(water depths greater than 500 meters), then as much as 25 percent of the dissolved silica supplied to the marine environment may be accounted for in antarctic continental shelf deposits.

A comparison of biogenic accumulation rates with surface primary production rates is useful, despite the effects of lateral transport and differences in the characteristic time scale of measurement. Based on the data of Gersonde and Wefer (1987) and Jennings, Gordon, and Nelson (1984) and the assumption that primary production is proportional to the solar intensity curve for this area over a 150-day growing period (November-April), first-order estimates of accumulation as a percentage of production can be calculated for silica and organic carbon. Approximately half of the silica produced in surface waters accumulates in bottom sediments, whereas only 10 percent of the carbon production in surface waters is preserved in the seabed. Additional field research is needed to establish the mechanism and site of fractionation between the organic and siliceous phases.

This work was supported in part by National Science Foundation grant DPP 85-12514. We would like to thank the crew of the *Glacier* as well as D. Brewster, R. Elliott, and B. McKee for their time and effort during the 5-week field program.

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Identification of oscillations in Ross Sea current data

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As part of the Pelagic Ross Ice Shelf Measurement project, 29 current meters were deployed in the Ross Sea near the ice-shelf edge during the 1983 and 1984 field seasons (Pillsbury and Jacobs 1985); the figure shows their positions. The data from these meters give current speed and direction every hour for over a year in most locations. These data should reveal the characteristics of Ross Sea ocean circulation and indicate which processes are most important in ventilating the cavity below the Ross Ice Shelf. One way to analyze these data is to identify periodicity in the currents and thereby to obtain a characteristic fingerprint of ocean dynamics. If the periods in the currents are found to be the same as tidal or seasonal, for example, then the currents are probably caused by tidal or seasonal forcing. To identify such periodicity, a method is needed to discriminate between natural periodicities and apparent periodicities caused by measurement error and random fluctuations.

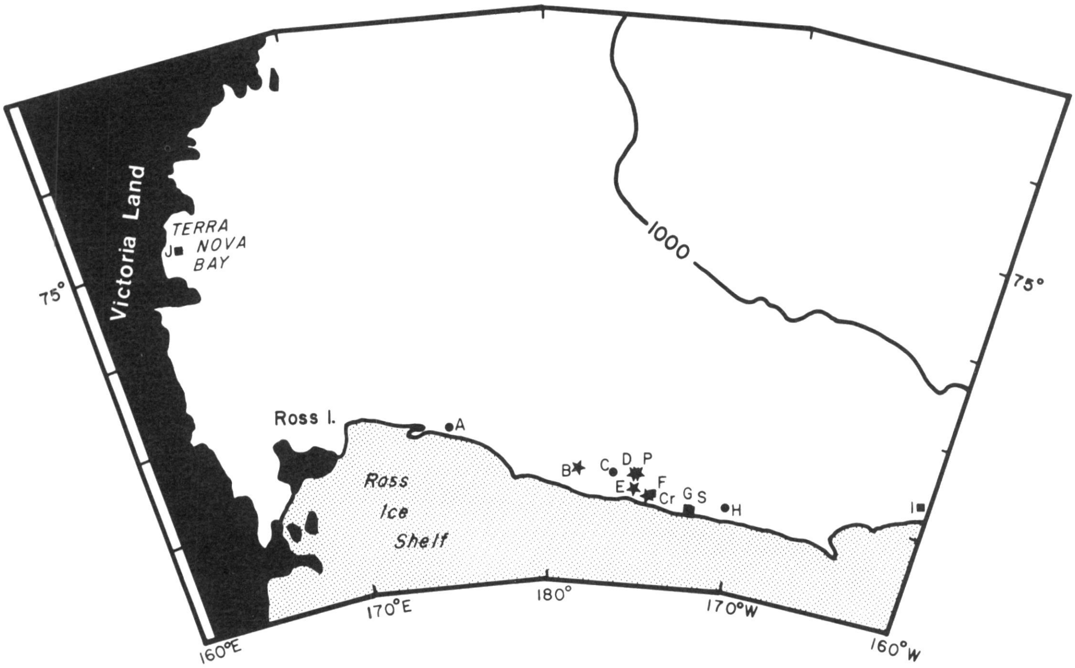
Fisher (1929) developed, and Grenender and Rosenblatt (1957) extended, one such method for distinguishing significant periods (unlikely to have been caused by random fluctuations), when there is no trend in amplitude of the currents with respect to period. This method could not be applied directly to the current-meter data, because the amplitudes do have a trend with respect to period. For example, current fluctuations with a period near 1 month have amplitudes 10 times larger than those with a period near 8 hours. For this situation, I used the deviation of current amplitude from the estimated trend to judge the significance of the period tested. I also required that a given periodicity be considered significant on several (at least three) of the current meters before concluding that it was probably physical. Although this method for identifying periods was developed for velocity analysis, it will work for other times series, such as temperature.

The table shows the periodic currents which were identified in the above manner. As expected, many of these periods are at or near tidal periods. The periods near 8 hours (ter-diurnal) and 9 long-period oscillations (0 1 5,) have no apparent atmospheric or tidal forcing. These periods could be forced by:

- interaction between waves,
- meteorological forcing at periods other than seasonal and daily, and
- feedback with the Ross Ice shelf.

Pedley, Paren, and Potter, (1986) also found ter-diurnal oscillations in data from underneath the ice shelf in George VI Sound, and suggested that they are related to the presence of an ice shelf. MacAyeal (1985) found that rectification of the daily and twice daily tides was insufficient to flush the cavity below the Ross Ice shelf at the derived rate. The long-period (longer than 1 day) oscillations found in the current-meter data may provide oscillations which can be rectified to form currents strong enough to flush the sub-ice cavity at the derived rate.

This work was supported by National Science Foundation grant DPP 84-15207, and National Aeronautics and Space Ad-



Location of the current-meter moorings. The number of current meters on each mooring is denoted by the symbol used to mark the mooring: a circle, square, or star represents one, two, or three, respectively.

Significant oscillations in Ross Sea current-meter data

Period hours[a]	Frequency[b]	Doodson number[c]			Number[d]	Associated tidal constituent[e]
—	0.0000	0	0	0	34	A0
8765.8	0.0001	0	0	1	12	Sa
4382.9	0.0002	0	0	2	6	Ssa
466.10	0.0021	0	1	5	3	
354.37	0.0028	0	2	−2	6	MSf
26.878	0.0372	1	−2	0	17	Q1
25.819	0.0387	1	−1	0	44	O1
25.744	0.0388	1	−1	1	3	
24.066	0.0416	1	1	−2	40	P1
24.000	0.0417	1	1	−1	3	S1
23.934	0.0418	1	1	0	45	K1
23.869	0.0419	1	1	1	4	psi1
12.872	0.0777	2	−2	2	4	mu2
12.660	0.0790	2	−1	0	20	N2
12.421	0.0805	2	0	0	31	M2
12.000	0.0833	2	2	−2	25	S2
11.976	0.0836	2	2	0	7	K2
8.007	0.1249	3	3	−4	9	SP3
7.993	0.1251	3	3	−2	13	SK3

[a] In hours.
[b] In cycles per hour.
[c] The first digit in the Doodson number gives the integral number of cycles the oscillation completes in a lunar day. The second digit gives the integral number of additional cycles per lunar month the oscillation completes compared to an oscillation precisely at the given number of cycles per lunar day. The third digit gives the number of additional cycles per solar year the oscillation completes compared to an oscillation at a period given by the first two digits alone.
[d] The number of individual data records (of the 46 possible) on which the period was distinguished from random fluctuations.
[e] The Darwin name of the tidal constituent near the analyzed frequency.

ministration student training grant NGT-50059. The data were collected and processed under National Science Foundation grants DPP 82-20677, DPP 81-19863, and Department of Energy Interagency Agreement DE-A101-84ER60201 to Oregon State University and Columbia University. Discussions with D.R. MacAyeal, S.S. Jacobs, S. Kristovich, and D.A.R. Kristovich were helpful in conducting this research. I would also like to thank D.R. Lindstrom for his help with the figure.

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