

OCEAN OPTICS XXIV

Valamar Lacroma Dubrovnik Hotel | Dubrovnik, Croatia | October 7–12, 2018

<https://oceanopticsconference.org>

Wednesday, October 10

Oral Session 8

14:00–16:00

15:40–16:00

A MODEL FOR DERIVING BENTHIC IRRADIANCE IN THE GREAT BARRIER REEF LAGOON USING MODIS SATELLITE IMAGERY

We developed a new ocean color model to derive benthic photosynthetically active radiation (bPAR) for waters of the Great Barrier Reef Marine Park (GBRMP), Australia. For coral reefs and other marine environments, the underwater light field is critical to ecosystem health. However, for the GBRMP, which spans 344,400 km², bPAR is still poorly understood as data currently do not exist at relevant spatial and temporal scales. We addressed this challenge by using satellite-derived bPAR from MODIS-Aqua imagery. The bPAR model uses: (i) surface values of the downwelling solar irradiance, $E_s(\lambda)$, (ii) high-resolution bathymetry data, and (iii) the spectral diffuse attenuation coefficient, $K_d(\lambda)$, calculated from derived spectral inherent optical properties. Using Beer-Lambert law, $E_s(\lambda)$ is propagated to the seafloor and spectrally integrated to derive instantaneous bPAR. Matchups between concurrent satellite-derived bPAR and in situ values recorded at several depths indicate that the model performs very well in the GBRMP with an average relative measurement error of 22%, a multiplicative bias range of 0.90 – 1.05 (e.g., the model on average is 10% lower or 5% greater than the observed values), and regression metrics of $r^2 = 0.60 - 0.78$, slope = 0.98 – 1.22 and intercept = -0.28 – 0.06. We demonstrate the model in central GBRMP, revealing patterns of strong inter- and intra-annual variability. Our model will be highly valuable to assess changes in bPAR in response to drivers, and its effects on benthic primary productivity. Concurrent work is also underway evaluating bPAR as a potential GBRMP water quality metric.

Marites Canto, James Cook University, marites.canto@my.jcu.edu.au, <https://orcid.org/0000-0001-8274-3438>

Lachlan McKinna, Go2Q Remote Sensing Solutions, lachlan.mckinna@go2q.com.au

Katharina Fabricius, Australian Institute of Marine Science, k.fabricius@aims.gov.au

Yvette Everingham, James Cook University, yvette.everingham@jcu.edu.au