Be-7 from aerosol samples from the Arctic collected on RV Polarstern cruise ARK-XXVI/3 from Tromso, Norway to Bremerhaven, Germany in 2011 (Be-7 Tracer Method project)

Website: https://www.bco-dmo.org/dataset/564463
Version: 17 August 2015
Version Date: 2015-08-17

Project
» Sample Analysis to Test a Novel Method of Determining Atmospheric Deposition of Trace Elements to the Ocean/Ice System of the Arctic (Be-7 Tracer Method)

Contributors	Affiliation	Role
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Coverage

Temporal Extent: 2011-08-17 - 2011-09-07

Dataset Description

Be-7 data from aerosol samples from the Arctic.

Methods & Sampling

Aerosol samples were collected using a TischTE-5170-VBL high volume aerosol sampler, modified to collect 12 replicate aerosol samples on 47mm open-face filter holders loaded with acid-washed Whatman-41 ashless filters for trace element analysis. The sampler was installed above the bridge on the bow of the ship to best sample clean air while avoiding sea spray. Aerosol collection was limited to times when the relative wind direction precluded exhaust contamination from the ship's smokestack from reaching the sampler.

Aerosol samples were collected during three sampling periods on 14-15 Aug., 24 Aug-1 Sept., and 7-15 Sept. 2011. In chronological order the three sampling volumes of air filtered, per circular filter, were 48.4, 207.8 and 273.5m^3 respectively. In addition to these filters, pre-combusted (480°C, >10 hours) quartz micro fiber (Whatman QMA) filters for the analysis of Hg (reported elsewhere) were deployed during 17-23 Aug., 2-14 Sept., and 16 Sept., 2011. In chronological order the three sampling volumes of air filtered, per circular filter, were 234.1, 280.7, and 54.6 m^3 respectively. The W41 47mm aerosol samples and GFF 47mm filters were stacked three-high in a plastic petrie dish and counted for ^{7}Be. As described above, this configuration was calibrated with a commercially prepared mixed solution of known gamma activities.

Data Processing Description

Please refer to:
Kadko, D. and D. Olson (1996) Be-7 as a tracer of surface water subduction and mixed layer history. Deep Sea Res. 43, 89-116. doi:10.1016/0967-0637(96)00011-8

BCO-DMO Processing Notes:
- formatted date to mm/dd/yyyy;
- modified parameter names to conform with BCO-DMO naming conventions;
- added column containing cruise_id;
- corrected mis-entered date from 08/07/2011 t o 08/17/2011;
- 03 October 2017: made dataset public per request from data contributor.

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Data Files

File
Be7_aerosol.csv (Comma Separated Values (.csv), 201 bytes) MD5:48fc625dd8be48d220d35cd389d533d2 Primary data file for dataset ID 564463

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Parameters

Parameter	Description	Units
date	Month, day, and year.	mm/dd/YYYY
cruise_id	Cruise identifier.	dimensionless
type	Type of filter.	dimensionless
Be7_aer	Aerosol 7Be concentration.	disintegrations per minute per cubic meter (dpm/m3)
Be7_aer_se	Standard error of aerosol 7Be concentration.	disintegrations per minute per cubic meter (dpm/m3)

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Instruments

Dataset-specific Instrument Name	TischTE-5170-VBL
Generic Instrument Name	Aerosol Sampler
Dataset-specific Description	Aerosol samples were collected using a TischTE-5170-VBL high volume aerosol sampler, modified to collect 12 replicate aerosol samples on 47mm open-face filter holders loaded with acid-washed Whatman-41 ashless filters for trace element analysis.
Generic Instrument Description	A device that collects a sample of aerosol (dry particles or liquid droplets) from the atmosphere.

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Deployments

ARK-XXVI-3

Website	https://www.bco-dmo.org/deployment/537987
Platform	R/V Polarstern
Report	http://dmoserv3.whoi.edu/data_docs/Be7_Tracer/649-2012_Schauer_ARK-26-3.pdf
Start Date	2011-08-05
End Date	2011-10-06
Description	The Polarstern expedition ARK-XXVI/3 "TransArc" (Trans-Arctic survey of the Arctic Ocean in transition) served the overarching goal to capture the physical, biological and chemical state of the Arctic Ocean in a changing climate. During TransArc, investigators sampled the ocean and ice properties and their ecosystems along gradients from the Eurasian shelf edge to the Canadian Basin. Polarstern left Tromso on August 5, 2011, with 54 scientists from 10 institutes of 7 countries and 43 crew members on board. A number of ice-tethered buoys and bottom-mounted moorings were deployed and recovered respectively. Ice thickness and optical measurements were made at stations, and an ROV was deployed for under ice observations. CTD casts, plankton net casts and sediment sampling were also conducted. The station work finished on September 26. After passing the ice-free Northern Sea Route to the western Barents Sea and the stormy Norwegian and North Seas, Polarstern returned to Bremerhaven on 6 October 2011.

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Project Information

Sample Analysis to Test a Novel Method of Determining Atmospheric Deposition of Trace Elements to the Ocean/Ice System of the Arctic (Be-7 Tracer Method)

Description from the NSF award abstract:
The investigators propose to use the naturally occurring isotope beryllium-7, which is produced in the atmosphere by cosmic rays and has a 53.3-day half-life, as a tracer for estimating the atmospheric fluxes of a variety of trace elements to the surface of the Arctic Ocean. They have collected samples of snow, sea ice, surface waters, and atmospheric aerosols through an international collaboration concurrent with the preparation of this proposal. This project provides funding for the analysis of Be-7 and for trace elements including aluminum, manganese, iron, cupper, zinc, cadmium, and lead. The atmospheric input of numerous chemical species into the global ocean has been shown to equal or exceed that from river sources. In the

Arctic, several contaminant elements in particular are dominated by atmospheric sources, with implications for the Arctic ecosystem and human health. The project will investigate several elements of interest to the international GEOTRACES program, which is currently formulating plans for coordinated Arctic work. The project will support a Ph.D. student who will incorporate these results into his dissertation.

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Funding

Funding Source	Award
NSF Arctic Sciences (NSF ARC)	PLR-1202990
NSF Arctic Sciences (NSF ARC)	PLR-1460290

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