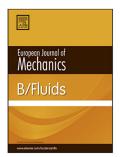
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## Turbulent characteristics of pulsating flow over hydraulically smooth surface

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## 14 Abstract

The mean flow and turbulence characteristics due to the interaction between wave and current 15 is investigated over the hydraulically smooth surface in a wave channel based on 16 measurement of the horizontal, bottom-normal and transverse velocity components in the 17 pulsating fluid using a 3-D micro-acoustic Doppler velocimeter. Pulsations, in the vicinity of 18 the wall are produced by superimposing the surface wave on unidirectional current using 19 plunger type wave-maker. The velocity time series of combined wave-current flow were 20 analysed within the framework of the phase-averaging. Further, to highlight the changes in 21 combined wave-current flow, a comparative study was made between the velocity profiles for 22 current-only flow and those measured for combined wave-current flow. The measured mean 23 stream-wise velocity for waves following a current is reduced towards the free surface when 24 compared with the current-only data. In addition, with an increase in wave height, a further 25 intense reduction of the velocity just below the wave trough occurs. To fully characterize 26 27 turbulent signals, the joint probability density function of stream-wise and bottom-normal velocity fluctuations is analysed. Spectral analysis was also performed to obtain the oscillation 28 29 pattern within the flow field that may affect the turbulent properties due to combined wavecurrent flow. 30

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32 Keywords: ADV; Flume; Power Spectra; Turbulent flow; Wave-current

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