



# Sensor / GPS Wavebuoy

Datawell - Oceanographic Instruments

## Differences and similarities between a sensor based and a GPS based wave buoy.

Since the early 1960s, sensor based wave buoys have been used, like e.g. the Waverider and the Directional Waverider, both by Datawell. The latter also measures wave direction by correlating the horizontal and the vertical buoy motion. With the introduction of the GPS satellite positioning system and the continual improvements of the GPS receivers, measuring the buoy motion via the GPS has become possible as well.

Datawell now supplies both the sensor based Directional Waverider (latest version the DWR MkIII) and the GPS based Directional Waverider (by the name DWR-G). In order to facilitate the choice between the two systems, we line up the distinct advantages of each individual system. For completeness the similarities are mentioned as well.

### Similarities

Waves are measured by measuring the motion of a moored buoy that follows the motion of the water particles at the sea surface. The dynamics of the mooring (at the low frequency side) and the dimensions of the buoy (at the high frequency side) determine the water particle following quality of the system. In this respect, the sensor buoy and the GPS buoy, having the same mooring and the same dimensions, perform equally well in following the waves.

And of course they share the onboard data logger, hull, flashlight, and transmitter, and they agree with respect to radio range, visibility, etc.

### Advantages of the sensor based Directional Waverider

Major advantages of the sensor based wave buoy over the GPS based wave buoy are:

- The motion of the buoy is measured under all circumstances. Whether tilted, flushed over, or even being pulled under water, the sensor

continues measuring the buoy motion. This in contrast to the GPS based buoy, which requires continuous radio-contact with a minimum number of GPS satellites.

- The power consumption of the sensor based buoy turns out to be significantly lower than the power consumption of the GPS based buoy, resulting in longer operational lifetime, or the possibility to use a smaller hull diameter when fewer batteries are required.
- Since the sensor is close to the centre of the hull, the sensor based buoy suffers less from artificial motions that a pitching and rolling GPS buoy measures because its GPS antenna is inevitably some distance above the hatch cover.

### Advantages of the GPS based Directional Waverider

- No sensor is required, making the GPS wave buoy cheaper, and insensitive for sensor break down.
- Since direction measurements do not rely on a compass, there is no need to use non-magnetic components. In particular, batteries can be of the standard, and thus cheap, magnetic alkaline type.
- It turns out that, where the buoy follows the waves adequately, the wave motion of the buoy can be measured down to lower frequencies.
- Since the GPS-receiver is much smaller than the sensor, a smaller buoy is possible and a 40 cm DWR-G is available. However, mooring and energy considerations limit the applicability of a small buoy.

### Conclusions

When interested in extreme wave conditions the sensor based buoy is the right choice. When measuring in mild conditions the less cumbersome GPS based buoy serves well.