

NGEE Arctic Spatial Reference System Guidance -- Seward Peninsula, Alaska

Purpose:

Define the best practices for obtaining vertical and horizontal coordinates of known precision and accuracy for sampling and measurement points and surface landscape features to meet the needs of the field sampling, landscape characterization, remote sensing, and modeling tasks of the NGEE Arctic, Phase 2.

Note the infrastructure and administrative controls to implement these best practices are not all in place. Please see the accompanying Action Plan.

Applicability:

This guidance is most applicable to the Seward Peninsula, Alaska, the region of NGEE Arctic, Phase 2, field activities.

Background:

Drivers for Spatial Reference System (SRS) decisions:

- Generally need a system that isn't too complex
- Visualization in Google Earth
- An accurate representation of the position for use in the data archive

Spatial Reference System Guidance:

Preferred Reference Ellipsoid: World Geodetic System 1984

- For primarily reasons of convenience, the WGS84 ellipsoid is preferred over the GRS80 used by the NAD83 system as it is easier to integrate directly into visualization tools and such while being nearly technically equivalent. However, using differential corrections from a well-defined control point further minimizes any error between the two systems. With that said, WGS84 is preferred and the GRS80 is included here for comparison only.

Spatial Reference System	Name	Semi-major axis	Semi-minor axis	Inverse Flattening (1/f)
Preferred	World Geodetic System 1984 (WGS84)	6,378,137	6,356,752.3142	298.257223563
For Comparison	Global Reference System 1980 (GRS80)	6,378,137	6,356,752.3141	298.257222101

Preferred Reference Geoid: National Geodetic Survey gravimetric geoid model version GEOID12B

- This reference geoid is the most recent vertical geoid product from NOAA (June 2016) and is selected for NGEE Arctic, Phase 2.
- http://www.ngs.noaa.gov/GEOID/GEOID12B/GEOID12B_TD.shtml

Horizontal Datum: North American Datum 1983 (NAD83) & World Geodetic System 1984 (WGS84) are equivalent for latitude and longitude

Vertical Datum: GEOID12B geoid model (see above Preferred Reference Geoid)

- GPS Note: If your GPS does not have the GEOID12B geoid model on it (such as a consumer GPS or phone) select the North American Vertical Datum 1988 and then plan to do additional processing later.

Preferred Projections:

- **Application specific:**
 - For surveying: UTM Zone 3N and Alaska Albers
 - For DEM & DSM products: these should match the surveying datum
 - For Google Earth: this is primarily a visualization tool and so it is okay to use a standard transformation

- For points logged using consumer GPS: record the type of GPS in the metadata and these points will be surveyed later with a more precise instrument

Suggested Transformation Tools:

- ArcGIS work should use the conversion tools included in the ArcToolbox.
- Users working with open source GIS applications should use the GDAL package from OSGEO for consistent transformations.
- Sometimes it will be required that you shift from a UTM coordinate system to a spherical one. Both ArcGIS and most open source GIS software have Python included.
 - The UTM package should be available in each to consistently facilitate conversions: <https://pypi.python.org/pypi/utm>
- A reminder: please record in your metadata/documentation what transformation tool was used and what projection the data started in.

Good Things to Know:

Send your newly collected sampling point coordinates to Lauren Charsley-Groffman (lcg@lanl.gov) for addition to Site Maps.

Ground Control Points

- Bob Busey will establish ground control points at the Teller, Kougarak, and Council research sites. Both local and regional ground control points are needed.
- Local would be situated within 100 meters of each study area (and multiples are ok).
- Local points will be resurveyed annually by doing a static survey and submitting the raw data to Online Positioning User Service (OPUS) for processing.
- Note that DGPS field protocols incorporate ground control points into field surveying task plans. The ground control points can only be used with DGPS. (Sorry consumer GPS folks.)

As of June 2016 - One (1) local control point has been installed and surveyed (with OPUS processing) at the Teller Site.

Contact for more information:

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Jitendra Kumar: jkumar@climatemodeling.org

Craig Ulrich: culrich@lbl.gov

Custodian for this guidance document: Lauren Charsley-Groffman: lcg@lanl.gov

Action Plan to Facilitate Implementation of SRS Guidance -- Seward Peninsula, Alaska

Purpose:

To fully implement the spatial reference system (SRS) guidance the following tasks must be completed in 2016 and maintained in the future to ensure continued good quality spatial data.

General Tasks:

1. Establish multiple ground control points at the Teller, Kougarok, and Council research sites.

Both local and regional ground control points are needed.

- Local would be situated within 100 meters of each study area (and multiples are ok).
 - Local points will be resurveyed annually by doing a static survey and submitting the raw data to Online Positioning User Service (OPUS) for processing.
2. Ensure that field protocols incorporate ground control points into field surveying task plans. Ground control points can only be used with DGPS.
 3. Define field protocols to ensure that surveying and point logging are reported in UTM or both UTM and latitude and longitude in decimal degrees.
 4. Define field protocols to ensure that when surveying where altitude measurements are also logged, the National Vertical Datum 83 with the 2012B geoid corrections are used.
 5. Ensure that Global Navigation Satellite System (GNSS) system used for the measurements is included in the metadata.
 6. Ensure that surveyed points are reported to Lauren Charsley-Groffman in a timely manner so new points can be incorporated on to maps and distributed to the Team.

Specific Actions:

Task	Responsible	Description	
Establish multiple ground control points	Bob Busey	In the spring and summer of 2016 will lead the effort to establish ground control in the Teller, Kougarak, and Council sites.	
Re-survey Annually	Bob Busey		
Primary point of contact for current project benchmarks	Lauren Charsley-Groffman		
Primary point of contact for background GIS documents	Lauren Charsley-Groffman	LANL principle for reference maps	

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