



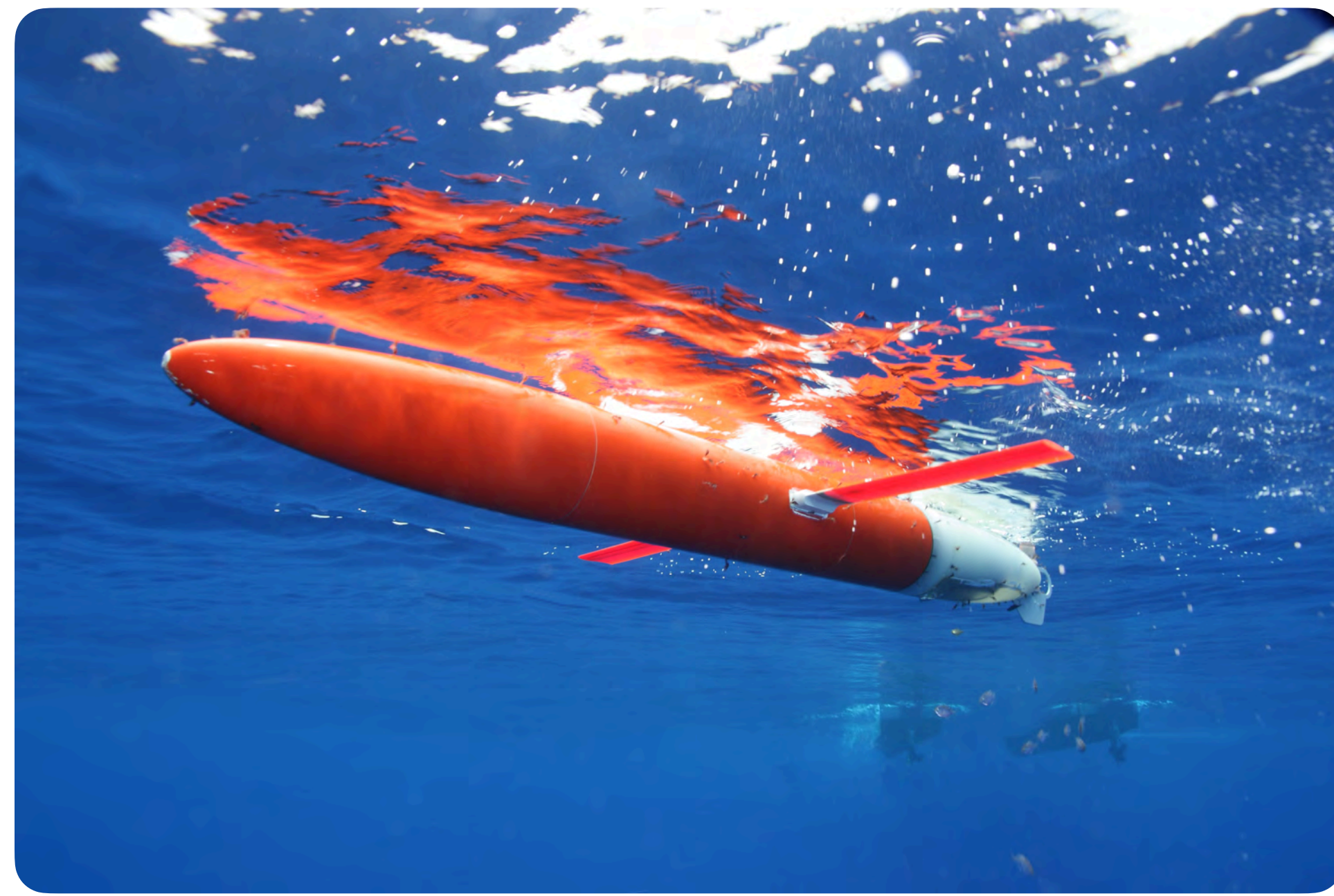
The 2023-2024 El Niño in the California Current System as observed by the California Underwater Glider Network

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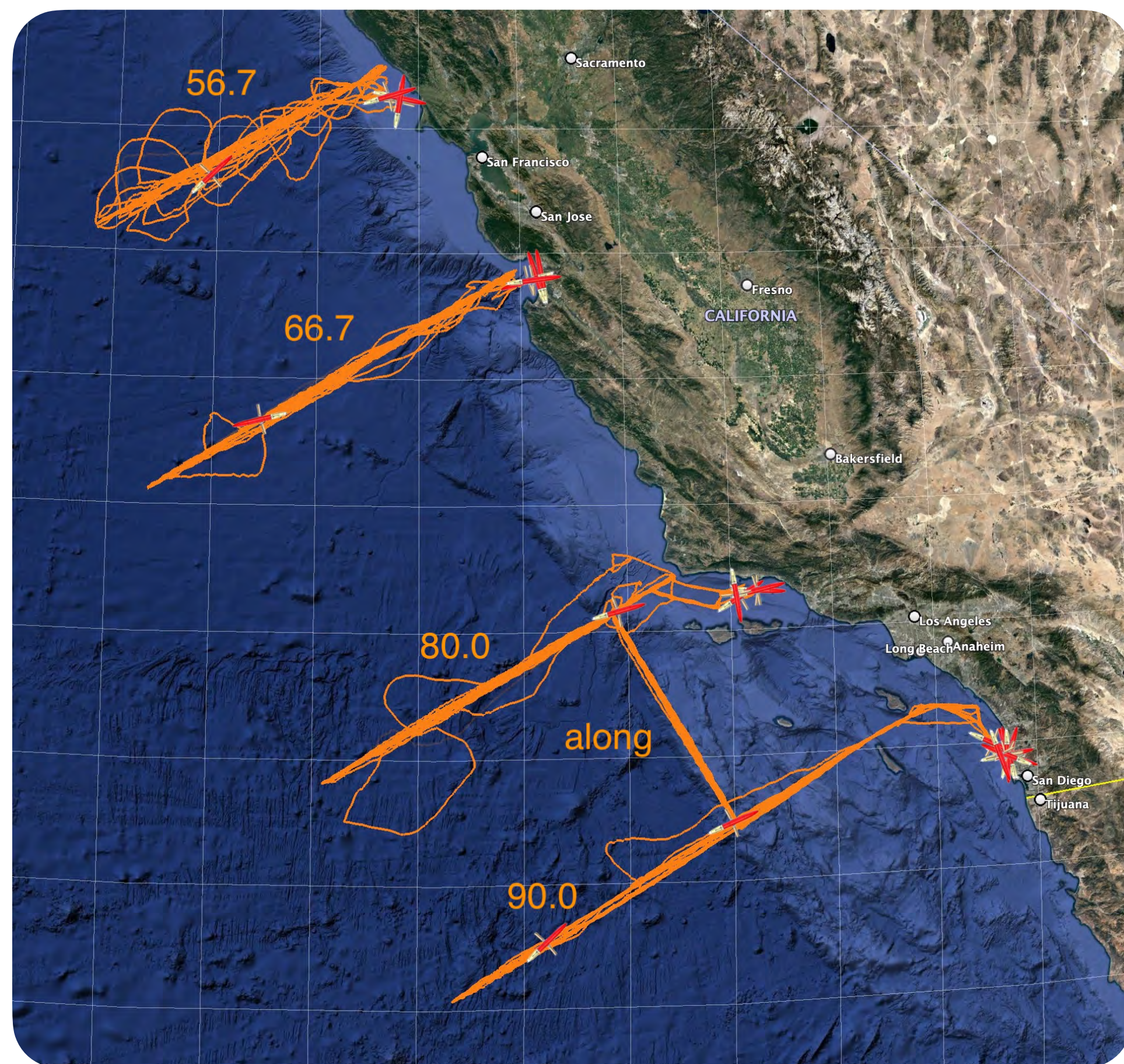
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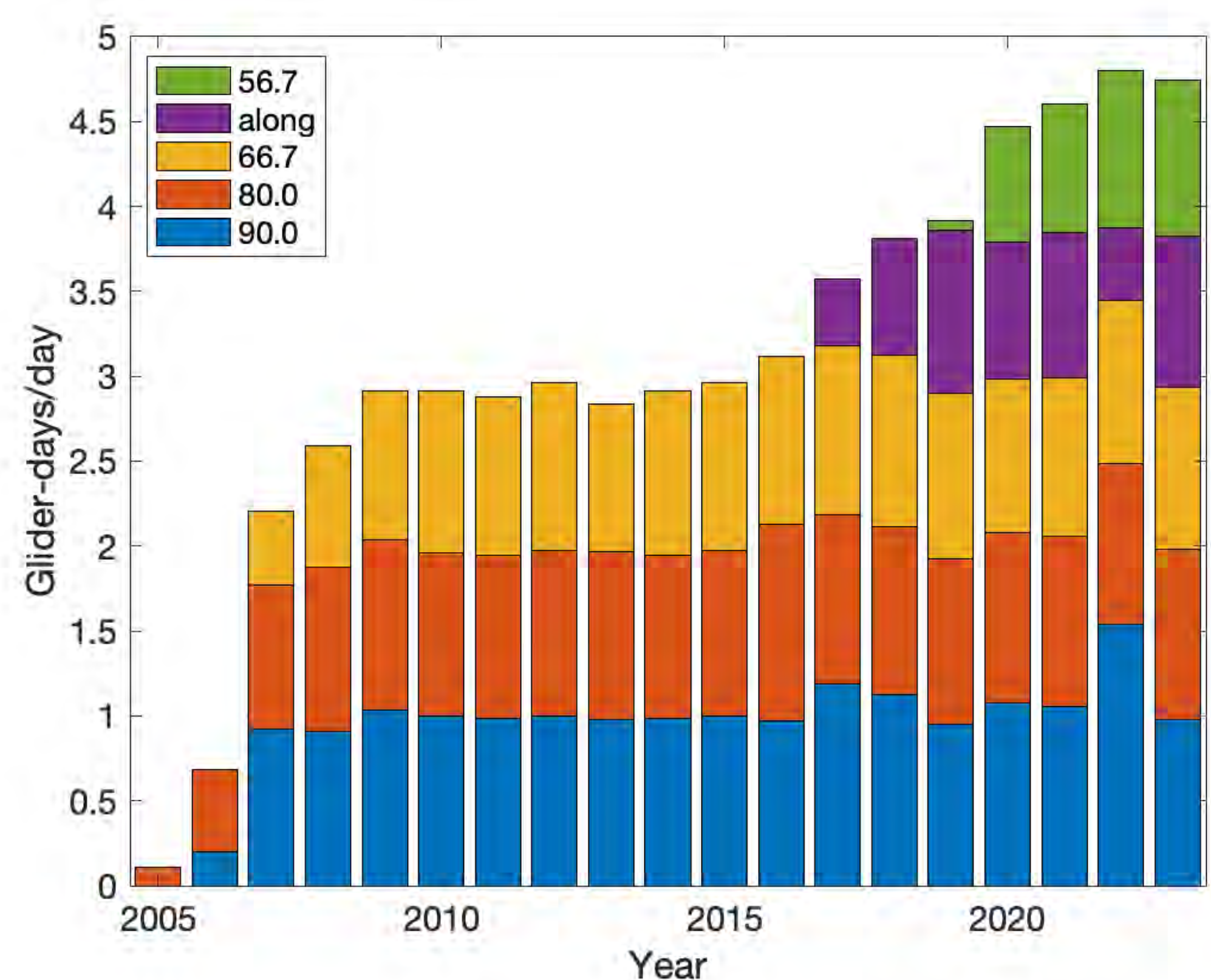
The overarching goal of the California Underwater Glider Network (CUGN) is to sustain baseline observations of climate variability off the California coast. The California Current System (CCS) is strongly affected by El Niño climate variability generated at the equator. The 2023-2024 El Niño was observed by the CUGN. Here, we show these recent observations and compare them to previous El Niños in 2009-2010 and 2015-2016.



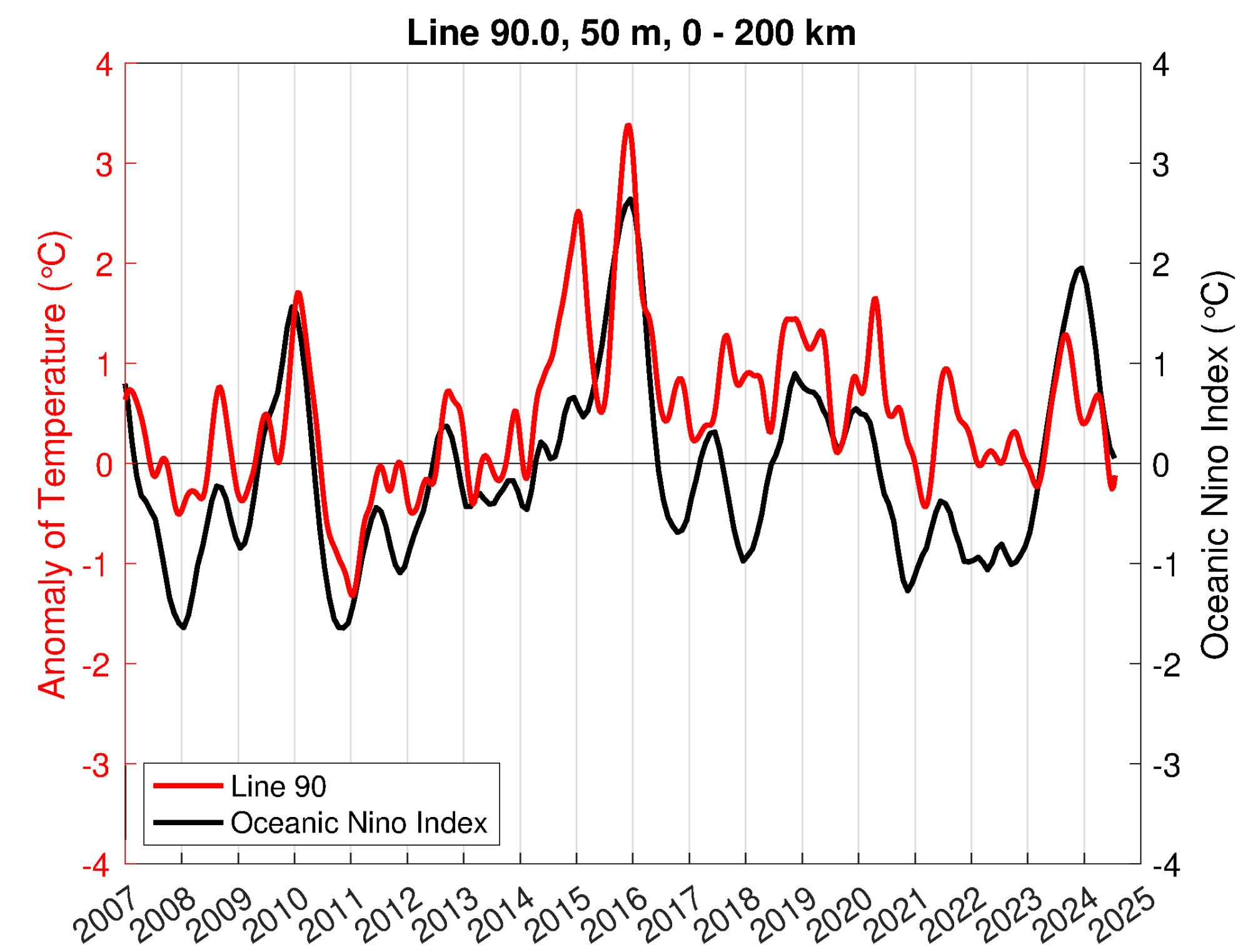
Spray underwater glider. Variables measured: pressure, temperature, salinity, velocity, chlorophyll fluorescence, dissolved oxygen, acoustic backscatter Cycle: 0-500 m depth, 3 km distance, 3 h time. Mission duration: 110 days.



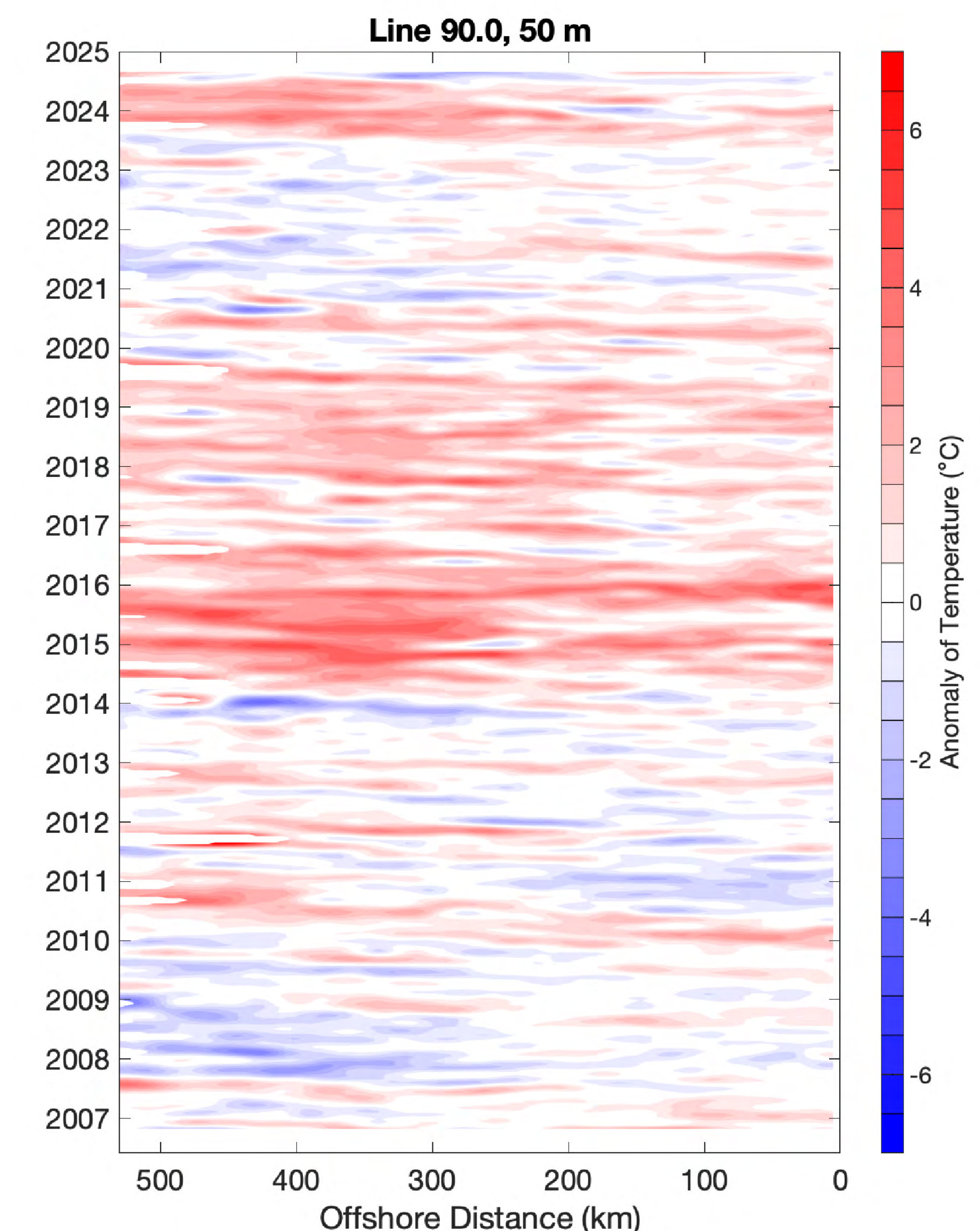
Glider tracks. Gliders are flown in the CalCOFI geometry on lines 56.7 (Bodega Bay), 66.7 (Monterey Bay), 80.0 (Pt. Conception), 90.0 (Dana Pt.), and alongshore at the shelf break between lines 80.0 and 90.0.



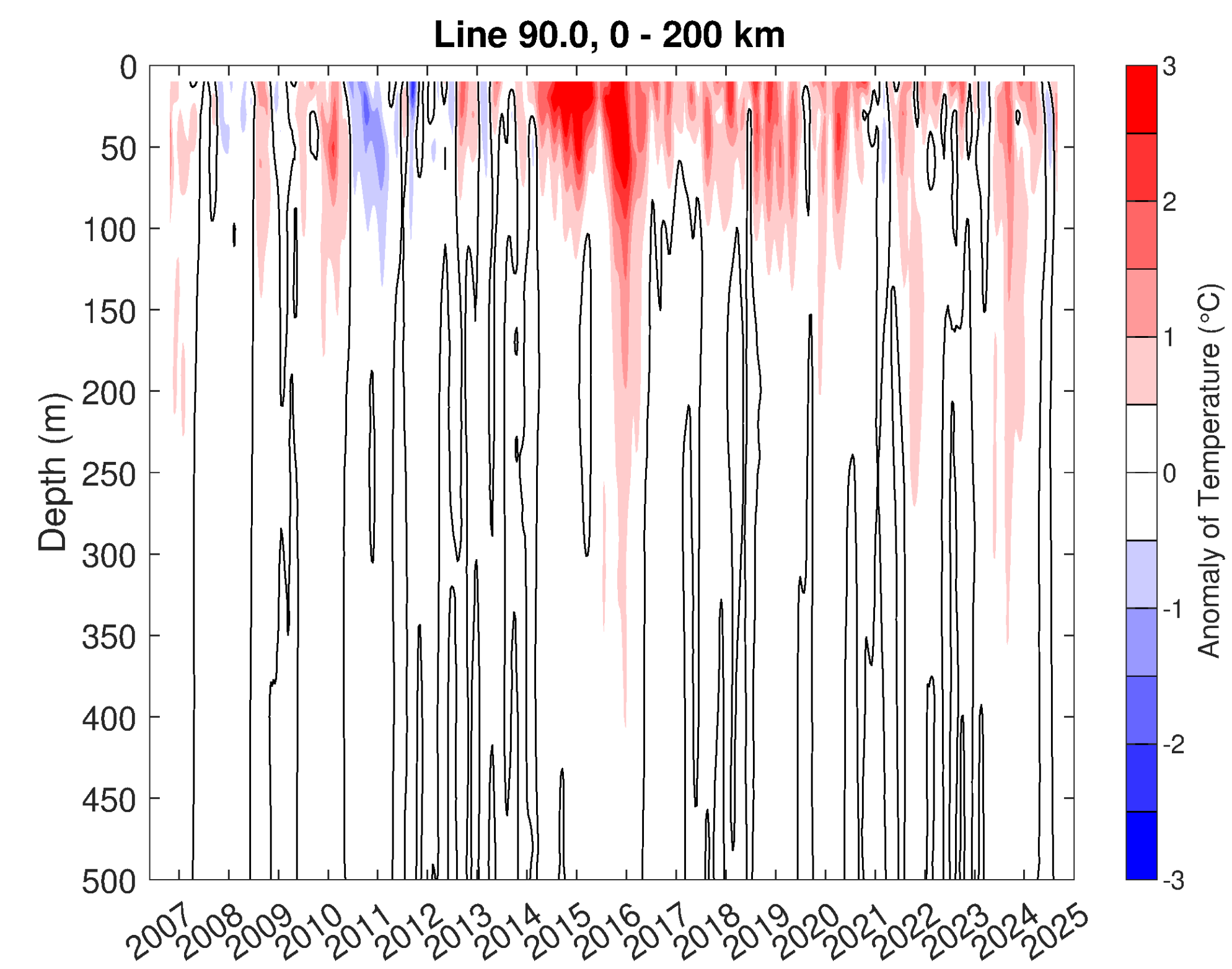
Performance metric. Glider-days/day averaged over the year on each line. Desired performance is a value of 1 on each line for a total of 5 glider-days/day. Totals to date: 60 years, 480,000 km, 200,000 dives.



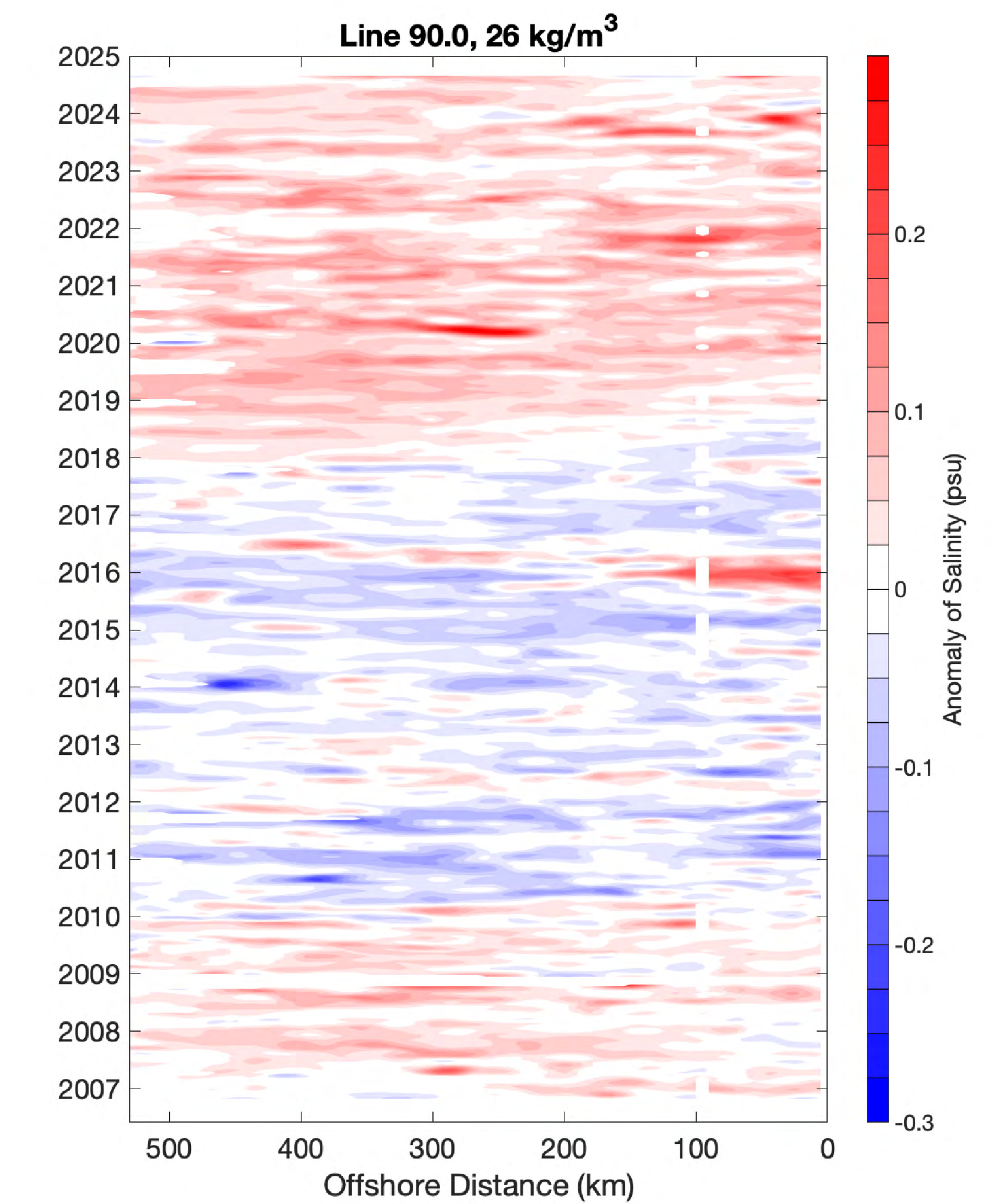
Southern California Temperature Index. Temperature anomaly (relative to 2007-2013) at 50 m on line 90.0, averaged over the inshore 200 km and filtered with a 3-month running mean. The temperature in the CCS is influenced by equatorial conditions as measured by the Oceanic Niño Index.



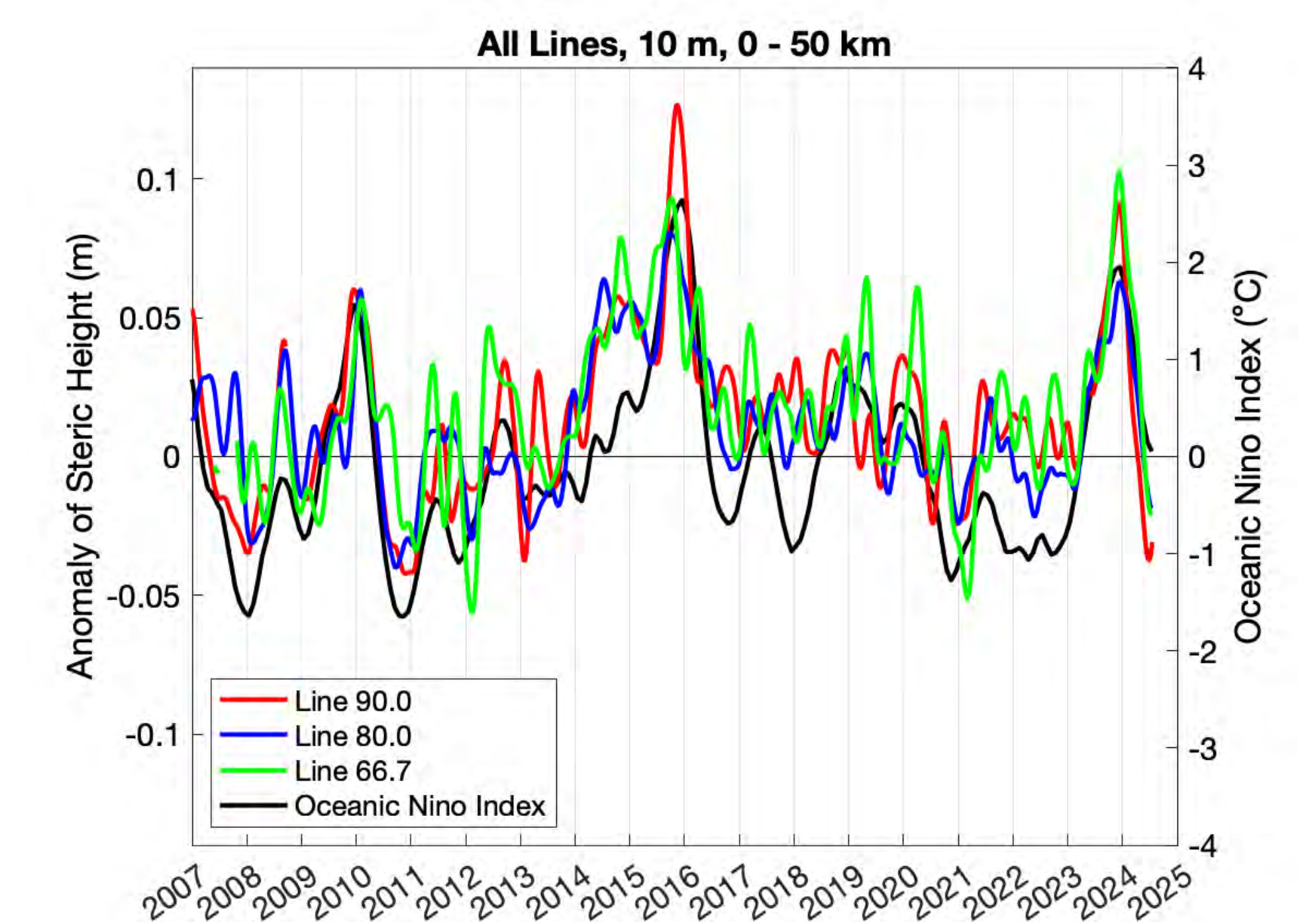
Temperature anomaly at 50 m on line 90. El Niños in 2009-2010, 2015-2016, 2023-2024. The warm anomaly starting in 2014 has persisted since. This increase in temperature has occurred throughout the eastern North Pacific. A cold patch 100-200 km offshore moderated the effect of the 2023-2024 El Niño.



Temperature anomaly in the inshore 200 km on line 90. A feature of El Niños is a deep temperature anomaly. High temperatures since 2014 are primarily in the upper 100 m. A cold patch in 2023-2024 is near 50 m, caused by anomalously doming of the thermocline.



Salinity anomaly on the 26 kg/m³ isopycnal, line 90. The strong positive salinity anomaly in 2015-2016 is an indication that source waters in the California Undercurrent were from further south than normal. Decadal variability in the salinity anomaly is apparent, with salty water in the CCS since 2018.



Steric height anomaly in the inshore 50 km, lines 90, 80, 66.7. El Niños consistently deliver high sea levels to the CCS, peaking near 0.1 m. This steric height increase reflects the warm deep anomaly caused by depressed isopycnals.

For more information including data and figures, see spraydata.ucsd.edu

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