**A long-term reference for detecting oceanic variations in the western North Pacific: JMA 50-year long 137**°**E repeat hydrographic section**

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Japan Meteorological Agency has been conducting ship-based repeat hydrographic and biogeochemical observations along the 137°E meridian since 1967 for winter and since 1972 for summer, and we celebrate its 50th anniversary this year. The 137°E section extends from 34°N south of Japan to 3°N off New Guinea, crossing major currents such as Kuroshio, North Equatorial Current (NEC), and North Equatorial Countercurrent (NECC) and major water masses such as Subtropical Mode Water (STMW), North Pacific Tropical Water (NPTW) and North Pacific Intermediate Water (NPIW) in the subtropical and tropical gyres. The 137°E section, as one of the GO-SHIP high-frequency repeat sections, has provided a comprehensive set of physical and biogeochemical measurements, including temperature, salinity, dissolved oxygen, nutrients and carbonate system parameters. The repeat survey along 137°E has been playing an important role as a long-term reference for detecting variations in ocean circulation, oceanic structure and air-sea interactions in the North Pacific, including those related to climate change. For example, the three major water masses mentioned above had significant decadal-scale (about 10 years) variations. These variations were associated with the variability of wind stress field in the central North Pacific characterized by two types of Aleutian Low (AL) changes: a change in the magnitude of AL and meridional movement of AL. The variation in the distribution of the STMW and NPTW were related to large eddy activity in the Subtropical Countercurrent and subtropical front regions between 15°N and 25°N. Furthermore, the137°E section revealed long-term changes of salinity and temperature in the surface and intermediate layers. Rapid freshening on both isobars and isopycnals began in mid-1990s and persisted for the past 20 years in the subtropical gyre. The freshening trend was strongest in STMW in the upper main thermocline, and also existed in a deeper layer corresponding to the Central Mode Water, extending over the whole ventilated thermocline/halocline. Trends of CO2 increase and acidification have also been clearly observed in both surface and interior of this section.