Context Map for Allan Hills Ice Coring Projects (QGIS)

Description: This map depicts the Allan Hills, Antarctica, along with geophysical data useful for understanding ice flow in this locality. Ice flow in the Allan Hills is not well understood, and our map helps address this gap in knowledge by compiling and visually representing various data sets rarely shown together. This is the first time a shareable map of the Allan Hills and all its layers has been available for download.

Software: All mapping and calculations were done within QGIS Firenze 3.28.3. except for the steepest flowlines which were computed using MatLab then imported into QGIS.

Opening the map: Double click on the file called “Allan Hills Shared.qgz”. If QGIS opens and the map does not show up, click the Zoom Full button (magnifying glass with three arrows) in the Map Navigation Toolbar.

Credits: Eads Fouché, Marguerite Shaya, T.J. Fudge, Nicholas Holschuh. This map was produced with the help of COLDEX (NSF award #2019719) and the University of Washington.

Questions: contact efouche25@amherst.edu

Layer Name	Data Name	Source and Description	Location
A09_Flowline	A09_Flowline_Points.csv	Howat, I. M., Porter, C., Smith, B. E., Noh, M.-J., and Morin, P., The Reference Elevation Model of Antarctica, The Cryosphere, 13, 665-674, https://doi.org/10.5194/tc-13-665-2019, 2019 Flow lines are labeled using the following format “[GPS stake start point]_Flowline” Flowlines were generated in MATLAB (see github linked below) assuming ice flows down the maximum surface gradient (derived from the REMA digital elevation model). Seed points correspond to a GPS stake location. Flowlines were created and compared to observed horizontal velocities collected by Spaulding et al. 2012. Flowlines are stored as vectors as well as individual points. https://github.com/nholschuh/NDH_MatlabTools/blob/master/particle_tracking.m	Flowlines/A09_Flowline/Points/A09_Flowline_Points.csv
AllanHills_Radar_Tracks	Allanhill_Radar_Tracks_	Conway, H. (2017) "Ground-based ice-penetrating radar profiles collected on the Allan Hills blue ice region" U.S.	Radar/Allanhill_Radar_Tracks_Sh

	Shared	Antarctic Program (USAP) Data Center. doi: https://doi.org/10.15784/601005 Description: Ground-based ice-penetrating radar profiles collected on the Allan Hills blue ice region between January 19 and January 31, 2016. Colors correspond to ice thickness.	ared
Bases	Bases_Shared.csv	Spaulding, N., Spikes, V., Hamilton, G., Mayewski, P., Dunbar, N., Harvey, R., . . . Kurbatov, A. (2012). Ice motion and mass balance at the Allan Hills blue-ice area, Antarctica, with implications for paleoclimate reconstructions. Journal of Glaciology, 58(208), 399-406. doi:10.3189/2012JoG11J176 Description: Name and location of bases used for placing GPS stakes in Allan Hills.	Bases/Bases_shared.csv
Contours	Rema_contours_100m_clipped.gpkg	Howat, I. M., Porter, C., Smith, B. E., Noh, M.-J., and Morin, P., The Reference Elevation Model of Antarctica, The Cryosphere, 13, 665-674, https://doi.org/10.5194/tc-13-665-2019, 2019 Description: Contour lines showing surface elevation in 10 meter increments. Derived from REMA mosaic 100 m digital elevation model using the contour extraction tool in QGIS.	Contours/Rema_contours_100m_clipped.gpkg
GPS_Stakes	Vertical_velocity_shared.csv	Spaulding, N., Spikes, V., Hamilton, G., Mayewski, P., Dunbar, N., Harvey, R., . . . Kurbatov, A. (2012). Ice motion and mass balance at the Allan Hills blue-ice area, Antarctica, with implications for paleoclimate reconstructions. Journal of Glaciology, 58(208), 399-406. doi:10.3189/2012JoG11J176 Description: Location of GPS stakes placed at the Allan Hills Tracking various measurements including horizontal velocities, direction of motion, and vertical uplift or submergence.	GPS Stakes/Vertical_velocity_shared.csv
Horizon_1	Tephra_Horizon_1.gpkg	Naming convention: “Horizon_[order]_[section of layer]” The oldest and northernmost tephra Horizon (true North) is “Horizon_1” and the number increases with each more southern tephra band. For segmented tephra layers, each section is assigned a number moving from left to right starting at one. Tephra layers were mapped during this study using data from MAXARs Worldview-2 multispectral imager. Horizons appeared with varying thickness and darkness in the blue ice	Tephra Layers/Horizon_1/Points/Tephra_Horizon_1_points.gpkg

		enabling the distinction of individual horizons. These were manually traced in QGIS. Tephra Horizons are stored as vectors as well as individual points.	
Horizon_2	Tephra_Horizon_2.gpkg	[See Horizon_1]	Tephra Layers/Horizon_2/Points/Tephra_Horizon_1_points.gpkg
Horizon_3	Tephra_Horizon_3.gpkg	[See Horizon_1]	Tephra Layers/Horizon_3/Points/Tephra_Horizon_1_points.gpkg
Horizon_4-1	Tephra_Horizon_4-1.gpkg	[See Horizon_1]	Tephra Layers/Horizon_4-1/Points/Tephra_Horizon_1_points.gpkg
Horizon_4-2	Tephra_Horizon_4-2.gpkg	[See Horizon_1]	Tephra Layers/Horizon_4-2/Points/Tephra_Horizon_1_points.gpkg
Horizon_4-3	Tephra_Horizon_4-3.gpkg	[See Horizon_1]	Tephra Layers/Horizon_4-3/Points/Tephra_Horizon_1_points.gpkg
Horizon_5-1	Tephra_Horizon_5-1.gpkg	[See Horizon_1]	Tephra Layers/Horizon_5-1/Points/Tephra_Horizon_1_points.gpkg
Horizon_5-2	Tephra_Horizon_5-2.gpkg	[See Horizon_1]	Tephra Layers/Horizon_5-2/Points/Tephra_Horizon_1_points.gpkg
Horizon_5-3	Tephra_Horizon_5-3.gpk	[See Horizon_1]	Tephra Layers/Horizon_5

	g		-3/Points/Tephra_Horizon_1_points.gpkg
Horizontal_Velocity	Vertical_velocity_shared.csv	Spaulding, N., Spikes, V., Hamilton, G., Mayewski, P., Dunbar, N., Harvey, R., . . . Kurbatov, A. (2012). Ice motion and mass balance at the Allan Hills blue-ice area, Antarctica, with implications for paleoclimate reconstructions. Journal of Glaciology, 58(208), 399-406. doi:10.3189/2012JoG11J176 Description: Horizontal velocity vectors showing annual movement of GPS stakes placed at the Allan Hills. Size and direction of arrow vector correlates with GPS stake horizontal velocity and direction of motion. Units: meters/year.	GPS Stakes/Vertical_velocity_shared.csv
Ice_Cores	Core_list_shared.csv	Higgins, John, personal communication, March 2nd, 2020. Shackleton, S., & Brook, E. (2023) "Allan Hills 2022-23 Shallow Ice Core Field Report" U.S. Antarctic Program (USAP) Data Center. doi: https://doi.org/10.15784/601696. Spaulding, N. E. et al. Climate archives from 90 to 250 ka in horizontal and vertical ice cores from the Allan Hills Blue Ice Area, Antarctica. *Quat. Res*. 80, 562–574 (2013) Yan, Y., Bender, M.L., Brook, E.J. *et al.* Two-million-year-old snapshots of atmospheric gases from Antarctic ice. *Nature* 574, 663–666 (2019). https://doi.org/10.1038/s41586-019-1692-3. Description: Name and location of Allan Hills ice cores.	Cores/Core_list_shared.csv
LIMA_virtual_Mosaic_15m	LIMA_virtual_Mosaic_15m.tif	Landsat Image Mosaic of Antarctica (LIMA) Project, https://lima.usgs.gov/access.php Description: LIMA:Landsat Image Mosaic of Antarctica. Clipped to the extent of the Allan Hills.	Imagery/LIMA_virtual_Mosaic_15m.tif
P16_Flowline	P16_Flowline_Points.csv	[See A09_Flowline]	Flowlines/P16_Flowline/Points/P16_Flowline_Points.csv
P17_Flowline	P17_Flowline_Points.csv	[See A09_Flowline]	Flowlines/P17_Flowline/Points/P17_Flowline_Points.csv

P18_Flowline	P18_Flowline_Points.csv	[See A09_Flowline]	Flowlines/P18_Flowline/Points/P18_Flowline_Points.csv
P19_Flowline	P19_Flowline_Points.csv	[See A09_Flowline]	Flowlines/P19_Flowline/Points/P19_Flowline_Points.csv
rema_mosaic_100m_v2.0_filled_clipped	rema_mosaic_100m_v2.0_filled_clipped.tif	Howat, I. M., Porter, C., Smith, B. E., Noh, M.-J., and Morin, P., The Reference Elevation Model of Antarctica, The Cryosphere, 13, 665-674, https://doi.org/10.5194/tc-13-665-2019, 2019 Description: Reference Elevation Model of Antarctica (REMA) at a 100 m resolution. Clipped to the extent of the Allan Hills. Used for calculating contours, slope, and flowlines.	DEM/rema_mosaic_100m_v2.0_filled_clipped.tif
Rema100m_Slope_Clipped	Rema100m_Slope_Clipped.tif	Howat, I. M., Porter, C., Smith, B. E., Noh, M.-J., and Morin, P., The Reference Elevation Model of Antarctica, The Cryosphere, 13, 665-674, https://doi.org/10.5194/tc-13-665-2019, 2019 Description: Slope of the Allan Hills derived from REMA 100 m resolution DEM using the slope analysis tool in QGIS.	Slope/Rema100m_Slope_Clipped.tif
Vertical_Velocity	Vertical_velocity_shared.csv	Spaulding, N., Spikes, V., Hamilton, G., Mayewski, P., Dunbar, N., Harvey, R., . . . Kurbatov, A. (2012). Ice motion and mass balance at the Allan Hills blue-ice area, Antarctica, with implications for paleoclimate reconstructions. Journal of Glaciology, 58(208), 399-406. doi:10.3189/2012JoG11J176 Description: Vertical velocity represented as colored circles corresponding to GPS stake locations. The color of the circle corresponds to the magnitude of uplift or submergence.	GPS Stakes/Vertical_velocity_shared.csv