The drift of objects floating in the sea

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The question how buoyant objects drift and where are they ultimately washed ashore must have troubled humans since the beginning of civilization. A good summary of the observational aspect of the problem is given in Ebbesmeyer (2015) and the references given therein. It includes the journey of shoes originally housed in containers that were accidently swept from the deck of cargo ships to the ocean as well as the famous world war two case of a corpse released by the British Counter Intelligence agency near the Spanish Coast. Of practical modern importance is the question how did the flaperon, belonging to the Malaysian Airplane lost last year (supposedly over the Indian Ocean near Western Australia), travelled almost across the entire Indian Ocean in just 15 months (corresponding to the very high speed of six centimeters per-second, about three times the speed of most ocean currents away from boundaries). Traditionally, it has been thought that three processes affect the drift--ocean currents, surface waves and wind. Of these, the last two are usually regarded as small. The waves effect (Stokes drift) is nonlinear and is probably indeed very small in most cases because the amplitudes are small. It is not so easy to estimate the wind effect and we will argue here that it is not necessarily small though it is obviously close to zero in some cases. The wind speed is typically two orders of magnitude faster than the water (meters per second compared to centimeters per second) and the stress is proportional to the square of the wind speed implying that the wind is important even if only a very small portion of the object protrudes above the sea-level. It is argued that wind, rather than ocean current dominated the drift of both the WWII corpse and the modern day flaperon.