

John Manobianco
ENSCO, Inc.

Global Environmental MEMS Sensors (GEMS): A Revolutionary Observing System for the 21st Century

Technological advancements in MicroElectroMechanical Systems (MEMS) have inspired ENSCO, Inc. to propose a revolutionary observing system known as Global Environmental MEMS Sensors (GEMS). The GEMS concept features in-situ, micron-scale airborne probes that can take measurements over all regions of the Earth with unprecedented spatial and temporal resolution. The GEMS concept is revolutionary because it foresees the future integration of evolving technologies to realize an observing system with stability and applicability over a broad range of weather and climate phenomena that impact mankind. GEMS have the potential to expand our understanding of the Earth system and improve weather forecast accuracy and efficiency well beyond current capability. Resulting improvements in forecast accuracy will translate directly into cost benefits for weather-sensitive industries worldwide, and mitigate the risk factors associated with life-threatening weather phenomena. Our proposal responds directly to three of the NIAC grand challenges in aeronautics and space and several NASA Earth Science Enterprise initiatives.

In the Phase I project, we validated the viability of GEMS and defined the major feasibility issues for system design and development. For Phase II, we will study these feasibility issues in detail to examine the potential performance and cost benefits, and develop a technology road map that will help NASA to integrate the concept into future missions and programs. Assessing the optimum probe design and deployment strategies requires an interdisciplinary collaboration to examine complex trade-off issues such as the number of probes required in the network, development and manufacturing costs, and the impact of probe observations on forecast accuracy. We propose to explore these trade-offs within the framework of a simulation-design-test cycle that represents a key pathway for development of the roadmap. To accomplish the follow-on Phase II project, ENSCO has assembled a team of personnel from industry and academia with extensive weather, instrumentation, and MEMS expertise.

