

Accurate Monitoring of the Danube Delta Dynamics using Copernicus Data

Corneliu Octavian Dumitru¹, Gabriel Dax^{1,2}, Gottfried Schwarz¹, Constantin Cazacu^{3,4}, Mihai Cristian Adamescu⁴, and Mihai Datcu¹

¹German Aerospace Center (DLR), Münchener Str. 20, 82234 Weßling, Germany

²Fachhochschule Salzburg, Urstein Süd 1, 5412 Puch bei Hallein, Austria

³Department of Systems Ecology and Sustainability, University of Bucharest, Romania

⁴Research Center in Systems Ecology and Sustainability, University of Bucharest, Romania

Emails: corneliu.dumitru@dlr.de, gottfried.schwarz@dlr.de, gabriel.dax@dlr.de, constantin.cazacu@g.unibuc.ro, mihaicristian.adamescu@g.unibuc.ro, mihai.datcu@dlr.de

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Abstract:

The Danube Delta is the second largest river delta in Europe and is the best preserved one on the continent and is inscribed on the UNESCO World Heritage List due to its biological uniqueness [1]. The Delta is formed around the three main channels of the Danube, named after their respective ports Chilia (in the north), Sulina (in the middle), and Sfântu Gheorghe (in the south). The greater part of the Danube Delta lies in Romania (Tulcea County), while its northern part, on the left bank of the Chilia arm, is situated in Ukraine (Odessa Oblast). Its total surface is 4,152 km². The waters of the Danube, which flow into the Black Sea, form the most pristine delta in Europe.

In the image processing literature there are not many studies treating the Danube Delta, especially for SAR data [2-4]. However, the monitoring of biodiversity from in-situ measurements has attracted more interest [5].

In this paper, we propose to use high-resolution Copernicus data in order to analyze the diversity of categories that can be extracted (using Sentinel-2 data) and to monitor the map-projected five-day evolution of the area within a period of seven months between November 2015 and May 2016 (using Sentinel-1 data with the advantage of being cloud free). For doing this, we propose and investigate three complementary methods: (1) Classification and change maps using active learning based on Support Vector Machine (SVM) [6]; (2) Coastline detection for change detection based on a correlation between polarimetric channels, the histogram, and the correlation map [7]; (3) Change detection based on Normalized Compression Distance (NCD) [8]. For each category, these classification results will be compared with reference ground truth data based on precision/recall metrics.

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