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A tactical modeling system applied to local surface drift and sound speed profile estimation

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Traditionally operational environmental support tends to loose reliability when considering smaller scale, shorter period environmental forecasts and analysis. These limitations are more important when considering fully relocatable systems or when monitoring data is sparse.

The NATO Tactical Ocean Modeling System (NTOMS) project running at the NATO Undersea Research Centre (NURC) was designed to address these shortfalls. It proposes a hierarchical methodology for environmental support that starts from the available operational information, builds a reliability flag based on statistical analysis and environmental model ensemble and introduces high resolution sampling and stochastic-feature modelling as a solution to improve the reliability and resolution of local end-products. The most complex and accurate products are to cover relocatable small area of interest, during limited periods of time, and are to be used either organically, on an unsupervised mode, or through netcentric support systems.

Multimodel superensemble forecasts, which exploit the power of an optimal local combination of individual models usually show superior forecasting skills when compared to individual models because they allow for local correction and/or bias removal. Here we apply linear and non-linear statistical methods to generate optimal superensembles from atmospheric, ocean, wave operational models and available local observations. Optimisation methods are based on a training/forecast cycle and include simple least-square methods, neural networks and genetic algorithms.

The performance and the limitations of the superensembles and the individual models are illustrated and discussed for ocean surface drift modelling and forecast of acoustic properties. These preliminary implementation examples, using a supervised method-

ology and simplified stochastic modelling, have shown for surface drift and sound speed profile related products, efficiency and reliability could significantly increase, when compared to using standard operational support. Embedded feature modeling also shown to locally improve the representation of the sub-mesoscale dynamics.

It was concluded the NTOMS approach could produce short term, locally more accurate oceanographic field estimation, accounting for the tactical modeling requirements. Furthermore, migration towards unsupervised and fully operational methods will require to improve model ensemble techniques, to improve stochastic-feature modelling and a more in depth exploitation of autonomous and/or remote environmental survey tools (e.g. SEPTR, acoustic tomography, radar and glider technologies).