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Date: June 26, 2008

North Atlantic Report #58:
Killworth Analysis on Run 13e18
DRAFT

1. Proposed Paper Outline

1. Present a (modified) Killworth-style analysis of our model SLA and New Production (NP) results. Compare will relative vorticity and Okubo-Weiss parameter.

    - 0.1° analysis grid
    - FFT window: 10-410 day, 0.1-10.3° longitude; to get rid of large scales only and retain Rossby waves and eddies. (See Figs. 1-4).
    - Examine FFT plots for dominant wavelength and frequency. [Show.] Compute correlation coefficients between fields, including time- and space-lags. (See Tables 1-2.) (Also see how Killworth did his cross-correlations, to detemine the dominant wavelength and frequency of correlation.)
    - The FFT power spectra show evidence for Rossby waves at low latitudes and eddies at high latitudes. The correlations coefficients generally become insignificant with spatial lags of 1° longitude, suggesting dominance of eddies.

2. Repeat Killworth's analysis exactly.

    - Objectively analyze the "data" (model output) onto a 0.5° analysis grid.
    - FFT window: 37-410 day, 1.9-10.3° longitude, westward-propogating only, to try to isolate Rossby waves.
    - This shows essentially the same picture as the eddy-inclusive analysis, just coarsened and weakened (see below). Correlations are weaker. The dominant SLA variability occurs where there is high vorticity near currents. Large-scale waves are not seen propogating from the European-African coast.
    - Note our NP analysis is not comparable to Killworth's Chl analysis.

2. Discussion of Attached Figures

Table 1: Correlation Coefficients for Longitude-Time Matrices at Specific Latitudes

	10°S	10°N	20°N	30°N	40°N	50°N
SLA vs Relative Vorticity:						
sla time lag (days):						
-20	0.0203	0.1103	-0.1833	-0.2247	-0.1914	-0.1229
-10	0.3263	-0.1824	-0.4103	-0.4610	-0.4291	-0.4139
0	**0.4745**	**-0.4442**	**-0.5311**	**-0.6445**	**-0.6613**	**-0.7577**
10	0.2894	-0.3340	-0.3333	-0.4551	-0.3867	-0.4159
20	-0.0181	-0.0422	-0.0395	-0.2099	-0.1465	-0.1489
sla lon lag (degrees):						
-1.0	0.1030	-0.0018	-0.1150	-0.0214	-0.0229	0.1939
-0.5	0.3775	-0.2831	-0.3985	-0.3867	-0.4004	-0.3329
0	**0.4745**	**-0.4442**	**-0.5311**	**-0.6445**	**-0.6613**	**-0.7577**
0.5	0.3167	-0.3827	-0.2989	-0.3845	-0.3930	-0.3060
1.0	0.0661	-0.1671	0.0523	-0.0086	0.0072	0.2306
$\log_{10}$(NP) vs. SLA:						
sla time lag (days):						
-20	0.1330	-0.0220	0.2477	0.0471	-0.0210	0.0218
-10	-0.1219	-0.1876	0.0910	-0.0272	0.0105	0.0164
0	-0.4340	**-0.4361**	-0.1702	-0.1426	0.0333	0.0199
10	**-0.4736**	-0.3670	**-0.3832**	**-0.2535**	-0.0367	-0.0264
20	-0.2314	-0.1035	-0.3718	-0.2515	-0.0436	-0.0314
sla lon lag (degrees):						
-1.0	0.0287	-0.2056	0.2783	0.0914	-0.0866	-0.0667
-0.5	-0.1997	-0.3555	0.1084	-0.0429	-0.0440	-0.0669
0	-0.4340	**-0.4361**	-0.1702	-0.1426	0.0333	0.0199
0.5	**-0.5113**	-0.4038	**-0.4283**	**-0.2606**	0.0120	-0.0004
1.0	-0.3707	-0.2535	-0.3815	-0.2561	-0.0105	-0.0257

Table 2: Correlation Coefficients for Longitude-Time Matrices at Specific Latitudes

	10°S	10°N	20°N	30°N	40°N	50°N
$\log_{10}$(NP) vs. Relative Vorticity:						
vort time lag (days):						
-20	0.1489	-0.0301	-0.2267	-0.0389	0.0142	0.0019
-10	0.1153	**-0.1175**	**-0.2712**	-0.1241	-0.0936	-0.0294
0	-0.1013	-0.0587	0.0114	**-0.1361**	**-0.2641**	**-0.1484**
10	**-0.2213**	0.0878	**0.2698**	0.1155	-0.0448	-0.0049
20	-0.1327	0.0798	0.2387	**0.1556**	0.0330	0.0318
vort lon lag (degrees):						
-1.0	0.0877	-0.0198	-0.1850	-0.0444	0.0609	0.0830
-0.5	0.0477	-0.0498	**-0.2832**	0.0296	-0.0135	0.0772
0	-0.1013	-0.0587	0.0114	**-0.1361**	**-0.2641**	**-0.1484**
0.5	**-0.2077**	0.1130	**0.2814**	0.1373	-0.0383	-0.0051
1.0	-0.1523	**0.1762**	0.2293	**0.1422**	0.0438	0.0179
$\log_{10}$(NP) vs. Okubo-Weiss:						
OW time lag (days):						
-20	0.0314	-0.0061	-0.0255	-0.0244	0.0101	-0.0070
-10	0.0380	0.0120	-0.0041	-0.0262	0.0472	0.0397
0	0.0414	-0.0166	0.0081	-0.0183	0.0863	0.0498
10	-0.0019	-0.0418	-0.0057	-0.0127	0.0175	0.0092
20	-0.0505	0.0227	0.0067	-0.0005	0.0047	0.0068
OW lon lag (degrees):						
-1.0	-0.0098	-0.0770	-0.0073	-0.0032	-0.0444	0.0222
-0.5	0.0251	-0.0532	0.0323	-0.0446	0.0142	0.0359
0	0.0414	-0.0166	0.0081	-0.0183	0.0863	0.0498
0.5	-0.0159	0.0161	0.0247	0.0172	0.0208	0.0016
1.0	-0.0611	0.0621	0.0152	0.0139	-0.0158	-0.0243

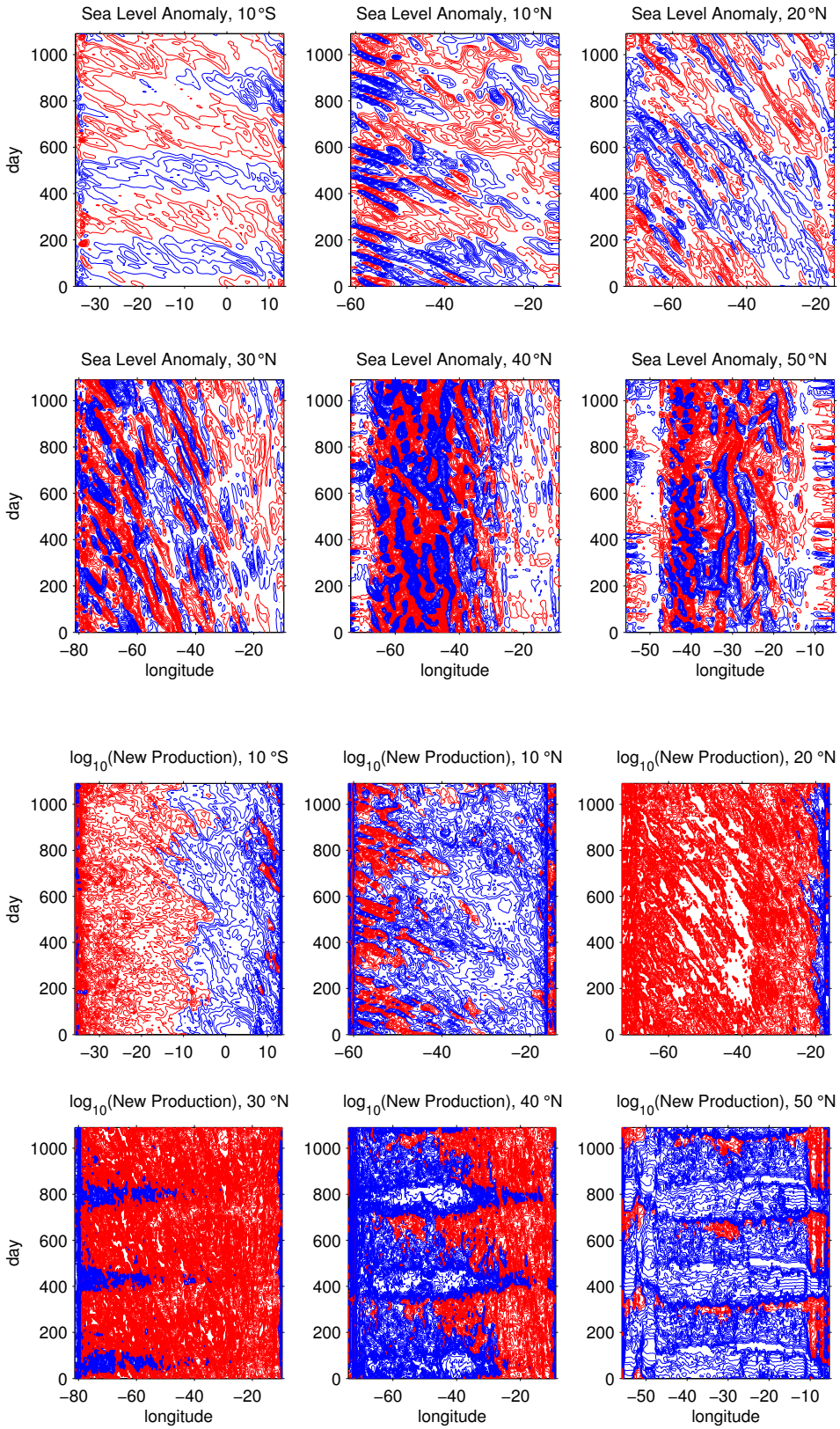

Fig. 1. 1993-1995 (a) unfiltered SLA, (b) unfiltered NP.

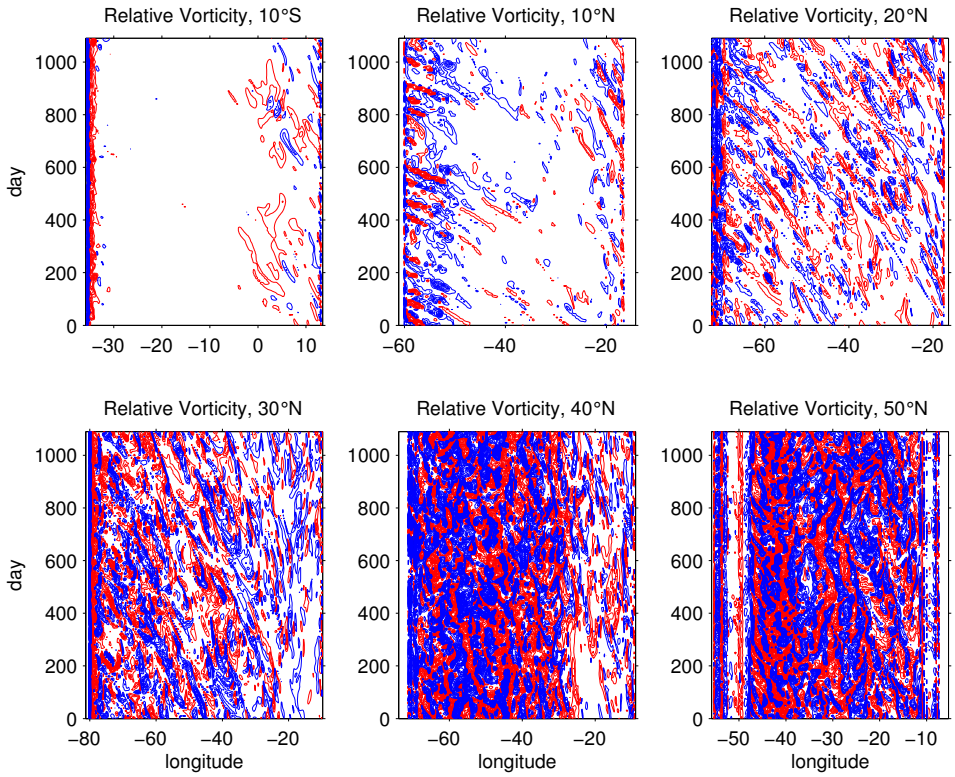

Fig. 2. 1993-1995 (a) unfiltered relative vorticity.

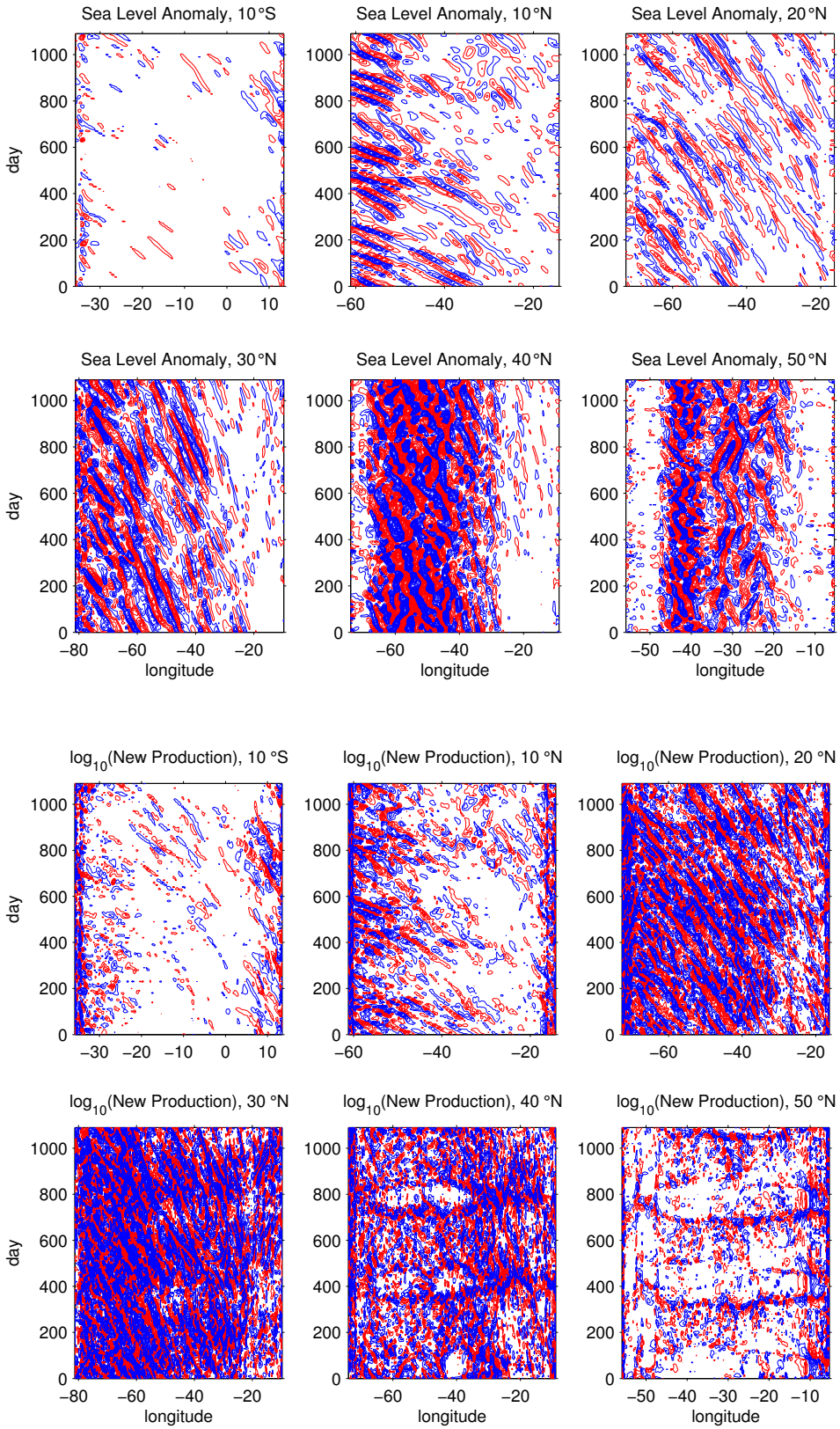

Fig. 3. $< 10.3°$, < 410 day filtered (a) SLA, (b) NP.

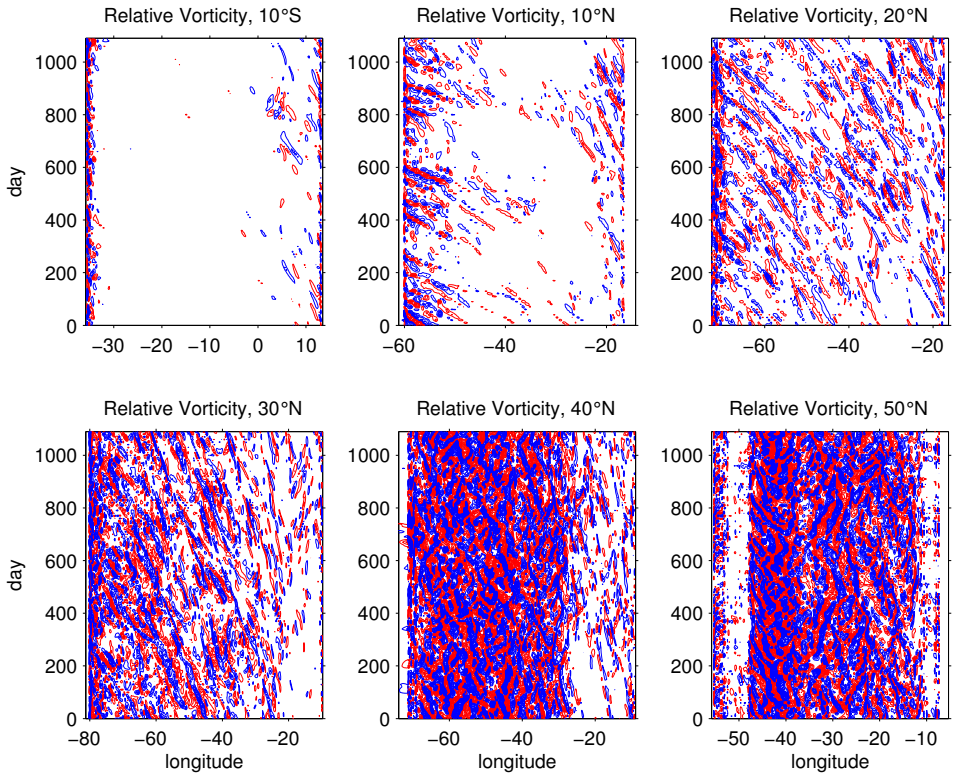

Fig. 4. $< 10.3°$, < 410 day filtered (a) relative vorticity.

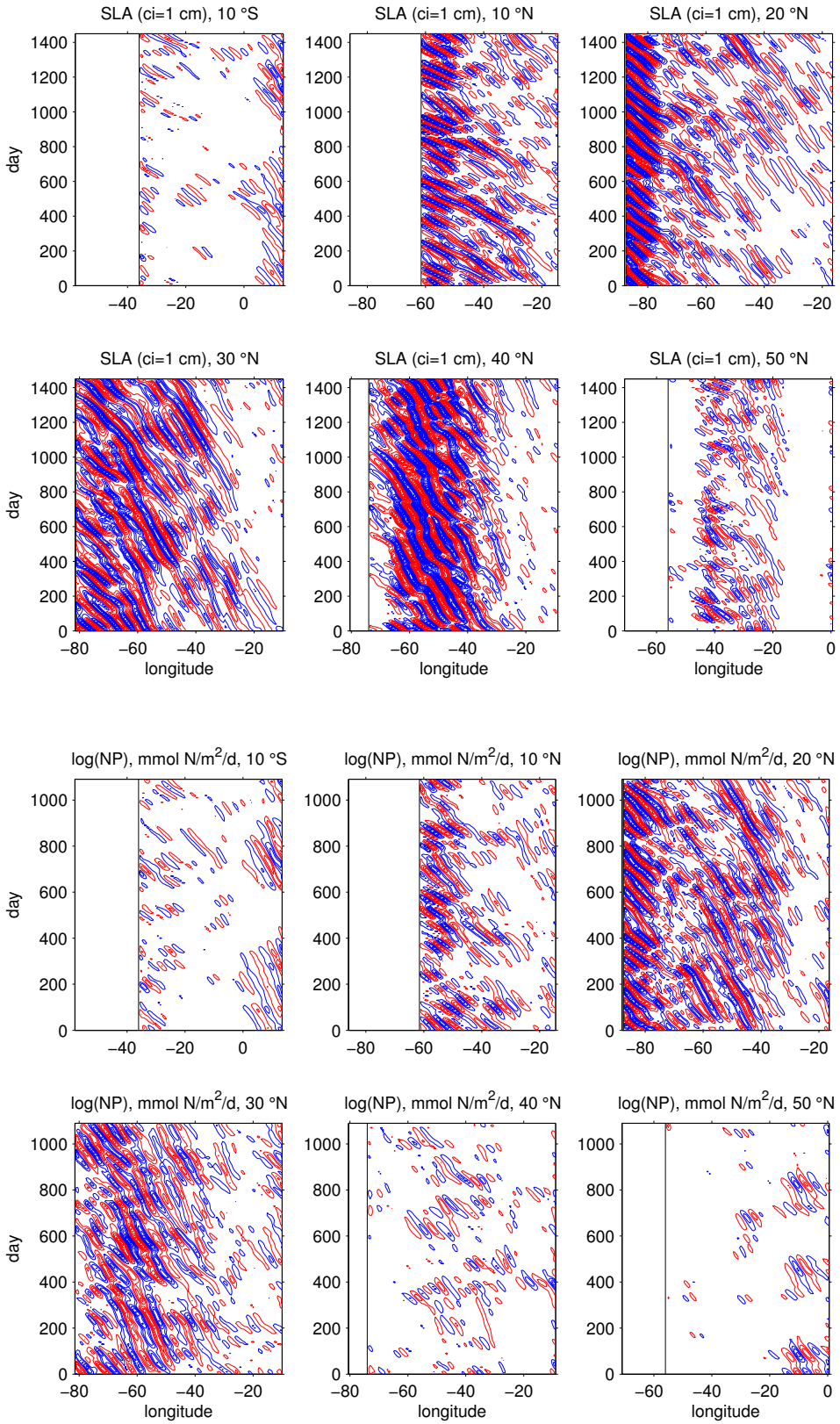

Fig. 5. 0.5° Killworth-filtered (a) SLA and (b) NP.

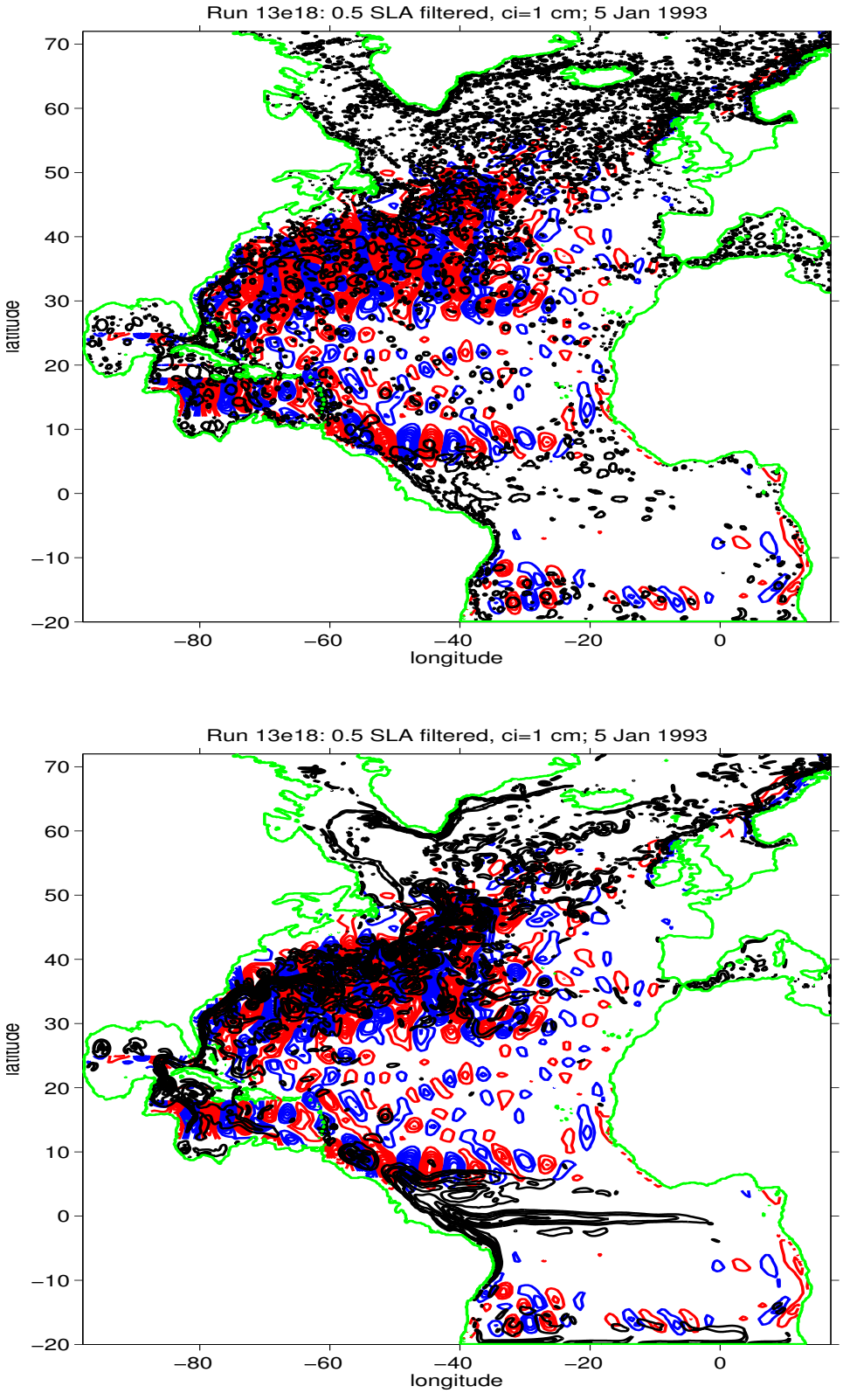

Fig. 6. 0.5° Killworth-filtered SLA (red/blue),
compared with (a) Okubo-Weiss parameter and (b) current speed.

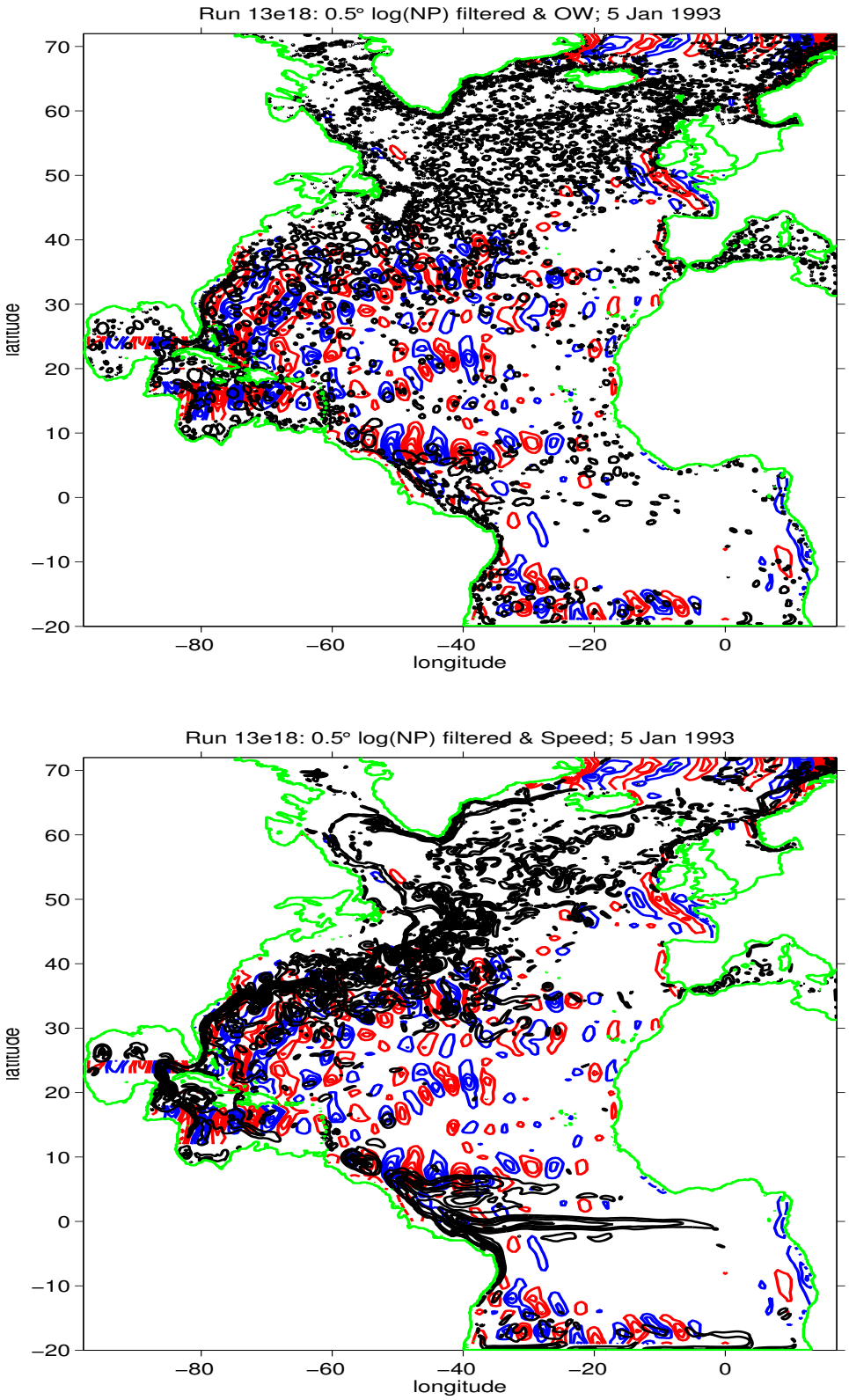

Fig. 7. 0.5° Killworth-filtered NP (red/blue),
compared with (a) Okubo-Weiss parameter and (b) current speed.