

MODELLING FORECAST ERROR STATISTICS using GAUSSIAN ANAMORPHOSIS

C.E. Testut^a, G. Garric^a, C. Perruche^a, L. Parent^a, E. Greiner^b and J.-M. Brankart^c

^a*Mercator-Ocean, Ramonville Saint Agne, France*, ^b*CLS, Ramonville Saint Agne, France*, ^c*LGGE/CNRS, Grenoble, France, ctestut@mercator-ocean.fr*

Mercator-Ocean has developed a hierarchy of ocean analysis and forecasting systems designed to simulate the global ocean circulation (from $1/4^\circ$ to $1/12^\circ$). These systems are based on the NEMO ocean/sea ice coupled model and the multivariate data assimilation system SAM2 (Système d'Assimilation Mercator V2). An extension of the coupling to the biogeochemical component using the PISCES model is also under development. However, up to now, in the real time operational applications, only the ocean component is controlled by the assimilation using in situ Temperature and Salinity vertical profiles, satellite Sea Surface Temperature and Altimetry. In practice, this assimilation scheme is based on a reduced order Kalman filter derived from the SEEK filter. The background error of the SAM2 method is represented by an ensemble of multivariate state vectors defining a subspace of the control space. In the future, Mercator-Ocean has then planned to extend the assimilation control both to the sea ice component and to the biogeochemical component. For the ice model or the biogeochemical model, the prior ensemble defining the forecast error statistics could be built from a free simulation as it is done for the oceanic component. However, the distributions of variables like the sea ice concentration or the chlorophyll are particularly not Gaussian, breaking the assumption of the linear analysis concerning the background error. This property could be restored by application of an anamorphic transformation based on the prior ensemble. This study presents the transformation algorithm in the context of an application on the sea ice or the biogeochemical quantities. The method will be illustrated by multivariate representers showing the extrapolation from observed to unobserved non-Gaussian variables like the sea ice thickness. Results using simple analysis scheme will be also presented in order to evaluate the impact on the statistical estimation step.