006

4 Strong Alaska flow
Jan 2010 - Feb 2010
4  Weak California Current and weak Alaska Current in summer 1993.
1 Strong Cal, Weak AC
Mar 2002 – Sep 2002

2 Strongest Cal
Oct 2007 - Apr 2008
3  Moderate Cal and AC  
Apr 2004 – Dec 2004

4  Weak Cal and AC  
Jul 1993 – Aug 1993
Summary:

With satellite altimetry and Foreman et al. (2008) absolute sea level maps we can determine strength of major currents in Gulf of Alaska. I plotted these currents as sea level differences.

North Pacific Current has decadal variability that aligns with the North Pacific Gyre Oscillation. The increase in its flow since the beginning of continuous altimetry in 1992 is likely due to a minimum in its flow in 1992 compared to the previous 50 years. Extremes of this current tend to vary with position and strength of N. Pac High and Aleutian Low Pressure Systems.

Alaska and California Currents have relatively larger interannual variability that seems to be governed by both position and strength of the Aleutian Low Pressure System and North Pacific High Pressure System in the previous few months.
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Fisheries and Oceans
Canada

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