Mean Sea Level

Definitions :

France - SHOM

Niveau moyen (in french)
Si on retranche à la hauteur d'eau observée à un instant donné, la marée prédite au même instant, on obtient un résidu fonction du temps appelé *niveau moyen instantané*. La valeur moyenne de cette quantité constitue le *niveau moyen*. Ce calcul peut se faire sur 24h (niveau moyen journalier), sur un mois (niveau moyen mensuel) ou sur toute autre période.

Mean Sea Level (in English)
If we subtract the tidal prediction from the observed (tide gauge) sea level, the remainder is called instant mean sea level. The average of this value is the mean sea level. The calculation may be done on a 24 hours time (daily mean sea level), on a month (monthly mean sea level) or any other period.

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The average height of the surface of the sea at a tide station for all stages of the tide over a 19-year period, usually determined from hourly height readings measured from a fixed predetermined reference level (chart datum).

More thoughts from Jukka Varonen (27 April 2010)

1. The Mean Sea Level of Oceans

The Mean Sea Level on open sea is the mean location of the sea surface in relation to the centre of the Earth. This mean location may also be measured in relation to an Earth centred fixed body like GRS80-spheroid. (Geoid model as a reference is not a good choice, because the global change of the MSL deform the geoid ,too.)

> The MSL at a certain point can be measured with continuous satellite altimetry or by using a floating buoy equipped with GPS-receiver. The accuracy is however poor.
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> The MSL at a certain point have regular and irregular variations. The weather in general causes yearly variation. The changes of location and strength of primary ocean currents cause irregularities and the global variations of meteorological conditions cause the same. However, when integrated through all points over the oceans, the overall mean value should be constant???
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> There are two global effects which tend to raise the MSL of Oceans, the water mass is increasing (true or not?) and temperature of the water mass tend to raise causing increasing volume of the water mass. We know the trend, but do we know the true effect even locally. The overall effect is even more unknown.

2. The local Mean Sea Level on coast

The mean location of sea level in reference to the Earth Crust on the coast has significant practical applications, one example is Hydrography.

This MSL is always a local realization, although the use of several tide gauges is almost mandatory for eliminating the effects of the unstable (descending) soil on some of the tide gauges.

The observation series shall be long, minimum 20 years, preferably 100 years.

The resulting MSL is always epoch-related

For the calculation of the MSL one has several choices

a. pure mean value of all observation (the residuals nay show some trend!)

b. before calculation eliminate the effect of global rise of the oceans (which model?)

c. before calculation eliminate the effect of ascending or descending of the Earth crust on that particular coastline (which model?)

   Use of b or c or both

d. try to eliminate the both previous effects by having a linear trend as an unknown to be solved

e. use even more sophisticated models to eliminate known or unknown effects (example: the amount of water in the Baltic Sea has been continuously larger for the last 25 years, compared to streaming of the water through the Danish Straits in the earlier years of 1900:s)