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Intermittency in breaking wave induced turbulence

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A series of Wave breaking experiments were performed at the 100 m long wave flume at LIM (UPC, Barcelona) under the SPANWAVE project of Hydralab1- Acoustic Doppler Velocimetry were measured at different heights as regular and non-regular waves were generated. From the 3D velocity time series, The orbital wave induced currents were filtered. From the 50 to 100 Hz 3D velocity data, mainly from transversal Vy components. ESS was applied to obtain the absolute and relative scaling exponents for each scale: the value of the absolute scaling exponents is the slope of the log. of the structure functions versus the log. of the scales. In the segments where the absolute exponents decrease, it is shown that the relative exponents behave in a much more regular fashion, even if the turbulence is non local (Mahjoub, 2000; Mahjoub et al., 1998; 2001). We delimit the interval where a good fit is obtained, checking the logarithm of the structure functions of order 3. The changes in the slope are better reflected by functions of higher order than in those of small order, so that changes in the slopes associate to a K41 inertial subranges may be established, but the width of these subranges will depend on the order of the structure function and on the level of intermittency produced by the wave breaking responding mainly to the regularity of the wave generator. The way to calculate a new intermittency parameter for the different subranges and orders show how intermittency in breaking wave induced turbulence and the sign of the scale to scale energy transfer may depend on the different large scale (l) spectral slopes. Active fully developed turbulence is present only when e T l / v V , exceeds a certain critical value, being e the turbulent dissipation, l the integral scale, v the kinematic viscosity, T the wave period and V the orbital velocity.

Mahjoub O B, Redondo JM and Babiano A (1998): Structure functions in complex

flows, Applied Scientific Research 59, 299-313.

Mahjoub O (2000): Non-local dynamics and intermittency in non-homogeneous flows, PhD, Technical University of Catalonia (UPC), 139pp.

Mahjoub O B, Granata T and Redondo J M (2001): Scaling laws in geophysical flows, Phys. Chem. Earth (B), 26, 281-285.