Machine learning, classification or clustering? Can we make use of the massive data sets obtained from Laser Optical Particle Counters for assessing biodiversity or species distribution?

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Monitoring of zooplankton on relevant scales to obtain meaningful distribution patters, to identify behaviour rules or to define environmental constraints, requires information on high temporal and spatial scale. Devices allowing for high frequency sampling on small scales like laser optical particle counters (LOPC), flow cams or video plankton recorders (VPR) have thus turned from beyond state of the art to commonly applied tools in marine science. Analysing and organizing the massive data output is still challenging and requires special techniques and database structures. Here we focused on the analysis of multi element particles (MEP) obtained from an LOPC. We compared and calibrate the output to/with zooplankton images sampled with a VPR, field data collected with bongo and multinets and vertical profiles obtained from ADCP. We applied different statistical and machine learning algorithms like classification trees, cluster analysis, PCA, self-organizing maps and neural nets to categorize MEPs to genus level and to identify spatial patterns. Samples originated from a transect across the North Sea performed in July 2014 where a remotely operated towed vehicle was deployed from Helgoland (German Bight) to Stonehaven (Scotland), connecting two long term sampling locations. Quality of MEP classification in separate validation experiments was about 40 and 80% but depended on the zooplankton class. High numbers of echinodermata larvae were observed close to the shore and at topographic features like the Dogger Bank, pteropods reached high concentrations in specific local spots like Devils Hole, gelatinous Zooplankton was mainly observed in offshore areas.

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