Geophysical Research Abstracts
Vol. 20, EGU2018-3738-1, 2018
EGU General Assembly 2018

A comparison between different approaches for detecting fronts using the Sea Surface Temperature product of the Sentinel-3 SLSTR instrument

Milto Miltiadou (1), Christiana Papoutsa (1), Vassilia Karathanassi (2), Polychronis Kolokousis (2), Dimitris Sykas (3), Virginie Lafon (4), Maria Prodromou (1), and Diofantos Hadjimitsis (1)

(1) Eratosthenes Research Centre, Department of Civil Engineering and Geomatics, Faculty of Engineering and Technology, Cyprus University of Technology, Limassol, Cyprus (christiana.papoutsa@cut.ac.cy), (2) Department of Topography, School of Rural and Surveying Engineering, National Technical University of Athens, Athens, Greece (karathan@survey.ntua.gr) , (3) Planetek Hellas, Athens, Greece (sykas@planetek.gr), (4) i-SEA, Bordeaux, France (virginie.lafon@i-sea.fr)

This research is part of the SEO-DWARF project which is funded under the H2020 MSCA-RISE call. The overarching aim of SEO-DWARF is the development of a web-based platform for marine applications, whereby the user can query and retrieve processed Sentinel images using natural language. At the end of the project, this platform offers the advantage to the end-users to search and retrieve the suitable Sentinel data according to their needs (phenomenon of interest) and as a result support the end-users to use Sentinel data in a more efficient and simplified way.

The aim of this study is to compare different methodologies that are suitable for marine front detection. Fronts are sharp boundaries between water masses with distinct variations in surface temperature, salinity, colour and/or surface slope. According to previous studies, it is well known that many fronts are identifiable by their strong temperature gradient. This research uses the Sea Surface Temperature (SST) product provided by the Copernicus Online Data Access. The SST is obtained by means of the three infra-red channels (3.74, 10.85 and 12 μm) of the Sentinel-3 SLSTR instrument, after been highly calibrated.

Four approaches of detecting fronts are implemented, tested and compared in the current study. The Laplacian and the Canny edge which are edge detection algorithms; and the k-means and the Mean Shift which are unsupervised clustering methods. Based at the results of the study, it was indicated that the Laplacian edge detection overestimates fronts, while the Canny edge detection algorithm underestimates them. Overall, the clustering approaches produce better results. The k-means clustering is a fast algorithm with good results, but the number of clusters needs to be pre-defined. The Mean Shift performs better, having the advantage that the number of clusters is automatically calculated, but it is very slow in comparison to the k-means. Finally, it is worth highlighting that the results are improved using the appropriate filtering and/or image enhancements. For example, the results of the Canny Edge detection algorithm were significantly better when a histogram equalisation image enhancement was applied before the Canny Edge.

The European commission suggests that all EU countries should take actions where fronts exist (e.g., introducing limitations on fishing). The flow patterns of fronts create zones that are enriched with food and resources for marine organisms, while climate change affects fish distributions and the productivity of marine species. It is therefore of high importance to systematically detect fronts in order to take the appropriate actions for preserving a resilient marine environment.