

Resistance wave-staff and pressure transducer - An accuracy check during wave measurements

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Laboratory tests on reliability of wave staff and pressure transducer in measuring wave heights have been made by various agencies. Laboratory and field tests and a discussion on possible causes of errors and their values are treated in this note.

For the wave staff the following errors have been considered :

1. Variation of the thread of the spiral.
2. Variation of the electrical resistance of the wire.

These two errors are usually random and selfcompensated after a short length of instrument.

3. Increase in length due to the tensile force (a few ‰); this suggests calibration of the instrument under the operative tensile force. More practically, once the wave staff has been tensed and some references have been marked on it, these can then be used as reference points for calibration under a limited force.

4. Short circuit of some resistance spires due to water drops remaining on the wave staff during a wave trough (maximum error 5 ‰). To take this into account laboratory calibration must be carried out in real conditions, i.e. first by immersion of the instrument, then calibrating it during gradual emersion.

5. The delay effect due to the adherence of water particles to the wave staff during rapid descending motion of the surface. The delay is equal to the falling time of the water which remains around the instrument (order of magnitude. 1 sec). Nevertheless the instantaneous error is large and in the case of high waves can surpass 40 cm.

6. Water spray during the relative varying horizontal motion of surface particles (order of cm.) — this is proportional to the diameter of the support.

7. Breaking waves and spray — unavoidable — together with 5, 6 and 7 establishes the limit of operative conditions for the instrument.

As regards the pressure transducer, consideration has been given to the consequence of water motion on the measurement itself. In wave measurements one is concerned with the variation of static pressure, while the dynamical effect of velocity can be of the same order of magnitude as the variation.

A positive test was made by covering the instrument with a small soft plastic bag, air or water filled. A series of tests carried out in the water tank of the institute of Oceanographic Sciences, Wormley, England, took into account the influence of relative water velocity and its direction. The effect of dynamical pressure was shown to be reduced to a few percent of its maximum value, independently of the direction of relative motion.

