XBT Data Management and Quality Control in Japan (II)

Improving Database by Historical XBT System

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We have started to reassemble historical expendable bathythermograph (XBT) data in order to improve an ocean subsurface database in the North Pacific. In the 1980s and early 1990s temperature observed by XBT were reported at the standard depths or inflection depths because temperature profile was recorded on strip chart (right panel of Figure 1) so that temperature and depth were digitized by hand (middle panel of Figure 1). We therefore discovered and collected about 3,300 of existing XBT strip charts of T-4 probe manufactured by Tsurumi-Seiki Co. Ltd. (TSK) in Japan Meteorological Agency and Japan Hydrographic and Oceanographic Department, and traced a recorded temperature profile at a higher resolution for every chart. The traced data are approximated by a function of elapse time and temperature so that we can convert to temperature profiles using fall rate equations which are provided by XBT manufacture, Hanawa et al. (1995) or others (left panel of Figure 1). These temperature profiles can also compare with other instruments such as CTD or Argo floats at the same or neighborhood time and position in order to estimate their systematic errors or uncertainties. The related information such as probe type and manufacture, fall rate equation, type of recorder or converter, launch height on shipboard are also included in database as metadata. The improved database will be used to assess the climate change and the sea level rise in the North Pacific. Furthermore we also discovered about 700 of XBT strip charts by Fuji, antarctic research vesel, in the Southern Ocean(Figures 2 and 3). These profiles obtained by T-5 probe by TSK, and they are not stored in Japan Oceanographic Data Center. Some traced profiles include errors such as spike or measurement failuer caused by noise, broken wire, bottom grounding or others, therefore automatic and expert quality control procedures develoed by International Quality-controlled Ocean Database (IQuOD) project will be adopted and imported to existing database.

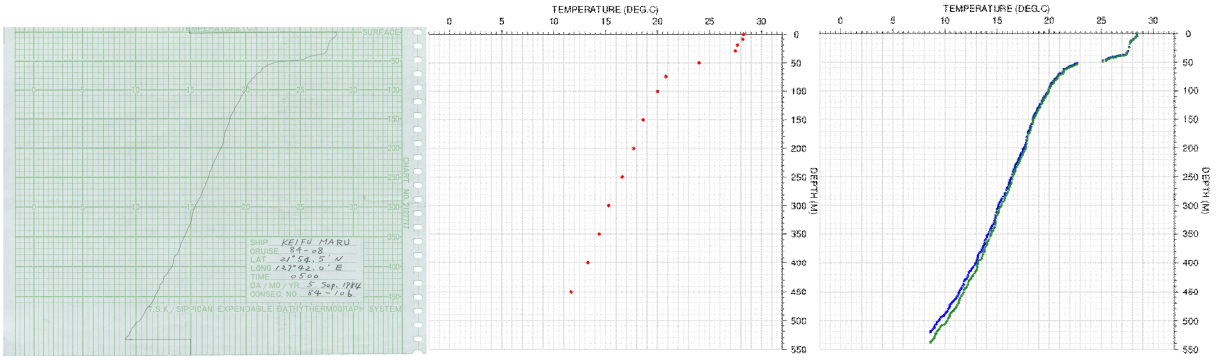

Fig. 1: An example of XBT cast by R/V Keifu-Maru, JMA, in May 1984. Recording profile on strip chart (left), reading temperature at standard depths (center ; stored in existing database), and traced profile in this study (right; bule line shows the observed depth derived from manufacture's fall rate equation, and green line shows the same but by Hanawa *et al.*(1995).).

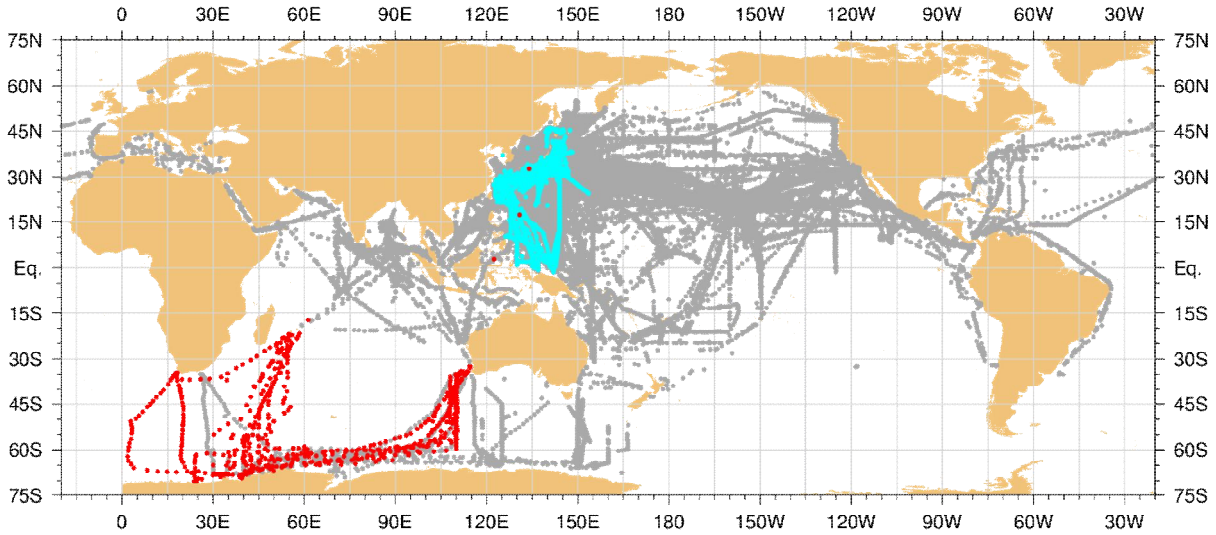

Fig. 2: Station map of all XBT casts archived in Japan Oceanographic Data Center (gray), and traced stations measured by research/survey vessels of Japan Meteorological Agency and Japan Hydrographic and Oceanographic Department (cyan), and new discovered XBT casts by Fuji (red) in this study.

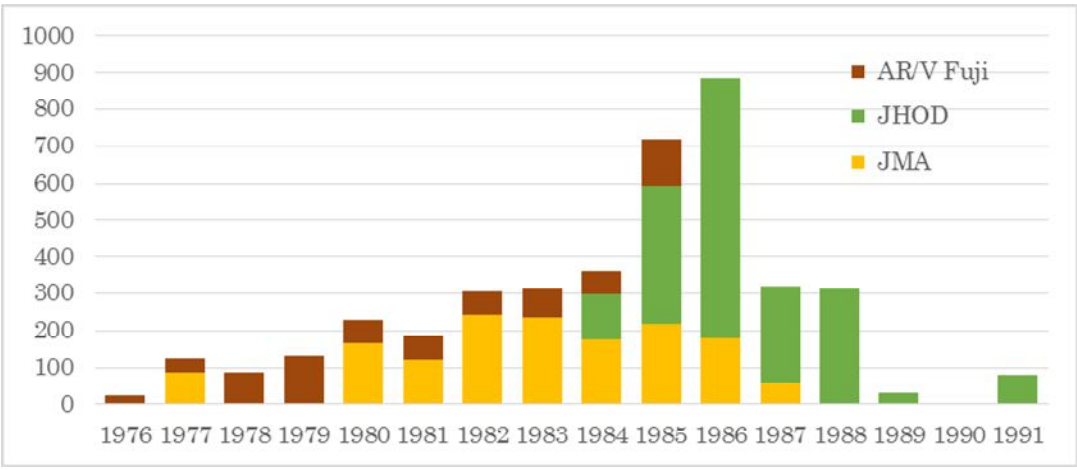

Fig. 3: Annual change of traced historical XBT profiles in this study.