



## Abstract View

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# Cotidal Charts for the Pacific Ocean near Hawaii Using $f$ -Plane Solutions

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#### ABSTRACT

The tidal constituents  $K_1$ ,  $O_1$ ,  $P_1$ ,  $Q_1$ ,  $M_2$ ,  $S_2$ ,  $N_2$ ,  $K_2$  derived from sea level records at six sites spanning the Hawaiian Islands show a systematic variation in amplitude and phase from site to site that indicate that the tide is mainly diffracted about the Hawaiian Islands Ridge rather than diffracted about the individual islands. This variation enables us to construct cotidal charts.

We model the tide by a small set of plane waves for a uniform depth, horizontally unbounded ocean on a flat, uniformly rotating earth appropriate to a given latitude and model the ridge by an elliptically shaped cylindrical island. Proudman's (1914) approximate solution of this problem is used to determine the set of plane waves that least-squares fit the tidal observations. These plane waves enable us to estimate the tidal motion in the deep ocean beyond Hawaii. The rms (root-mean-square) fit of the model to the Hawaiian tidal constituents is <7% of the constituent amplitude. In fact, our tidal model, extrapolated out some 1200 km to Johnston Island, only differs from the tidal constituents observed there by <27% in amplitude and <18° in phase for the  $K_1$ ,  $O_1$ ,  $M_2$ ,  $S_2$ ,  $N_2$  and  $K_2$  constituent. We feel, therefore, that the cotidal charts derived here are reasonably valid for the ocean within a 1000 km radius of Honolulu.

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