measurements of the concentrations of various particulate and gaseous pollutants, the chemical constituents of precipitation, turbidity and the downward components of radiation. Special air pollution research networks will also be operated from time to time for testing physical and numerical models. In this connection, the co-operation of the provinces will be sought to exchange suitable data.

Work continued on improving the performance of the lysimeter. A successfully modified soil moisture control system was designed and installed. In order to operate the lysimeter in severe winter conditions, a device was developed and installed to prevent ice formation and snow accumulation in the gap between the lysimeter and the retaining wall. In a co-operative research program with the Ontario Ministry of Agriculture and Food in connection with frost protection of vineyards, frequency and strength of inversions at three sites in the Niagara Peninsula were continuously measured. Experiments were also conducted to bring down warm air from aloft using helicopters to stir the air at a height of about 75-100 ft. Work was carried out on evaporation from sunken and non-sunken class A pans to determine their energy components in order to arrive at the most important meteorological parameters for reduction of data to open water evaporation.

Hydrometeorological studies contribute to greater efficiency in the design and operation of dams, sewer systems and other water control structures; improved forecasting of lake and river levels, floods, water supply and irrigation requirements; and more efficient design and operation of hydro-electric power developments. Work continued on improving estimates of the distributions of precipitation, evapotranspiration and snowpack water content using surface instrumentation and remote sensing techniques. Progress was made in the development of mathematical models of water balances and energy balances involving meteorological data and hydrological applications. Efforts were directed to studying the effects of man on the hydrological cycle and the resultant spectrum of water-related environmental management problems. Much of this work was carried out in support of federal-provincial projects and the International Hydrological Decade.

Studies of atmospheric processes in the earth's atmosphere boundary layer, that layer of the atmosphere from the surface up to a few thousand feet, are of importance in such fields as agriculture, forestry, oceanography, weather forecasting, etc. Study topics include wind and turbulence in the surface boundary layer; turbulent fluxes of momentum, heat and moisture; radiation and surface energy balance; and temperature and humidity microstructure. A major program was carried out to investigate the interaction of the atmosphere and Lake Ontario by measuring the evaporation and heat flux from or onto the lake and the wind drag on the lake surface. A highly instrumented jet aircraft was used to extend the level of observations up to 1,000 ft and over the whole lake. The results will be useful in incorporating the lake effects into forecasting models.

Another major program was the Global Atmospheric Research Program (GARP) Atlantic Tropical Experiment (GATE). The main interest of this program is in developing dynamical and thermo-dynamical models of the tropical boundary layer. In particular, the interaction of the boundary layer with the cloud layer and larger phenomena will be studied.

Meteorological services research. A rapidly expanding program of applied research, including some more fundamental aspects where necessary, is grouped together in the Meteorological Services Research Branch in order to provide support for the expansion and improvement of forecast services of the AES. Centralized aspects of the forecast system, carried out at the Canadian Meteorological Centre, receive support through a program of research and development in numerical-dynamical weather prediction using a very large computer to simulate atmospheric behaviour. Improvements are being made based on advances in dynamic, computational and occasionally quasi-empirical techniques. International effort in this area is being strongly influenced by the Canadian program.

Research and development to improve and automate the regional and local operations of the forecasting system are being intensively pursued. New forecasting operations are being investigated, including systems for predicting air pollution potential, ice in navigable waters, forest fire hazards, avalanches and wind-waves. A comprehensive environmental prediction system in support of oil drilling in the Beaufort Sea is being developed and will include prediction of ice masses and ice floes, weather elements and sea-state.