TRANSMISSION OF SUBINERTIAL KELVIN WAVES THROUGH A STRAIT

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Abstract

Solutions are found for the transmission of $1^1/_2$-layer subinertial Kelvin waves through an "Ideal Strait" with parallel channel walls and square corner mouths. This is shown to be a wave interference problem similar to the classical optics problem of multiple beam interference. The outlet of an Ideal Strait has the same reflection characteristics as the inlet, setting up internal reflections within the strait and a consequent interference condition that has several important consequences:

- energy transmission of a strait is a function of channel length as well as width,
- transmission is frequency dependent, and approaches 100% at low frequencies for all channel widths, as long as the dynamics remain linear and inviscid,
- the amplitude of the pressure signal on the downstream side of the channel approaches zero as the transmission approaches 100%.

Numerical solutions are found for transmission through a strait with coastal geometry corresponding to the 200 m isobath at Lombok Strait, and the results show that the Ideal Strait model with an appropriate effective width can accurately predict the transmission characteristics of a more complex strait. In particular, even though the minimum channel width is less than one fifth of the local Rossby radius, the strait is shown to approach total transmission within the intraseasonal frequency band.