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Ocean Science Discussions

Interactive comment on "DINEOF reconstruction of clouded images including error maps. Application to the Sea-Surface Temperature around Corsican Island" *by* J.-M. Beckers et al.

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General comments:

The authors recently developed a method for filling gaps in SST images. That method (DINEOF) was shown to be more accurate than OI and significantly cheaper, the only disadvantage with respect to OI being the capability of the latter to yield spatial distributions of statistical errors associated with the interpolation process. With this new paper that disadvantage disappears, since the authors demonstrate that errors associated with the DINEOF method can be taken from OI. The paper is clear, rigorous and well written. I only have some comments that might help to clarify specific aspects.

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Specific comments:

- Pag. 741, expression (13): as it is written it seems that by truncating the EOF expansion at a number N one exactly eliminates the actual noise (the variance of which is defined in (7)) and keeps the true signal from the original data set. Obviously this is not ensured by the method, otherwise you would have a perfect method !. I would suggest to state here (instead of after (17) and prior to (18)) that you assume that the first N EOFs contain signal and the remaining EOFs some noise, but stating also that this 'noise' does not necessarily match the actual noise in the sense of the OI definition (7).

- Pag. 743, l. 15: when introducing (18) it could be useful to remark that the assumption of uncorrelated errors (i.e., that R=I) is a strong one in the case of satellite data, and that this point will be addressed in section 6.3.

- Section 6.3 (pag. 754): the way of circumventing the problem of considering a non-diagonal error matrix R leading to (51) is not clear to me (but perhaps it is clearly explained in Barth et al., 2006).

- Still in section 6.3 (pag. 755, l. 26-27): it is stated that the correlation length of the SST anomalies should be larger than the correlation length of the observational error. This is usually the case for in situ measurements, but what prevents satellite data to be contaminated by large scale noise, e.g. derived from atmospheric corrections applied to raw data ?.

- Related to the previous point: the value of the correlation length of the SST anomalies is computed by fitting an exponential function exp{-d/L} to the correlation of SST data. Thus, this value would be different if the fitted function was different (e.g., a gaussian exp{-d2/2L2}). Is there any way of ensuring that these definitions of L are consistent with the L appearing in (52) and (53) ?.

- Section 6.4 (pag. 759): why not using an artificially clouded image, so that the results

OSD

3, S206–S208, 2006

of DINEOF, OI and the error maps can be checked against actual values ?. Moreover, the chosen case does not seem the most adequate, in the sense that the cloud coverage is somehow related (in shape) with the spatial structure of the actual field (or at least with the spatial structure of the recovered field).

- Pag. 759, l. 18-20: it is stated that “It is unlikely that an OI method using an isotropic and homogeneous error covariance would be capable of reconstructing the Northern Current in a situation where very few data are available”. This is true, but it is also true that when OI is used to fill data gaps in satellite images, the correlation function is usually not taken as homogeneous and isotropic. Satellite data are precisely one of the few data sets that allow to use point-to-point (i.e., non-homogeneous, non-isotropic) correlation functions.

- Pag. 760, l. 5: it is stated that “the SST on 30 December is notably colder than on 26 December”. How do you know it if the image of December 30 is completely clouded to the west of Corsica ? (are they real clouds or artificial clouds so that you know the actual values ?).

Other minor points:

- Pag. 736, l. 18: “Ěthe signal/noise ratio of the data are be perfectly known...” - Pag. 741, just before (13): should the upper index of  be ‘m’ instead of ‘n’ ? - Pag. 745, l. 20-21: “Using covariance matrixes based only on available data” - Pag. 747, l. 1: when stating the equivalence between (29) and (30) it would be helpful to send the reader to the Appendix (the reduction of the dimension of the problem stated in (29)-(30) is a crucial point). - Pag. 756, l. 12-15:: from the given values, the factor between the internal radius of deformation and its associated wavelength is about 6. I have seen other works setting this factor to 4, since the wavelength is considered equal to 2 times the diameter of the structures. Any comment on this ?

Interactive comment on Ocean Sci. Discuss., 3, 735, 2006.