Movie 1: The development of the perturbation streamfunction ψ and for the β-plane modon of Figure 3(a) of the main text with background vorticity gradient $\beta = 0.4$. The modon, marked by '+', moves to the left from an initial position marked with '+', generating a Rossby wave wake that by $t = t_0 = 1$ is quasi-steady in the neighbourhood of the modon. The equations are integrated in a frame moving to the left at constant speed unity. Initially the modon accelerates under the β-effect to move slightly faster than unity but then slows due to wave drag. The wake behind behind the modon is established between the initial and current modon positions as the modon moves away. Slowly propagating transient waves can be seen in the neighbourhood of the initial modon position.

Movie 2: The development of the perturbation streamfunction ψ and perturbation buoyancy b as for Movie 1 but for the stratified dipole of Figure 4 of the main text with a buoyancy frequency of $N = 0.4$. The dipole, marked by '+', moves to the right from an initial position marked with '+', generating an internal wave wake that by $t = t_0 = 10$ is quasi-steady in the neighbourhood of the dipole. The equations are integrated in a frame moving to the right at constant speed unity. The qualitative development follows that of Movie 1: initially the modon accelerates under buoyancy effects to move slightly faster than unity but then slows due to wave drag; the wake behind behind the modon is established between the initial and current modon positions as the modon moves away; and slowly propagating transient waves can be seen in the neighbourhood of the initial modon position. The main difference from the β-plane modon is the longer wavelength of the stratified waves, reflecting the differing power of U in the expression for the wavenumber.