A FURTHER NOTE ON THE DETERMINATION OF MEAN SEA LEVEL

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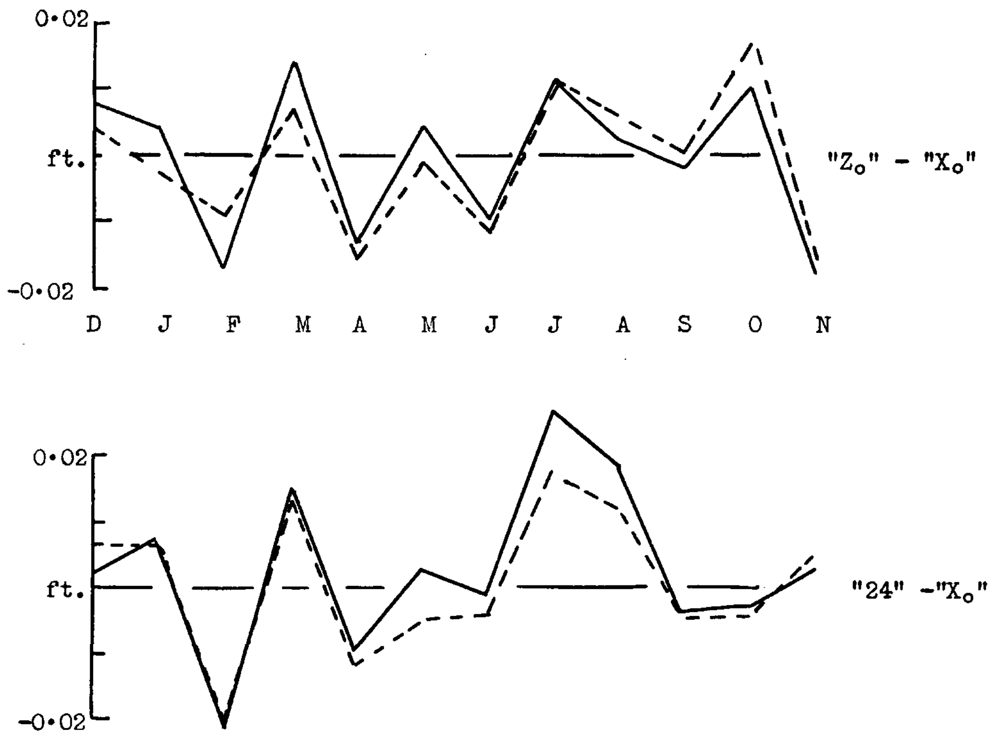
In a paper appearing in the 1958 May issue of the International Hydrographic Review I compared the relative merits of the various methods in common use for obtaining mean values of sea level, from the point of view of their efficiency in eliminating contributions from the tidal wave. It was concluded that for the least labour, with the maximum accuracy, a numerical filter, referred to as Z_0, was the most effective, when shallow water tides of the eigth-diurnal and higher species may be ignored. Whilst tables were given illustrating the eliminating powers of the various methods upon the major tidal constituents, no actual example was given of the results of reducing a typical year's records, and at the request of a number of bodies interested in the time-saving potentialities of the Z_0 filter this omission is hereby rectified.

The records chosen for the experiment were those for Port Alfred in the St. Lawrence Estuary for the period December 1956 to November 1957. The spring range is of the order of 16 feet and disturbances due to meteorological causes are much in evidence. A complete harmonic tidal analysis had already been effected for these data, and so the results of the X_0 stencil were available. In addition, monthly and annual means were computed from the same data by the Z_0 stencil and a direct and unweighted average of the 24 hourly values per day. The results are given in the table appended. It was shown in the paper quoted above (see Table 1) that the most efficient means of eliminating the tidal contributions to daily mean sea level is the X_0 stencil, and this has therefore been used as the best representation of mean sea level in the present experiment. Values of the monthly anomalies obtained by the Z_0 stencil and by the direct average of 24 hourly heights are tabulated and plotted below.

These anomalies show a correlation with the number of days in the month, being greatest in the positive sense for months of 31 days. This indicates an incomplete elimination of the tide, and corrections were computed for the lunar semi-diurnal constituent M_2, the largest single constituent at Port Alfred, from the expression given at the foot of page 9 (*) in the paper under discussion. The corrected monthly and annual deviations are tabulated in brackets and plotted as pecked lines. It will be seen that whilst there is some improvement, a correlation still exists, and

(*) This is the reprint page number, and corresponds to page 124, *I.H. Review*, May 1958.



Anomalies of monthly mean level at Port Alfred, December 1956 to November 1957.

MONTHLY AND ANNUAL VALUES OF SEA LEVEL AT PORT ALFRED, IN FEET

Month		« Z_0 »	« X_0 »	« 24 »	Anomalies « Z_0 » — « X_0 »		« 24 » — « X_0 »	
1956	Dec.	9.096	9.088	9.090	—.008	(—.003)	.002	(.007)
1957	Jan.	8.749	8.745	8.753	.008	(—.003)	.008	(.007)
	Feb.	9.057	9.074	9.052	—.017	(—.009)	—.022	(—.021)
	Mar.	9.210	9.196	9.210	—.014	(.007)	.014	(.013)
	Apr.	8.747	8.761	8.751	—.014	(—.016)	—.010	(—.012)
	May	9.188	9.184	9.187	.004	(—.001)	.003	(—.005)
	June	9.346	9.356	9.355	—.010	(—.012)	—.001	(—.004)
	July	9.520	9.509	9.536	.011	(.011)	.027	(.017)
	Aug.	8.912	8.910	8.928	.002	(.006)	.018	(.011)
	Sept	9.045	9.047	9.043	—.002	(.000)	—.004	(—.005)
	Oct.	8.919	8.909	8.906	.010	(.017)	—.003	(—.004)
	Nov.	9.330	9.348	9.351	—.018	(—.016)	.003	(.004)
Yearly Mean		9.092	9.093	9.097	—.001		.004	

possibly represents the sum of the contributions from the remaining tidal constituents.

The mean monthly anomaly taken with regard to sign, and the standard deviation of the anomalies, are : —

	$Z_0 - X_0$ (ft.)		$24 - X_0$ (ft.)	
Mean anomaly	—0.001	(—0.001)	0.003	(0.001)
Standard deviation	0.011	(0.010)	0.012	(0.011)

These figures, taken in conjunction with the values of the annual means, clearly indicate that there is nothing to choose between the Z_0 stencil and the direct averaging of 24 hourly values as regards their efficiency in eliminating tidal contributions. The time and labor saved in reading off only 8 heights per day for the Z_0 stencil is therefore the outstanding factor.