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Improvement of Hydrodynamic Models of Shallow Water Bodies Using Combined Eulerian and Lagrangian Observations

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This study focuses on improving hydrodynamic modelling in shallow water estuaries using GPS tracked Lagrangian drifter data. The inclusion of drifter data will improve hydrodynamic models, which are commonly used to assess and manage risks of flooding, sediment transport, and pollutants. Additionally, this approach presents opportunities to better understand the impacts of infrastructure and land management activities on waterways and identifies vulnerabilities of lakes and river estuary environments, as well as relevant adaptability strategies. The management of these shallow water bodies relies on the outputs of hydrodynamic models calibrated with field measurements. Traditionally, Eulerian hydrodynamic models used in shallow water systems are calibrated using observations from fixed instruments. With the recent availability of inexpensive GPS tracked drifters that can be deployed in shallow estuaries, a higher density of data can be collected, that can improve the confidence in the hydrodynamic model outputs. Here we present the assimilation procedure and results of calibrating a hydrodynamic model for shallow waters using Lagrangian observations in addition to fixed measurements. The numerical model Delft3D was set up for Currimundi Lake in South East Queensland, which is an ICOLL (Intermittently Opening and Closing Lake or Lagoon).We investigate the effectiveness of assimilated Lagrangian drifters data on improving the accuracy of the spatiotemporal velocity and water height distributions. The calibrated numerical model will further be used for modelling advection-dispersion of potential contamination, sediment transport, and flood modelling within the channel.