INTRODUCTION

Babanin and Haus (2009) recently presented evidence of high levels of turbulence induced by steep non-breaking waves. They proposed a Reynolds-like threshold wave parameter ($a^2w/\nu = 3000$, a wave amplitude, w wave angular frequency, water viscosity) for the spontaneous occurrence of turbulence beneath surface waves. This is contrary to conventional engineering understanding and the widespread use of irrotational wave theories based on classical experimental validation.

Many laboratory wave experiments were carried out in the early 1960's (e.g. Wiegel, 1964). In those experiments no evidence of turbulence was reported and steep waves behaved as predicted by the high order irrotational wave theories within the accuracy of the theories and experimental techniques at the time.

The spontaneous generation of turbulence under waves can have serious consequences for wave modelling, where the irrotational flow assumption has secured its place in engineering design.

This contribution describes unique flow visualisation experiments for large scale steep non-breaking waves using conventional dye techniques in the wave boundary layer extending above the wave trough level.