SATELLITE-TRACKED DRIFTING BUOYS DETECTING OCEAN CIRCULATION

Recently, satellite-tracking of drifting buoys has been practiced widely for collecting environmental data. A few hundred of buoys were deployed in FGGE program, for example, mostly in the Antarctic Sea where meteorological and oceanological knowledges had been relatively limited. In Japan, the Hydrographic Department started the Kuroshio investigation with drifting buoys (Fig. 1) in January 1980, by using the ARGOS system, and has deployed five buoys in several parts of the Kuroshio.

The ARGOS system, operated under the cooperation between the CNES (Centre National d'Etudes Spatiales), NASA and NOAA since 1979, collects and disseminates environmental data being transmitted from fixed or mobile platforms in air or on the earth surface. Location of each platform is determined by measuring the Doppler effect on the carrier frequency (401.65 MHz fixed) of incoming message transmitted from platform to satellite - whose orbit is polar-sun-synchronous with 101 minutes' period. Sensor messages and location are reassembled and stored in the satellite memory for transmitting back to the telemetry stations, and then forwarded to the Service ARGOS Data Processing Center for demultiplexing and processing the results that will be disseminated to users as magnetic tape, telex, print-out, etc.

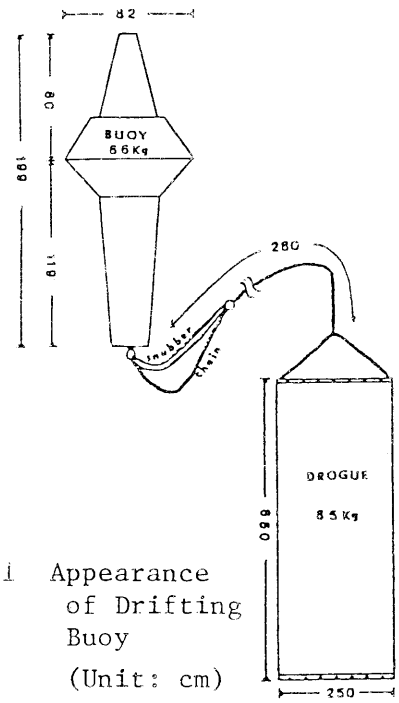

Fig. 1 Appearance of Drifting Buoy (Unit: cm)

The drifting buoys the Hydrographic Department deployed are produced by HERMES Electronic Ltd. (Canada), equipped with transmitter manufactured by HANDER (U.S.A.), and each has two sensors for sea-surface temperature and battery voltage of transmitter. The localization results of five buoys examined on a fixed point (35.6646 N, 139.7654 E) showed a satisfactory accuracy.

The drift trajectories revealed meander and eddies in various areas (Fig. 2). Especially, the buoy, launched in the Kuroshio current west of Okinawa on 11 March 1980, showed an unexpected behavior to oceanographers. That is, it flowed along the Kuroshio for only 7 days after

the launching, but turned to the southwest of Amami-Oshima, and passed to the east of Okinawa in late April. After then, the buoy continued anticyclonic circulation during about 200 days, suggesting the existence of a cold eddy in that area. This was confirmed by R/V Shoyo and Takuyo of the Hydrographic Department in November and December 1980, respectively.

As shown above, buoy tracking proved useful in detecting the variability of ocean circulation, especially in the area where conventional ship observation is ineffective. And it also showed that our knowledge about ocean circulation is still meager except in very limited areas.

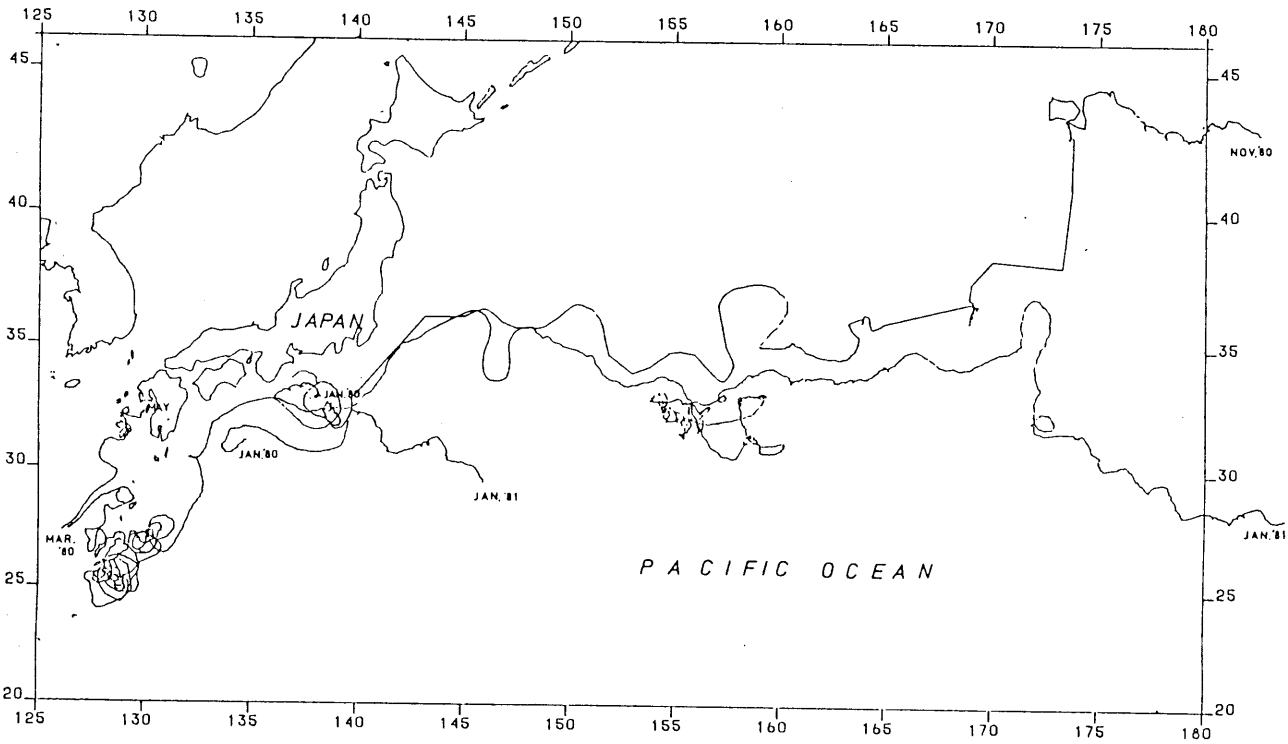

Fig. 2 Drift Trajectories of Buoys in Jan. 1980 - Jan. 1981