



CHAPTER 9

TIDES AND TIDAL CURRENTS

ORIGINS OF TIDES

900. Introduction

Tides are the periodic motion of the waters of the sea due to changes in the attractive forces of the Moon and Sun upon the rotating Earth. Tides can either help or hinder a mariner. A high tide may provide enough depth to clear a bar, while a low tide may prevent entering or leaving a harbor. Tidal current may help progress or hinder it, may set the ship toward dangers or away from them. By understanding tides and making intelligent use of predictions published in tide and tidal current tables and descriptions in sailing directions, the navigator can plan an expeditious and safe passage through tidal waters.

901. Tide and Current

The rise and fall of tide is accompanied by horizontal movement of the water called tidal current. It is necessary to distinguish clearly between tide and tidal current, for the relation between them is complex and variable. For the sake of clarity mariners have adopted the following definitions: Tide is the vertical rise and fall of the water, and tidal current is the horizontal flow. The tide rises and falls, the tidal current floods and ebbs. The navigator is concerned with the amount and time of the tide, as it affects access to shallow ports. The navigator is concerned with the time, speed, and direction of the tidal current, as it will affect his ship's position, speed, and course.

Tides are superimposed on nontidal rising and falling water levels, caused by weather, seismic events, or other natural forces. Similarly, tidal currents are

superimposed upon non-tidal currents such as normal river flows, floods, and freshets.

902. Causes of Tides

The principal tidal forces are generated by the Moon and Sun. The Moon is the main tide-generating body. Due to its greater distance, the Sun's effect is only 46 percent of the Moon's. Observed tides will differ considerably from the tides predicted by equilibrium theory since size, depth, and configuration of the basin or waterway, friction, land masses, inertia of water masses, Coriolis acceleration, and other factors are neglected in this theory. Nevertheless, equilibrium theory is sufficient to describe the magnitude and distribution of the main tide-generating forces across the surface of the Earth.

Newton's universal law of gravitation governs both the orbits of celestial bodies and the tide-generating forces which occur on them. The force of gravitational attraction between any two masses, m_1 and m_2 , is given by:

$$F = \frac{Gm_1m_2}{d^2}$$

where d is the distance between the two masses, and G is a constant which depends upon the units employed. This law assumes that m_1 and m_2 are point masses. Newton was able to show that homogeneous spheres could be treated as point masses when determining their orbits.



Figure 902a. Earth-Moon barycenter.

Chapter 9 Tides And Tidal Currents

Ian Pickup



Chapter 9 Tides And Tidal Currents:

Chapter 9 Tides And Tidal Currents Book Review: Unveiling the Power of Words

In a global driven by information and connectivity, the power of words has are more evident than ever. They have the capability to inspire, provoke, and ignite change. Such is the essence of the book **Chapter 9 Tides And Tidal Currents**, a literary masterpiece that delves deep in to the significance of words and their impact on our lives. Written by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we will explore the book is key themes, examine its writing style, and analyze its overall impact on readers.

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Table of Contents Chapter 9 Tides And Tidal Currents

1. Understanding the eBook Chapter 9 Tides And Tidal Currents
 - The Rise of Digital Reading Chapter 9 Tides And Tidal Currents
 - Advantages of eBooks Over Traditional Books
2. Identifying Chapter 9 Tides And Tidal Currents
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Chapter 9 Tides And Tidal Currents
 - User-Friendly Interface
4. Exploring eBook Recommendations from Chapter 9 Tides And Tidal Currents
 - Personalized Recommendations
 - Chapter 9 Tides And Tidal Currents User Reviews and Ratings

- Chapter 9 Tides And Tidal Currents and Bestseller Lists
- 5. Accessing Chapter 9 Tides And Tidal Currents Free and Paid eBooks
 - Chapter 9 Tides And Tidal Currents Public Domain eBooks
 - Chapter 9 Tides And Tidal Currents eBook Subscription Services
 - Chapter 9 Tides And Tidal Currents Budget-Friendly Options
- 6. Navigating Chapter 9 Tides And Tidal Currents eBook Formats
 - ePub, PDF, MOBI, and More
 - Chapter 9 Tides And Tidal Currents Compatibility with Devices
 - Chapter 9 Tides And Tidal Currents Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Chapter 9 Tides And Tidal Currents
 - Highlighting and Note-Taking Chapter 9 Tides And Tidal Currents
 - Interactive Elements Chapter 9 Tides And Tidal Currents
- 8. Staying Engaged with Chapter 9 Tides And Tidal Currents
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Chapter 9 Tides And Tidal Currents
- 9. Balancing eBooks and Physical Books Chapter 9 Tides And Tidal Currents
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Chapter 9 Tides And Tidal Currents
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Chapter 9 Tides And Tidal Currents
 - Setting Reading Goals Chapter 9 Tides And Tidal Currents
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Chapter 9 Tides And Tidal Currents
 - Fact-Checking eBook Content of Chapter 9 Tides And Tidal Currents
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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