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ACTIVITIES OF THE HYDROMETEOROLOGICAL SERVICE OF THE SOVIET UNION

By Academician E.K. Federov

The presence in Australia of Academician Federov, Second Vice President of WMO for a meeting of the Bureau of the World Meteorological Organisation provided the opportunity for the Australian meteorological community to hear an authoritative first-hand account of the activities of their counterparts in the Soviet Union. Academician Federov opened his address by affirming his belief that, in world meteorology, the exchange of ideas and experience is every bit as important as the exchange of information in the usual sense and so he welcomed the opportunity for an exchange of ideas with Australian meteorologists.

As implied by its title the Hydrometeorological Service of the USSR is responsible for the provision of information and forecasts concerned with all phases of the water cycle - their responsibilities extend to conditions of the rivers and seas as well as the atmosphere. The basic product, as with meteorological services throughout the world, is information - past records and future anticipated conditions of rivers, seas and weather for use in planning and construction, and in exploitation of transport systems etc. In appraising the role of the Hydrometeorological Service in the USSR economy, Academician Federov estimated that, with a cost of 5-6000 million roubles (1 rouble = \$1.01) annually due to natural disasters (drought, etc.), the saving realised by the activities of the Hydrometeorological Service is of the order of 5-800 million roubles and this would rise to 1500 million roubles if the service was fully exploited by its user interests. This is to be compared with an annual expenditure of 250 million roubles to maintain the Service.

The USSR Hydrometeorological Service incorporates a number of research institutes and these account for 20 percent of the total budget. Approximately 4000 full synoptic observing stations (6-7 staff each) are supplemented by another 7000 stations reporting one or two elements only and staffed by one person on a part-time basis. There are 190 radiosonde stations in Soviet territory and approximately 14 weather ships take observations at sea. The 500 airport forecasting offices and 200 weather bureaux in larger cities are administered through 34 local administrative offices, one in each Republic excepting the Russian Federal Republic which has 20. Each of these local offices incorporates a forecasting and climatological office and a communications unit. In addition there are four USSR Regional Meteorological Centres of World Weather Watch. In total, the staff of the Hydrometeorological Service numbers approximately 75,000 of whom 55,000 are women.

Academician Federov listed as the three main problems faced by the Hydrometeorological Service: technology, forecasting and weather modification, and he discussed these in turn in some detail. The problems incurred by a rapidly developing technology include heterogeneity of instrumentation and observational technique. With the advent of radar and sputniks, a complex of conventional land-based and remote sensing techniques must be integrated into a single processing system. Plans at present in the implementation stage include a network of 300 meteorological radars each with a radius of activity of 200 km; 5000 semi-automatic observing stations (manned only by day with a staff of about 2 instead of 6-7) and a

number of fully automatic stations; satellite systems with continuous scanning television camera and 3 channel (0.3-3.0 μ , 8-12 μ , 3-30 μ) radiometers; routine precipitation measurement by radar (comparison tests have shown that precipitation distribution can be assessed by radar with an accuracy comparable to that from a conventional raingauge network with one raingauge to every 400 square km) possibly involving two or more radar beams at different frequencies or with different polarisation; routine snow depth measurement by aircraft monitoring the distribution of gamma radiation from the ground, as well as the use of aircraft for assessing the quantity of grass on the prairies and conditions of harvest.

Moving to the problem of forecasting, Academician Federov dealt only briefly with the short range forecast question, mentioning that Moscow and ten other centres in the USSR issue routine prognoses using numerical methods, and more refined primitive equation models are under development with simultaneous quantitative research into the important physical processes (e.g. the condensation process) which provide part of the link between the forecast pressure field and the actual weather. Turning to long range forecasting the speaker mentioned that this had a history extending over 40 years in the USSR. The original method based on the recurrence of types of synoptic evolution is still used, and the accuracy of the resulting monthly forecasts is assessed at 65 percent. Along with this synoptic technique the methods of physical statistics employing such parameters as ocean current temperature anomalies are being employed, but the results are marginally less satisfactory than those of the synoptic technique. New methods are currently being developed by Blinova and her co-workers.

Moving to the third topic, that of weather modification, Academician Federov stressed that the greatest obstacle is the high energy of atmospheric processes. In the USSR dry ice and silver iodide seeding of clouds is regularly undertaken for 3 purposes: (i) to suppress hail, (ii) to dissipate cloud and fog on airports and (iii) to stimulate rain. The hail suppression technique involves the location of the strong updraught region within the storm by radar and the firing of shells or rockets into the hail area. Though not always successful, it is estimated that a saving of some 30 million roubles results annually for an expenditure of 3 million roubles on the hail suppression programme. Dealing with the use of cloud seeding for rain stimulation, while claiming a 10 percent increase in precipitation, the speaker took pains to stress that, physically, clouds act as generators rather than bottles and the precipitation released by stimulated glaciation of supercooled clouds cannot be greater than the relatively small water storage within the cloud. The average naturally precipitating cloud releases something like 20 times more water than contained within its boundary at any particular instant.

Academician Federov concluded his interesting and informative talk with some general comments and personal views on the prospects for climate modification. He then showed two recently produced Russian films with sound-track commentary in English, dealing with high atmospheric soundings by land-launched and ship-launched rockets in the Soviet Arctic and with the Russian meteorological satellite systems.

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