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Development of geospatial data-based nutrient models at the global scale: influence of dataset spatial resolution on Kappa map comparison statistics and geospatial catchment descriptors

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There is increasing concern at global and local scales on the impacts of nitrogen (N) and phosphorus (P) loads to sensitive fresh water ecosystems and the coastal zone. Land use activities cause the release of N and P from terrestrial systems to aquatic waterways. The use of geospatial datasets to help understand land-ocean interactions has increased dramatically over the last 10 years. This is because global scale studies are now required to link climatic change, changes in population and land use with land surface processes. Model development and performance are dependant on the data that are used in their development and operation. Due to inadequacies of our process knowledge and data availability at the global scale, empirical and lumped semi-process based models are widely used.

As part of a project to address these issues, we developed stochastic socio-ecological models that estimate the annual global riverine exports of N and P. During model development we explored some of the uncertainties associated with global scale models. Digital elevation model (DEM) resolution is an important factor in catchment modelling exercises. In this paper we report on a map comparison exercise using crisp and fuzzy measures of agreement assessing the goodness of fit of a widely used coarse (0.5^o) (stn30p) and a fine ($1\ km^2$) (Hydro1k) resolution DEM with a large database

of geospatial catchment descriptors. We found that there was a higher level of agreement with the finer resolution datasets. In addition, we have made novel applications of ways to examine the reproducibility of the extracted data and the error associated using mean square prediction error.