ECV T07

GLOBAL TERRESTRIAL NETWORK FOR PERMAFROST (GTN-P)

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Permafrost refers to earth materials that remain at or below 0°C for at least two consecutive years. In the Northern Hemisphere, permafrost regions occupy approximately 23 million km², or 24 percent of the ice-free land surface. These regions include large areas of Canada, China, Mongolia, Russia and Alaska, and areas at higher elevations in mountain chains of many other countries in both the Northern and Southern Hemispheres. As warming occurs, permafrost landscapes are susceptible to increased thaw and associated ground settlement, erosion and slope failures. Unlike snow and ice covers, permafrost and the overlying seasonal thaw zone (active layer) is not easily observed remotely, and requires *in situ* observations to define its extent and properties. Permafrost temperature is used to detect the terrestrial climate signal since it provides an integration of changes at the ground surface, that in turn may reflect changes in climate.

MONITORING OF PERMAFROST AND ACTIVE LAYER

Permafrost monitoring is conducted mainly through ground-based, point measurements. Permafrost thermal state (i.e. ground temperature) and active layer thickness are the key permafrost variables identified for monitoring under the GCOS/GTOS programmes.

The Global Terrestrial Network for Permafrost (GTN-P), approved in 1999 and coordinated by the International Permafrost Association (IPA), comprises two international monitoring networks: Thermal State of Permafrost (TSP) boreholes, and Circumpolar Active Layer Monitoring (CALM).

More than 15 countries participate in these networks. Protocols for standard measurements and data reporting requirements are available on the Web sites.

NETWORK EXTENT

Monitoring sites are located in the high-latitude and high-altitude regions of the Northern Hemisphere. Existing and new sites in Antarctica and the subantarctic region are being added. GTN-P largely comprises voluntary regional networks, including the Mackenzie region in Canada; an Alaskan transect and deep boreholes in northern Alaska; boreholes in Europe initiated under the Permafrost and Climate in Europe (PACE) programme, and regional networks in China, Russia and Mongolia. Additional activities such as "TSP Norway", several in Russia, Canada and Alaska (USA) have been initiated or expanded under the International Polar Year (IPY) and the Permafrost Observatory Project.

Active borehole sites contributing to GTN-P

Permafrost temperature reflects integrated changes in ground surface energy balance, in turn reflecting possible climate change

Logging permafrost temperatures in an abandoned exploratory oil well, northern Alaska. Photograph provided by Gary Clow, U.S. Geological Survey

Currently, 165 sites, in both hemispheres contribute to CALM, and have operated for more than a decade. The TSP programme has identified over 550 candidate boreholes, several hundred are currently active and contribute to GTN-P.

DATA MANAGEMENT

Metadata and site information are available for many of the boreholes and all CALM sites (see Web sites). The National Snow and Ice Data Center (NSIDC) and its Frozen Ground Data Center, based on availability of funds, provide many valuable services and products related to historical and contemporary permafrost and seasonally frozen ground data. Management and dissemination of active layer data for CALM is currently supported through 2008 by a grant from the U.S. National Science Foundation. Short-term data management for TSP is partially supported by grants or programmes at the University of Alaska, U.S. Geological Survey, Geological Survey of Canada, and the new Nordic TSP project. Both CALM and TSP contribute soil temperature and moisture data to the Terrestrial Ecosystem Monitoring Sites (TEMS) database.

FUTURE

Funding of both field measurements and data activities are traditionally based on short-term grants from member countries.

Both IPA and IPY goals are to establish a permanent observatory network for both hemispheres and, where possible, at sites that are protected from human disturbance. Some key sites should be co-located with or near other observatories, including WMO stations.

Cost for individual sites varies based on personnel, access and logistics. National and international commitments are required at a minimum of several million dollars per year, which includes support to data management.

New regional maps of permafrost properties and areal extent are required, built on GTN-P data and related modelling. The Ninth International Conference on Permafrost (NICOP) in June 2008 in Fairbanks, Alaska, will provide published reports on many current GTN-P activities.

RELATED LINKS:

GTNP: www.gtnp.org | **CALM:** www.udel.edu/geography/calm | **IPA:** www.ipa-permafrost.org
Norway TSP: www.tspnorway.com | **FGDC:** http://nsidc.org/fgdc | **NICOP:** www.nicop.org