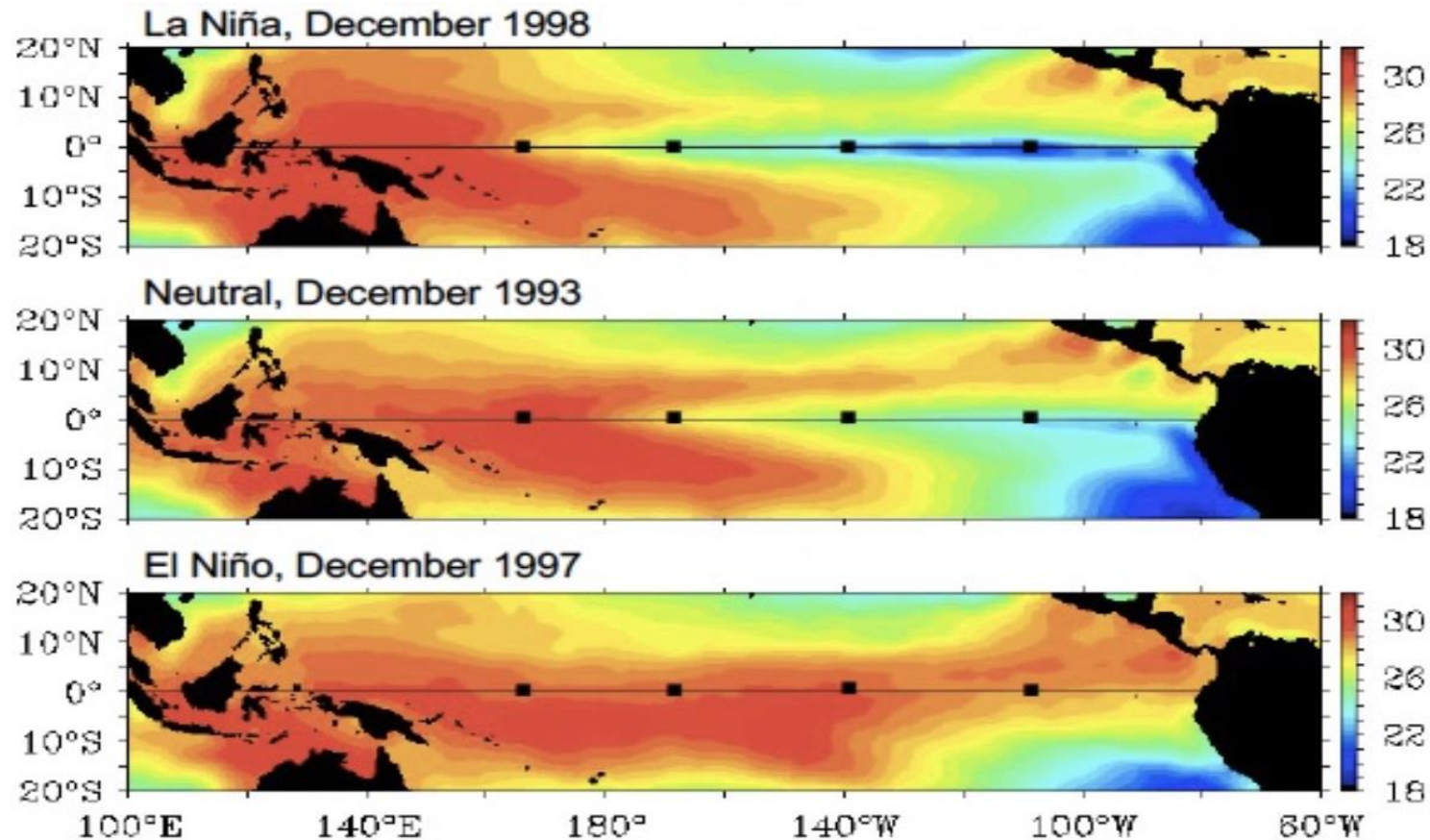


Influence of *In-Situ* Data Assimilated in ECCOv4r4

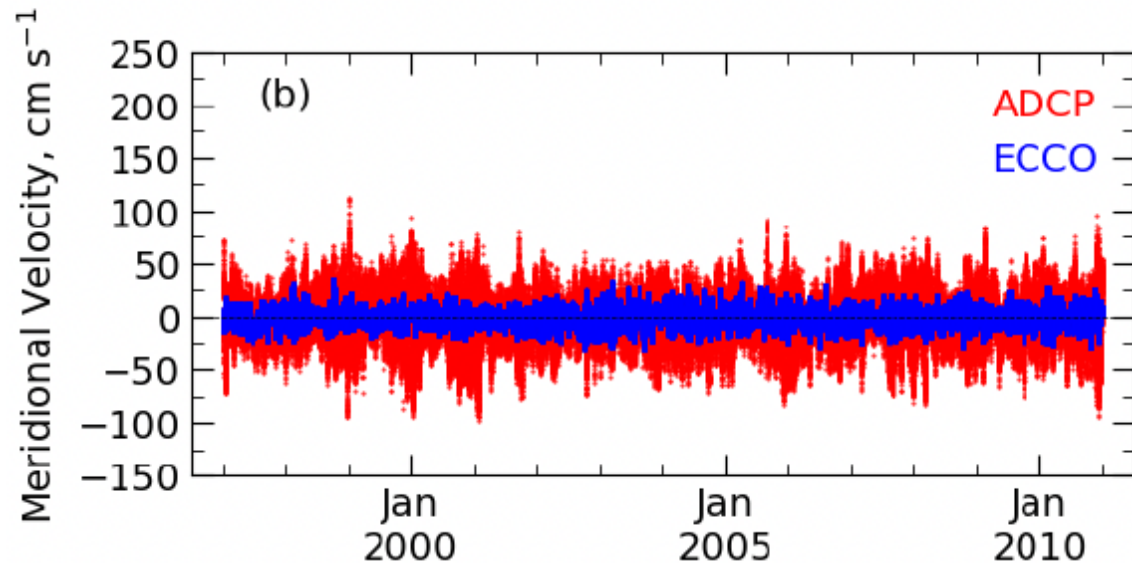
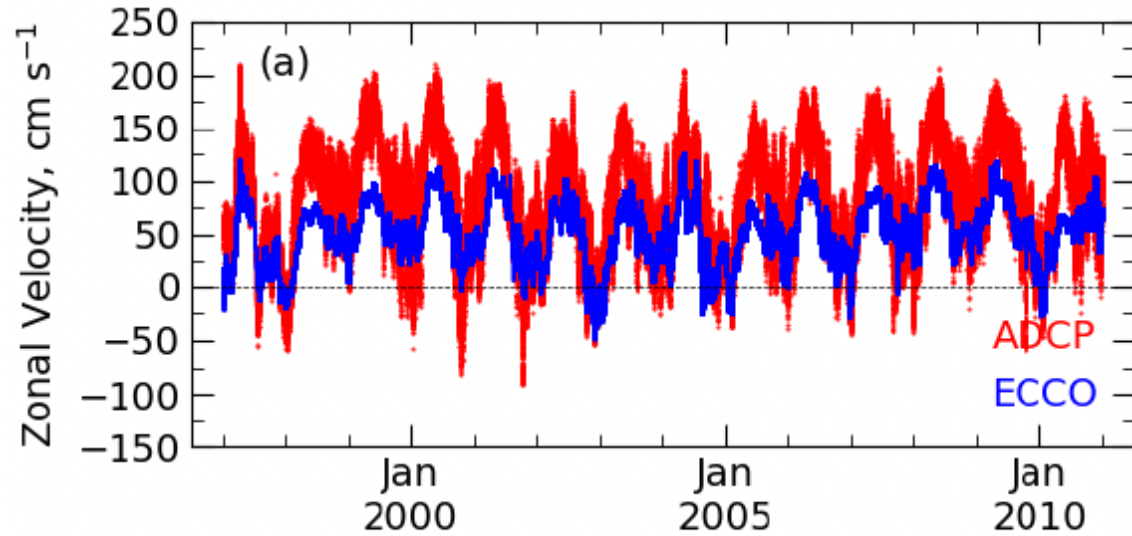
David Halpern (SIO)
Megan K. Le (UT Austin)
Timothy A. Smith (NOAA CIRES)
Patrick Heimbach (UT Austin)



■ ADCP locations
165°E, 170°W, 140°W, 110°W

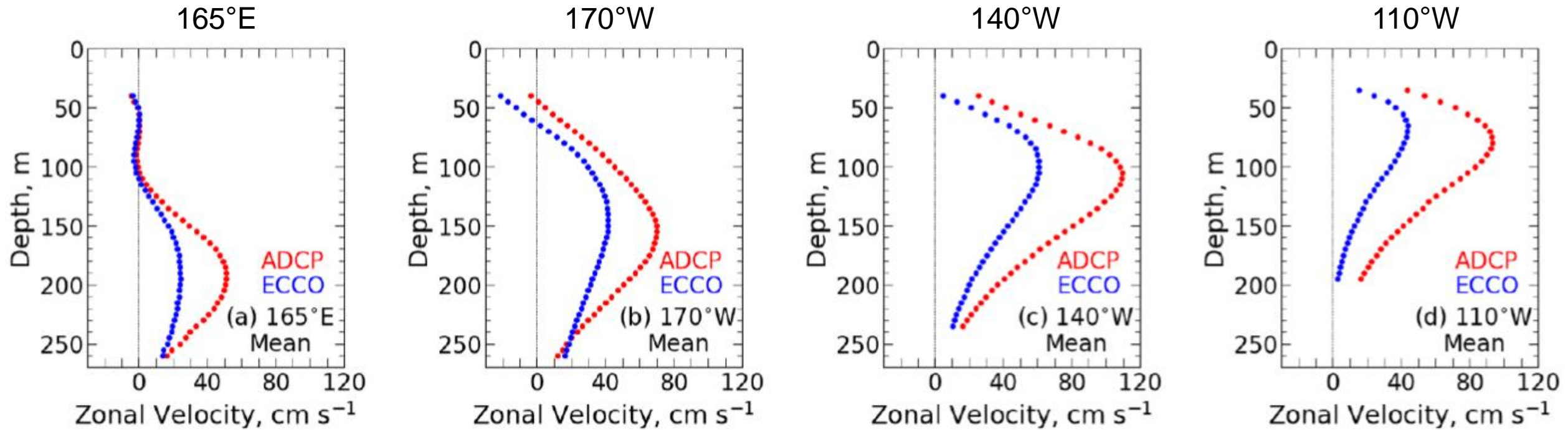
ADCP measurements were considered to be independent ground truth for current speed and direction because its well-established uncertainties were 5 cm s^{-1} and 2.5° .

Overview of **ECCOv4r4** and **ADCP** Currents in the Pacific Equatorial Undercurrent



- 1-h averaged **ECCOv4r4** and **ADCP** **u** and **v**
- 1 Jan 1997 to 31 Dec 2010 (14 years)
- 75-m depth at 140°W [depth of maximum mean eastward current (core speed) = 105 m]
- **ECCOv4r4** **u** and **v** current speeds were considerably smaller than those measured with an **ADCP**
- **ECCOv4r4** and **ADCP** **u** current speeds were highly correlated (correlation coefficient of 0.82)
- Only a meager 14% of the **ECCOv4r4** and **ADCP** **v** current variances were linearly related
- Annual cycle dominated **u** with **ECCOv4r4** solutions having a smaller amplitude than **ADCP** observations
- no major time scale was visible in **v** currents

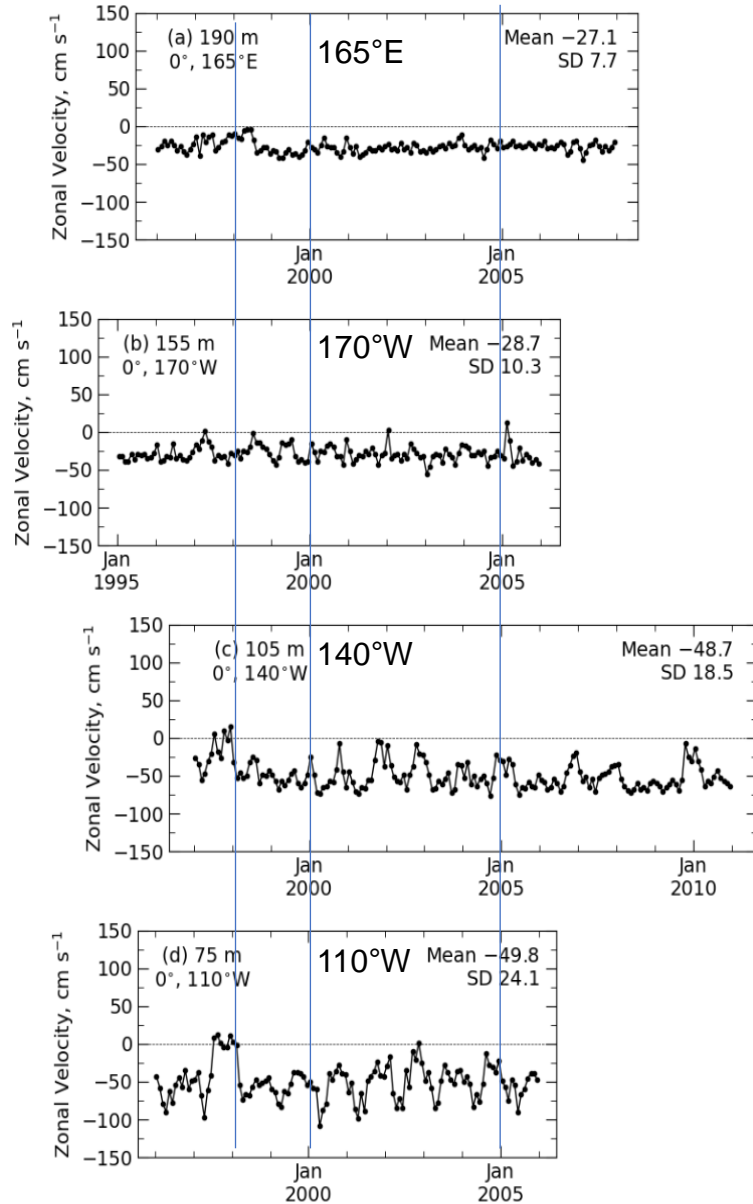
Record-length Mean Zonal Current Profiles



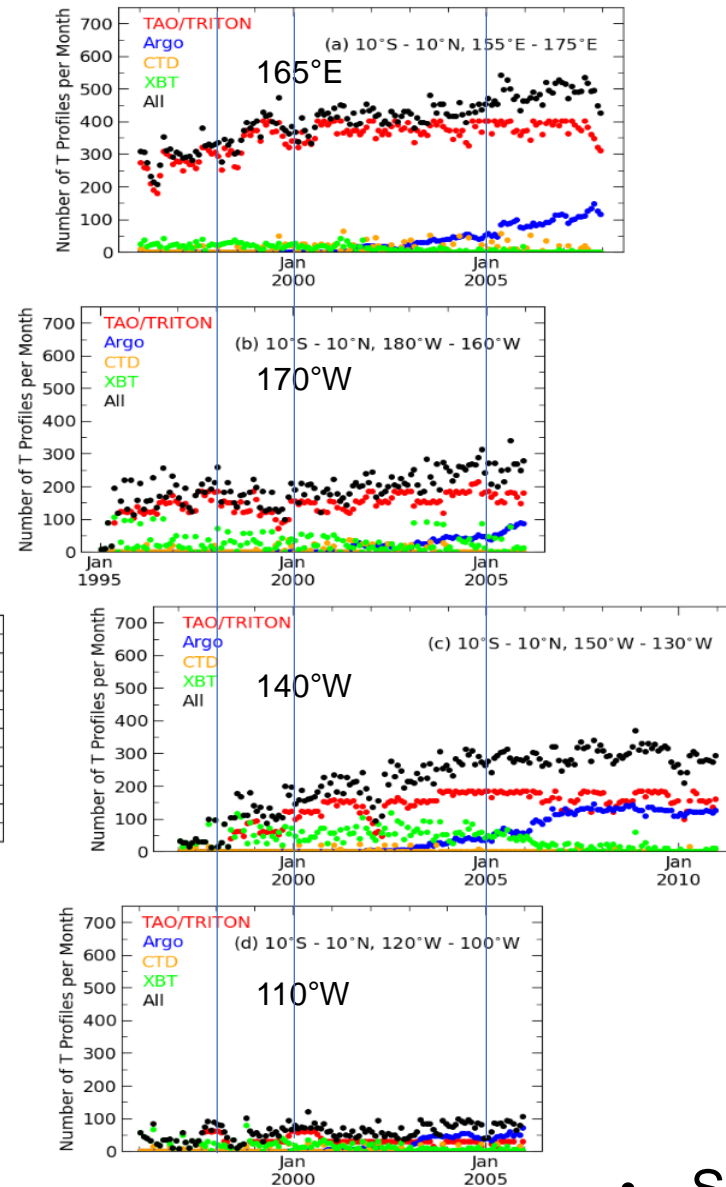
$\Delta \mathbf{u}$ = monthly-mean **ECCOv4r4** – **ADCP** core speed

Impact of Quantity of Assimilated *In-Situ* Temperature Data

ECCOv4r4 - ADCP Δu



Monthly number (N) of **Argo**, **CTD**, **XBT**, and **TAO/TRITON** profiles assimilated in ECCOv4r4 in 20°x20° regions centered on ADCP mooring



Hypothesis: Representativeness of ECCOv4r4 currents is related to quantity of assimilated *in-situ* data

- Valid
 - 165°E: high N & low Δu
 - 110°W: low N & high Δu
- Invalid
 - 165°E: N increases but Δu remains uniform
 - 110°W: large fluctuations in Δu were independent of uniform N
 - 110°W & 8-mo interval in 1997: low N & $\Delta u = 0$
- Weak hypothesis
- Similar with salinity [no “green” dots]

Discussion Questions

- 1) Was the approach suitable to determine impact of quantity of assimilated *in-situ* data in ECCOv4r4?
- 2) Was 20°x20° *in-situ* data-impact region too large or too small?
- 3) Was monthly-mean value the appropriate time scale?
- 4) Can ECCOv4r4 be run with assimilation of only specific *in-situ* data, e.g., only Argo T(z) & S(z)?
- 5) What lessons were learned from other studies of the impacts on ocean currents of *in-situ* data assimilated in OGCM-data systems?
- 6) Your suggestions ...