High and medium resolution, optical and SAR satellite data fusion for aquaculture ponds mapping in Brazil

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**Abstract.** In the last decade, aquaculture in Brazil has grown substantially due to the high request for fresh fish products in the national markets. This activity can threaten wetland habitats without proper environmental and landscape planning and management. The uncontrolled introduction of dams along the stream network may profoundly change or deplete the ecosystems' biodiversity and related functions. Moreover, conflicts may arise between different and competitive water users since it relies on scarce resources. In this context, aquaculture ponds mapping, and monitoring can be very relevant for analyzing the environmental impacts of this activity and pursuing a more effective rural landscape planning and management. The application of geographic object-based (OB) image analysis techniques in the Google Earth Engine (GEE) cloud environment has increased rapidly due to the broadly-recognized advantages in applying these approaches to medium or high-resolution images. In this context, this work aims to assess the fusion of high and medium resolution satellite data, available both in the optical and SAR (Synthetic Aperture Radar) domain, to implement an OB approach for aquaculture ponds mapping within GEE. To this aim, we compare various classification approaches (both pixel- and object-based, all based on the Random Forest, Machine Learning algorithm) where the satellite datasets are used according to different levels of integration and combination. The study areas in Rondonia State, Brazil, were selected considering the high presence of fishponds mixed with other surface water bodies. The OB approach produced a sensible improvement in the classification accuracy with all the dataset combinations. Integrating high- and medium-resolution data in the OB approach improved classification accuracy substantially. This study demonstrated the applicability of the OB approaches in GEE even in vast study areas and on high-resolution imagery. The methodology can be applied in future diachronic analysis to assess and monitor the introduction of aquaculture ponds to address sustainable planning and management of these human activities.

References

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