TIDE

Tides are defined as the rise and fall of sea levels caused by the combined effects of the gravitational forces exerted by the Moon and the Sun and the rotation of Earth. The difference in the height of low tide and high tide is called the tidal range. Around the Irish coast tidal ranges vary from around 1.75 metres on the south east coast of Ireland to an average of 4.5 metres on the west coast. Without accurate tide height data, sonar measurements have a large error range. INFOMAR installs semi-permanent tide-gauges to get an accurate representation of the tidal range in the survey area. Each gauge measures the pressure needed to force an air bubble to the bottom of a thin plastic tube and converts this to a depth measurement!

If you want to know more about tide, click here

TIDE GAUGES

Tide gauges measure change in sea level relative to a vertical datum. They continuously record the height of the water level with respect to a height reference surface close to the geoid. Water enters the device at the bottom of the tube and electronic sensors measure its height and send the data to a computer. During a typical INFOMAR survey, tide gauges are positioned along the coast and within the survey area to provide an accurate representation of the tide dynamics operating in the area.

Onshore tide gauges

Onshore tidal data is available via the Irish National Tide Gauge Network or by using temporary gauges (installed in advance of the survey and removed upon completion). We use the OTT Nimbus Bubbler Gauge. A battery powered air compressor pumps air down a thin plastic tube to an underwater bubble pot. A measured pressure is delivered from the pump depending on the depth of water above the bubble pot (based on the Archimedes' principle) and converted to a height measurement of the water above the bubble pot.

An OTT Nimbus gauge at Rossaveal, Co. Galway. The battery, data logger and air pump are all housed in a water proof box on the pier.

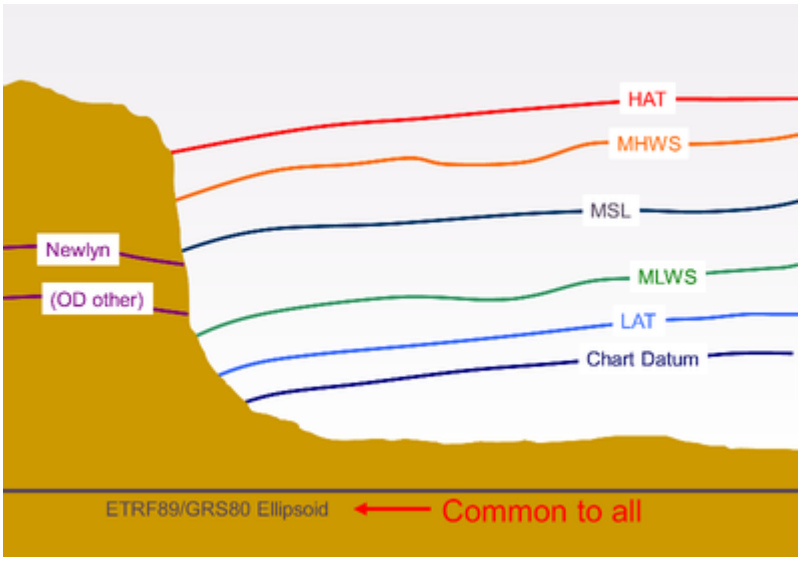
Offshore tide gauges

These instruments are deployed from the survey vessel, placed inside a protective cage, lowered onto the seabed and marked with a buoy, flag, light beacon and radar reflector. Their positions are also reported to the coast radio station to warn other vessels operating in the area. The primary gauge used offshore is the Valeport Midas WLR with HOBO Water level Logger Pressure gauges used as back up. The data are compared with onshore tidal data and both datasets referenced to an onshore datum and used to correct the water depth readings from the multibeam echosounder.

Midas WLR tide logging instrument used to measure changes in offshore tide height during the survey.

GPS derived TIDE

The accuracy of GPS systems have dramatically improved recently and it is now possible to achieve sub-metre or cm level accuracies nearly everywhere in the world, both on horizontal and vertical axes. Additionally, the introduction of the Vertical Offshore Reference Frame (VORF) surfaces, which precisely model the separation between terrestrial reference frames used for GPS/GNSS positioning (ETRF89 or ITRF) and reference surfaces (MSL, LAT & Chart Datum (CD)), has revolutionised the way tide is calculated and applied to bathymetric data.



Vertical reference frames available (on land and offshore) within the VORF model.

Any ship equipped with a high precision GPS receiver and using the VORF transformation models will effectively become its own tide gauge, with no need to rely on tide gauge observations made at remote ports. This simplifies survey logistics, improves efficiency and allows seamless merging of data collected on land and sea.

INFOMAR have adopted this new method of tidal correction since 2008 and undertakes extensive validation of the VORF surfaces to ensure the modelled surface separations are as accurate as possible. Further information on VORF are available here.