Title
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Journal
Communications Earth & Environment, 4(1)

ISSN
2662-4435

Authors
Wolfe, Wiley H
Martz, Todd R
Dickson, Andrew G
et al.

Publication Date
2023

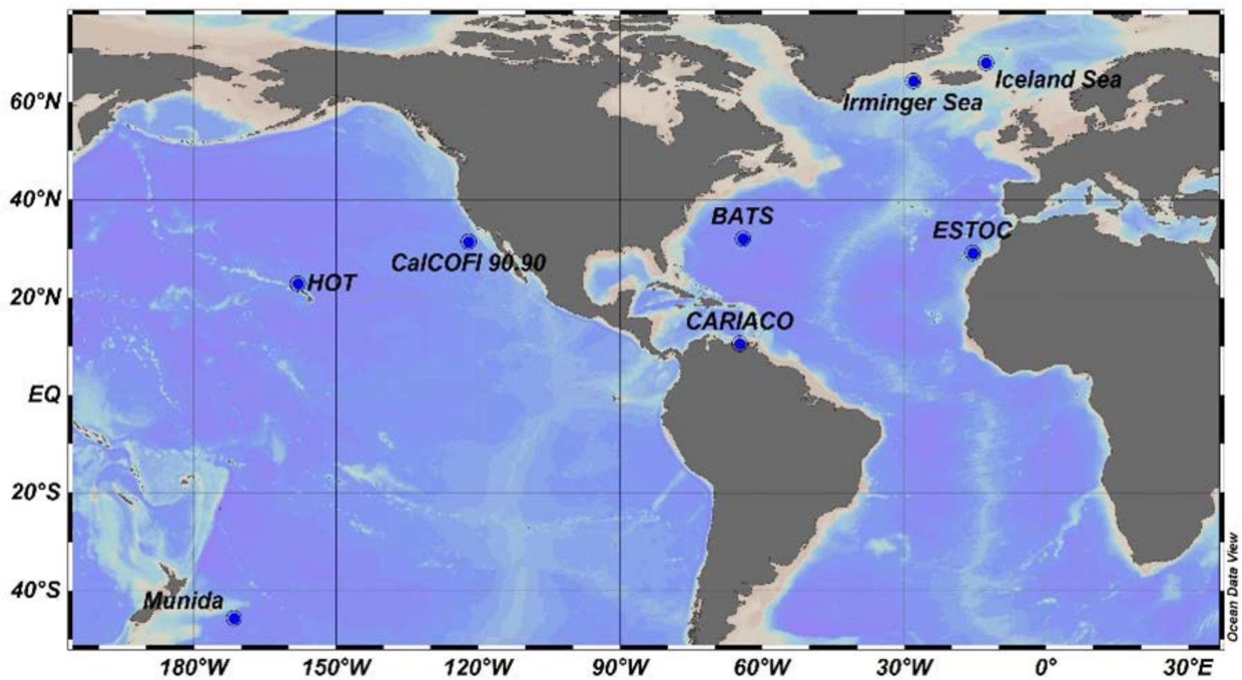
DOI
10.1038/s43247-023-01065-0

Supplementary Information for: A 37-year record of ocean acidification in the Southern California Current

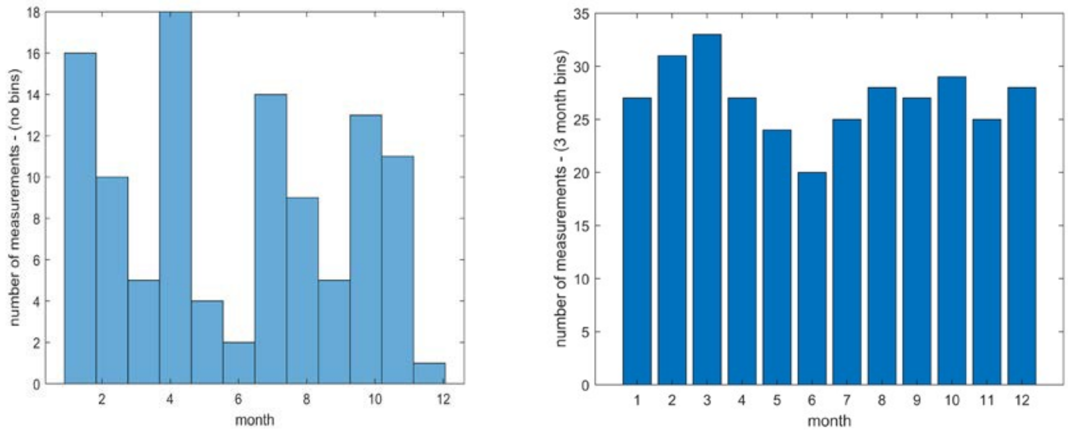
Wiley H. Wolfe[1], Todd R. Martz[1]*, Andrew G. Dickson[1], Ralf Goericke[1], Mark D. Ohman[1]

Corresponding author: Todd R. Martz (trmartz@ucsd.edu)

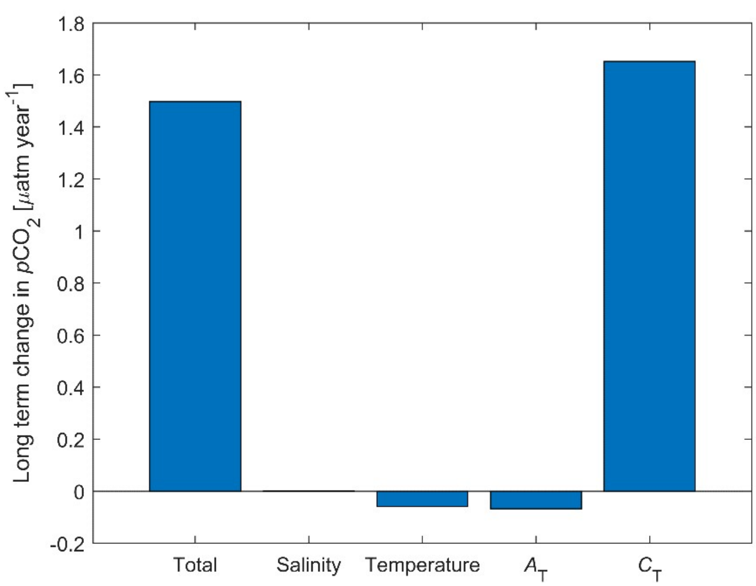
[1]Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA, USA.



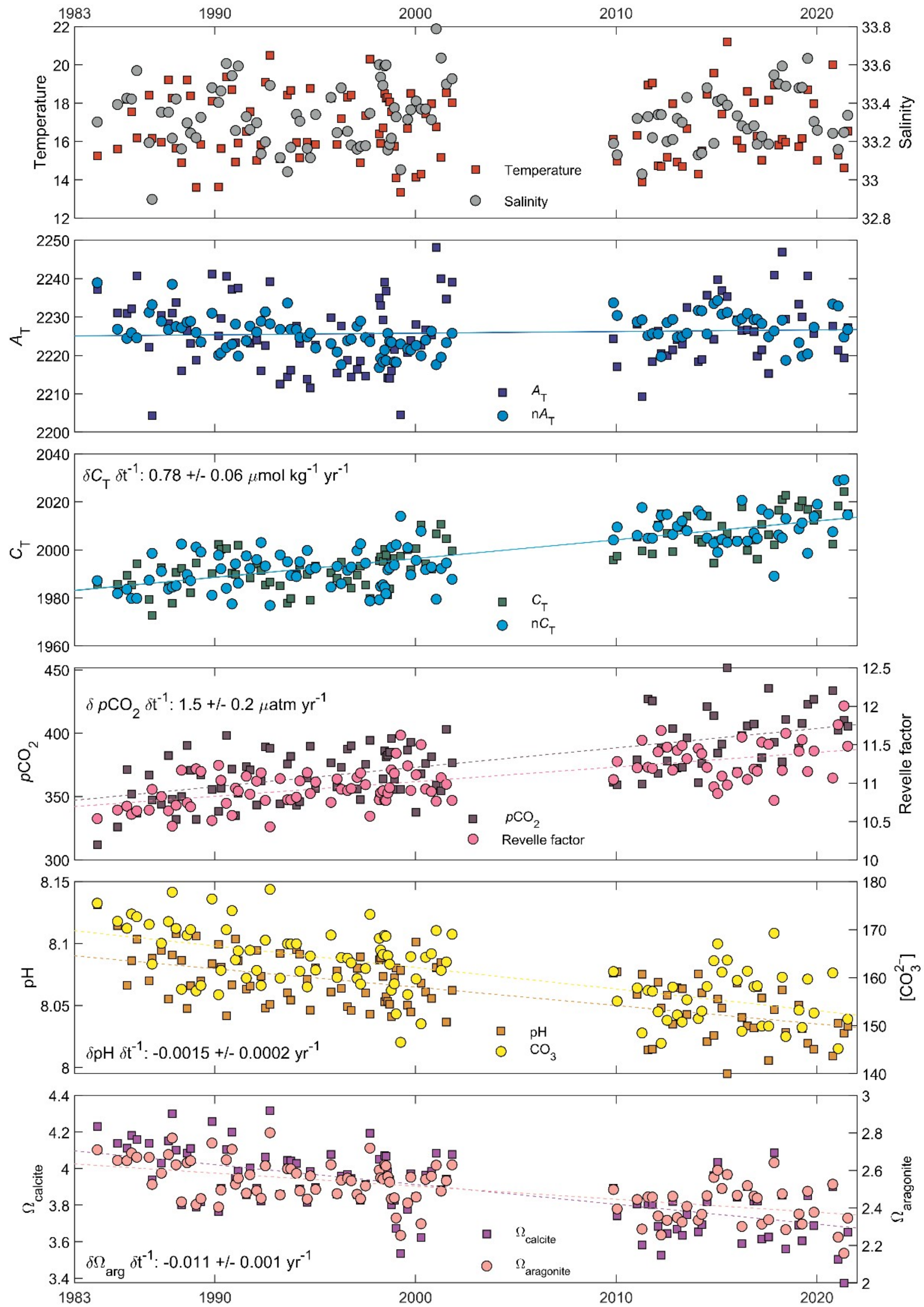
Supplementary Fig. 1. The locations of CalCOFI station 90.90 the other seven long term time series of seawater inorganic carbon[9].



Supplementary Fig. 2. The number of observations from each month over the time series, before (left) and after binning (right).



Supplementary Fig. 3. Contributions of salinity, temperature, A_T, and C_T to the long-term trend in sea surface pCO_2.



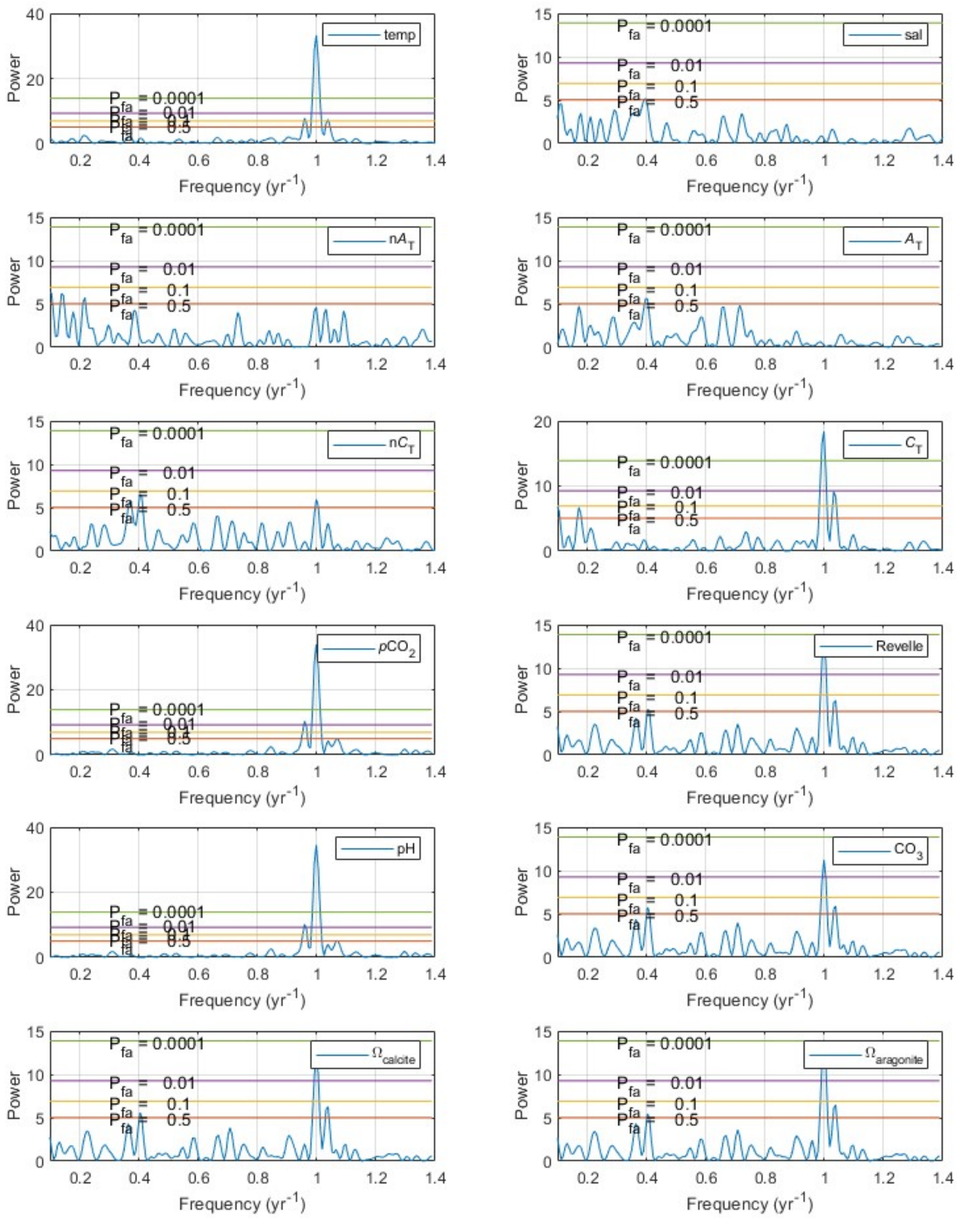
Supplementary Fig. 4. The time series observations at station 90.90 without seasonal detrending. Regression statistics shown in Supplementary Table 1.

Supplementary Table 1. Trend statistics from station 90.90 presented without seasonal detrending (from Supplementary Fig. 4).

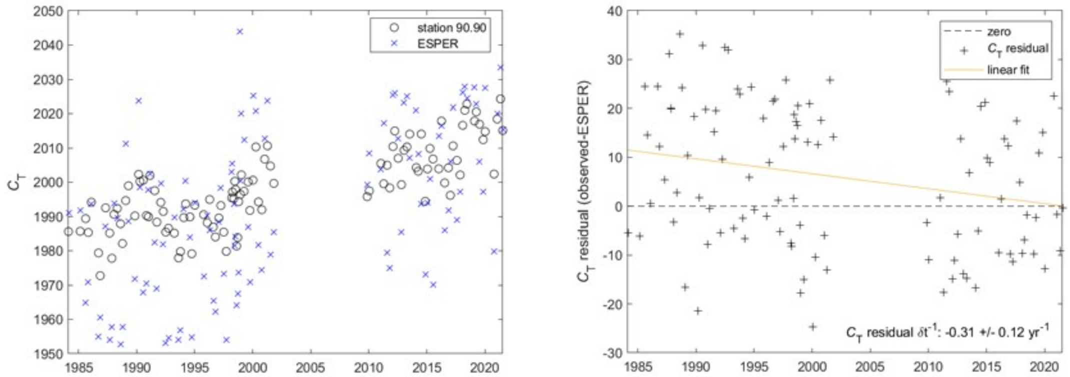
Parameter	Slope	standard error	units	*n*	r^2	*p*-value
Hydrography						
Temperature	-0.0041	0.0148	°C yr^{-1}	107	0.0007	0.7824
Salinity	0.0001	0.0013	yr^{-1}	107	0.0001	0.9310
Ocean acidification indicators						
pH	-0.0015	0.0002	yr^{-1}	105	0.4334	<0.0001
CO_3^{2-}	-0.449	0.0516	µmol kg^{-1} yr^{-1}	105	0.4241	<0.0001
$\Omega_{calcite}$	-0.0108	0.0013	yr^{-1}	105	0.4155	<0.0001
$\Omega_{aragonite}$	-0.007	0.0009	yr^{-1}	105	0.3754	<0.0001
seawater carbonate chemistry						
C_T	0.7846	0.0604	µmol kg^{-1} yr^{-1}	107	0.6167	<0.0001
nC_T	0.7775	0.0658	µmol kg^{-1} yr^{-1}	107	0.5706	<0.0001
A_T	0.0431	0.0775	µmol kg^{-1} yr^{-1}	105	0.0030	0.5796
nA_T	0.0425	0.0397	µmol kg^{-1} yr^{-1}	105	0.0110	0.2867
$p$$CO_2$	1.5317	0.1712	µatm yr^{-1}	105	0.4372	<0.0001
Revelle factor	0.019	0.002	yr^{-1}	105	0.4696	<0.0001

Supplementary Table 2. Descriptive statistics of the seasonal cycles shown in Fig. 1, right. The peak of seasonal cycle and peak-trough amplitude of surface hydrography and seawater carbon chemistry (from Supplementary Fig. 1, right).

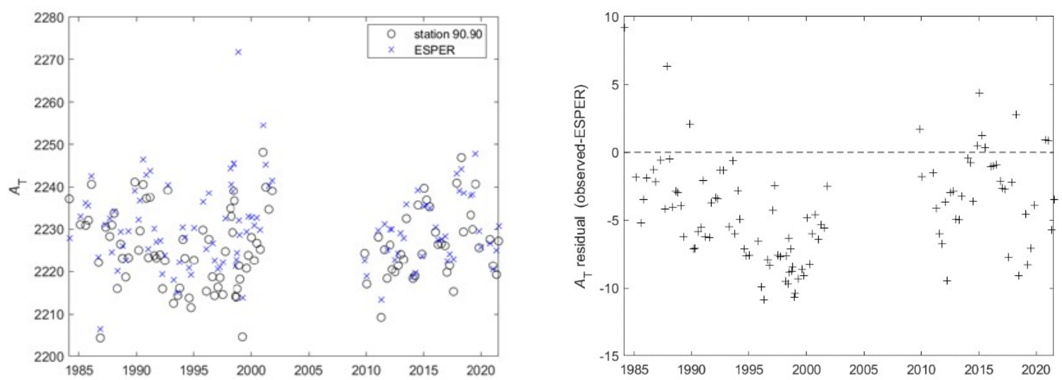
Parameter	peak	standard error	amplitude	standard error	units
Hydrography					
Temperature	18.6	1.0	3.2	2.0	°C yr^{-1}
Salinity	33.4	0.1	0.1	0.3	yr^{-1}
Ocean acidification indicators					
pH	8.08	0.02	0.04	0.04	yr^{-1}
CO_3^{2-}	167	4	10	15	µmol kg^{-1} yr^{-1}
$\Omega_{calcite}$	4.05	0.10	0.26	0.37	yr^{-1}
$\Omega_{aragonite}$	2.61	0.07	0.18	0.25	yr^{-1}
seawater carbonate chemistry					
C_T	2006	14	17	22	µmol kg^{-1} yr^{-1}
nC_T	2002	17	11	23	µmol kg^{-1} yr^{-1}
A_T	2229	7	7	16	µmol kg^{-1} yr^{-1}
nA_T	2228	3	4	6	µmol kg^{-1} yr^{-1}
pCO_2	396	19	41	39	µatm yr^{-1}
Revelle factor	11.2	0.5	0.4	0.6	yr^{-1}



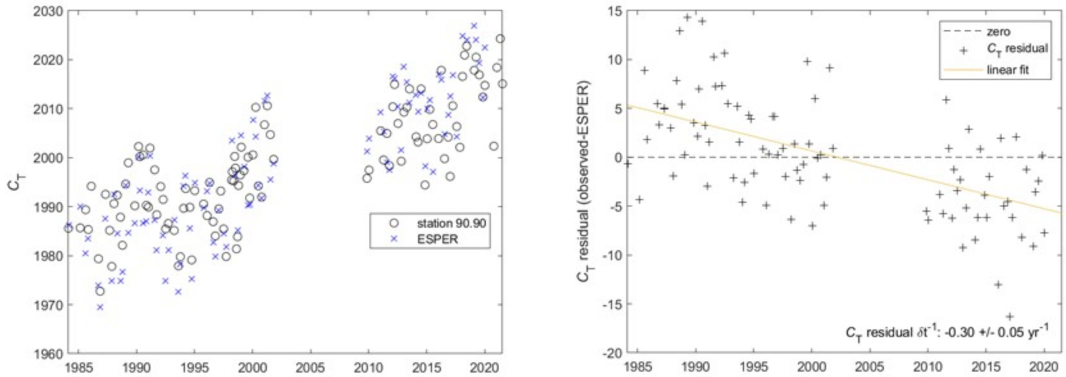
Supplementary Fig. 5. Power spectral density of each time series variable calculated using the MATLAB function 'plomb'**.** Frequencies between 0.1 and 1.4 yr^{-1}. Most parameters exhibit a strong annual signal.



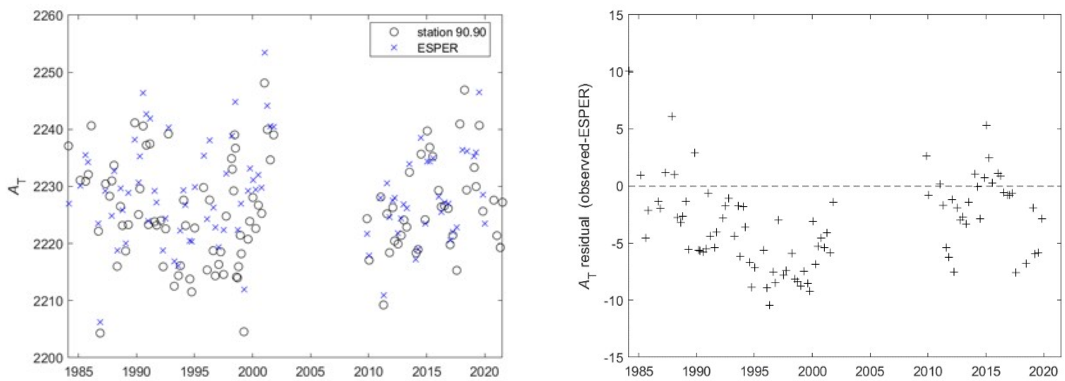
Supplementary Fig. 6. ESPER predictions using only temperature, salinity, latitude, longitude, depth, and year. (Left) Observed and ESPER predicted C_T over time. (Right) The residual C_T, Observed – ESPER, over time.



Supplementary Fig. 7. ESPER predictions using only temperature, salinity, latitude, longitude, depth, and year. (Left) Observed and ESPER predicted A_T over time. (Right) The residual A_T, Observed – ESPER, over time.



Supplementary Fig. 8. ESPER predictions using all available predictor variables (temperature, salinity, phosphate, nitrate, silicic acid, oxygen, latitude, longitude, depth, and year). (Left) Observed and ESPER predicted C_T over time. (Right) The residual C_T, Observed – ESPER, over time.



Supplementary Fig. 9. ESPER predictions using all available predictor variables (temperature, salinity, phosphate, nitrate, silicic acid, oxygen, latitude, longitude, depth, and year). (Left) Observed and ESPER predicted A_T over time. (Right) The residual A_T, Observed – ESPER, over time.