Contents

1. Introduction
   1.1 General
   1.2 Major Tidal Constituents - Lunar
   1.3 Major Tidal Constituents - Solar
   1.4 Major Tidal Constituents - Shallow Water
1. Introduction

1.1 General

The following documentation gives a brief explanation of the most commonly used Harmonic constituents.

1.2 Major Tidal Constituents

Lunar

- **M₂**
  - The semi-diurnal constituent of a fictitious moon, which moves in a circular orbit in the plane of the equator.

- **N₂ & L₂**
  - Modulate M₂, converting the circular orbit of the fictitious moon into an elliptical one in the plane of the equator.

- **ν₂, λ₂, μ₂ & S₂**
  - Modulate M₂, allowing for the fact that the real moon’s orbit is not elliptical, but pear shaped, since the sun attracts it more at new moon than at full moon. This S₂ is not the main semi-diurnal constituent of the mean sun.

- **K₂**
  - Modulates M₂, converting the orbit from the plane of the equator into the mean plane of the real moon.

- **K₁ & O₁**
  - The diurnal constituents of a fictitious moon which has a fixed circular orbit in the mean plane of the real moon.

- **J₁, M₁ & Q₁**
  - Modulate K₁ & O₁, allowing for the fact that the moon’s orbit is not circular, but elliptical. M₁ is the sum of two constituents, which cannot easily be separated.

- **Mᵢ & Mₘ**
  - ‘Long Period’ lunar constituents, with periods of about a fortnight and one month respectively. They have very small amplitudes, and are often masked by meteorological and shallow water effects.

1.3 Major Tidal Constituents

Solar

- **S₂**
  - The semi-diurnal constituent of the mean sun, which moves in a circular orbit in the plane of the equator.

- **T₂**
  - Modulates S₂, allowing for the fact that the sun’s orbit is an ellipse. Another constituent, which operates with T₂, is so small that it is not named and is neglected.
Description of Harmonic Constituents

$K_2$  
Modulates $S_2$, allowing for the fact that the sun’s orbit is in the plane of the ecliptic. Another constituent, which operates with it, is so small that it is not named and is neglected. This $K_2$ has the same speed as the moon’s $K_2$, and the two are combined.

$K_1$ & $P_1$  
The diurnal constituents of a fictitious sun which has a circular orbit in the plane of the ecliptic. This $K_1$ has the same speed as the moon’s $K_1$, and the two are combined.

$S_{sa}$ & $S_a$  
‘Long Period’ solar constituents, with periods of about six months and one year respectively. They have very small amplitudes, and in practice cannot usually be distinguished from changes in MSL caused by prevailing winds and monsoons.

1.4 Major Tidal Constituents  
Shallow Water

$M_4$  
The second harmonic of $M_2$ with twice its speed.

$MS_4$  
A quarter diurnal constituent produced from $M_2$ & $S_2$. It has a speed equal to the sum of their two speeds.

$M_6$  
The third harmonic of $M_2$ with three times it’s speed.

$2MS_6$  
A sixth diurnal constituent produced from $M_2$ and $S_2$. It has a speed equal to the sum of twice the speed of $M_2$ plus the speed of $S_2$.

There are of course many other shallow water constituents with high harmonic frequencies, as shown in Annex B.