Tidal Data – Coastal and Offshore

At The Coast

The NOC has provided a national and international tidal prediction service since the 1920s. Predictions for over 700 standard and secondary ports around the UK, and for many international locations, can be computed. The harmonic method used throughout the world was developed at NOC over 75 years ago and is constantly reviewed and updated when necessary.

We use the harmonic method of tidal prediction with up to 240 harmonic constituents at standard port locations. Alternative methods for complex shallow-water ports are used when the harmonic method fails to produce the required level of accuracy.

We are the sole provider of tidal predictions to the Environment Agency who run the Thames Barrier and are part of the United Kingdom Coastal Flood Forecasting group (UKCFF).

The UK National Tide Gauge Network which was developed by NOC gives us access to high quality data which is analysed using the latest methods to produce the most up-to-date harmonics which are used to compute the tides into the future.

We have an long-standing agreement with the Hydrographic Office for free exchange of data ensuring both parties have the best data – essential for the safety of shipping around the UK.

All data is checked and validated. Predictions are compared to observed data to ensure quality and accuracy. Historical data can be computed for research purposes.

Tidal Harmonic Analysis

The NOC also offer a tidal harmonic analysis service. For clients that have their own tide gauge or access to such data, we can carry out a full quality control and analysis of the data which will generate a unique set of harmonic constituents for that location. These can then be used to derive the most accurate tidal predictions possible. The client can receive the raw data, fully formatted tide tables or even a custom version of our own POLTIPS-3 software preconfigured with the results of the analysis.

Offshore Predictions

Hydrodynamic numerical models developed and run at NOC have been harmonically analysed to generate a set of harmonic constants for each cell. It is these harmonic constants that enable NOC's own POLPRED software to compute tidal data (elevations and currents) at any date and time in the past or future.

POLPRED: Reference Datum

The reference datum is an 'undisturbed sea surface parallel to the geoid' which we approximate to Mean Sea Level. Within the POLPRED software, computed data can be changed to Lowest Astronomical Tide (LAT) datum. The value used for LAT is an estimate based on the model data set.

POLPRED: Coordinate System

The only connection that hydrodynamic models have with any physical datum is their

Model Name	Resolution	Limits	# grid cells
North West Continental Shelf (CS3)	1/6° longitude 1/9° latitude (approx 12km)	48°N to 63°N 12°W to 13°E	11,800
High Resolution Continental Shelf (CS20)	1/60° latitude 1/40° longitude (horizontal resolution approximately 1 nautical mile (1.8km))	48°N-61°30'N 12°W-13°E (within the 200m depth contour at the continental shelf edge)	358,611
Eastern Irish Sea(EIS)	1/60° longitude 1/90° latitude (approx 1.2km)	53.2°N to 55°N 4.5°W to 2.7°W	10,446
English Channel	1/60° longitude 1/90° latitude (approx 1.2km)	48.5°N to 52°N 5.7°W to 4.1°E	72,782

bathymetry (water depth data), which is typically synthesised from a number of charts. This also defines the sea/land boundary in numerical models. The charts (and therefore the horizontal coordinates) used in any models predating 2000 are to OSGB36. Since 2000, the Admiralty has been adjusting charts to WGS84: were we to reconstruct all of our bathymetric datasets today, then WGS84 coordinates could be directly related to our models. As it is - formally one should apply the WGS84/OSGB36 correction. Practically, this will make little difference since the separation is of the order 100m worst case and the models within POLPRED all have a resolution lower than this. Therefore for practical purposes the latitudes and longitudes in POLPRED can be considered to be WGS84.

POLPRED: Accuracy in shallow/coastal waters

The higher the model resolution is then the more accurate the results will be for shallow/coastal waters. Higher resolution models also perform better where local features such as sandbanks might be a cause of concern.

The table above shows some of the more popular models developed by the NOC.

Validation

Model validation is carried out during the setup process with standard validation techniques. Both CS3 and CS20 model would have been fine tuned with tide gauge data at coastal locations during the initial runs of the model. CS20 validation is documented in the Technical Report for the Atlas of UK Marine Renewable Energy Resources.

3-D Models

The CS3 model provides depth-averaged currents. The CS3-3D model is a pseudo 3-D models which can provide current data at six different depth (sigma) levels deduced from the depth-averaged currents using a set of vertical current profiles. The CS20 is a true 3-D model with a much higher resolution in both the horizontal and the vertical. Running the CS20 model with 32 sigma levels used an improved vertical mixing scheme – the general ocean turbulence model[1]. This gives more accurate tidal currents, although it tends to have higher friction, hence slower currents in many regions. Vertical profiles are determined by how the bottom friction is transmitted through the water column by turbulent mixing (hence the importance of the turbulence model). If you require more info on the CS20 Sigma levels ask for the CS20 Sigma Levels Information Sheet available from the Marine Data Products Team at the National Oceanography Centre.

[1] *Umlauf, L., Burchard, H. and Bolding, K., 2005. GOTM – Scientific Documentation Version 3.2. No. 63 of Marine Science Reports, Baltic Sea Research Institute, Warnemünde, Germany*