GUEST EDITORIAL

Climate Support Services for Canadian Naval Operations

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❄ INTRODUCTION

In the Spring 2005 issue of *Starshell*, an article regarding future operations in the Arctic [*"A Canadian Naval Capability in the Arctic" by Rob Huebert, PhD*] was based on the premise that global warming will continue and that increasing open water will make the Arctic more navigable to merchant ships and naval vessels than at present.

Guidance on climate change issued by the Intergovernmental Panel on Climate Change (IPCC) to policy makers and planners, tends to support this prediction but not without some fundamental reservations. This has caused well meaning but partially informed environmental activists to issue some more positive predictions which have only a tentative scientific basis. In turn, these have been made sensational by quasi-scientific editorials, articles and letters in the popular press.

However, in the opinion of many scientists with global expertise in palæo-climatology, in solar physics and meteorological/oceanographic operational services based on instrumental data, climate change is still too complex to predict with any degree of certainty. It must be realized that the IPCC was set up by governments to ascertain the positive effects of fossil fuel emissions upon "greenhouse gas" (GHG) global warming — not to investigate with equal intent the contributory, or offsetting effects that natural variability may be causing. Natural variation components remain poorly estimated integers in the complex regression equations of climate change models.

This article endeavours to present a balanced appreciation of the state of climate research to date; particularly with reference to the Arctic. Moreover, to recount briefly the participation of the Canadian Navy in the research and development of environmental data collection and its application to marine operations in all our areas of national and NATO responsibility, including the Arctic.

❄ DATA SOURCES

Among the centres of expertise in Arctic climatology, oceanography and ice coverage variability, the USA/USSR International Arctic Research Centre (IARC) at Fairbanks, Alaska, has collected and analysed an extensive data base of Arctic surface station reports of the last century. The most authentic satellite information is found in the Atlas and papers published by Oceans and Ice Branch, NASA, Greenbelt, MD. Additionally, the Canadian Ice Service, Ottawa, specializes in conditions in Canadian waters and the Norwegian Polar Institute, Oslo, in the Norwegian and Barents Sea areas.

❄ SOME CLIMATE CHANGE FACTS

This section is based on the author's personal contact with research scientists at these foregoing centres of expertise. Also, over fifty years experience in global operational marine meteorology in the RN and RCN, employment by the UN (WMO/UNDP) and participation in the deliberations of WG1, the Scientific Assessment Group of the IPCC.

There has been no publication issued to date under the auspices of these centres of expertise which suggests that Arctic climate, as a whole, is currently changing beyond the range of variability experienced in the first half of the last century. The Arctic warmed most rapidly in the 1920-40 period, reaching a maximum temperature around 1938. During the next thirty years it cooled with similar rapidity, before starting to rise again more slowly over the past thirty years. The current temperature has not yet reached the previous maximum — as shown in Figures 1 and 2.

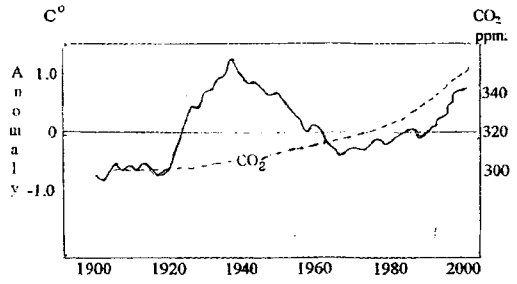

Fig. 1. Arctic Composite Mean Annual Surface Temperature.

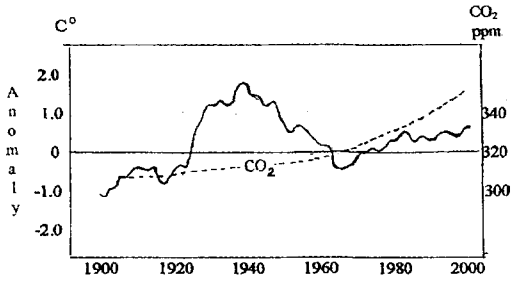

Fig. 2. Arctic Composite Mean Winter Surface Temperature.
(Adapted from Polyakov, I. et al 2002)

Glacier growth and melting vary locally in speed and extent. Glaciers are slow moving ice rivers dependent, for the most part, upon steady precipitation above the freezing level — so are often in a state of flux in temperate or tropical latitudes. In some polar regions, precipitation tends to be persistent enough to provide a balance between ice accumulation and loss, and iceberg release. In Greenland for example, summer melt and iceberg release on the east coast are countered by heavy precipitation on the west coast causing the glacier to retain a fairly steady balance (Gribben, J.

1995). NASA scientists have estimated from the satellite readings over the past twenty years, that there has been an inter-hemispherical balance in the polar glacier cover. The change in global sea ice extent has been marginally negative (in the order of -0.01 + /-0.003 x 10^6 km^2/decade), and there has been no significant change in the ice-free areas in the global ice-packs. (Gloersen, P. 1999). See Figure 3 below.

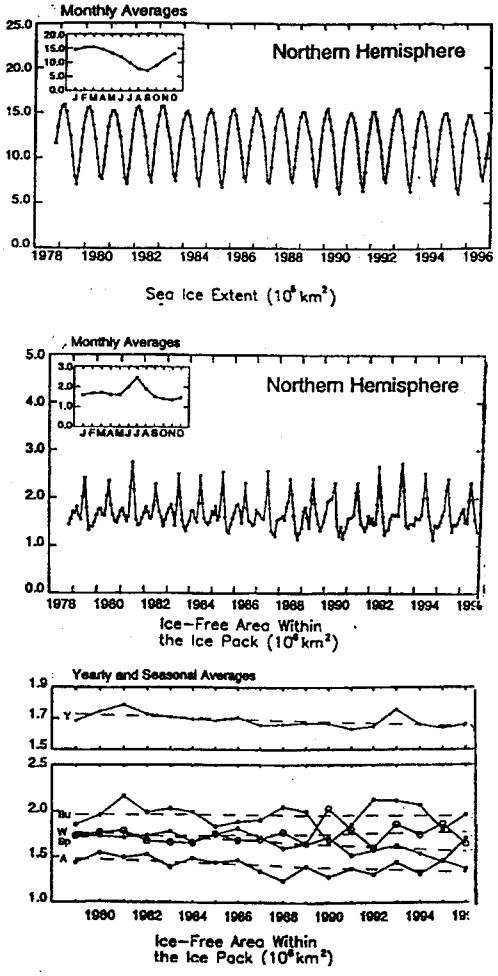

Fig. 3. Sea Ice Extent and Ice-free Areas in the Ice Pack. (ex Parkinson, C. et al, 1999)

Over the past century there is no apparent correlation between the rise in GHGs and temperature change in the Arctic (Figures 1 and 2). Temperature tends to be governed at the Pole, by some inter-decadal natural variability in atmospheric and oceanic circulations such as the North Atlantic (NAO) the Pacific/North America (PNA) pressure oscillations, El Niño events, and possibly the Gleissberg 80 year solar cycle (Mysak, L. 1989; 1990).

❄ MILITARY PARTICIPATION

Most of our readers will be aware that expertise in marine environmental support services has been actively pursued to ensure a high level of proficiency in naval operations in the RN, USN and Canadian navies since WWII. The advent of the nuclear submarine, with its high speed and capability of operating in ice covered waters, created a period when conventional surface ASW defence was at a disadvantage. Better detection systems were urgently needed to counter this defence deficiency.

In 1960 the Canadian Forces Weather Service, with assistance from the Bedford Institute of Oceanography (BIO) and the Defence Research Establishment Atlantic (DREA), joined with similar RN and USN agencies to develop improved anti-submarine warfare environmental prediction systems (ASWEPS). An Ice Information Centre under the direction of an ex-RCN officer, was set up in Halifax by DOT.

In 1965, SACLANT recognised that ASWEPS advice was needed throughout NATO sea areas. A research centre was established in La Spezia, Italy, and a planning coordinator appointed on the NATO staff in Norfolk, VA. to initiate an operational support services organization. The RCN accepted this responsibility and held this post for about the next twenty years.

As oceanographic information is applicable to all marine operations, the organization was renamed the NATO Military Oceanographic Service (MILOC) and co-located and combined with active NATO Fleet Weather Centres. The METOC Centre in Maritime Command HQ Halifax, was established in 1970 and tasked to provide continuous analysis and forecast services in meteorological, oceanographic and ice information, by a dedicated FAX broadcast, in support of marine operations in the Canadian Atlantic and Arctic sea areas. A centre in Esquimalt was also activated for West Coast operations.

Consequently, when it comes to expertise in environmental support to marine operations in all our sea areas, there exists a wealth of empirical knowledge and operational competence within the CFWS and the Canadian Ice Service. Moreover, we have the scientific research backup from highly qualified Defence Research Establishments on both coasts and in Ottawa.

It should also be appreciated that NATO is not just a military organization, but also comprises civilian committees. Among these, there is a Science Committee under which exists a subcommittee on Oceanographic Research which has sponsored many investigations in Canadian universities in marine environment science over the past fifty years.

Naval operations planners will also be aware that navigation publications such as Sailing Directions, UK Admiralty, USN and Canadian Coastal Pilots, also provide meso-scale regional environmental data and even micro-scale information down to harbour area specifications. These publications are continually updated whenever relevant new intelligence is received.

❄ SCIENCE AND POLITICS

Let us now examine the main reasons for dubiety in the global warming hypothesis by some scientists, many of whom have been closely associated with the IPCC but now find its politicised and narrow approach to climate change so biased as to be scientifically unacceptable. Firstly, CO_2 is not the major "greenhouse gas" — which, by far, is water vapour. The IPCC admits that the effect of water vapour is too complex to estimate accurately, despite the fact that it is believed that a 4% rise in cloud cover might completely negate the anthropogenic GHG warming component. Moreover, palæo-climatic information gleaned from historical documents, solar and astronomical observations, and proxy data from tree rings, ice cores, etc., indicate that climate variability, prior to the industrial era, was of a similar order in magnitude as that recorded by

instruments in the last 200 years. However, even warmer and colder periods may also have occurred during the past millennium associated with natural causes which remain active today.

Secondly, the IPCC Panel is itself a house divided on the cause of climate change. The Chairman, Sir John Houghton (a former Director of the UK Meteorological Service) has published papers and made numerous speeches confirming that GHGs are now, without doubt, the main cause of current climate change anomalies.

However, his Deputy is Prof. Yuri Izrael, Director of the Climate and Ecological Institute of the Russian Academy of Sciences. He publicly pronounced, prior to the recent G8 meeting in Gleneagles, Scotland, that the global warming hypothesis is too overshadowed by fallacies and misconceptions to form the basis for political decisions. There is no proven link between human activity and global warming. (Note: Sir John Houghton has to voice the political preference of Tony Blair on this issue, and Yuri Izrael that of Vladimir Putin.)

So much for the scientific integrity of the IPCC at the Panel level. No wonder why so many of the top scientists have resigned from WG1 — the Scientific Assessment Group — when their scientific guidance is also being revised by the editorial staff, to be politically acceptable for government and public policy and planning. In fact, the Guidance Report has to be approved by governments before being publicly released in order to maintain policy and planning continuity.

❄ ALTERNATIVE HYPOTHESES

There are two other hypothetical scenarios for climate change which have been issued by teams of scientists in highly regarded research centres. References to these are buried in the fine print of IPCC documentation and rarely get press coverage.

Oceanographers at Woods Hole Oceanographic Institute and at Princeton University are warning that, if warming should continue unabated, the upper levels of the Greenland and Labrador Seas would become deepening layers of low saline ice-melt water. Being relatively buoyant, these would not sink to maintain the North Atlantic Deep Water (NADW). Normally, the latter advects southwards to equatorial latitudes where it causes tropical water to be fed into the Gulf of Mexico to generate the Gulf Stream, the main cause for the warm characteristics of the North Atlantic and Norwegian Sea. If this thermohaline pump circulation fails, then the Norwegian Sea will freeze over and a Little Ice Age event will re-occur, such as happened in the period 1670-1710 (known as the Maunder Minimum).

There have been signs in the last fifty years that the thermohaline pump is in a critical state. Periodic excesses of ice-melt water in the Labrador Current have been coincident with the cod fishery failure; also a significant cooling of the Gulf Stream occurred between 1955 and 1990, which has only warmed marginally since then.

A second scenario is that held by many solar physicists who have found that solar component is far from constant in climate change temperature trends. It is governed by variability in at least four cycles (the Schwabe, Hale, Gleissberg and Suess) with periodicities of about 11, 22, 80 and 200 years respectively. In particular, when the apices of the two latter are in conjunction (such as they are now), a very warm period occurs. However, during this century, they will move towards their nadir values. The composite effect will be a period of about sixty years of cooling, with climatic conditions becoming similar to the Maunder Minimum. Global cooling would be far more devastating than warming in meeting the food needs for a world population far in excess of today.

❄ CONCLUSION

Aspects of the global warming hypothesis are being emphasized and utilized by government to meet political ends including satisfying the laudable pressure by environmental activists to address the hazards of atmospheric, terrestrial and oceanic pollution. However, with regard to climate change, until the variability in all the contributory components can be assessed with some degree of confidence, guidance is partial and unreliable. In the meantime, the wise approach to all planning with regard to climate variability, is to maintain an efficient flexible response to extreme conditions which often tend to be local and the intensity unexpectedly severe.

❄ ACKNOWLEDGEMENTS

In the appendices, diagrams of Arctic temperature and ice cover analyses relevant to statements in this presentation are submitted. The author is grateful to Professor Igor Polyakov of IARC, and Dr. Per Gloersen of NASA, for these, and for their advice and peer review in compiling this presentation.

❄ REFERENCES

Gloersen, P. et al, 1999. Spatial Trends and Seasonality in Hemispherical Sea Ice Cover 1978-1996. J. Geophys. Res. Vol. 104, No. 09.

Parkinson, C. et al, 1999. Arctic Sea Ice Extents Areas and Trends. J. Geophys. Res. Vol. 104, No. 09.

Polyakov, I. et al, 2003. Variability of Air Temperature and Pressure in the Maritime Arctic 1875-2000. Journal of Climate Vol. 16, 15 June 2003.

NASA SP-511 1993. Arctic and Antarctic Sea Ice 1978-1987. Satellite Passive Micro-Wave Observations and Analyses.

Mysak, L. et al, 1989. Arctic Sea Ice Extent and Anomalies. Atmosphere/Ocean 27, pp. 376-405.

Mysak, L. et al, 1990. Sea Ice Anomalies in the Greenland and Labrador Sea and their Relation to Interdecadal Arctic Climate Cycles. Climate Dynamics 5, pp. 113-115.

Gribbon, J. 1995. Global Warming Cuts No Ice on Greenland. New Scientist, 11 Nov. 1995.

Canadian Ice Service 2002. Sea Ice Climatic Atlas, Northern Canadian Waters 1971-2000.

Dick Morgan served forty years in the RN and RCN, as well as in NATO appointments, retiring from DND in 1979 as the Superintendent of Meteorology and Oceanography. He has been employed as an expert by the UN World Meteorological Organization as an adviser to marine environment support services in SE Asia, and was enrolled as a researcher at Exeter University in 1998. He received his PhD in 2000 for a thesis on Climate Change in the North Atlantic relevant to the Global Warming Hypothesis. Dick is a member of NSNOA.