

## Analysis of the Impact of Suez Canal on the Robustness of Global Shipping Networks

**Authors :** Zimu Li, Zheng Wan

**Abstract :** The Suez Canal plays an important role in global shipping networks and is one of the most frequently used waterways in the world. The 2021 canal obstruction by ship Ever Given in March 2021, however, completely blocked the Suez Canal for a week and caused significant disruption to world trade. Therefore, it is very important to quantitatively analyze the impact of the accident on the robustness of the global shipping network. However, the current research on maritime transportation networks is usually limited to local or small-scale networks in a certain region. Based on the complex network theory, this study establishes a global shipping complex network covering 2713 nodes and 137830 edges by using the real trajectory data of the global marine transport ship automatic identification system in 2018. At the same time, two attack modes, deliberate (Suez Canal Blocking) and random, are defined to calculate the changes in network node degree, eccentricity, clustering coefficient, network density, network isolated nodes, betweenness centrality, and closeness centrality under the two attack modes, and quantitatively analyze the actual impact of Suez Canal Blocking on the robustness of global shipping network. The results of the network robustness analysis show that Suez Canal blocking was more destructive to the shipping network than random attacks of the same scale. The network connectivity and accessibility decreased significantly, and the decline decreased with the distance between the port and the canal, showing the phenomenon of distance attenuation. This study further analyzes the impact of the blocking of the Suez Canal on Chinese ports and finds that the blocking of the Suez Canal significantly interferes with China's shipping network and seriously affects China's normal trade activities. Finally, the impact of the global supply chain is analyzed, and it is found that blocking the canal will seriously damage the normal operation of the global supply chain.

**Keywords :** global shipping networks, ship AIS trajectory data, main channel, complex network, eigenvalue change

**Conference Title :** ICMTSD 2022 : International Conference on Maritime Transport and Ship Design

**Conference Location :** New York, United States

**Conference Dates :** April 25-26, 2022