executive summary

Bathymetry is foundational data, providing basic infrastructure for scientific, economic, educational, managerial, and political work. Applications as diverse as tsunami hazard assessment, communications cable and pipeline route planning, resource exploration, habitat management, and territorial claims under the Law of the Sea all require reliable bathymetric maps to be available on demand (Appendix 2). Fundamental Earth science questions, such as what controls seafloor shape and how seafloor shape influences global climate, also cannot be answered without bathymetric maps having globally uniform detail.

Current bathymetric charts are inadequate for many of these applications because only a small fraction of the seafloor has been surveyed. Modern multi-beam echosounders provide the best resolution, but it would take more than 200 ship-years and billions of dollars to complete the job. Fortunately, the seafloor topography can be charted globally, in five years, and at a cost under $100M. A radar altimeter mounted on an orbiting spacecraft can measure slight variations in ocean surface height, which reflect variations in the pull of gravity caused by seafloor topography. A new satellite altimeter mission, optimized to map the deep ocean bathymetry and gravity field, will achieve a resolution threshold that is critical for both basic science and practical applications, including:

- Determining the effects of bathymetry and seafloor roughness on ocean circulation and mixing, climate, and biological communities, habitats, and mobility.
- Improving tsunami hazard forecast accuracy by mapping the fine-scale topography that steers tsunami wave energy.
- Understanding the geologic processes responsible for ocean floor features unexplained by simple plate tectonics, such as abyssal hills, seamounts, microplates, and propagating rifts.
- Mapping the marine gravity field to improve inertial navigation and reveal the subseafloor structure of continental margins for both geologic research and offshore resource exploration.
- Providing bathymetric maps for numerous other practical applications, including planning submarine cable and pipeline routes, improving tide models, and defining international boundaries on territorial claims to the seabed under the United Nations Convention on the Law of the Sea.

Because ocean bathymetry is a fundamental measurement of our planet, there is a broad spectrum of interest from government (DoD, NASA, NIMA, NOAA, and NSF), the research community, industry, and the general public.