An Image Segmentation Algorithm for Isolating Ocean Fronts of Interest

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***Abstract*—Ocean fronts are one of the main transportation means for material and energy in the ocean. The research on detecting ocean fronts has become a hot topic in oceanographic research in the last few years. Although current research techniques can accurately detect ocean fronts from remote sensing images, the detection results frequently encompass all ocean fronts present across the entire ocean region. Ocean fronts often exhibit complex and dynamic behavior, with multiple fronts overlapping and covering each other in space and time. As a result, it has become challenging to isolate and independently analyze specific ocean fronts of interest. To address this issue, this paper proposes an image segmentation algorithm to segment ocean fronts. This segmentation method contributes to the advancement of oceanographic studies and supports improved understanding of the intricate dynamics within marine ecosystems.**

***Index Terms*—Ocean Front, Remote Sensing, Image Segmentation.**

I. Introduction

IMAGE segmentation is the technique used to partition an image into a certain number of specific and unique regions, which can then be used to propose objects of interest. Ocean front image segmentation is of great significance for the statistical and correlation analysis of ocean fronts. In this paper, we propose an image segmentation method aimed at independently segmenting ocean fronts of interest from ocean front images.

II. Method

In this paper, we implement our segmentation method on the China Coastal ocean front dataset [1]. This dataset contains ocean front images detected using the Multiscale Microcanonical Formalism (MMF) model [2]. Our ocean front segmentation method mainly includes the following steps: (1) removing coastal boundaries and islands from ocean front detection results, (2) removing noise from the resulting image, (3) using morphological method to isolate overlapping ocean fronts, (4) numbering the ocean fronts segmented, and (5) restoring the position and value of the ocean fronts.

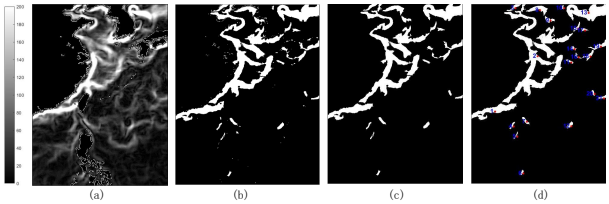

Fig. 1. Results of some key steps of the proposed segmentation method.

III. Results

Some image segmentation results are shown in Fig. 1. The coastal boundaries of the ocean front image (Fig. 1 (a)) are removed, and the remaining is clean ocean fronts (Fig. 1 (b)). Noises, including small ocean fronts, are eliminated. Then, a morphological method is applied to segment the overlapping ocean fronts. Finally, several ocean fronts of interest are isolated. The isolated ocean fronts are restored to their value and position in the ocean front image (Fig. 1 (c)). After that, the isolated ocean front are numbered and labeled according to the horizontal ordinate in the segmentation image (Fig. 1 (d)).

IV. Conclusion

The segmentation method proposed in this paper can segment ocean fronts from complex backgrounds, providing clean and independent ocean fronts. By effectively segmenting the fronts of interest, researchers can conduct further in-depth analysis to understand the ocean front's unique characteristics, ecological impacts, and responses to environmental changes.

References

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