



# SPECIFIC EDDY VISCOSITY FOR WAVE BOUNDARY LAYERS: CALIBRATION BY A TWO EQUATION $k-\omega$ MODEL

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## SPECIFIC EDDY VISCOSITY FOR WAVE BOUNDARY LAYERS: CALIBRATION BY A TWO EQUATION k- $\omega$ MODEL

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Coastal zones are of high vulnerability to natural hazards/disasters. Waves, currents and tides make coastal zones areas changing due to erosion and deposition of sediments. Thus, an understanding of sediment transport process in coastal zones is of crucial importance for accurate predictions of coast line evolution and sea-bed changes. However, the modeling of coastal sediment transport needs a compromise between two types of models: detailed mathematical models and engineering approaches. This compromise is imposed by on the one hand the accuracy of predictions and on the other hand the usability in practical applications. In coastal engineering practical accurate engineering models which take into account the more important involved physics, are needed.

In the engineering approach, the net (averaged over the wave period) total sediment transport is obtained as the sum of the net bed load and net suspended load transport rates (Fredsoe and Deigaard 1992). For suspended load, the net sand transport is defined as the sum of the net current-related and the net wave-related transport components. These suspended transport components require computation of the time-averaged suspended sediment concentration (SSC) profile and its integration in the vertical direction (van Rijn 2007). Computation of SSC needs the sediment diffusivity  $\varepsilon_s$  which is related to the eddy viscosity  $\nu_t$  by the parameter  $\beta$  (i.e., the inverse of the turbulent Schmidt number).

The aim of our study is to improve the prediction of SSC in wave boundary layers by using simple analytical tools which take into account the more important involved physics, for practical use in coastal engineering.

Our study will show that:

- For practical applications the period-averaged eddy viscosity could be described by a simple analytical formulation (Absi, 2010)
- The shape of the analytical period-averaged eddy viscosity formulation will be validated by BSL k- $\omega$  model (Suntoyo and Tanaka, 2009) for sinusoidal (figure 1) and asymmetric waves
- Period-averaged eddy viscosity profile depends on the wave non-linearity parameter and requires therefore a specific calibration.

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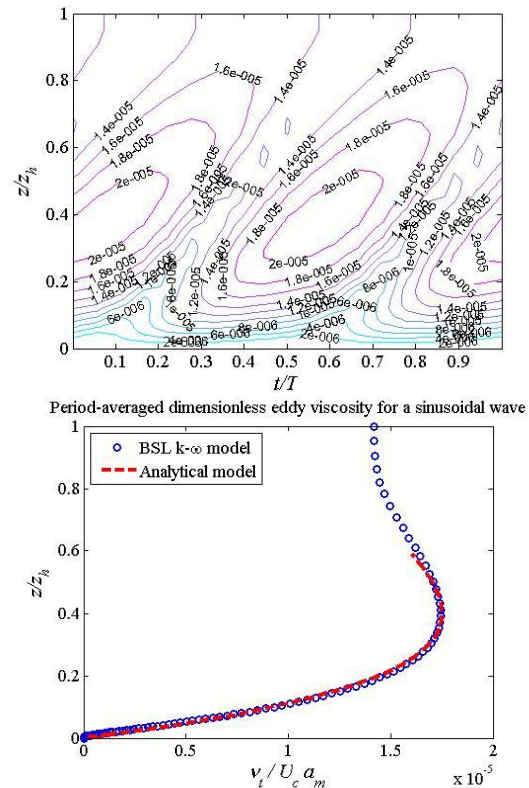


Figure 1 - Dimensionless eddy viscosity for sinusoidal wave; Top: Temporal and Spatial Variation obtained by BSL k- $\omega$  model; Bottom: Period-averaged dimensionless eddy viscosity.

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