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On the onset of surface wind drift at short fetches as observed in a wind wave flume

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Ocean surface drift is of great relevance to properly model wind waves and specially the early stages of surface waves development and ocean-atmosphere fluxes during incipient wind events and storms. In particular, wave models are not so accurate predicting wave behaviour at short fetches, where wind drift onset might be very important. The onset of surface drift induced by wind and waves is being studied through detailed laboratory measurements in a large wind-wave flume. Wind stress over the water surface, waves and surface drift are measured in the 40m long wind-wave tank at IRPHE, Marseille. While momentum fluxes are estimated directly through the eddy correlation method in a station about the middle of the tank, they provide reference information to the corresponding surface drift onset recorded at rather short non-dimensional fetches. At each experimental run very low wind was on (about 1m/s) for a certain period and suddenly it was constantly accelerated to reach about 13 m/s (as well as 8 and 5 m/s during different runs) in about 15 sec to as long as 600 sec. The wind was kept constant at that high speed for 2 to 10 min, and then suddenly and constantly decelerate to 0. Surface drift values were up to 0.5 cm/s for the highest wind while very distinctive shear was detected in the upper 1.5 cm. Rather linear variation of surface drift was observed with depth. Evolution of the surface drift velocity is analysed and onset behaviour is addressed with particular emphasis in accelerated winds. This work represents a RugDiSMar Project (CONACYT 155793) contribution. The support from ANUIES-ECOS M09-U01 project, CONACYT-187112 Estancia Sabática, and Institute Carnot, is greatly acknowledged.