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Biophysical modelling of phytoplankton communities from first principles using two-layered spheres: Equivalent Algal Populations (EAP) model

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Abstract:

There is a pressing need for improved bio-optical models of high biomass waters as eutrophication of coastal and inland waters becomes an increasing problem. Seasonal boom conditions in the Southern Benguela and persistent harmful algal production in various inland waters in Southern Africa present valuable opportunities for the development of such modelling capabilities. The phytoplankton-dominated signal of these waters additionally addresses an increased interest in Phytoplankton Functional Type (PFT) analysis. To these ends, an initial validation of a new model of Equivalent Algal Populations (EAP) is presented here. This paper makes a first order comparison of two prominent phytoplankton Inherent Optical Property (IOP) models with the EAP model, which places emphasis on explicit bio-physical modelling of the phytoplankton population as a holistic determinant of inherent optical properties. This emphasis is shown to have an impact on the ability to retrieve the detailed phytoplankton spectral scattering information necessary for PFT applications and to successfully simulate reflectance across wide ranges of physical environments, biomass, and assemblage characteristics.