

EGU21-16382

<https://doi.org/10.5194/egusphere-egu21-16382>

EGU General Assembly 2021

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Estimating and modeling spatio-temporal complex-valued covariance functions

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Oceanographic data belong to the wide class of vectorial data, for which the decomposition in modulus and direction is meaningful, and the vectorial components are characterized by homogeneous quantities, with the same unit of measurement. Another feature of oceanographic data is that they exhibit spatio-temporal dependence.

In Geostatistics, such data can be properly modelled by recalling the theory of complex-valued random fields. However, in the literature, only techniques for modeling and predicting the spatial evolution of these phenomena were proposed; while the temporal dependence was analyzed separately from the spatial one, or just time-varying complex covariance models were used. Thus, the novelty of this paper regards some advances of the complex formalism for analyzing complex data in space-time and new classes of spatio-temporal complex covariance models.

A case study on spatio-temporal complex estimating and modeling with oceanographic data is provided and a comparison between two classes of complex covariance models is also proposed.