OBSERVATIONAL EXPERIMENT OF THE ANTARCTIC OZONE HOLE OF 1991 UNDER THE POLAR PATROL BALLOON (PPB) PROJECT: (1) A PRELIMINARY RESULT OF TRAJECTORY ANALYSIS (ABSTRACT)

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The Polar Patrol Balloon (PPB) project is to execute a long duration circumpolar balloon experiment in the Antarctic using a zero-pressure balloon with an auto-ballast control to keep it at an almost constant pressure level in the stratosphere. The PPB project has been developed under cooperation between the Institute of Space and Astronautical Science and the National Institute of Polar Research. An actual trajectory of a PPB launched from Syowa Station (69°S, 40°E) is compared with that calculated from objective analysis data of the Japan Meteorological Agency (JMA). The differences between the actual and calculated trajectories are discussed to check reliability of the JMA objective analysis data for the stratosphere, and to detect sub-synoptic scale variability due to gravity waves and other causes.

A balloon for observation of ozone and aerosol was launched from Syowa Station at 0755 UT on 23 September 1991, directed eastward around the 80 hPa level (~16 km) in the lower stratosphere in the inside of the polar vortex, i.e., inside the ozone hole, for about 5 days. It reached near 80°S, 250°E (110°W) around 02 UT on 28 September after flying three-fourths of the way around Antarctica in the stratosphere, and dropped to the Ross Ice Shelf at the earth's surface around 85°S, 200°E (160°W) around 20 UT on 28 September. The plan of the experiment is described in H. Kanzawa and Y. Kondo (Antarct. Rec., 35, 227, 1991), and the results of the ozone and aerosol measurements are presented by Hayashi et al. in the present issue.

The calculated trajectory is, in general, poleward of the actual one. The JMA wind speed is somewhat larger than the actual one. For example, at 12 UT on 24 September, the calculated position is about half a day forward of the actual one. The faster predicted movement may account for the poleward position in calculation. The differences for both cases are considered to be due to sub-synoptic scale motion (e.g., gravity waves) or inability of the JMA analysis to adequately express synoptic scale motion. The next step to distinguish the cause of the differences is to calculate trajectories using the actual positioning data of the PPB at each time step as initial positions, and to compare the trajectories with the actual one at each time step.

For details, the reader may refer to H. Kanzawa et al. (Proc. 1992 Quadrennial Ozone Symp., in press, 1993).