

Continued Permafrost Warming in Northern Alaska, 2007 Update

G.D. Clow¹ and F.E. Urban¹

¹U.S. Geological Survey, Denver Federal Center, Earth Surface Dynamics, Lakewood, CO 80225; 303-236-5509, Fax: 303-236-5349, E-mail: clow@usgs.gov

USGS maintains a permafrost monitoring network on federal lands in northern Alaska as part of the Global Terrestrial Network for Permafrost (GTN-P). This network consists of two arrays: 1) An array of 15 automated meteorological/active-layer stations, and 2) an array of 20 deep boreholes, the majority of which are located on the Arctic Coastal Plain (a few are located in the foothills of the Brooks Range). Temperature measurements are made in the deep borehole array every 5 years to monitor the thermal state of permafrost from the surface down to 125+ meters.

During the summer of 2007, permafrost temperatures were obtained from the portion of the borehole array located on the Arctic Coastal Plain as part of an international effort to obtain a global snapshot of the thermal state of permafrost during the International Polar Year. Previous measurements made in the USGS/GTN-P borehole array had shown little trend in permafrost temperatures during the 1980s, followed by a ~3 K warming between 1989 and 2002-03. The 2007 measurements show that shallow permafrost temperatures have continued to warm since 2002-03. The magnitude of the warming ranges from 0.0 to 1.0 K (mean = 0.4 K), depending on local site conditions. The total average permafrost warming in this region since 1989 is now ~ 3.5 K.

Data from the co-located USGS/GTN-P meteorological array show that the 2002-03 borehole measurements coincided with a peak in mean-annual air temperatures on the Arctic Coastal Plain in Alaska. Mean-annual air temperatures cooled substantially during 2004, but have been rising since and are now warmer than those experienced during 2002-03.

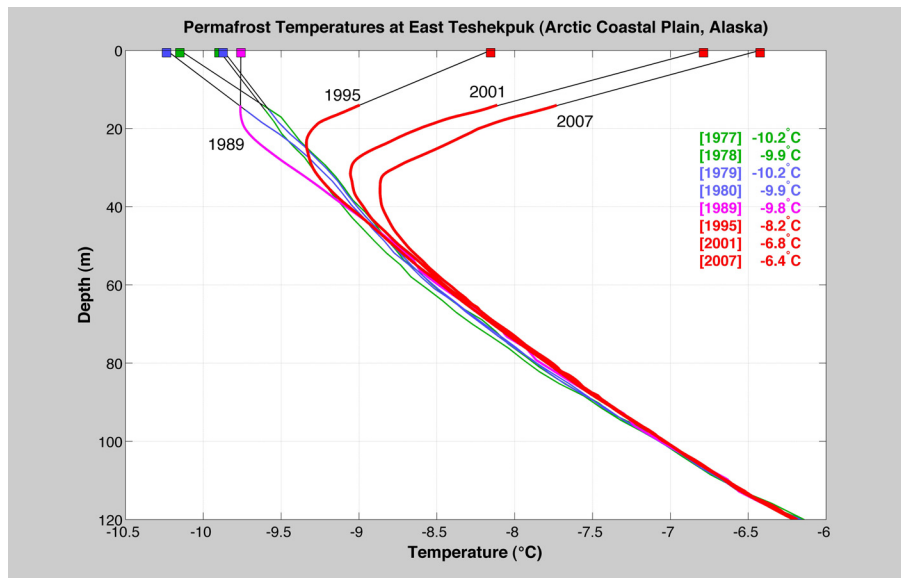


Figure 1. Permafrost temperatures measured in the East Teshekpuk borehole on the Arctic Coastal Plain in Alaska since 1977. Also shown are the extrapolated mean-annual surface temperatures which have increased about 3.6 K at this site since the late 1970s. East Teshekpuk is one of 20 deep boreholes currently monitored by the U.S. Geological Survey in Arctic Alaska.