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TO: D J FISK, DEPT OF ENVIRONMENT. FAX NO. 01-276-8355.
FROM: DR P WADHAMS, AT SEA "POLARSTERN". FAX NO 00871-1120543.
URGENT - PLEASE DELIVER TO DR FISK TODAY. 2 pages.

Dear Dr Fisk,

Thank you for your letter of 16 October, transmitting the Prime Minister's request for ideas relevant to her forthcoming speech on global environmental issues to the UN General Assembly. I received the letter by fax today aboard this ship, and I enclose a reply as follows.

FS "Polarstern". At sea, Antarctic Ocean. 23 October.

Dear Prime Minister,

Thank you very much for your invitation to submit ideas relevant to your forthcoming speech to the United Nations General Assembly. My office faxed the letter to me today aboard ship, so please excuse the haste of my reply.

In the polar regions today we are seeing what may be early signs of man-induced climatic change. Data now coming in from Halley Bay and from instruments carried aboard the ship on which I am sailing show that we are entering a spring ozone depletion which is as deep as, if not deeper than, the depletion in the worst year to date (1987). It completely reverses the recovery observed in 1988. The lowest recording aboard this ship is 150 Dobson units for ozone total content during September, compared with 300 for the same season in a "normal" year.

In the Arctic we found that in 1987 the sea ice over a large region north of Greenland was significantly thinner than in an earlier survey in 1976, amounting to a 15% loss in average thickness over an area of 300,000 sq km (twice the area of Great Britain). If not a sign of warming this is at least a sign of a radical change in the pattern of surface currents, which normally drive the ice towards the coast of Greenland and pile it into pressure ridges. In the Antarctic we have not found evidence of thinning during our present expedition, but our data confirm that the first-year ice which forms the bulk of the Antarctic sea ice cover is remarkably thin (only 50-80 cm thick) and so is probably unable to sustain a significant atmospheric warming without melting.

Sea ice is a thin and delicate skin separating the ocean from the atmosphere over an area of more than 30 million sq km. It reflects most of the solar radiation falling on it, so helping to cool the planet's surface. If its area were reduced the warming of the Earth would be accelerated due to the extra absorption of radiation by the ocean. Sea ice also takes part in a complex set of interactions with the ocean, including the production of "bottom water" by the sinking of surface water which has been made more dense by the addition of salt from freezing. This sinking carries CO2 into the deep ocean. If this process were to cease the world would lose one of its major oceanic CO2 sinks, again accelerating greenhouse warming.

While the stability of the great continental ice sheets which cover Antarctica and Greenland is not seriously doubted, there have certainly been unusual events recently. Both in 1986 and 1987 there were break-outs of giant icebergs (up to 80 miles long) from the ice shelves in the Ross and Weddell Seas, carrying away a volume of ice many times that normally calved in a year from the entire coastline of Antarctica.

The lesson of these polar processes is that an environmental or climatic change produced by Man may take on a self-sustaining or "runaway" quality because of positive feedbacks which are not weakened by

countervailing restraints. The effects may therefore be greater than one would expect from the magnitude of the original cause. The change may also be irreversible: an ice cover once removed may be difficult to re-establish, just as the creation of new desert by the expansion of the Sahara may be a process that cannot be reversed.

The polar regions are only one of the "indicator areas" of the world in which the climatic effects of our interference with the environment may be detected. But they are especially important because the magnitude of the warming is expected to be greatest at high latitudes, so that the polar regions may provide the earliest evidence of significant change taking place.

I would like to suggest an idea here. A valuable role which we as a nation could play, in collaboration with the other great scientific nations of the developed world, would be to undertake the monitoring of the climate-related processes and changes which are occurring in the polar regions, in order to take advantage of the opportunity which this early warning offers. The job of monitoring would be a major one, including work on the atmospheric and oceanic circulations, sea ice extent and thickness, changes in ice sheets, and associated biological changes. The whole project could be called a "World Polar Watch", and it would provide unique opportunities for fruitful international collaboration, including an important role for the developing countries of the South. In the Arctic the work of the World Polar Watch would necessarily be carried out by developed nations with scientific interests there, perhaps through the newly-established International Arctic Sciences Committee which would offer new scope for collaborations involving the USSR. In the Antarctic the work could be carried out through SCAR (the Scientific Committee for Antarctic Research) and could involve those developing nations which have joined the Antarctic Treaty system and SCAR but which at present lack an inspiring scientific role. Here the World Polar Watch offers a wonderful opportunity for a genuine unification of effort and partnership between North and South, with a goal which is important to both.

While working down here for the past six weeks I have been conscious that even the Antarctic Ocean is not a dead sea of ice, but is itself full of life - penguins, seals, whales and petrels. The rest of our planet, and the precious life that it contains, may be able to benefit from the vital information that these regions have to offer,

Yours sincerely,

Peter Wadhams

Dr Peter Wadhams.

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