



**National Centre for Polar & Ocean Research**  
(Ministry of Earth Sciences, Govt. of India)  
Headland Sada, Vasco-da-Gama, Goa - 403 804



**Invites Nominations from Scientists/Researchers for forthcoming IODP expedition**

IODP-India invites nominations in a prescribed format along with detailed bio-data and research experience, from geoscientists/researchers working in established national institutions/organizations and universities, to participate in the forthcoming International Ocean Discovery Program (IODP) **Expedition 406: New England Shelf Hydrogeology** aboard a Mission Specific Platform (MSP). NCPOR will provide the requisite financial support to the selected candidates towards their participation in the said expedition. However, it will be the responsibility of the candidates to obtain the necessary Visas / permissions from the countries of embarkation and disembarkation on their own. A scientific plan is mandatory for a successful nomination.

Further details and format can be obtained at [www.ncpor.res.in](http://www.ncpor.res.in) or by email to [iodp.india@ncpor.res.in](mailto:iodp.india@ncpor.res.in)

**Last date by which IODP-India/NCPOR receives nominations for Expedition 406: 14 August 2023**

For and on behalf of NCPOR  
Group Director (IODP-India)

Complete nominations may kindly be emailed to [iodp.india@ncpor.res.in](mailto:iodp.india@ncpor.res.in)

Information on forthcoming IODP Expedition aboard a Mission Specific Platform (MSP)

**Expedition 406: New England Shelf Hydrogeology**  
**June-August 2024 (Offshore); late 2024 or early 2025 (Onshore)**

### **Background and Objectives**

In many coastal settings worldwide, the distribution of freshwater within continental shelf sediments is far out of equilibrium with modern sea level. One of the most remarkable examples is found on the Atlantic continental shelf off New England where groundwater within shallow Pliocene-Pleistocene sand aquifers over 100 km offshore has low salinity (3000 mg/l or less). On Nantucket Island, a 514m deep borehole penetrating the entire Cretaceous-Tertiary sedimentary package shows considerable variations in salinity with extremely fresh (<1000 mg/l) water in sand aquifers, higher salinity (30-70% of seawater) in thick clay/silt layers, and intermediate-to-low salinity in thin confining units.

IODP Expeditions 313 and 317 also showed abrupt freshwater-saltwater boundaries linked to lithology. This demonstrates the disequilibrium nature of such systems; diffusion tends to eliminate such patterns. Pore fluid within Pleistocene to upper Cretaceous sands beneath Nantucket Island is also found to be modestly overpressured, ~4m relative to the local water table.

The proposal hypothesizes that the rapid incursion of freshwater on the continental shelf in New England could have been caused by one or more of the following mechanisms:

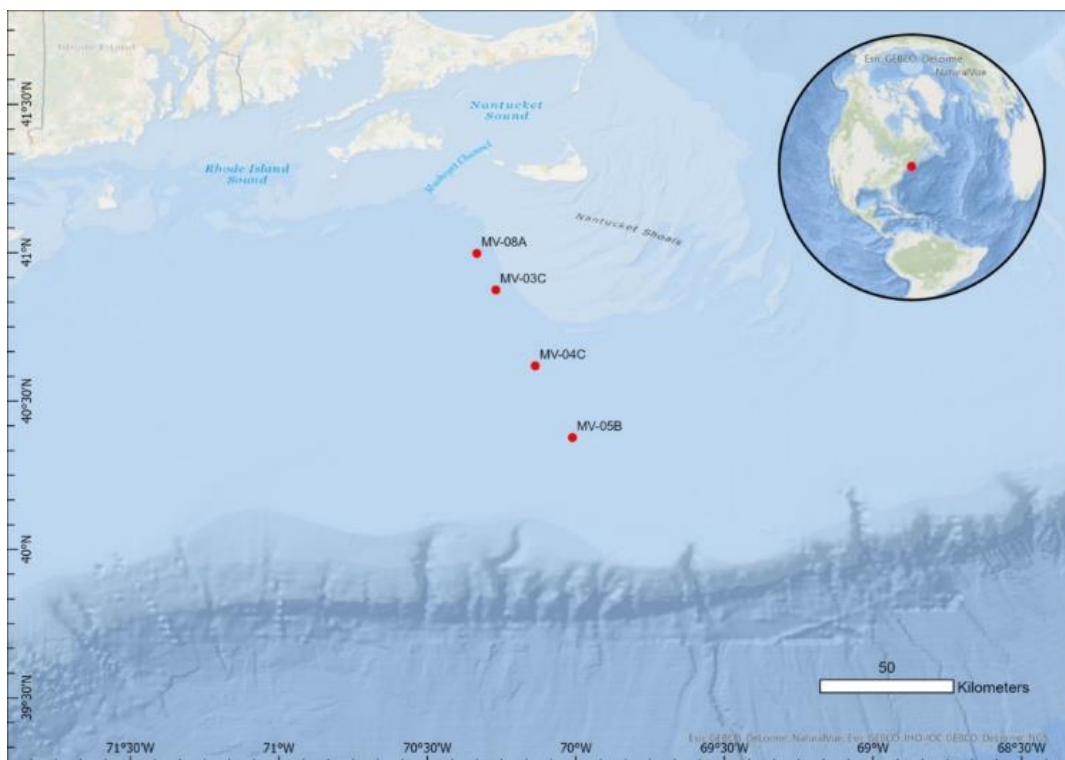
- 1) meteoric recharge during Pleistocene sea-level low stands including vertical infiltration of freshwater associated with local flow cells on the shelf;
- 2) sub-ice-sheet recharge during the last glacial maximum;
- 3) recharge from pro-glacial lakes.

Further, hypothesize that the overpressures could be due to

- 1) Pleistocene sediment loading;
- 2) fluid density differences associated with emplacement of a thick freshwater lens over saltwater (analogous to excess pressures in the gas legs of petroleum reservoirs).

It is argued these different recharge mechanisms and overpressure models can be distinguished through drilling, coring, logging, and fluid sampling. Noble gas and environmental isotope data will be necessary to completely evaluate recharge models.

This work will extend the understanding of the current and past states of fluid composition, pressure, and temperature in continental shelf environments. It will help better constrain rates, directions, and mechanisms of groundwater flow and chemical fluxes in continental shelf systems. It will contribute to the development of new tools for measuring freshwater resources in marine environments. The apparent transient nature of continental shelf salinity patterns could have important implications for microbial processes and long-term fluxes of carbon, nitrogen, and other nutrients to the ocean. Successful drilling will test process-based models for shelf freshwater off New England. These models can then be applied to other shelf freshwater systems around the world.



The full proposal and addendum describing the primary drill sites, as well as up-to-date expedition information, can be found on the Expedition 406 webpage <http://www.ecord.org/expedition406/>.

### Important Notes:

1. For more information on IODP Expedition 406 please visit [www.iodp.org](http://www.iodp.org) and use the link [iodp.tamu.edu/scienceops/](http://iodp.tamu.edu/scienceops/).
2. Applications in a prescribed format available on the website [www.ncpor.res.in](http://www.ncpor.res.in) shall be considered.
3. **Last date by which IODP- India/ NCPOR receives nomination for IODP Expedition 406: 14 August 2023**
4. A scientific plan is mandatory for a successful nomination. Once nominated candidates will have to submit a detailed science plan along with sample data request which may also form a basis for collaborative research programs between their host organization and NCPOR.