Karlstad Applied Analysis Seminar (2021)

Meiron Zollmann, Tel Aviv University, Israel

January 27, Wednesday, 10:30

Multi-Scale Modeling of Intensive Macroalgae Cultivation and Marine Nitrogen Sequestration

Abstract

Multi-scale macroalgae growth models are required for the efficient design of sustainable, economically viable and environmentally safe farms. Here, we develop a multi-scale model for Ulva sp. macroalgae growth and nitrogen sequestration in an intensive cultivation farm, regulated by temperature, light and nutrients. The model incorporates a range of scales by incorporating spatial effects in two steps: light extinction at the reactor scale (1 m) and nutrient absorption at the farm scale (1 km). The model was validated on real data from an experimental reactor installed in the sea. Biomass production rates, chemical compositions and nitrogen removal were simulated under different seasons, levels of dilution in the environment and water-exchange rate in the reactor. This multi-scale model provides an important tool for environmental authorities and seaweed farmers who desire to upscale to large bioremediation and/or macroalgae biomass production farms, thus promoting the marine sustainable development and the macroalgae-based bioeconomy