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Unperturbed normal mode method for forward surface scattering

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A technique is presented that uses an expansion in unperturbed modes to calculate acoustic scattering from ocean surface waves in a shallow water waveguide. The basic formalism as well as a useful extension to account for the difference between the water column and the domain in which the modes are calculated. The coupling between the modes due to the waves is local at the ocean surface, unlike the coupling of local modes. Numerical examples of the calculation are given for both a sinusoid surface wave and a random surface wave with a typical wind driven spectrum.