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IODP Proposal Cover Sheet

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☐ **New** ☑ **Revised** ☐ **Addendum**

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Title:	Paleoenvironmental evolution of the Baltic Sea Basin (BSB) through the last glacial cycle
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Keywords: *(5 or less)*	Late Pleistocene, paleoclimate, sea levels, glaciation history, deep biosphere
Area:	Baltic Sea

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Permission to post abstract on IODP Web site: ■ Yes ☐ No

Abstract: (*400 words or less*)

We aim at retrieving sediments, in different settings of the Baltic Sea, from the last interglacial-glacial cycle to address scientific questions along four main research themes, see below. This will be accomplished by drilling in six sub-basins, one in the gateway of the BSB (Anholt), where we focus on sediments from MIS 6-5 as well as MIS 2–1. A sub-basin in the southwesternmost part of the BSB (Little Belt) possibly holds a unique MIS 5 record. Two sub-basins in the south (Bornholm Basin, Hanö Bay) may hold long complete records from MIS 4–2, and one deep (450 m) sub-basin in the central Baltic (Landsort Deep) promises to contain a thick and continuous record of the last ca 14000 years. Finally, the sub-basin in the very north (Ångermanälven River eustary) contains a unique varved (annually deposited) sediment record of the last >10000 years. All in all these six areas will contain a set of sediment sequences of the last ca 140000 years, with paleoenvironmental information on a semi-continental scale; the Baltic Sea drains an area four times as large as the basin itself. The location of the BSB in the heartland of a recurrently waning and waxing ice sheet, the Scandinavian Ice Sheet (SIS), has resulted in a complex development: repeated glaciations of different magnitude, sensitive responses to sea level and gateway threshold changes, large shifts in sedimentation patterns and high sedimentation rates. Its position also makes it a unique link between Eurasian and NW European terrestrial records. Therefore the sediments of this largest European intra-continental basin form a rare archive of climate evolution over the last glacial cycle. The high sedimentation rates provide an excellent opportunity to reconstruct climatic variability of global importance at unique resolution from a marine-brackish setting, and comparable sequences cannot be retrieved anywhere in the surrounding onshore regions. Furthermore, and very crucial, the large variability (salinity, climate, sedimentation pattern and oxygenation) that the BSB has undergone during the last glacial cycle makes it optimal for new research on the deep biosphere, its evolution, biogeochemical processes and e.g. also on how the post-glacial diffusive penetration of conservative seawater ions may alter the chemical composition and microbial physiology in the sub-seafloor biosphere.

The scientific communities of the nine countries around the Baltic Sea have by tradition had the Baltic Sea and its many intriguing scientific problems as a focal point for research. Now comes the challenge!

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Scientific Objectives: (*250 words or less*)

The planned research on retrieved sediment cores will focus on four main scientic objectives: (i) Climate and sea level dynamics of MIS 5, including onsets and terminations, (ii) The complexities of the last glacial, MIS 4–MIS 2, (iii) glacial and Holocene (MIS 2–MIS 1) climate forcing, and (iv) Deep biosphere in the Baltic Sea Basin (BSB) sediments. It is envisaged that the planned transect of drilling sites, from west to north as well as from south to north, in this repeatedly glaciated and environmentally very dynamic region will add totally new scientific insights in a variety of research fields. These involve e.g. regional and global issues on the timing and forcing of rapid climate change and sea levels, mechanisms behind hypoxia-driving processes in intra-continental type of sea basins, glacial history of the Scandinavian Ice Sheet and its inter-action with the climate system, as well as e.g. the controlling mechanisms for prokaryotic communities and underlying biogeochemical mechanisms in the seabed of a highly variable environment and how this has affected the phylogenetic diversity of the microbial communities and which biogeochemical processes predominate today in the deep lying glacial and interglacial deposits. An unusually large set of biological, physical (incl. a variety of dating and paleomagnetic methods), chemical and biogeochemical methods (see special table) as well as a set of novel approaches will be applied to the drilled sediments. The different engaged research groups have a wide set of necessary instruments, dating facilities and laboratories at their disposal.

Please describe below any non-standard measurements technology needed to achieve the proposed scientific objectives.

Proposed Sites:

Site Name	Position	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
BSB-1B	56.36.695N, 11.42.361E	34	214	6	220	Late Saalian, Eemian and early Weichselian
BSB-2B	56.34.667N, 11.47.320E	34	149	6	155	Late Saalian, Eemian and early Weichselian
BSB-3	55.01.00N, 10.07.00E	35	150	6	156	Late Saalian, Eemian and early Weichselian
BSB-4	55.08.00N, 09.48.00E	23	180	6	186	Late Saalian, Eemian and early Weichselian
BSB-5B	55.43.290N, 15.13.590E	61	36	6	42	Early and Mid Weichselian (littoral facies)
BSB-6B	55.41.520N, 15.32.250E	67	52	6	58	Early and Mid Weichselian (littoral facies)
BSB-7B	55.28.034N, 15.28.680E	85	74	6	80	Early and Mid Weichselian (deep lake facies)
BSB-8	55.17.258N, 15.28.917E	93	93	6	99	Early and Mid Weichselian (deep lake facies)
BSB-9	58.37.60N, 18.15.30E	451	152	6	158	Expanded Late Weichselian-Holocene sequence
BSB-10	62.46.70N, 18.02.95E	86	40+	0	40	Varved Holocene sequence
BSB-11	62.57.35N, 17.47.70E	68	40+	0	40	Varved Holocene sequence