Correspondence

DEAR EDITOR,

In my article [1], the wave is assumed to be travelling in deep water, meaning that the depth h and wavelength λ are such that h/λ is large. If this restriction is abandoned, in the notation used in the article the velocity components of a water particle with mean position $(\bar{x}, \bar{y})$ are (Ramsay [2])

$$\dot{x} = an \frac{\cosh m(\bar{y} + h)}{\sinh mh} \sin(m\bar{x} - nt),$$

$$\dot{y} = -an \frac{\sinh m(\bar{y} + h)}{\cosh mh} \cos(m\bar{x} - nt).$$

At and below a wave crest, $\dot{y} = 0$, $\cos(m\bar{x} - nt) = 0$, $\sin(m\bar{x} - nt) = 1$, and

$$\dot{x} = an \frac{\cosh m(\bar{y} + h)}{\sinh mh}.$$

From the surface to the depth h beneath a crest, the rate of forward transport of water volume (per unit length normal to the plane Oxy) is

$$\dot{V} = \int_{-h}^{0} \dot{x}\, d\bar{y} = \frac{an}{\sinh mh} \int_{-h}^{0} \cosh m(\bar{y} + h)\, d\bar{y}$$

$$= \frac{an}{\sinh mh} \left[\frac{1}{m} \sinh m(\bar{y} + h)\right]_{-h}^{0}$$

$$= \frac{an}{m}.$$

This is the same value as for deep water, which is not surprising because continuity of rate of transport of mass requires it.

Yours sincerely,

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References

1. Maurice N. Brearley, About tsunamis, *Math. Gaz.* **89** (November 2005), pp. 437-440.
2. A.S. Ramsey, *A treatise on hydromechanics*, Part II, Bell (1960).

https://doi.org/10.1017/S0025557200179355 Published online by Cambridge University Press