中文摘要

針對養殖池的水溫，利用不連續、完全混合之水平容積團塊假設發展出描述溫度垂直分佈的數學模式。介於水池表面與空氣之間的熱交換以應用於水庫、湖泊及污水處理池之熱平衡理論與經驗關係計算。水柱中的熱傳遞則是利用紊流擴散與溫度梯度來推導。於民國八十二年九月八日至九月十五日進行虱目魚池現場實測，實測資料包括不同深度的水溫及氣候因子（日射量、空氣溫度、相對濕度及風速），並分析其二十四小時中的變化情形。利用四階 Runge-Kutta 法求出的數值解與實測值進行模式驗證，結果吻合(上層水溫誤差值為±0.5℃，下層則為±1.5℃），顯示本模式可適用於淺水養殖池。

關鍵詞：養殖池；溫度變異；熱分層

Abstract

A mathematical model to describe the vertical temperature distributions in shallow aquaculture ponds is presented from the viewpoint of discrete, completelymixed, and horizontal volume lumps assumptions. The theoretical and empirical relationships applied to heat balance calculations in lakes, reservoirs and waste treatment ponds are used to calculate the energy exchange between pond surface and atmosphere. Energy transfer between volume lumps is derived via the turbulent mixing and the temperature gradient. A field measurement is implemented in a milk fish pond during September 8-15, 1993. Measurements included water temperature at different pond depths and various meteorological factors (solar irradiance, air temperature, relative humidity and wind velocity) in which 24-hr variations were analyzed. The responses from the model solved by 4th-order Runge-Kutta method are found to compare favorably with that from field measured results (the errors of upper volume lumps are ±0.5℃, while ±1.5℃ for the lower volume lumps). Therefore, the model is capable of predicting water temperature at each volume lumps.

Keywords：Aquaculture pond ; Temperature variation ; Thermal stratification