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Operational Impacts of the Environment on Mid-Frequency Navy Sonar Systems In Shallow Water

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The coastal oceans represent a challenging domain for mid-frequency maritime Anti-Submarine Warfare (ASW) sonar systems to operate effectively. Information on the advantages and disadvantages of, as well as general tactical employment criteria for the prevalent types of active mid-frequency sonar systems found in the world's navies is provided. Operational performance of these systems, which include hull-mounted sonars, monostatic buoys and multistatic active systems, as well as dipping sonars, is always affected by shallow water environmental parameters. These acoustic and oceanographic factors include frequent bottom interactions of the transmitted acoustic energy, highly variable sound speed and noise fields, strong coastal currents and high levels of acoustic clutter. Accurate and timely four-dimensional sensor performance predictions and optimization recommendations can mitigate some of the negative impact of the environment on sonar detection ranges. We discuss the trade-offs and assumptions made by modern computer-based tactical decision aids to deliver the most accurate environmental information balanced by the need to deliver these data in tactical time frames useful to the ASW mission planner and sonar operator at sea. We will also present thoughts on the quantification of acoustic uncertainty in support of ASW operations and the need for high-fidelity active sonar training systems.