EGU21-12069
https://doi.org/10.5194/egusphere-egu21-12069
EGU General Assembly 2021
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Development of surface roughness length and drag parameterizations over deep seas

Alberto Rabaneda
Institute of Marine Sciences (ICM-CSIC), Department of Physical Oceanography and Technology, Spain
(arabaneda@icm.csic.es)

Many formulations to determine the sea surface roughness length (z_0) have been proposed in the past. The well-known Charnock's equation is applied in most of the previous research. In this study, a different point of view is adopted to develop a new formulation. The starting point is an alternative method for surface roughness length calculation, i.e., the Lettau's method. This method has already been validated onshore in the presence of obstacles over a domain; for obstacles with a defined cross-section perpendicular to the wind direction plane. Over deep waters, it is expected to find only one type of obstacle, i.e., consecutive waves forming straight lines. Different wave systems and the presence of swell add complexity to determine the sea surface profile. Hence, the adaptation of Lettau's method seems reasonable, but the demonstrated dependency of z_0 to wave age cannot be neglected.

Wind-generated waves result from a kinetic energy transfer between the atmosphere and the sea surface. However this physical process is not represented in the well-known logarithmic law. While this effect can be neglected onshore, in offshore environments it can be significant, as 20% of the time z_0 is found to be over the expected range. Therefore, a kinetic energy transfer correction is included into an offshore logarithmic law. With an aerodynamic z_0, achieved by the adaptation of the Lettau's equation, and the new offshore logarithmic law, an empirical method for the kinetic energy transfer correction is proposed.