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Extreme waves in South Atlantic Ocean near Northeast Coast of Brazil

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Conventional ocean wave measurements have been traditionally made on 20 minutes recordings hourly or longer. Recently Petrobras has started making virtually continuous wave measurement at their platforms in South Atlantic Ocean near northeastern of Brazil. The data were recorded from vertical microwave range finder radars type, manufactured by Miros. The availability of this new extensive data sets have availed some new and fresh wave data analysis schemes which cannot be done previously and therefore some new perspectives in ocean waves data analysis and understanding.

The interest of Petrobras in ocean waves and extreme wave in particular are stemmed from the need designing offshore structures against extreme waves based on detailed knowledge of their statistics, spectral characteristics, as well as local kinematics, wave breaking and loading properties. As the effective operation of current jack-up rig mobilization in the field is also intrinsically related to extreme wave characteristics.

From May through December of 2010 the data set has accumulated over 8 months of continuous wave measurements. While many other conventional interests can be re-examined by this data set, we are particularly interested in seeking topics that cannot be studied by conventional measurement apparatus. One of these is the examining the well-known theoretical Rayleigh relation that correlates extreme wave heights with the number of waves in the data:

Hmax/Hs =sqrt (logN/2),

Where N is the number of waves in the data set and Hmax and Hs are respectively the extreme wave and significant wave heights in the data set.

Up to now the conventional measurement system greatly limits the number of N one can work with. Therefore this theoretical Rayleigh relation has remained an ideal expectation that has not extensively applied without substantial validation.

Over 8 months of continuous wave measurements have provided a number of N that exceeded 4 million consecutive individual wave heights and an exceptional opportunity for testing the above theoretical Rayleigh relation among other things.

We are hoping that by presenting the results of this exciting study will serve to inspire more innovating wave measurements and pioneer new measurement and analysis that have not significantly modernized in nearly 6 decades.