Mapping diversity indices: a false simple question

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Abstract: Mapping diversity is central to numerous research and applied fields in ecology. Mapping species diversity indices allows monitoring spatial and/or temporal variation in communities faced to environmental and human impacts, and helps identifying areas for effective conservation planning and management. Two approaches can be considered to map diversity: (i) the indirect approach, which consists in modeling individual species distributions, then stack the distributions of all species and map the desired diversity index and (ii) the direct approach which relies on mapping directly the desired diversity index. The latter approach is inaccurate because diversity indices are non additive. Therefore, the variance and some of its derivatives like the variogram are not appropriate tools to measure variability. β-diversity, which quantifies the turnover between locations, has thus been

investigated. More precisely, we integrated the variograms of β-diversity (i.e. the betagram) within the interpolation procedures. We then confronted results of this novel direct approach with the outcomes of i) the direct kriging estimation of α-diversity and ii) the indirect approach based on individual kriging maps. Two diversity indices were considered in this study: species richness and Rao's quadratic entropy that we applied on 18-years of surveys of the fish community in the northwestern Mediterranean Sea. We finally showed that none of the approaches performed well, for different reasons, and that further methodological development is still needed.