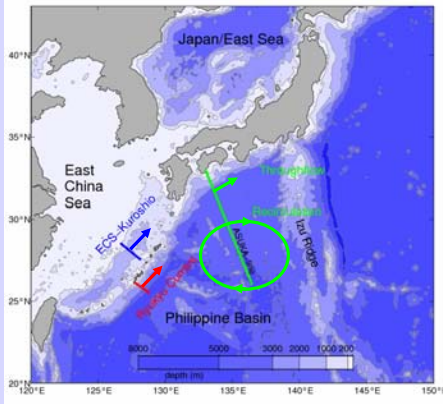


Manifestation of the Pacific Decadal Oscillation in the North Pacific Western Boundary Current System

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I. Western Boundary Current System



In the western North Pacific, northward transport is carried by the ECS-Kuroshio and Ryukyu Current. These western boundary currents merge and flow eastward south of Japan across the ASUKA-line, with some flow continuing as throughflow across the Izu Ridge and the remainder recirculating in the Philippine Basin.

II. Long-term Monitoring of Absolute Transports

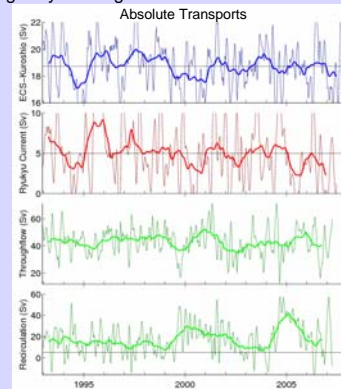
In situ measurements



satellite altimeter



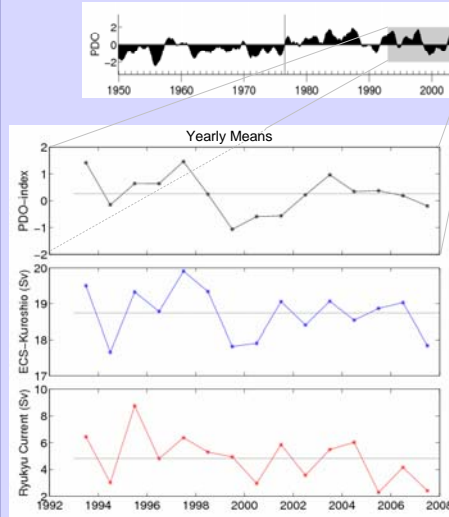
Using *in situ* measurements (from inverted echo sounders, pressure sensors, current meters, and ADCPs) absolute transports have been determined for these four flows and used to calibrate local satellite altimetry, resulting in the following 15-year long time series of absolute transports:



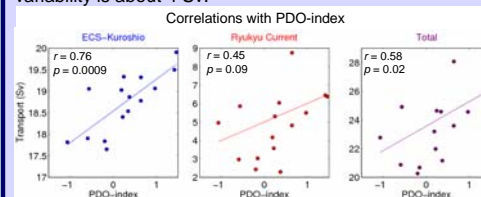
Thin lines show 10-day interval transports; heavy lines show moving 1-year averages

III. Interannual Variability of Absolute Transport

Yearly-mean absolute transports in the ECS-Kuroshio and Ryukyu Current are positively correlated with PDO-index.

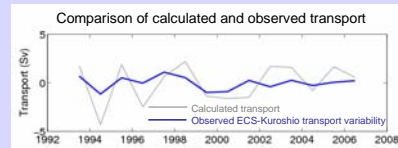
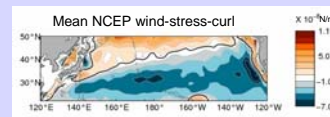


Both correlations are highest at zero-lag. The total interannual transport variability associated with PDO-index variability is about 4 Sv.



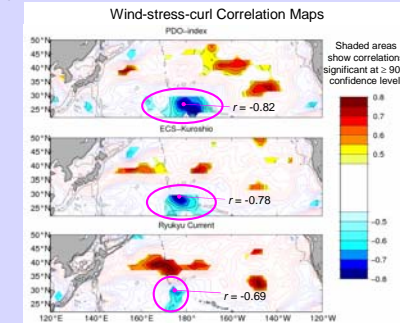
IV. Role of Wind-stress-curl

Interannual ECS-Kuroshio transport variability is **not well-represented** by calculations using the Sverdrup balance with yearly-means of **wind-stress-curl integrated** over the entire North Pacific.

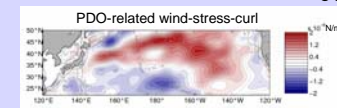


V. PDO-index and Wind-stress-curl

Yearly-mean wind-stress-curl in the central North Pacific near 30°N is negatively correlated with yearly-mean PDO-index, ECS-Kuroshio transport, and Ryukyu Current transport.

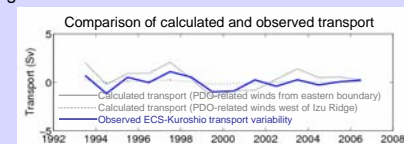


Regressing the wind-stress-curl field onto PDO-index shows that as PDO-index increases, wind-stress-curl over the central North Pacific becomes more strongly negative.



This is consistent with 1) reduced SST in the central North Pacific (positive phase PDO) and 2) stronger southward Sverdrup transport resulting in stronger WBC return flow.

Interannual ECS-Kuroshio transport variability is **well-represented** by calculations using the Sverdrup balance with the yearly means of **PDO-related wind-stress-curl** integrated over the entire North Pacific.



VI. Conclusions

- Interannual transport variability is well-correlated with PDO-index ($r = 0.76$) for the ECS-Kuroshio and to a lesser extent the Ryukyu Current ($r = 0.45$).
- These strong correlations occur with no time-lag.
- Interannual WBC transport variability is not well-described by the total wind-stress-curl field over the North Pacific.
- Wind-stress-curl over the central North Pacific is strongly negatively correlated, both with PDO-index and with WBC transport.
- Sverdrup calculations using PDO-related wind-stress-curl reproduce the observed ECS-Kuroshio transport variability.