

## **Differential GPS techniques used for ADCP measurements in remote areas of Alaska**

Randy H. Host<sup>1</sup> and Matthew D. Nelson<sup>2</sup>

<sup>1</sup>Hydrologist, U. S. Geological Survey, Alaska Science Center  
1910 Alex Holden Way, Juneau, AK 99801; PH (907) 789 5766; email: rhost@usgs.gov

<sup>2</sup>Hydrologic Aid, U. S. Geological Survey, Alaska Science Center  
1910 Alex Holden Way, Juneau, AK 99801; PH (907) 789 5766; email: mdnelson@usgs.gov

Alaska has many sediment laden, high gradient streams with moving bed conditions where differential GPS is required to track boat movement during streamflow measurements made using acoustic Doppler current profilers. The remote nature of most streamgages in Alaska makes acquiring a differentially corrected GPS signal difficult primarily for three reasons:

- 1) National Geodetic Survey Continuously Operating Reference Stations are located largely near urban areas nationally and few exist in Alaska;
- 2) Wide Area Augmentation System signals are transmitted by geostationary satellites positioned over the equator on a line-of-sight frequency; and
- 3) Private companies currently (2006) that provide independent GPS reference stations do not cover Alaska.

Recent installation of ground reference stations in Alaska can provide adequate corrections, but the mountainous geography of Alaska often obstruct signal-correction transmissions from the equatorial positioned broadcast satellites. As a result, the current practice in the Alaska Science Center is to establish a temporary base station and use radio modems to broadcast a differential correction for a streamflow discharge measurement. Radio multiplexers are required when using a tethered boat deployment. A differential signal is broadcast from shore to the boat and then a corrected signal from the GPS on the boat and the streamflow information are transmitted back to shore. Problems sometimes arise from this additional complexity in radio communications, including a lack of available sites for locating base stations in narrow valleys during high flow, switching between manned and unmanned boat deployments, and limited carrying capacity in small aircrafts.