



SUMMARY OF SCIENCE FINDINGS, INTERPRETATION AND DEDUCTIONS

Below is a summary of the scientific findings of the Catlin Arctic Survey, their implications and wider comment about the state of the floating sea ice of the Arctic Ocean.

Prof Peter Wadhams, Polar Ocean Physics Group, Dept of Applied Mathematics & Theoretical Physics, University of Cambridge, has been Catlin Arctic Survey's lead scientific adviser from the beginning of the project. Professor Wadhams helped in the selection of the route to be taken in the northern Beaufort Sea.

Prof Wadhams is one of the world's leading authorities on the current and future state of the sea ice cover in the North Pole region and leads a research programme at the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge.

The analysis of the data collected by Catlin Arctic Survey was undertaken by Professor Wadhams and another researcher in this Polar Oceans Physics Group, Nick Toberg.

Their report "Verification of Catlin Arctic Survey Surface Observation Techniques" (N. Toberg & P. Wadhams) will be developed into a paper for submission to the scientific journal "Cold Regions Science and Technology" (Elsevier).

The Catlin Arctic Survey undertook a trek across the floating sea ice of the Arctic Ocean for 73 days, beginning on March 1st 2009. The team of explorers was led by Pen Hadow. Along with colleagues Martin Hartley and Ann Daniels, Hadow covered a distance of 435 kilometres heading in a northwards direction from 81.83°N 129.97°W, finishing on May 7th at 85.45°N 124.84°W.

The intention of the survey was to capture data on the thickness of the floating sea ice. Hadow developed with scientists a pioneering method to conduct the survey. This included manual drilling at regular intervals along the route and observations of morphological features such as pressure ridges, rubble fields and open leads of water.

Six thousand separate pieces of data were generated and have been analysed by the Polar Ocean Physics Group, University of Cambridge. They have found them to be scientifically valid to produce values for the mean ice thickness and the distribution of different ice thicknesses.

The scientific value of the survey is enhanced because Catlin Arctic Survey was the only team from any country surveying Arctic Ocean sea ice thickness in 2009, making the results the most current.

The measurements can be summarized as follows:

- the average (mean) thickness of the ice-floes or underformed ice along the route was found to be 1.8 metres;
- the average (mean) thickness of the total ice cover when the substantial volume of ice contained in compressed ridges and rougher rubble fields increased to 4.8 metres. (In the Beaufort Sea it has been calculated that 68-73% of the volume of the total ice mass during winter is composed of deformed multi-year ice in features such as pressure ridges.
- The 1.8 metre ice floe thickness is within the normal range of ice thickness associated with ice formed from open water the previous summer.

- Catlin Arctic Survey demonstrated that the entire traverse across the northern margins of the Beaufort Sea covered by the survey was characterized by first year ice. This is the significant finding by CAS because the region has traditionally contained older, thicker multi-year ice. This is a key discovery because it means this area of ice is now more likely not to survive the summer melts in future and will become open water each year, bringing forward the likely date when the summer sea ice will be completely gone.

Catlin Arctic Survey's core scientific objective is 'to help scientists determine with a higher degree of certainty the likely timeframe for seasonal sea ice loss'. The data supports the new consensus amongst sea ice researchers, based on the seasonal variation of ice extent and thickness, and changes in temperatures, winds and especially ice composition, that the Arctic will be ice-free in summer within about 20 years, with much of the decrease happening within 10 years.

The Catlin Arctic Survey sea ice data has now been processed by the University of Cambridge, and is now formatted for use by any research group focused on the modelling of current and future Arctic Ocean sea ice conditions.

SEARCH Sea Ice Outlook (an international collaborative scientific effort focused on modelling sea ice conditions and part-funded by the US National Science Foundation and the US National Oceanic & Atmospheric Administration) has now received the processed data and will be incorporating it into its Autumn Review due to be published on 24 October 2009. SEARCH involves approximately forty leading sea ice research groups from around the world who specialize in modelling different aspects of the sea ice and the processes affecting its state. (Note: SEARCH stands for Study of Environmental Arctic Change).