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TITLE: Big Geospatial Data Analytics for Global Mangrove Biomass and Carbon Estimation

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ABSTRACT:

The objective of this study is to estimate the biomass and carbon of global-level mangroves as a special type of wetland. Mangrove ecosystems play an important role in regulating carbon cycling, thus having a significant impact on global environmental change. Extensive studies have been conducted for the estimation of mangrove biomass and carbon stock. However, this estimation at a global level has been insufficiently investigated because the spatial scale of interest is large and most existing studies are based on physically challenging fieldwork surveys that are limited to local scales. Over the past few decades, high-resolution geospatial data related to mangroves have been increasingly collected and processed using remote sensing and Geographic Information Systems (GIS) technologies. While these geospatial data create potential for the estimation of mangrove biomass and carbon, the processing and analysis of these data represent a big data-driven challenge. In this study, we present a spatially explicit approach that integrates GIS-based geospatial analysis and high-performance parallel computing for the estimation of mangrove biomass and carbon at the global level. This integrated approach provides support for enabling and accelerating the global-level estimation of mangrove biomass and carbon from existing high-resolution geospatial data. With this integrated approach, the total area, biomass (including above- and below-ground), and associated carbon stock of global mangroves are estimated as 130,420 km<sup>2</sup>, 1.908 Pg, and 0.725 Pg C for the year of 2000. The averaged aboveground biomass density of global mangroves is estimated as 146.3 Mg ha<sup>-1</sup>. Our analysis results demonstrate that this integrated geospatial analysis approach is efficacious for the computationally challenging estimation of global mangrove metrics based on high-resolution data. This global-level estimation and associated results are of great assistance for promoting our understanding of complex geospatial dynamics in mangrove forests.

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