GUEST COMMENT

The Next Century's Environment and Need for Observational Data

The 20th century is approaching its end under conditions of major intensification of a number of global environmental problems. Of these the most 'popular' is climate warming as a result of the increasing concentration in the atmosphere of such 'greenhouse' gases as carbon dioxide, methane, nitrous oxide, and tropospheric ozone.

As has been correctly mentioned in the Report of the Intergovernmental Panel on Climate Change (IPCC), approved by the participants of the Second World Climate Conference (held in Geneva, Switzerland, during 29 October–7 November 1990), it is not yet clear to what extent the global climate warming observed during the last 100 years has been due to the natural variability of the climatic system (including the atmosphere, ocean, land, ice-cover, and comprising The Biosphere) and the anthropic increase in the concentration of 'greenhouse' gases (GGs). The climate modelling results are not at variance with the possibility of anthropogenically-induced warming, but cannot be considered as the cause-and-effect explanation. Doubtless, the very important fact that water vapour is the principal GG, requires much more attention.*

The problem is that water vapour exists on the Earth in three phases, and this circumstance causes considerable difficulties in taking account of water phase transformations and their consequences. So, for instance, the problem of parameterization of the processes of formation and evolution of cloud cover, as well as of its interaction with radiation, has not been solved so far (Kondratyev, 1992). No less important is the consideration of the climate-forming role of the interaction between the atmosphere and oceans.

Climate change is only a part (and not even the main one, in spite of its practical significance) of the problem of global change. Of key significance (also from the viewpoint of climate change) is the fact that, under conditions of an undisturbed environment, the global biogeochemical cycles of various elements (C, S, N, P, etc.) are closed with a high degree of accuracy (of about 0.01%). During the last century, this closedness decreased by an order of magnitude: if this tendency continues, it could lead to a global ecological catastrophe – such as complete destruction of the existing Biosphere in a few centuries' time. Thus, the problem of Biosphere dynamics acquires fundamental importance (Kondratyev, 1990; Marchuk & Kondratyev, 1992).

Analysis of Biosphere dynamics on the basis of observational data requires a combined use of both conventional (on land and in the oceans) and satellite observational means. It is highly important to concentrate conventional observational means (ships, especially) in those regions of the globe where ecological variability is particularly strong, as well as to apply the ecosystem–ecocomplex approach to planning observational systems. This situation puts forward, as a high-priority problem, the necessity to plan optimally global observational systems, including, for example, those which are being envisaged for the project 'Mission to Planet Earth'. The problems mentioned must be central ones in the course of the realization of the International Space Year.

The Earth's system is an open one in the sense that it is subject to considerable impact of various cosmic factors, such as the variability of solar activity and galactic cosmic rays. Many aspects of these problems are uncertain so far, and this opens up possibilities for surprise phenomena. However, long-term monitoring of total and spectral extraterrestrial solar radiation is necessary (Kondratyev, 1992).

KIRILL YAKOVLEVICH KONDRATYEV, *Counsellor*
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* A referee emphasizes that 'the impact of water vapour as a greenhouse gas has been grossly overlooked, and that indeed this is a fundamental problem', adding 'the changes to the global biochemical cycles are also of very great concern'. — Ed.

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