



# EXPRESSION OF INTENT FOR ACTIVITIES IN IPY 2007-2008

**Deadline for Submission - January 14, 2005**  
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## 1.0 PROPOSAL INFORMATION

1.1 Title of proposed activity

PERmafrost and Carbon Emissions (PEACE)

1.2 Acronym or short form title of proposed activity

PEACE

1.3 Concise outline of proposed activity

The goal is to explore the climate vulnerability to a positive feedback associated with possible release of Carbon containing gases from within and under the thawing permafrost in a warmer climate scenario.

Existing estimates of Carbon content in soils within the permafrost regions are of order of 400 PgC. Climate warming by 2°C scenarios and associated possible 25% reduction in the near-surface permafrost may result in a release of up to 100 PgC into the atmosphere, which would exert a large impact on the rate of global warming.

The project will examine current distribution of the permafrost and seasonally frozen soils and assess current quality and quantity of Carbon in frozen soils, the near-surface permafrost, and the extensive peatlands within and adjacent to permafrost regions of Planet Earth. This will enable preliminary estimates of current Carbon fluxes from regions of underlain by permafrost and containing seasonally frozen soil.

The project will consider several processes which are expected to control Carbon dynamics in thawing permafrost. This will involve biogeochemical modelling and experimentation using data from flux towers and chamber techniques. The scope of the land surface models will be extended to include permafrost dynamics under a warming climate. Where possible, these models will be extended to include hydrological processes. Vegetation change and associated Carbon dynamics will also be considered.

The project will conclude with a series of experiments with Earth System models that will more fully represent the climate warming – permafrost - Carbon feedback with best possible account of biogeochemical and hydrological processes. This will reveal warming potential associated with Carbon stocks currently fully or partially isolated from the atmosphere by permafrost and/or frozen soil.

### Summary of Activities:

1. Spatial Distribution Carbon Stocks Associated with Permafrost
  - Refine existing digital databases of spatial distribution
  - Re-assessment of current soil carbon content in frozen soils and peatlands (including below 1-2 m depth)
  - Assessment of southern boundary of permafrost changes

- 2. Carbon Processes
  - Development of biogeochemical modeling of C dynamics in thawing permafrost with emission trajectories:
    - Review of processes controlling carbon emissions in thawing permafrost
    - Current fluxes and controlling processes (eddy-covariance measurements)
- 3. Climate Impacts (100 years time frame)
  - Off-line calculations of carbon emissions impacts on climate change.
  - Work with Earth System models including permafrost models (eg, GCMs) to bring critical elements of permafrost dynamics, hydrological, and carbon cycle components into model development to explore feedbacks to climate.

1.4 Which IPY 2007-2008 theme(s) will be addressed by the project (see Note 1)

<b>Theme 1 – The current state of the polar environment</b>	Y
<b>Theme 2 - Change in the polar regions</b>	Y
<b>Theme 3 - Polar-global linkages and interaction</b>	Y
<b>Theme 4 – Investigating new frontiers</b>	N
<b>Theme 5 - The polar regions as vantage points</b>	N
<b>Theme 6 - Human societies in polar regions</b>	Y

1.5 What is the major target of the proposed activity (specify one – see Note 1)

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<b>Theme 2 - Change in the polar regions</b>	Y
<b>Theme 3 - Polar-global linkages and interaction</b>	Y
<b>Theme 4 – Investigating new frontiers</b>	N
<b>Theme 5 - The polar regions as vantage points</b>	N
<b>Theme 6 - Human societies in polar regions</b>	N

1.6 What is the major target of the proposed activity (specify one – see Note 1)

<b>Natural or social science research</b>	Y
<b>Education/Outreach and Communication</b>	N
<b>Data Management</b>	N
<b>Legacy</b>	N
<b>Other Targets</b>	N

1.7 What significant advance(s) in relation to the IPY themes and targets can be anticipated from this project?

- Theme 1:** Assessment of current Carbon stocks within the permafrost and seasonally frozen soils.
- Theme 2:** Estimates of additional warming associated with the role of Carbon in permafrost regions.
- Theme 3:** Global climate warming potential associated with Carbon stocks isolated by permafrost and seasonally frozen soils.

1.7 What international collaboration is involved in this project? (see Note 2)

The project will be executed in collaboration between the Global Carbon Project, the World Climate Research Programme Climate and Cryosphere project and the International Permafrost Association. The project will be linked to COSMOS activities.

## 2.0 FIELD ACTIVITY DETAILS

2.1 Outline the geographical location(s) for the proposed field work (see Note 3)

Permafrost (perennially frozen ground) may occur where the mean annual air temperature is less than  $-1^{\circ}\text{C}$  and is generally continuous where it is less than  $-7^{\circ}\text{C}$ . It is estimated that permafrost regions occupy a quarter of the Earth's ice free area. Methane emissions from the Arctic continental shelves where relict permafrost exists is another potential source region.

2.2 Define the approximate timeframe(s) for proposed field activities?

The activities should commence before the IPY and be concluded during the IPY period.

2.3 What significant logistic support/facilities will be required for this project? Can these resources be usefully shared with other projects? (see Note 4)

No significant logistics envisaged. If existing, new and representative remote sites for flux measurements and aircraft observations are involved, the project may require additional support.

2.4 Will the project leave a legacy of infrastructure? (see Note 1)

None anticipated. However, field sites from which data are utilized might become part of long-term observatories (Flagship Observatories). For instance in the U.S. Barrow and the Toolik LTER site are currently under consideration, a Canadian network is proposed, and the Abisko Research Station in Sweden has a long tradition of flux studies.

2.5 How is it envisaged that the required logistics will be secured? (one or more options can be identified)

Consortium of national polar operators	N
Own national polar operator	Y
Another national polar operator	Y
National agency	Y
Military support	N
Commercial operator	N
Own support	Y
Other sources of support	Y

Further details: Flux sites will require logistics

2.6 Has the project been "endorsed" at national or international level (see Note 5)

Y	The draft proposal was considered and approved by the First Session of the CliC Scientific Steering Group (Hobart, Australia, October 2004). The Global Carbon Project has identified the permafrost-carbon-climate feedback as a critical vulnerability of the Earth System and made it a research priority (GCP 2003. A framework for Internationally Coordinated Research of the Global Carbon Cycle, ESSP Report No. 1).
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### 3.0 PROJECT MANAGEMENT AND STRUCTURE

3.1 Is the project a component (established over the IPY 2007-2008 timeframe) of an existing plan, programme or initiative or is it a new autonomous proposal?

New Project	YES	Component of an existing or planned activity	YES
PEACE will be a subproject of the Global Carbon Project, WCRP CliC Project, and several activities of the International Permafrost Association. Coordination with the International Arctic Science Committee (IASC) project C-FATE: Carbon stock, carbon cycling and trace gas flux studies and the IASC ICARP II conference in November 2005 will be developed.			

3.2 How will the project be organised and managed? (see Note 6)

The project will have a leader, a small Steering Committee, links to several research groups and international programmes (GCP, CliC, IPA etc); including peatland projects. The project proposal will be amended and agreed by all the participants.

3.3 What are the initial plans of the project for addressing the education, outreach and communication issues outlined in the Framework document? (see Note 7)

Results from the project will be published in scientific literature and this information can be used in the learning process. Graduate students and post docs will participate in many project activities.

3.4 What are the initial plans of the project to address data management issues (as outlined in the Framework document)? (see Note 8)

Data management practices will comply with requirements set out by the IPY Framework.

3.5 How is it proposed to fund the project? (see Note 9)

A request for funding will be prepared and submitted to ICSU. Other sources of funding will be sought.

3.6 Is there additional information you wish to provide?

Numerical experimentation of PEACE may affect IPCC scenarios. The activities related to stocks will rely on recently completed GIS-based projects from West Siberia (Sheng, Smith, MacDonald et al.) and the Usa Basin (Kuhry and Mazhitova) to update carbon stocks in permafrost and peatland regions of Russia and Canadian estimates by Tarnocai..

## 4.0 PROPOSER DETAILS

### 4.1 Lead Contact for the Expression of Intent

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### 4.2 List other project members and their affiliation.

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