

aava\_frostboils\_akade\_2005\_readme\_metadata.pdf

AAVA readme file for Frost Boil Vegetation Plots (November 14, 2016)

Dataset Title: Alaska Arctic Vegetation Archive: Frost Boil Vegetation Plots

Dataset Author: Anja N. Kade

Alaska Arctic Vegetation Archive Dataset Name: frostboils\_kade (FB\_AK)

#### Dataset Description:

The vegetation associated with cryoturbated frost-heave features on the North Slope, Alaska was described by Kade et al. (2005) as part of the "Biocomplexity associated with biogeochemical cycles in arctic frost-boil ecosystems" project (National Science Foundation grant OPP-0120736) from 2002 to 2006. The study sites spanned a latitudinal gradient from the Arctic Ocean (bioclimate subzone C) and Coastal Plain (bioclimate subzone D) to the Arctic Foothills (bioclimate subzone E), Alaska.

Seven study sites were established along a N-S-transect, with a total of 117 releve plots on frost-heave features and surrounding stable tundra. Nine community types were identified in three bioclimate subzones: dry nonacidic nonsorted circles (10 plots), dry nonacidic dwarf-shrub tundra (5 plots) and coastal nonacidic willow-sedge tundra (5 plots) in bioclimate subzone C; moist nonacidic nonsorted circles (42 plots), moist nonacidic dwarf shrub-sedge tundra (20 plots) and wet nonacidic sedge tundra (5 plots) in bioclimate subzone D; and moist acidic lichen- and dwarf shrub-rich nonsorted circles and earth hummocks (15 plots), moist acidic tussock tundra (10 plots) and wet acidic nonsorted circles (5 plots) in bioclimate subzone E.

The study plots were chosen subjectively in areas of homogeneous, representative vegetation, permanently marked and geo-referenced. For each plant community, the minimum sampling area was determined. At each study plot, site variables were recorded and a soil sample of the upper 10 cm of the mineral horizon was collected. The raw environmental data were published in a data report (Barreda et al. 2006). The vegetation data were analyzed using the Braun-Blanquet approach, and the plant community types, including three new associations, were published in Kade et al. (2005). Unpublished spectral data is included.

Subsets of the vegetation and environmental data were used in several subsequent publications (Kade et al. 2006, Kade and Walker 2008, Reynolds et al. 2008, Walker et al. 2008, Walker et al. 2011, Walker et al. 2012).

## References:

Barreda, J. E., Knudson, J. A., Walker, D. A., Raynolds, M. K., Kade, A. N., and Munger, C. A. 2006. Biocomplexity of patterned ground, Dalton Highway, 2001–2005. Data Report, Alaska Geobotany Center, University of Alaska Fairbanks. 252 pp.

Kade, A., Walker, D. A., and Raynolds, M. K. 2005. Plant communities and soils in cryoturbated tundra along a bioclimate gradient in the Low Arctic, Alaska. *Phytocoenologia* 35:761–820.

Kade, A. 2006. Biocomplexity of nonsorted circles in the Low Arctic, Alaska. PhD thesis, University of Alaska, Fairbanks, Alaska, USA.

Kade, A., Romanovsky, V. E., and Walker, D. A. 2006. The N-factor of nonsorted circles along a climate gradient in Arctic Alaska. *Permafrost and Periglacial Processes* 17:279–289.

Kade, A., and Walker, D. A. 2008. Experimental alteration of vegetation on nonsorted circles: effects on cryogenic activity and implications for climate change in the Arctic. *Arctic, Antarctic, and Alpine Research* 40:96–103.

Raynolds, M. K., Walker, D. A., Munger, C. A., Vonlanthen, C. M., and Kade, A. N. 2008. A map analysis of patterned-ground along a North American Arctic Transect. *Journal of Geophysical Research – Biogeosciences* 113:G03S03.

Walker, D. A., Epstein, H. E., Romanovsky, V. E., Ping, C. L., Michaelson, G. J., Daanen, R. P., Shur, Y., Peterson, R. A., Krantz, W. B., Raynolds, M. K., Gould, W. A., Gonzalez, G., Nicolsky, D. J., Vonlanthen, C. M., Kade, A. N., Kuss, P., Kelley, A. M., Munger, C. A., Tarnocai, C. T., Matveyeva, N. V., and Daniëls, F. J. A. 2008. Arctic patterned-ground ecosystems: A synthesis of field studies and models along a North American Arctic Transect. *Journal of Geophysical Research – Biogeosciences* 113:G03S01.

Walker, D. A., Kuss, H. P., Epstein, H. E., Kade, A. N., Vonlanthen, C., Raynolds, M. K., and Daniëls, F. J. A. 2011. Vegetation of zonal patterned-ground ecosystems along the North American Arctic Transect. *Applied Vegetation Science* 14:440–463.

Walker, D. A., H. E. Epstein, M. K. Raynolds, P. Kuss, M. A. Kopecky, G. V. Frost, F. J. A. Daniels, M. O. Leibman, N. G. Moskalenko, G. V. Matyshak, K. O. VV, A. V. Khomutov, B. C. Forbes, U. S. Bhatt, A. N. Kade, C. M. Vonlanthen, and L. Tichý. 2012. Environment, vegetation and greenness (NDVI) along the North America and Eurasia Arctic transects. *Environmental Research Letters* 7:015504.

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Direct Plot Archive Record Link: <http://geobotanical.portal.gina.alaska.edu/manager/catalogs/9629-alaska-arctic-vegetation-archive-frost-boil-ve>

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Link to VegBank Record: Will add when available

Missing data: Indicated by '-9999' for numerical data and 'n/a' for categorical or text data

Files Available for Download:

1) AAVA Frost Boil Modified Source Data

1a) Frost Boil Species Cover

[aava\\_frostboils\\_akade\\_2005\\_spp\\_modsrc.csv](#)

[aava\\_frostboils\\_akade\\_2005\\_spp\\_modsrc.xlsx](#)

These files contain species cover data for the Frost Boil vegetation plots in both .csv and .xlsx format. The source of these data is the Phytocoenologia publication (Kade et al. 2005). Species cover classes are old Braun-Blanquet: r (rare), + (common, but less than 1 percent), 1 (1-5 percent), 2 (6 to 25 percent), 3 (26 to 50 percent), 4 (51 to 75 percent), 5 (76 to 100 percent). Both the dataset author determinations and the current nomenclature according to the Panarctic Species List (PASL) are listed. Taxa are listed in alphabetical order according to the accepted PASL name. In 10 instances, taxa were lumped into a single taxon in the PASL: 1) *Cetraria islandica* (*Cetraria islandica* and *Cetraria islandica* s. *crispiformis*), 2) *Cladonia gracilis* s. *lat.* (*Cladonia gracilis* and *Cladonia gracilis* s. *elongata*), 3) *Dicranum spadiceum* (*Dicranum spadiceum* and *Dicranum angustum*), 4) *Pedicularis albolabiata* (*Pedicularis neoalaskanum* and *Pedicularis sudetica* and *Pedicularis sudetica* s. *albolabiata*), 5) *Polytrichastrum alpinum* (*Polytrichastrum alpinum* v. *alpinum* and *Polytrichastrum alpinum* v. *fragile*), 6) *Pseudolophozia sudetica* (*Lophozia sudetica* v. *anomala* and *Lophozia sudetica* v. *sudetica*), 7) *Sphenolobus minutus* (*Sphenolobus minutus* and *Anastrophyllum minutum*), 8) *Stellaria longipes* (*Stellaria longipes* s. *longipes* and *Stellaria longipes* s. *l.*), 9) *Tortella tortuosa* (*Tortella tortuosa* and *Tortella arctica*), 10) *Tritomaria quinquedentata* (*Tritomaria quinquedentata* and *Lophozia collaris*). The plot numbers in the source data are the

author's. The main plot numbers in the Turboveg database are accession numbers and will differ. The author's plot numbers are retained in the 'Field releve number' field in the Turboveg database.

#### 1b) Frost Boil Environmental Data

aava\_frostboils\_akade\_2005\_allenv\_modsrc.csv

aava\_frostboils\_akade\_2005\_allenv\_modsrc.xlsx

These files contain modified environmental data for the Frost Boil vegetation plots in both .csv and .xlsx format. The source of these data is the Biocomplexity of Patterned Ground Data Report (Barreda et al. 2006, Tables 8, 10-16, 17, 18, and 28), field data sheets, and calculated data. For information about the source of the fields and adjustments made to meet Turboveg standards see No. 4) below. The header data in the Turboveg database only includes a subset of these data. The plot numbers in the source data are the author's. The main plot numbers in the Turboveg database are accession numbers and will differ. The author's plot numbers are retained in the 'Field releve number' field in the Turboveg database. The codes and scalars used in this file are described in the Legend for Environmental Variables file in the project metadata folder

(aava\_frostboils\_akade\_2005\_envlegend\_metadata.pdf and

aava\_frostboils\_akade\_2005\_envlegend\_metadata.docx).

Improvements to the source data include: 1) total forb cover, lichen cover and bryophyte cover were summed from existing data, 2) total vegetation cover was a sum of the plant functional types (absolute cover computed in the office), 3) texture was calculated using sand, silt, and clay data and the U.S.D.A. Natural Resources Conservation Service Texture Calculator ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2\\_054167](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167)), 4) plot size was rounded to the nearest two decimal points, and 5) aspect was converted from cardinal directions to degrees.

#### 2) AAVA Frost Boil Turboveg Database

aava\_frostboils\_akade\_2005\_tv.zip

This file is the Frost Boil Turboveg Database (.dbf). Turboveg is a software program for managing vegetation-plot data (see <http://www.synbiosys.alterra.nl/turboveg/>). The database includes both species cover and environmental header data. The header data for the database are consistent across all datasets in the AAVA. There are both required and recommended fields for inclusion in the AAVA. Consequently, only a subset of the modified source environmental data are included in the database and these may be cross-walked to the AAVA data dictionary. The species nomenclature used in the database is according to the Panarctic Species List (PASL) (beta 1.0) created for the Arctic Vegetation Archive. The current data dictionary and PASL files are required for the correct use of this data in Turboveg. These files are updated periodically and available for download via 'Data

and Resources' section of the data record.

For the crosswalk from the source data to the database, we made the following changes: 1) texture was cropped to major categories to crosswalk to Turboveg standards, 2) latitude and longitude measurements were projected to WGS 84 and checked against aerial photographs, and 3) total vegetation cover was not included in Turboveg as it does not conform to Braun-Banquet methodology.

### 3) AAVA Frost Boil Ancillary Data

#### 3a) Frost Boil Plot Location Map

aava\_frostboils\_akade\_2005\_plotmap\_anc.pdf

This file is a map of the general locations where the Frost Boil permanent vegetation plots were sampled from the author's thesis, Biocomplexity of nonsorted circles in the low Arctic, Alaska (Kade, 2006).

#### 3b) Frost Boil Plot Photos

aava\_frostboils\_akade\_2005\_plotphotos\_anc.pdf

This file contains vegetation and soil photos from the Frost Boil permanent vegetation plots provided by the author.

#### 3c) Frost Boil Soils Data

aava\_frostboils\_akade\_2005\_soildata\_anc.csv

aava\_frostboils\_akade\_2005\_soildata\_anc.xlsx

These are the soils data for the Frost Boil permanent vegetation plots that are modified from the data report Barreda et al. 2006, Table 18. The data were transposed. See the data report for further information.

#### 3d) Frost Boil Spectral Data

aava\_frostboils\_akade\_2005\_hyperspectraleepstein2006\_anc.csv

aava\_frostboils\_akade\_2005\_hyperspectraleepstein2006\_anc.xlsx

Hyperspectral data were collected between July 19–30, 2006 by Howie Epstein, using an Analytical Spectral Devices, PSII. Data were collected preferentially during clear sky conditions and close to midday (10AM–3PM). The fiber-optic sensor with 25 degree field of view was held at nadir above each releve at 1 m height, yielding a circular footprint of about 0.15 square meters. Each measurement is the average of 5 samples taken at 1-second intervals. White reference calibrations were made prior to each measurement using a Spectralon plate, as well as a dark reference. Data are reflectances for wavelengths in approximately 1.4nm bands from 400–900nm. Data is unpublished.

#### 3d) Frost Boil Publications

barredaj\_2006\_biocomplexvegplots.pdf

kadea\_2005\_permafrostperiglacprocess\_nonsortcirclesclimatgradnt.pdf  
kadea\_2005\_phytocoenologia\_cryoturbatetundra&bioclimatgradnt.pdf  
kadea\_2008\_arcticalpineres\_alterveg\_nonsortedcircles.pdf  
raynoldsm\_2004\_biocomplexitysnowdpthdata.pdf  
walkerd\_2008\_jgeophysicalres\_arcticpatterngrndsntsynthes&models.pdf  
walkerd\_2011\_applvegsci\_vegpatterngrndnaarcticbioclimatgradnt.pdf  
walkerd\_2012\_environreslett\_ndvinorthameric&eurasiatransect.pdf

These are .pdf files of the references cited in the dataset description for the Frost Boil permanent vegetation plots. Journal names are abbreviated using the standards for the abbreviation of titles of periodicals and serial titles. The following reference was unavailable digitally: Kade, A. 2006. Ph.D. Thesis, Biocomplexity of nonsorted circles in the low Arctic, Alaska.

#### 4) AAVA Frost Boil Metadata

aava\_frostboils\_akade\_2005\_envlegend\_metadata.doc  
aava\_frostboils\_akade\_2005\_envlegend\_metadata.pdf  
aava\_frostboils\_akade\_2005\_readme\_metadata.txt

These files are metadata for the Frost Boil permanent vegetation plots and include a legend for the modified environmental data and readme that are specific to this dataset.

#### Modifications to environmental source data:

The table below in comma separated values format indicates the modifications made to source data in the preparation of the AAVA Frost Boil Modified Source Environmental Data files (aava\_frostboils\_akade\_2005\_allenv\_modsrc.csv and aava\_frostboils\_akade\_2005\_allenv\_modsrc.xlsx) and fields that were used to crosswalk these data to the Turboveg database (aava\_frostboils\_akade\_2005\_tv.zip).

VARIABLE, IN MODIFIED SOURCE ENVIRONMENTAL DATA FILE, IN TURBOVEG FILE WITH SAME NAME, SOURCE AND CHANGES MADE TO DATA  
RELEVE NUMBER, Y, Y, All tables. Kade et al. 2005 and Barreda et al. 2006b. The plot numbers in the modified source data are the author's. The main plot numbers in the Turboveg database are accession numbers and will differ. The author's plot numbers are retained in the 'Field releve number' field in the Turboveg database.  
ERECT DWARF SHRUB COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.  
PROSTRATE DWARF SHRUB COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.  
EVERGREEN SHRUB COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.  
DECIDUOUS SHRUB COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.  
ERECT FORB COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.  
MATTED FORB COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.  
NON-TUSsock GRAMINOID COVER (PERCENT), Y, Y, Table 8 in Barreda et al. 2006.

TUSsock GRAMINOID COVER (PERCENT),Y,Y,Table 8 in Barreda et al. 2006.  
 FOLIOSE LICHEN COVER (PERCENT),Y,N,Table 8 in Barreda et al. 2006.  
 Fruticose and foliose were combined by the author 2014 for Turboveg field 'Cover lichen.'  
 FRUTICOSE LICHEN COVER (PERCENT),Y,N,Table 8 in Barreda et al. 2006.  
 Fruticose and foliose were combined by the author 2014 for Turboveg field 'Cover lichen.'  
 CRUSTOSE LICHEN COVER (PERCENT),Y,Y,Table 8 in Barreda et al. 2006.  
 PLEUROCARPOUS MOSS COVER (PERCENT),Y,N,Table 8 in Barreda et al. 2006.  
 Pleurocarpous and acrocarpous moss and liverwort cover were combined by the author 2014 for Turboveg field 'Cover mosses & liverworts.'  
 ACROCARPOUS MOSS COVER (PERCENT),Y,N,Table 8 in Barreda et al. 2006.  
 Pleurocarpous and acrocarpous moss and liverwort cover were combined by the author 2014 for Turboveg field 'Cover mosses & liverworts.'  
 LIVERWORT COVER (PERCENT),Y,N,Table 8 in Barreda et al. 2006.  
 Pleurocarpous and acrocarpous moss and liverwort cover were combined by the author 2014 for Turboveg field 'Cover mosses & liverworts.'  
 HORSETAIL COVER (PERCENT),Y,N,Table 8 in Barreda et al. 2006.  
 ALGAE COVER (PERCENT),Y,Y,Table 8 in Barreda et al. 2006.  
 TYPE OF FROST BOIL,Y,N,Tables 10–16 in Barreda et al. 2006.  
 CHARACTERISTIC SPECIES (ABBREVIATED),Y,N,Tables 10–16 in Barreda et al. 2006.  
 DATE (YYYYMMDD),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 PLOT SIZE (SQUARE METERS),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 ELEVATION (M),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 ROCK COVER (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 BARE SOIL COVER (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 SALT CRUST COVER (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 STANDING WATER COVER (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 DEAD VEGETATION (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006. In Turboveg field 'Cover litter.'  
 TOTAL VEGETATION COVER (PERCENT),Y,N,Tables 10–16 in Barreda et al. 2006. These are summed values (absolute cover) calculated in the office, and are not included in the Turboveg database 'Total Vegetation Cover' field which reserved for Braun–Blanquet relative cover.  
 VEGETATION HEIGHT (CM),Y,Y,Tables 10–16 in Barreda et al. 2006.  
 MICRORELIEF (CODE),Y,N,Tables 10–16 in Barreda et al. 2006.  
 MICROSITE (CODE),Y,N,Tables 10–16 in Barreda et al. 2006. Aided with crosswalk to Turboveg field 'Habitat type.'  
 SITE MOISTURE (SCALAR),Y,Y,Tables 10–16 in Barreda et al. 2006. Aided with crosswalk to Turboveg field 'Site moisture.'  
 SOIL MOISTURE (SCALAR),Y,N,Tables 10–16 in Barreda et al. 2006.  
 GLACIAL GEOLOGY (CODE),Y,N,Tables 10–16 in Barreda et al. 2006.  
 TOPOGRAPHY (CODE),Y,N,Tables 10–16 in Barreda et al. 2006. Aided with crosswalk to Turboveg field 'Topographic position.'  
 SNOW DURATION (CODE),Y,N,Tables 10–16 in Barreda et al. 2006.  
 DISTURBANCE DEGREE (SCALAR),Y,N,Tables 10–16 in Barreda et al. 2006.  
 STABILITY (CODE),Y,N,Tables 10–16 in Barreda et al. 2006.

EXPOSURE (CODE),Y,N,Tables 10–16 in Barreda et al. 2006.

LOCATION,Y,Y,Table 17 in Barreda et al. 2006. Turboveg field 'Location.'

SAND (PERCENT),Y,N,Table 18 in Barreda et al. 2006. Aided in soil texture calculation.

CLAY (PERCENT),Y,N,Table 18 in Barreda et al. 2006. Aided in soil texture calculation.

SILT (PERCENT),Y,N,Table 18 in Barreda et al. 2006. Aided in soil texture calculation.

SOIL PH (PASTE),Y,Y,Table 18 in Barreda et al. 2006.

MEAN MOSS LAYER HEIGHT (CM),Y,N,Table 18 in Barreda et al. 2006.

SOILS–DEPTH OF ORGANIC HORIZON (CM),Y,Y,Table 18 in Barreda et al. 2006.

SOILS–DEPTH OF A HORIZON (CM),Y,N,Table 18 in Barreda et al. 2006.

LATITUDE (DD) ,Y,N,Table 28 in Barreda et al. 2006.

LONGITUDE (DD),Y,N,Table 28 in Barreda et al. 2006.

FROST SCAR COVER (PERCENT),Y,N,From original field datasheets.

MEAN THAW (DEPTH),Y,N,From original field datasheets.

LANDFORM (CODE),Y,N,From original field datasheets. Aided in crosswalk to Turboveg field 'Topographic position.'

SURFICIAL GEOLOGY (CODE),Y,Y,From original field datasheets. Crosswalked to Turboveg field 'Surficial geology.'

SURFICIAL GEOMORPHOLOGY (CODE),Y,N,From original field datasheets. Aided with crosswalk to Turboveg field 'Habitat type.'

SOIL UNITS,Y,N,From original field datasheets.

DISTURBANCE TYPE (CODE),Y,N,From original field datasheets.

SLOPE (DEGREES),Y,Y,From original field datasheets.

ASPECT,Y,Y,From original field datasheets. Converted from cardinal directions to degrees to crosswalk to Turboveg field 'Aspect.'

PLANT COMMUNITY NAME (Kade et al. 2005),Y,Y,Tables 4–12 and text in Kade et al. 2005. Phytocoenlogia paper. Turboveg field 'Plant community name.'

LATITUDE (DD) WGS 84,Y,Y,Projected by L. Wirth to WGS 84 for crosswalk to Turboveg field 'Latitude.'

LONGITUDE (DD) WGS 84,Y,Y,Projected by L. Wirth to WGS 84 for crosswalk to Turboveg field 'Longitude.'

SOIL TEXTURE (CALCULATED),Y,Y,"L. Druckenmiller used sand, silt, and clay data and the U.S.D.A. Natural Resources Conservation Service Texture Calculator ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2\\_054167](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167)) for Turboveg field 'Soil texture.'"

FORB COVER (CALCULATED BY THE AUTHOR 2014) (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006. Used source data from tables to calculate these fields for Turboveg.

TOTAL GRAMINOID COVER (CALCULATED BY THE AUTHOR 2014) (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006. Used source data from tables to calculate these fields for Turboveg.

FOLIOSE AND FRUTICOSE LICHEN COVER (CALCULATED BY THE AUTHOR 2014) (PERCENT),Y,Y,Tables 10–16 in Barreda et al. 2006. Used source data from tables to calculate these fields for Turboveg.



BRYOPHYTE COVER (CALCULATED BY THE AUTHOR 2014) (PERCENT),Y,Y,Tables 10-16 in Barreda et al. 2006. Used source data from tables to calculate these fields for Turboveg.

MOSS AND LIVERWORT COVER (CALCULATED BY THE AUTHOR 2014) (PERCENT),Y,Y,Tables 10-16 in Barreda et al. 2006. Used source data from tables to calculate these fields for Turboveg.

MEAN CANOPY COVER (CALCULATED BY THE AUTHOR 2014) (PERCENT),Y,Y,Tables 10-16 in Barreda et al. 2006. Used source data from tables to calculate these fields for Turboveg.