Opportunity Title: Ocean Acoustic Modelling for Superior Environment Intelligence
Opportunity Reference Code: ICPD-2025-53

Organization Office of the Director of National Intelligence (ODNI)

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 3 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at: https://orise.orau.gov/icpostdoc/index.html.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/28/2025 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Next Generation and Generation After Next sonar superiority in the underwater battlespace will depend significantly on our understanding and exploitation of the ocean acoustic environment. Understanding acoustic behavior in the ocean environment, and acoustically-relevant properties of the environment, is highly complex depending on a wide range of factors that change both spatially and temporally across multiple scales – even on the calmest days, the ocean is constantly changing, under the influence of a wide range of complex and dynamic ocean-acoustic factors. Presently, only the simplest acoustically-relevant properties of the environment are well described by measurements and only the simplest ocean-acoustic factors are considered in modelling.

This research topic aims to combine several research challenges to produce a plenary ocean-acoustic model that can digest complex ocean-acoustic data and generate superior intelligence about the ocean-acoustic environment, reflecting a greater understanding of acoustically-relevant properties of the environment, which can be exploited for the purposes of intelligence, surveillance, and reconnaissance, as well as commercial monitoring of the ocean. Research challenges include:

- mathematical descriptions of acoustically-relevant ocean properties, such as internal waves, eddies, and spice, covering multiple spatial and temporal scales
- development of physics based, data driven, or hybrid acoustic models, including noise and propagation models, to describe acoustic behavior in the presence of different acoustically-relevant ocean properties
- sensitivity and uncertainty analysis and quantification, based on the quantity and quality of input environment data to ocean-acoustic models
- investigate the computational efficiency and accuracy of different

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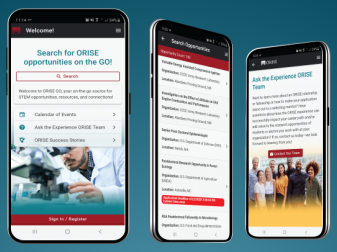
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models, including different model configurations
- development of schemes to generate, visualize, and exploit the best available description of the ocean acoustic environment
- investigate ocean-acoustic models, and other methods, to monitor the health of, and changes to, the ocean environment

Example Approaches:

The research challenges can be approached using a mix of applied mathematics, programming, statistics, data analysis, and machine learning. Examples approaches include:

- develop an underwater acoustics foundation model to understand and process ocean-acoustic data and to generate ocean-acoustic information for different applications; this could include the design and conduct of large scale data collection and preparation activities and other data collection to enable fine tuning for specific applications.
- develop new analytical and numerical models to understand and predict acoustic behavior in a variety of different environment conditions; this could include the development of methods to synthesize a variety of acoustically relevant properties of the environment and to represent these properties in the acoustic models.
- develop an efficient framework or architecture for combining different ocean models and acoustic models; this could include the design and development of intelligent hybrid models that optimize the combinations of models based, for example, on uncertainty or computational efficiency.

Relevance to the Intelligence Community:
Next generation projects are demanding a greater understanding of the ocean acoustic environment and truer descriptions of the environment from which to improve the prediction accuracy of acoustic models and the associated performance of sonar systems. The environment information associated with this understanding needs to be presented and communicated to users in a manner that is readily ingested and examined and is actionable in a tactically relevant timeframe. This is equally important for our understanding of complex ocean processes and the sustainable use of the oceans – healthy oceans are vital for life on earth.

Superior environment intelligence about the ocean-acoustic environment is critical to maintaining the advantage in intelligence, surveillance and reconnaissance activities against an evolving threat. This advantage can be realized by exploiting environment information to detect, track, and collect beyond the threat sensor range and by managing environment information to understand threat platform behavior.

This research topic would accelerate the creation, maturation and exploitation of ocean-acoustic models to demonstrate the operational benefits obtained from superior understanding of the ocean-acoustic environment to guide decision making and to support intelligence

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authorities. Much of the recent progress in collecting, modelling, processing and exploiting underwater acoustic data has been made by research groups outside the UK and it is important for the UK to grow excellence in underwater acoustics to maintain an operational advantage.

Key Words: Sonar, underwater acoustics, ocean, measurements, modelling, data, information, intelligence, surveillance, reconnaissance

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the appointment start date
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Point of Contact Keri Tarwater

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 👁)
  - **Communications and Graphics Design** (3 👁)
  - **Computer, Information, and Data Sciences** (17 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)
  - **Environmental and Marine Sciences** (14 👁)
  - **Life Health and Medical Sciences** (45 👁)
  - **Mathematics and Statistics** (11 👁)
  - **Other Non-Science & Engineering** (2 👁)
  - **Physics** (16 👁)
  - **Science & Engineering-related** (1 👁)
  - **Social and Behavioral Sciences** (30 👁)